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Implementation of Comprehensive Footcare Program Within Primary Care

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IMPLEMENTATION OF COMPREHENSIVE FOOTCARE PROGRAM
WITHIN PRIMARY CARE

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Presented to the Faculty of the University of the Incarnate Word
in partial fulfillment of the requirements
for the degree of

DOCTOR OF NURSING PRACTICE

UNIVERSITY OF THE INCARNATE WORD

December 2021

ACKNOWLEDGEMENTS

Nurses need to be current and commit themselves to lifetime learning because of the profession's dynamic nature coupled with the ever-changing needs of the patients, new diseases, or existing diagnoses that challenge standing treatment protocols. An advanced practice nurse has more career prospects and increased responsibilities. It also opens the door for specialization in nursing practice areas such as women's health, pediatric, oncology, and family nursing.

I am grateful to God Almighty and all of those I have had the pleasure to work with during this and other related projects. Each nursing faculty member at The University of the Incarnate Word has provided me extensive personal and professional guidance and taught me a great deal about nursing and life in general. I would especially like to thank Dr. Karen Weis. This project would not have been possible without the incredible dedication and efforts of Dr. Weis, who has kindly agreed to be my project advisor. As my teacher and mentor, she taught me more than I could ever give her credit for here. She has shown me, by her example, what a good soldier, teacher, nurse, researcher, and person should be.

Nobody has been more important to me in the pursuit of this career than my family members. I want to thank my mother, whose love, prayers, and guidance are with me in whatever I pursue. Most importantly, I am grateful to my loving and supportive wife, Adunni, and my three beautiful children, Oluwatosin, Adedamola, and Adebowale, who provide endless inspiration. *There is always a light at the end of a dark tunnel.*

Moses A. Ademola-Ojo BSN, RN

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Abstract

The incidence of diabetes and its complications is escalating, with over 34.2 million adults in the United States having diabetes. Despite a decade-long decline in lower-extremity amputations, the incidence is growing (Nichols, 2019), with little emphasis on preventive foot evaluations within primary care. The purpose of this project was the implementation of a multi-faceted program aimed at early identification of lower extremity complications with focused patient education, improved assessment, and documentation, and referral for specialty care. The intervention process included staff training, patient education, foot examination, monofilament testing, pinprick tests, ankle reflex, and tuning fork test. Foot abnormality, loss of protective sensation, differentiation of sharp and dull sensation, vibratory sensation or perceptions, and ankle reflexes were evaluated and measured with the Michigan Neuropathy Screening Instrument to provide objective scoring and determine referrals. Between January and May 2021, 100% of diabetic patients (n = 197) received comprehensive foot assessments and specialty referrals compared to near-zero percent foot assessments in the previous year. I identified 14.1% patients who had high self-foot assessment scores indicating an increased risk of foot ulcers and amputation. All patients received education; 37% had bilateral foot abnormalities, of which 21% required referrals. Approximately 43% of the patients assessed had decreased sensation, without ulcerations. Documentation was completed 100%. Approximately 50% of diabetic foot complications can be prevented with foot care programs that include patient education, regular examination, testing, footwear, nail care, and specialty referrals, all components that can be implemented and sustained by nurse practitioners within primary care.

Keywords: diabetic, diabetic foot, foot examination, foot ulcer, lower extremity amputation, quality improvement

Implementation of Comprehensive Footcare Program Within Primary Care

The incidence of diabetes and its complications are escalating. Available data from the Centers for Disease Control and Prevention (CDC, 2020) indicates that more than 34.2 million American adults have diabetes, with another 88 million people 18 years or older diagnosed with prediabetes. The disease not only affects health and quality of life but also contributes to increased healthcare expenses, labor loss, and costs insurers billions of dollars each year. Some of the most serious problems affecting many of those with diabetes are peripheral neuropathy, peripheral arterial disease, and associated ulcers, which leads to an increased risk for foot complications, lower extremity trauma, injury, ulceration, infection, and potential amputation (American Diabetes Association [ADA], 2020). Of concern is the rise in lower extremity amputations despite a decline experienced a decade ago (Nichols, 2019).

Diabetic foot ulcers are the leading cause of nontraumatic lower-extremity amputations (Cousart & Handley, 2017). Poor glycemic control and loss of sensation related to ulcers caused by neuropathy are the critical risk factors for amputations in diabetic patients. About 50% of senior patients with diabetes suffer from one form of peripheral neuropathy or the other (Hicks & Selvin, 2019). Diabetic polyneuropathies are associated with significant morbidity and mortality, yet it is one of the most preventable complications of diabetes mellitus.

The various complications can be reduced or prevented with evidence-based footcare programs that include patient education, regular examination, and an emphasis on appropriate footwear combined with early detection and recognition of peripheral neuropathy (Cousart & Handley, 2017). However, studies have shown that healthcare providers emphasize achieving glycemic control as a priority over foot examinations and care (Williams et al., 2018).

Statement of the Problem

The ADA (2020) recommends that providers perform a comprehensive foot examination at least annually to detect risk factors for ulcers, sensory loss, calluses, and amputations for all patients with diabetes and more often in patients with a history and evidence of sensory loss, amputations, or foot ulceration all of which are complications of diabetic mellitus (Al Sayad et al., 2015). Studies have shown that lower extremity amputations cause a more significant reduction in quality of life than other diabetes complications, including end-stage renal disease and blindness. It has been noted that foot care programs promote early detection, prevention, and treatment of elements that lead to diabetic foot complications (Cousart & Handley, 2017). Foot care programs that include regular foot examination, education, testing and evaluation, podiatric referrals, and footwear could prevent significant diabetes-related amputations.

Current guidelines recommend screening diabetic patients' feet for early detection, recognition, and reducing the risk of developing other diabetic foot complications, including ulcers, infections, bone recognition joint pain, poor circulation, and calluses. Therefore, careful examination of the lower limbs is vital in the early diagnosis and treatment of diabetic complications. Unfortunately, available screening methods and detection of the foot problems are either not followed, underutilized, or not performed in many primary care practice settings. An audit of the health records of 100 active diabetes mellitus patients and direct observations of the providers during assessment and treatment revealed gaps in the care received by diabetic patients. The electronic medical records (EMRs) and charts reviewed indicated no documentation of foot examinations or testing. Instead, the practice emphasis appeared to focus on glycemic control to improve HbA1c values.

Current Practice Assessment

The Primary Care Assessment

The project site is a primary healthcare practice conveniently located in Arlington, Texas, with the mission to improve the health of those they serve through a commitment to excellence in all they do. Founded approximately 5 years ago by a primary care physician, the clinic is headed by the primary care physician who doubles as the chief executive officer, supported by a pediatrician, two family nurse practitioners, four medical assistants, a phlebotomist, and an office secretary. The health care center provides primary care services to children and adults from 8 weeks of age and above for Arlington and the surrounding areas. The clinic is open Monday through Friday from 8:00 a.m. to 5:00 p.m. When asked about the mission and purpose of the clinic to aligned values, the practice manager, pediatrician, and the providers all indicated that the mission and purpose of the clinic aligned to their values, and all reported that this congruence has led to their longevity with the practice. They are all dedicated to improving patient care and outcomes through evidence-based practice. Staffing fluctuations and patient flow due to the COVID-19 pandemic during the weeks the clinic was assessed made it challenging to discuss the purpose as it relates to the practice and personal values with the entire staff.

The practice provides full primary healthcare services to a diverse patient population having commercial health insurance plans, Medicaid, Medicare, CHIP as well as private pay. The clinic supports the care and treatment of approximately 200 patients a week seeking services ranging from preventive health to acute and chronic illness management. Approximately 20% are children seeking pediatric services, 50% are adults (non-geriatric), and 30% are geriatric patients seeking health services. The most common reasons for seeking care include hypertension, diabetes mellitus, respiratory, skin, and heart disorders. Other diagnoses include

hyperlipidemia, genitourinary and gastrointestinal disorders, obesity, and routine wellness visits. The clinic offers interpreters for non-English speaking patients and collaborative agreements with cardiology, endocrinology, neurology, gastroenterology, urology, and dermatology specialists, providing a robust referral service program to promote improved patient outcomes. Patient visits occur between 8:00 a.m. and 5:00 p.m., Monday through Friday. The busiest days are Tuesday and Wednesday. There is an inflow of pediatric patients predominantly on Mondays and Fridays. Patients with chronic health issues are seen every day of the week. All walk-in patients are also all accommodated without an appointment. Surveyed patients indicated 100% satisfaction with the length of time to get an appointment with their chosen provider and their telephone experiences with the office staff. However, they were dissatisfied with the patient wait times at the clinic, which averaged approximately 80 mins.

The team is recognized for providing healthcare services that are comparable and measurable to the performance outcomes of their contemporaries in the local area. The team meets monthly to discuss operational and quality improvement issues.

The pediatrician is responsible for providing outpatient primary care services to patients from birth to 18 years of age, including assessing, diagnosing, treating, referring patients to other disciplines, and prescribing medications as appropriate. The primary care physician provides full direct care services to adult patients. The family nurse practitioners' patient population includes all age groups. They examine, diagnose, treat, and prescribe medications. They consult with and report directly to the lead physician regarding clinical issues and medical care delivery activities.

The practice manager plans and coordinates, directs, and supervises various elements of the clinic. The manager oversees the billing and collection activities, patient services, and workplace policies for the front and back-office employees. She is also responsible for the day-

to-day management of all business activities and resources of the practice in collaboration with the practice's chief executive.

The medical assistants (MAs) are described as the workhorses of the practice. They assist with the day-to-day operations of the front and back office, and support and coordinate patient referrals and communication. They help with non-invasive and direct patient care procedures, such as EKGs, vision, and hearing screenings, completion of Clinical Laboratory Improvement Amendments waived testing and assist with medical examinations within the medical assistants' scope of practice. The MAs also obtain the patient's medical history and vital signs and ensure all quality metrics are collected and documented per the practice policies and procedures. The medical assistants report directly to the providers as well as the practice manager. The general office clerk registers new patients and updates existing patient data, manages patient accounts, provides call reminders to patients with next-day appointments, updates patient information, verifies, and activates patient insurance plans, as necessary.

The general office clerk reports to the practice manager. Staff satisfaction affects patient satisfaction as well as service quality and health outcomes. None of the staff completed nor returned the distributed surveys, but some indicated dissatisfaction with their pay and service conditions. This information was not shared with the stakeholders per their request for fear of reprisal.

The assessment of practice patterns was focused on overall flow. As with the entire assessment, this element was meant to identify the organization's strengths and weaknesses and provide suggestions for the areas that could benefit from change or improvement. The flow of the clinic's regular daily activities presented normal patterns and expectations. Although there is no formal huddle for all the staff, the day begins with the nurse practitioners discussing issues or

tasks with their assigned medical assistants. The daily schedule is consistent, although changes in patterns occur based on patient requirements and staff dynamics.

The busiest months at the practice are July and August when there is an increase in back-to-school physicals and vaccinations. January is another busy period because of the flu season and children are returning from the Christmas holidays to start school. The slowest months are November, December, and June due to the holidays and children being out of school. Walk-in patients create the greatest variation in practice patterns. Walk-in patients arrive at the clinic daily, but the highest volume is on Mondays and Fridays. The staff believe this is primarily due to patients seeking treatment before the weekend on Friday and coming in on Mondays seeking care due to a weekend illness.

Team communication depended on dialogue throughout the day rather than a daily huddle with all staff members. Overall goals for the clinic and the organization are presented at the monthly meetings where updates, concerns, and changes, as well as safety, and patient care issues are reviewed. The culture at the clinic is intimate and enmeshed. The medical assistants and the front office clerk have overlapping responsibilities and are expected to pick-up duties of absentee staff. The relationships between the providers and other staff are respectful and pleasant.

Processes enable succinct operations. The clinic has processes for assessment and evaluation, diagnosis, recommendations, and ensuring quality outcomes. The various processes start with patient walks-in, self-check-in at the receptionist's desk, and end after the provider reviews the patient's record and assesses the patient in the examination room. The medical assistant is responsible for following-up on all the open items from the appointment by

completing the providers' orders, which may include prescriptions, lab orders, and discharge instructions. The patient is discharged when all the requirements have been met.

Within health care organizations, a metric is a well-defined performance measurement used to monitor and evaluate relevant health care processes to minimize costs and increase patient satisfaction and health outcomes (Agency for Healthcare Research and Quality, 2015). The clinic's selected patient-centered outcomes are (a) heart failure indicators that include ventricle assessment and testing, patient education, weight management, blood pressure screening, and medication therapy; (b) diabetes mellitus care that covers HbA1c management, lipid measurement and management, blood pressure management, eye examination; and (c) preventive care services, including vaccinations, blood pressure and lipid measurement, colorectal cancer screening, tobacco use, and cessation.

Available records from the Tarrant County, of which Arlington Clinic belongs, indicate that 11% of the population have diabetes and another 8% are prediabetic. Also, diabetes is the 6th leading cause of death in the county (Tarrant County Public Health, 2019). Of the estimated 2,000 unique patients seeking care at the practice, 800 individuals representing 40% of the patient population have diabetes mellitus as either the principal diagnosis or as an adjunct with other health conditions such as hyperlipidemia and hypertension, and heart disorders.

Needs Assessment

An in-depth observation and needs assessment of the practice was conducted over several weeks. The provider and the staff were involved throughout the process, providing relevant data and answering questions when needed. The assessment found that inadequate staffing due to the COVID-19 pandemic, especially for medical assistants, was the key factor responsible for treatment delays in the practice. Other issues accountable for treatment delays were the patients'

lack of health insurance coverage and the absence of co-payment for a visit. Some of the patients seen at the clinic were furloughed from their jobs due to the ongoing pandemic. These findings were shared with clinic stakeholders as delays in treatment are considered a form of diagnostic error that could result in patient harm or death. The Joint Commission advised that all healthcare organizations maintain adequate staffing levels, increase patient and family engagement, and enhance care transition from one provider to another to avoid treatment delays.

Another area identified as a potential topic of interest was the required components of an annual diabetic foot examination. Forty percent of the patient population seeking care at the clinic have diabetes mellitus as either the primary diagnosis or as an adjunct with other health conditions such as hyperlipidemia and hypertension, and heart disorders. Physical examination, assessment of sensory and peripheral pulses are associated with early detection of peripheral artery disease and neuropathy as well as prevention of wound formation and lower extremity amputation. The EMRs audit revealed no routine foot screening in at-risk patients nor documentation of annual diabetic foot examination. Based on observation and the clinic assessment, gaps in diabetic care were identified and discussed with the provider and staff. The determination was made that the focused issue for the application of an evidence-based project, was a comprehensive footcare program for patients with diabetes.

Secondary Needs Assessment

In today's healthcare environment, changes are essential for an organization to meet clinical practice guidelines and regulatory requirements for better patient outcomes. The practice assessment findings regarding gaps in the evaluation and treatment of diabetic patients were raised with the clinic leadership with mutual trust and respect. The management was willing and ready to support measures to remedy gaps found from the practice assessment.

An assessment of the organization's readiness for change is a forerunner to a project's implementation phase. The various stakeholders supported the proposed process change in order to achieve a successful change in practice. Therefore, the practice readiness for change discussion and evaluation included (a) the project goals and objective; (b) expectations and concerns from the stakeholders that needed to be considered for project success; (c) leadership support of the project, (d) assessment of the practice's ability to adapt to the proposed change, (e) ways to minimize potential project failure, and (f) other essential project needs, such as financial implications, assets, and resources needed for the proposed project.

Project Identification

Despite clear recommendations by the American Diabetes Association, that all patients with diabetes receive an annual comprehensive foot evaluation, no patient records indicated documentation of feet evaluations during clinic visits. Therefore, the practice does not meet the clinical practice guidelines recommended by the ADA regarding the foot care of diabetic patients. The organization's stakeholders supported the recommendation for a routine comprehensive foot evaluation at least annually, and the additional recommendation that patients with evidence of sensory loss or prior ulceration or amputation have their feet inspected at every visit, as diabetic peripheral neuropathy has been associated with foot complications such as ulcerations and lower-extremity amputations. Decreasing diabetic foot complications requires a thorough foot care program that includes examinations, testing, patient education, footwear, nail care, and podiatrist referrals. The Arlington clinic does not have a diabetic foot care program in place for early detection and prevention of diabetic foot complications, including lower extremity amputations. The clinic's lack of emphasis on foot assessment and care was not surprising, given that studies have shown that healthcare providers emphasize achieving

glycemic control as a priority over foot examinations and care (Williams et al., 2018). Diabetic peripheral neuropathy, which may present no symptoms, affects more than 50% of older adults suffering from diabetes mellitus. Foot care programs that include early recognition, treatment, and appropriate diabetic neuropathy management are crucial.

Also, the performance of foot examinations and testing of high-risk patients at every clinical visit by their primary care provider is known to improve patients' health outcomes (Gallman et al., 2017). Closing the practice gaps in the foot examination, testing, and clinical management of at-risk diabetic patients by primary care providers would save healthcare costs, improve quality of life, and patient outcomes with early detection of polyneuropathies and treatment to prevent ulcerations, foot infections, and amputations.

Purpose

The purpose of this project was the implementation of a multi-faceted program aimed at early identification of lower extremity complications in at-risk diabetic patients with focused patient education, foot examination, and testing, nail care, proper footwear, documentation, and referral for specialty care to decrease diabetic foot complications and amputations.

Objectives

The objectives for the project were to:

1. Train and educate 100% of the clinical staff regarding diabetic foot care.
2. Establish and provide patient education for preventive foot self-care to 100% of patients being seen for diabetes-related appointments.
3. Foot assessment that aligns to the Michigan Neuropathy Screening Instrument (MNSI), completed on 100% of annual visits for patients with diabetes.
4. Establish specialty referral and treatment for foot complications; determined by a score on the MNSI greater than 7.

5. Documentation of completed foot assessments in 100% of all patients' EMRs.

Anticipated Outcome

By May 30, 2021:

- Increase providers' awareness and compliance with ADA recommendations.
- 100% of patients with diabetic-related appointments will receive preventive self-care foot education.
- Use of the MNSI with 100% of the foot examinations.
- 100% of treatment and referrals align to MNSI evaluation and the project protocol.
- Documentation of results of the MNSI foot evaluation within the EMRs.

Summary and Strength of the Evidence

Diabetic peripheral neuropathy, which may present no symptoms, affects more than 50% of older adults suffering from diabetes mellitus (Hicks & Selvin, 2019). Foot care programs that include early recognition, treatment, and appropriate diabetic neuropathy management are important in preventing associated co-morbidities. Perez-Panero et al. (2019) conducted a systematic review and meta-analysis of 12 selected diabetic clinical practice guidelines and provided the level of evidence supporting the recommendations. They found that all the guidelines similarly supported the importance of evaluating the diabetic foot and footwear, assessing for foot deformity, gait, and ability to perform an exercise, and determining the patient's risks. All the studies reviewed supported the importance of comprehensive foot examination. Routine foot evaluation through varied approaches is critical and has a significant role in preventing ulcers and diabetes-related morbidity and mortality.

An observational study of the frequency of lower extremity amputations in people with diabetes by Ahmed et al. (2017) found an increased prevalence of foot ulcerations in men. The males had 1.6 times the risk of foot ulcers than females and were 2.8 to 6.5 times more likely to

have foot amputations. The study highlighted a total lack of awareness about footcare within a diabetic population, which was worse than what other studies have shown. The authors concluded that patient education, routine foot care, and proper footwear could reduce foot ulcers and prevent 85% of amputations in diabetic patients.

In a case-controlled study to identify risk factors and assess the level of awareness of diabetic foot care among the diabetic population, 250 patients with a 10-year or more history of diabetes, and the presence of diabetic foot ulcers (DFU) received examinations that included, smoking history, hypertension status, evidence of foot trauma, and the presence or absence of peripheral neuropathy (Nongmaithem et al., 2016). The selected patients were subdivided into two groups (Group I: Patients with DFU and Group II: Patients without DFU). The neurological foot examination was performed by administering the Michigan Neuropathy Screening Instrument (MNSI). Touch sensation was assessed using the Semmes-Weinstein monofilament. Assessment of peripheral arterial disease was done by clinical examination and Doppler studies. A structured questionnaire regarding foot care awareness was given to both groups. The study results indicated that age and gender were not significantly related to the risk of DFU. However, presence of DFUs were six times more common in smokers than nonsmokers. Also, the percentage of patients with foot fissures, calluses, and deformities was significantly higher among patients with DFUs than diabetic patients without foot ulcers. The loss of touch and vibration sensation was considerably higher among those having DFUs. Similar to the results of Ahmed et al. (2017), male patients had a greater incidence of foot ulcers than females. The study concluded that early testing or screening for neuropathy and foot complications is recommended in diabetic patients to reduce DFUs and amputation risks. Also, regular foot examination and

provision of patient-friendly educational materials, with provider reinforcement, is vital for reducing the knowledge gap regarding foot care in the diabetic population.

Similarly, clinical assessment and monitoring, when combined with regular foot self-care and examination, was found to be an effective approach for early detection of foot problems and preventing amputations in a cross-sectional cohort study of 2040 adults with type 2 diabetes (Al Sayad et al., 2015). In 2017, Ang et al. conducted a large retrospective cohort study evaluating the effectiveness of diabetes foot screening in the primary care setting for identifying risk factors and preventing LEA. The sample consisted of 26,173 patient chart reviews. Of these, 16,382 (62.6%) had undergone at least one foot screening during a designated, 2-year follow-up period while 9,791 had not received any foot screening. Those who had routine foot screenings, had a significantly lower percentage of LEAs (0.02% vs. 0.52%) than those who did not have routine foot screenings. They found the risk of lower extremity amputations (LEAs) in people with diabetes was 20 times higher than in the non-diabetic sample.

The progressive and irreversible course of diabetic polyneuropathy neuropathy ultimately increases ulcerations and LEAs rates (Yang et al., 2020). The Michigan Neuropathy Screening Instrument has been deemed within the literature as a valid tool for measuring distal peripheral neuropathy in type 2 diabetes mellitus. The scoring precision of the MNSI makes it a valuable screening test for diabetic polyneuropathy neuropathy and specialist referral for further evaluation and treatment (Kaymaz et al., 2020). The MNSI, as a screening tool, is easy to use, brief, and noninvasive.

Based on the evidence surrounding the benefits of diabetic comprehensive foot care, the ADA recommended in their January 2021 clinical practice guidelines that providers perform a comprehensive foot evaluation at least annually to identify risk factors for ulcers and

amputations, and a foot inspection should be completed at every visit for patients with evidence of sensory loss or prior ulceration or amputation. Additionally, the American College of Foot and Ankle Surgeons (2020) recommends specialty referral for foot care, protective shoes, and pressure reduction strategies, combined with patient and provider education programs to prevent foot amputations. Unfortunately, available methods for early identification of foot problems are underutilized in primary care settings (Park & Kim, 2018). Decreasing diabetic foot complications requires a thorough foot care program that includes examinations, testing, patient education, footwear, nail care, and podiatrist referrals. Studies have clearly determined the importance of comprehensive foot care programs that ensure early identification and treatment of diabetic foot sensory loss to prevent diabetic foot complications such as infections, ulcerations, and amputations, combined with patient education.

Methods

Project Intervention

This project provided a multi-pronged approach aimed at early identification of lower extremity complications in patients with diabetes. The program included (a) focused patient education, (b) improved assessment and documentation; and (c) referral for specialty care to decrease complications and amputations associated with diabetes. The long-term goals of the project were to close gaps in foot care, decrease diabetic foot complications, and improve diabetic patients' health outcomes. Implementation of the project objectives increased the primary care provider awareness and compliance with clinical practice guidelines. The project's long-term goals were to increase the identification of patients at risk for diabetic foot complications, decrease the prevalence of foot ulcerations and lower extremity amputations, and improve patient health outcomes and satisfaction. There was an urgent need to develop an

efficient and effective diabetic foot screening program at the primary care clinic to prevent foot complications. The availability of portable, non-invasive, convenient, objective, accurate, and ready-to-use devices such as the monofilament, tuning fork, and pinprick promoted program uptake within the clinic, particularly as the devices are easy to use and did not require specialist training in routine clinical care; making the results available within minutes. The MNSI, a validated assessment tool for a comprehensive foot exam, was selected for use in this population.

Setting / Population

The interventions were performed in the examination rooms of the practice. The providers, with support from the medical assistants, completed the recommended assessments. The project population consisted of all patients with type 2 diabetes mellitus who were actively followed at the clinic. Those who had never had their feet examined, tested, nor inspected in the previous one to two years had their feet assessed, treated, and specialty referrals made when necessary.

Individuals with current foot ulcers, foot infections, and amputations were not eligible for the foot assessment. Instead, emphasis was placed on assessing the foot's condition and determining the ulcer and or infection's timeframe and appropriate care plan. Each complete foot examination required between 5 to 10 mins. The providers communicated changes in care resulting from the examination to the patient and referred patients to specialty care as needed.

Staff Education and Training

As the project lead, I educated the providers and all the clinical staff on the recommendations of the ADA clinical practice guidelines regarding foot assessment and care of diabetic patients in primary care settings. Staff were trained on the comprehensive diabetic foot examination with an in-service power-point presentation. The elements of the MNSI were used

to educate staff, and the providers on the components of diabetic foot exams, the importance of annual exams were discussed, as well as the intended plan for documentation of foot examination in the patients' healthcare records.

The nurse practitioners (NPs) underwent performance training on diabetic foot examination and testing with 10-g Semmes-Weinstein monofilament, pinprick tests, ankle reflex, 128-Hz tuning fork at the primary care clinic before the implementation of the project start date. The medical assistants were trained to prepare individual patients for the foot examination, ensure the examination rooms were stocked with the materials and equipment needed to perform a thorough foot assessment, and assist patients with the completion of the patient section of the Michigan Neuropathy Screening Instrument form. The provider and medical assistants were trained to discuss and encourage diabetic patients to report foot problems at every clinical encounter.

Patient Education

The intervention process included educating all diabetic patients who accessed the clinic on the importance of self-foot care. They were instructed on the benefits of regular foot exams conducted by their providers and or specialists, daily self-inspection, and wearing protective footwear to keep their feet healthy. A pamphlet entitled "Foot Care for a Lifetime" containing information about routine foot care, daily self-inspection, socks, shoes, and foot care warnings was given to each patient. The 15-item self-administered patient portion of the MNSI questionnaire was given to the patients to complete and report subjective neuropathic feelings in their legs and feet before a comprehensive examination by the provider. The patients were also encouraged to discuss any questions or concerns they might have regarding their feet with the primary care provider.

Foot Examination and Screening

The NPs performed comprehensive foot examination on all the diabetic patients accessing the clinic to detect risk factors for ulcers, infection, and amputations. The patients' skin status was examined for color, thickness, dryness, cracking, sweating, and infection. The examiner checked between toes for fungal infection, ulceration, calluses, and blisters. The providers evaluated and treated all identified abnormalities and completed Part B of the Michigan Neuropathy Screening Instrument (MNSI). All patients with a sensory deficit, that is, the inability to feel a pinprick or light touch, ulcerations, nail infections, and decreased peripheral pulses, were referred for specialty evaluation and treatment.

The Michigan Neuropathy Screening Instrument

The Michigan Neuropathy Screening Instrument (MNSI) is a valid measure of distal symmetrical peripheral neuropathy in patients with type 2 diabetes (Kaymaz et al., 2020). The MNSI 15-point questionnaire was given to all the diabetic patients accessing the clinic. A 'Yes' response to questions 1-3, 5-6, 8-9, 11-12, 14-15 and a 'No' response to questions 7 and 13 were each counted as one point. Questions 4 and 10 are not included in the scoring algorithm (Park & Kim, 2018). A total score of greater or equal to three was considered abnormal. The provider documented the patient's responses in Part B of the Michigan Neuropathy Screening Instrument (MNSI) and within the EMR with specialty referrals made when necessary.

However, individuals with current foot ulcers, foot infections, or bilateral amputations were not required to complete the MNSI 15-point self-assessment questionnaire. Instead, emphasis was placed on assessing the foot's condition and determining the ulcer and or infection's timeframe and appropriate care plan. Changes in care resulting from the examination and the need for specialty referral were communicated to the patient.

Monofilament Test

The 10-g monofilament is a simple instrument used in screening the diabetic foot for loss of protective sensation (Ball et al., 2015). The 10-g Semmes-Weinstein monofilament examination (SWME) was performed at ten touch sites per foot, one dorsal, and nine plantar areas to determine at-risk individuals who might require a more comprehensive assessment. The monofilament was applied perpendicular to the foot and the skin, touched with enough force until the monofilament was bent at about 1 cm, and then held for approximately two secs. The dorsal midfoot and the plantar aspect of the foot, including the first, third, and fifth digits, the first, third, and fifth metatarsal heads, the medial and lateral midfoot, and the calcaneus were tested for sensation. Screening results include, noting a '+' for the sensation felt and a '-' where no sensation was felt. A total score of less than 8 on a 10-point scale for each foot was considered an abnormal result. Findings were documented in Part B of the Michigan Neuropathy Screening Instrument (MNSI) and the EMR.

Pinprick Test

The pinprick test is a gross test to check the ability to feel a pinprick and determine the difference between sharp and dull sensations. The pinprick exam was performed using a sterile disposable toothpick over the patients' foot's plantar surface by applying stimulus on the distal first, third, and fifth toes of each foot to detect a cutaneous pain sensation and to differentiate such feelings from pressure stimuli. The patient does not observe the test procedure. The exam included the combined application of a sharp object with a dull object, and the patients were instructed to say each time they felt a sharp or dull sensation. The inability to distinguish sharp or dull sensations was considered abnormal. A lack of pinprick sensation is associated with an

increased risk of ulceration: the findings were documented in Part B of the Michigan Neuropathy Screening Instrument (MNSI) and within the EMR.

Tuning Fork Test

The tuning fork test was used to measure vibratory sensations or perceptions and to detect diabetic peripheral neuropathy. The 128-Hz tuning fork was tapped by the provider to create vibration and then applied to the bone on the tip of the patient's great toe. The patients were asked to report the time when vibration diminished below perception. A detection-time difference between the patient and the provider of greater than 10 secs. was considered abnormal and specialist referrals were made for the affected patients. The NPs documented findings in Part B of the Michigan Neuropathy Screening Instrument (MNSI) and within the EMR.

Ankle Reflex Test

The absence of ankle reflexes has been associated with an increased risk of foot ulceration (Brown et al., 2020). The test was performed on both ankles while the patients kneel on a chair with toes pointing toward the floor. The foot was dorsiflexed by the provider, foot and the Achilles tendon were gently stroked with the reflex hammer. An absent or decreased ankle reflex was considered abnormal. The NP documented findings in Part B of the Michigan Neuropathy Screening Instrument (MNSI) and the EMR.

Organizational Barriers and Facilitators

Organizational and human factors can be barriers associated with the implementation of a quality improvement project. For instance, lack of human resources or inadequate staffing, heavy workload requirements, lack of materials and equipment, and non-cooperation by the provider and or staff may constitute a barrier to implementing a project at the organizational level. In contrast, lack of knowledge, lack of time to read and complete the questionnaire, and insufficient

English language proficiency by individual patients may cause an impediment in implementing a quality improvement project.

However, this quality improvement project was strongly supported by the family nurse practitioner responsible for providing student mentorship. The implementation of a comprehensive foot care program at the clinic interested her. She was motivated and ready to implement the program, as she wanted to make measurable improvements in health outcomes for patients with diabetes. Although, a small staff, all showed positive buy-in of the project, and contributed tremendously to the project's success. The staff promoted an environment conducive to effective communication, which fostered a collaborative approach for the project implementation, and ensured standardization of the project components and data collection. The clinic staff were cross trained to perform dual roles. For instance, if a medical assistant was absent, the receptionist, who doubled as a medical assistant, would assist with the patients' medical screening before their scheduled appointments. Team members of the clinic met with the DNP student weekly to discuss operational and quality improvement issues. The medical assistants assisted with the coordination of appointments, referrals, and patient communication. Spanish-speaking patients were provided with an interpreter who worked at the clinic.

The clinic experienced a low number of patients accessing the clinic for care due to the ongoing COVID-19 pandemic, and during the period of very unfavorable weather conditions. Particularly during the pandemic, most patients preferred telehealth over face-to-face care at the clinic. To overcome this barrier and increase diabetic patients' participation and ensure the success of the quality improvement initiative, the medical assistants called and scheduled all diabetic patients who were due to be seen for face-to-face appointments. Reminders were also sent to those whose appointments are expected in a few days and weeks. After that, there was an

increase in patients accessing the clinic in person. All COVID-19 precautions were taken (masks worn by patients and clinic staff, and all patients were asked about COVID-type symptoms at check-in). The patient population clearly adjusted to the new procedure and processes associated with COVID-19, although many of the patients accessing the clinic had received the COVID-19 vaccine.

Stressing collaboration and providing ongoing training and education throughout the project, also helped eliminate barriers identified barriers and facilitate the success of the quality improvement project. Other aspects that enabled successful project implementation were (a) ease of implementation, (b) low cost to implement, and (c) anticipated improvement in diabetic patients' health outcomes. The clinic stakeholders supported the project, and the medical provider ensured the necessary resources were available to implement the proposed project. All type 2 diabetes mellitus patients accessing the clinic were educated on the importance of self-foot care, comprehensive examination by the provider, and how to complete the Michigan Neuropathy Screening Instrument (MNSI) 15-point questionnaire form. In addition to the educational materials being provided in both English and Spanish, interpreters were available to answer questions or explain the materials for non-English speaking patients.

Ethical Considerations

Project implementation and management require consideration of ethical boundaries. Protection of patient privacy was the primary ethical consideration with the implementation of the project. Protecting the privacy of the patient and maintaining the confidentiality of private information is essential. A medical record number was created and used to track patient demographics, symptoms, and interventions. The number was used as the patient identifier for data collection and analysis. No identifiable or non-identifiable information obtained during this

project was shared or used for any purposes other than that for which it was collected. Only authorized individuals had access to the project information and data collected. The project information was stored and secured in a password-protected computer to prevent unauthorized access.

Evaluation Plan

The evaluation plan allows for ongoing learning and feedback throughout the design, planning, and implementation stages of a project aligned to the objectives. The project objectives were (a) train and educate 100% of the clinical staff regarding diabetic foot care, and the assessment protocol per ADA guidelines; (b) establish diabetic patient education for preventative foot self-care, aligned with patient's quarterly follow-up appointments; (c) by May 2021, 90% of patients with type 2 diabetes would receive a comprehensive foot exam and risk assessment as part of their annual or quarterly visit; (e) 100% of foot assessments and follow-up reminders would be documented in the patients' EMR; and (f) 100% of patients with foot complication(s) would be referred for specialty evaluation. The project objectives were evaluated using the Michigan Neuropathy Screening Instrument (MNSI). The MNSI was used to assess foot abnormalities and deformities that include Charcot foot, excessively dry skin, callus formation, ulceration, flat feet, hammertoes, overlapping toes, and amputation. The lower extremity was evaluated for loss of protective sensation, differentiation of sharp and dull sensation, vibratory sensation or perception, and ankle reflexes.

The Plan-Do-Study-Act cycle was used as the overarching design for the project. Data for each specified outcome were collected at established intervals and analyzed to determine improvement opportunities. The MNSI is made up of two separate assessments. The first part consists of a 15-item patient questionnaire, comprised of yes/no questions pertaining to their

recent history of foot sensation, including temperature sensitivity, numbness, and pain, comprised of yes/no questions. Patients with a score of ≥ 7 were to have their modifiable risks treated and specialty referral for further evaluation, as their self-assessment indicated some level of neuropathy. The clinical portion of the MNSI is a provider-administered examination of the lower extremity that includes (a) inspection of the feet for deformities, dry skin, hair, or nail abnormalities, calluses, or infection; (b) assessment of vibration sensation at the dorsum of the great toe; (c) grading of ankle reflexes, and (d) monofilament testing for loss of protective sensation. Each foot was assessed for deformities, dry skin, calluses, infections, and fissures. The presence of any abnormality (for each foot) received a score of 1. The presence of an ulcer added an additional score of 1. Reflexes were tested on each ankle. An absent reflex received a score of 1, present with reinforcement received a score of 0.5, and 0 if present without reinforcement. Vibration was similarly scored as present if the examiner sensed the vibration on his/her finger for less or equal to 10 secs. longer than the patient felt it on their great toe (score of 0), decreased, if sensed for greater or equal to 10 secs. (scored as 0.5) or absent (scored as 1). For the monofilament testing, each foot received a score of 0 if a sensation was felt, reduced sensation received 0.5, and an absent sensation received a score of 1. The total possible score was 10 points. Patients with a score of ≥ 2.5 had an abnormal examination, which indicated neuropathy, and the need for treatment of modifiable risks and specialty referral for further evaluation.

Results

The project intervention occurred from January 22, 2021, through May 14, 2021. During this period, 197 patients: 106 male (53.8%) and 91 female (46.2%) had their feet clinically evaluated for abnormalities, sensory loss, and risk for diabetic neuropathy, a precursor for foot

ulceration and amputation in the diabetic population with the use of the Michigan Neuropathy Screening Instrument (MNSI). The baseline characteristics of the 197 patients are described in Table 1.

Table 1

Summary Demographic and Characteristics

Baseline Variables	N	%
Age (years) mean = 62.67		
≤ 56 years	49	4.0
57 to 65 years	79	61.0
≥ 65 years	69	35.0
Gender		
Male	106	53.8
Female	91	46.2
Race/Ethnicity		
White	29	14.7
Hispanic	55	27.9
Black	102	51.8
Asian/Other	11	5.6
Years Diagnosed		
Mean years	12.9	
< 10 years	73	37.1
> 10 years	124	62.9
Cardiovascular		
Disease(s)		
Present	192	97.0
Absent	5	3.0

Demographic data were collected on the patients at their initial appointment, and they were not rescreened. Results were analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 25. The patients ranged in age from 41 to 86, with the mean age being 62.7 years. Of the patients seen, 49 (4%) were equal or less than 56 years of age, while 148 (96%) were older than

56 years, indicating a positive correlation between age and type 2 diabetes mellitus complications ($r = 0.792$). Over half of the sample were Black, non-Hispanic, 102 (51.8%). Approximately sixty-three percent of the population has had diabetes for ten or more years. Other cardiovascular diseases such as heart disorders, hypertension, and hyperlipidemia were noted in 192 (97.0%) of the patients, indicating a significant association between diabetes mellitus and cardiovascular disease.

Table 2 presents detailed descriptive data for the study variables. Patients with a history of current foot ulceration or amputations did not have their feet tested but were seen and treated for their present symptoms. The intervention focused on the prevention, treatment, and detection of neuropathies and foot abnormalities and included patient education, a patient self-assessment with the MNSI questionnaire, ankle reflex, 10-g monofilament, and 128-Hz tuning fork assessments. Significant improvements were made in patient education, foot examination, diabetic footwear, and specialty referrals. All diabetic patients seen during the implementation period received patient education, including a foot care brochure provided by the Health Resources and Services Administration Unit of the U. S. Department of Health and Human Services.

Education of Clinical Staff and Patients

The project's goal to educate 100% of the clinical staff regarding diabetic foot care and assessment protocol per American Diabetic Association guidelines were met. Before the project's implementation, the nurse practitioners (providers) was prompted to view a short educational video on "Performing a Comprehensive Diabetic Foot Exam." After that, the project lead requested a return demonstration by the NPs on a staff member to assess their knowledge and

Table 2

Summary of Variables Measured

Variables	Frequency (n)	%
Patient Education		
Given	197	100
Not Given		
Self-Assessment Score		
< 7 Symptoms	116	58.9
> 7 Symptoms	81	14.1
Foot-Appearance		
Normal	114	57.9
One Foot Abnormal	11	5.6
Both Foot Abnormal	72	36.5
Monofilament		
Normal	72	36.6
Reduced	67	34.0
Absent	58	29.4
Vibration Perception		
Present	106	53.8
Decreased	84	42.6
Absent	7	3.6
Ankle Reflex		
Present	141	71.6
Decreased	55	27.9
Absent	1	0.5
Pinprick Test		
Present	197	
Absent		100
Ulceration		
Absent	197	100
Present		
Follow-up		
Specialty Referral	42	21.32
Onsite Treatment (Clinic)	45	22.84
Routine appointments	110	55.84
EMR Documentation		
Yes	197	100
No		

Note. EMR = Electronic medical Record; N = 197

understanding of diabetic footcare. Thus, the project objective to provide staff and patient education for (a) preventive foot self-care, and (b) provider assessments aligned with patients' quarterly follow-up appointments were met.

Patient Self-Assessment

The 15-item patient questionnaire portion of the Michigan Neuropathy Screening Instrument (MNSI) revealed some degree of neuropathic symptoms. Detailed information related to each of the assessments is provided in Table 2. Over half of the sample (58.9%) had scores of < 7 on their self-reported symptoms questionnaire. This aligned with the finding that over half the sample (57.9%) had normal foot appearance. Slightly more than 14% of patients self-assessed as having more than seven symptoms, indicating an increased risk of foot ulcers and amputation.

Foot Examination (MNSI)

The findings for the monofilament and vibration assessment were divided evenly, between normal and reduced or decreased sensation. Differences in the loss of sensation for the monofilament were more pronounced, in that almost 30% of the sample had an absence of sensation, while only 3.6% of the sample had an absence of perception of the vibration. Decreased or absent ankle reflexes were uncommon (28.4%). Bilateral foot abnormalities were identified in 37% of the sample, of which 21% required referrals. While there was decreased sensation in approximately 43%, there were no ulcerations. All patients identified as having an increased risk for foot ulceration were treated at the clinic or given a specialty referral.

Treatment and Referrals

Between January and May 2021, 100% of diabetic patients ($n = 197$) received comprehensive foot assessments and specialty referrals compared to a near-zero percentage the

previous year. In all, 45 (22.84%) patients with dry skin and calluses were treated at the clinic, while 42 (21.32%) patients at greater risk for ulceration or diabetic foot ulcers received specialty referrals. Routine follow-up appointments were given to 110 (55.84%) patients with zero or minimal risks for foot complications.

Electronic Medical Record Documentation

All the examinations were thoroughly documented within the EMR. The addition of a template within the EMR aligned to the components of the MNSI checklist, promoted comprehensive clinical notes for each patient.

Discussion

Persons with diabetes have an increased risk for foot complications, lower extremity trauma, injury, ulceration, infection, and amputation (CDC, 2019). Despite a decade-long decline in lower-extremity amputations, the incidence of amputations is growing, with foot ulcers and neuropathy increasing risk (Nichols, 2019). While preventable with thorough assessment, there was little emphasis on comprehensive foot evaluations at the clinic. The providers' lack of time to carry out multiple foot assessments in a single visit and the emphasis on glycemic control as a priority over foot examinations and care were identified as barriers to a quality foot program within this primary care setting.

The purpose of this evidence-based, quality improvement project was to implement a multi-pronged program of focused patient education, improved assessment, and documentation, and referral for specialty care aimed at early identification of lower extremity complications in patients with diabetes to decrease complications and amputations associated with the disease. Implementation of the project objectives was expected to increase the primary care providers' awareness and compliance with clinical practice guidelines and promote identification of patients

at an increased risk for diabetic foot complications. The long-term goals included improved patient health outcomes and quality of life.

This quality improvement project showed an overall improvement of documented comprehensive foot assessment in patients with type 2 diabetes mellitus from near zero percent pre-implementation to 100% post-implementation. Based on the benchmarks established during the project timeframe, all the diabetic patients having their annual or quarterly appointments had their feet assessed. All diabetic patients who may have never had their feet examined and tested or inspected in the previous one to two years completed Part A of the Michigan Neuropathy Screening Instrument (MNSI) form. The self-assessment provided an opportunity for increased patient self-awareness.

During the initial phase of implementation, the clinic witnessed a low number of patients accessing the clinic for care, secondary to the COVID-19 pandemic. The patients received their routine and follow-up appointments through telehealth options. To increase diabetic patients' participation and promote the success of the quality improvement initiative, the medical assistants made follow-up calls and scheduled appointments for all the diabetic patients due to be seen. They also sent reminders to those whose appointments were expected in a few days or weeks. All diabetic patients randomly interviewed after receiving education stated that they would return to the clinic for future foot care services, indicating that a foot care program within the primary care setting was beneficial in providing self-foot care education on primary prevention methods, which promoted a collaborative role with one's primary care provider.

Foot ulcers are the leading cause of non-traumatic lower extremity amputations in diabetic patients (Cousart & Handley, 2017). Literature has noted that foot care programs promote prevention, early recognition, and treatment of elements that lead to diabetic foot

complications (Cousart & Handley, 2017). The treatment of at-risk individuals involved in developing foot ulcers could prevent foot ulcerations and lead to a reduction in lower extremity amputations. Therefore, the significant improvement seen in the providers adherence to ADA's screening guidelines, regarding annual foot exams indicated successful implementation of the initiative. Additionally, all patients with complications such as loss of protective sensations, structural abnormalities, or vascular disease were referred for specialty care evaluation. A major strength of this project included the use of objective tests to assess for abnormalities in the feet of patients with diabetes. The assessments were completed using the MNSI checklist. This ensured a systematic approach to the foot examination. The results reflected complete and thorough examinations for all patients meeting the inclusion criteria. All the examinations were thoroughly documented within the EMR. The addition of a template within the EMR, aligned to the components of the MNSI checklist, promoted comprehensive clinical notes for each patient. Using a systematic approach for both assessment and documentation, promoted early identification of those at-risk for foot complications and amputations. The approach to both patient education and assessment encouraged the successful up-take and sustainment of the intervention because of its ability to be implemented within the available appointment timeframe.

Strengths and Limitations

This project was limited by the relatively small convenience sample. The 15-item, patient self-report questionnaire was subjective and therefore, might be subject to bias. The Clinic's patient population could also be considered a limitation. The clinic is located in a suburb of Arlington, Texas. Most of the patients accessing the clinic are minorities with low

socioeconomic status. Since this was a localized, quality improvement project, the sample is not sufficient to generalize the results to a larger population of diabetic patients.

The clinic experienced a low number of patients accessing the clinic for care due to the COVID-19 pandemic and unfavorable weather conditions in February 2021. However, this barrier was overcome by calling and scheduling appointments for all diabetic patients due to be seen. Reminders were also sent to those whose appointments were expected in a few days or weeks. Following this initiative, there was an increase in diabetic and other patients accessing the clinic in person. The clinic stakeholders supported and provided materials and resources needed to implement the project. Interpreters working at the clinic assisted non-English speaking patients with questions and explanations of the materials. The educational materials were also provided in both English and Spanish.

Recommendations

Preventive care is a vital component of diabetic care. The project implemented multiple elements important in the prevention of diabetic foot complications. Patients diagnosed with type 2 diabetes received education on how to perform foot assessments and recognized the importance of the collaborative relationship with one's provider. According to the literature, about 50% of diabetic foot complications can be prevented (Miranda & Da Ros, 2020). Foot care programs that include patient education, regular examination, testing, footwear, nail care, and specialty referrals benefit the diabetic population and are essential to prevent long-term complications (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDKD], 2017).

Studies have shown that lower extremity amputations pose a more significant reduction in quality of life than other diabetes complications (Molina & Faulk, 2020). While not assessed

during this project, sustained intervention application is anticipated to reduce diabetes-related amputations significantly. Alert systems within the EMR and standing orders for annual foot examinations are recommended to alert the provider when assessments are due (Perri-Moore et al., 2016). The added alerts within the EMR and the addition of task boxes, streamlined documentation and improved the intervention's success and sustainment. Maximizing the EMR capabilities by adding task boxes and alerts promoted providers' awareness and adherence to the ADA recommendations regarding foot care for people with diabetes and possibly reduced the number of 'missed' patient appointments that should have included a comprehensive foot examination. Additionally, this foot care program, implemented with the MNSI assessment checklist, could be easily replicated in other primary care settings to increase comprehensive diabetic foot examination rates.

Implications for Practice

This evidence-based quality improvement project is an example of developing a comprehensive, sustainable program. The program promoted the full scope of practice for nurse practitioners. It is appropriate for nurse practitioners within the primary care setting, to provide services for patients with loss of protective sensation or previous diabetic foot complications. The MNSI checklist that includes a full assessment with scoring, provides a mechanism for easy identification of patients who require referrals for specialty services. Patient education, clinical examination, and foot monitoring by primary care providers are essential to prevent foot complications and amputation in diabetic patients. As already emphasized, approximately 50% of diabetic foot complications can be prevented with foot care programs that include patient education, regular examination, testing, footwear, nail care, and specialty referrals, all components that can be implemented and sustained by nurse practitioners within primary care.

Conclusion

Primary care is the core of our healthcare delivery system; with primary care providers assisting individuals in preventing disease by early identification of risk factors and managing chronic illness. Available methods for early identification of foot problems are underutilized in primary care (Park & Kim, 2018). Implementing a solid foot care program in a primary care setting for early detection and treatment of foot complications can lead to improved quality of life in the diabetic population.

Foot examination is a vital part of care in diabetic patients, often overlooked by primary care providers. The implementation of this evidence-based diabetic foot care program improved diabetic self-foot care education, increased providers' awareness, and promoted early identification of potential foot complications. The added alerts within the EMR promoted the full benefits of the program and its sustained use of the program, which is critical to reaching the long-term goal of decreasing complications and amputations associated with diabetes. The entire clinic staff recognized the importance of the initiative and supported its continued use. The project intervention results reflected positive outcomes for the implementation of the ADA foot care recommendations and guidelines.

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Appendix A:

Michigan Neuropathy Screening Instrument: Patient Version

A. History (To be completed by the person with diabetes)

Please take a few minutes to answer the following questions about the feeling in your legs and feet. Check yes or no based on how you usually feel. Thank you.

- | | | |
|---|-----|----|
| 1. Are your legs and/or feet numb? | Yes | No |
| 2. Do you ever have any burning pain in your legs and/or feet? | Yes | No |
| 3. Are your feet too sensitive to touch? | Yes | No |
| 4. Do you get muscle cramps in your legs and/or feet? | Yes | No |
| 5. Do you ever have any prickling feelings in your legs or feet? | Yes | No |
| 6. Does it hurt when the bed covers touch your skin? | Yes | No |
| 7. When you get into the tub or shower, are you able to tell the hot water from the cold water? | Yes | No |
| 8. Have you ever had an open sore on your foot? | Yes | No |
| 9. Has your doctor ever told you that you have diabetic neuropathy? | Yes | No |
| 10. Do you feel weak all over most of the time? | Yes | No |
| 11. Are your symptoms worse at night? | Yes | No |
| 12. Do your legs hurt when you walk? | Yes | No |
| 13. Are you able to sense your feet when you walk? | Yes | No |
| 14. Is the skin on your feet so dry that it cracks open? | Yes | No |
| 15. Have you ever had an amputation? | Yes | No |

Total: _____

Appendix B

Michigan Neuropathy Screening Instrument

B. Physical Assessment (To be completed by health professional)

1. Appearance of Feet

<p>Right</p> <p>a. Normal <input type="checkbox"/> 0 Yes <input type="checkbox"/> 1 No</p> <p>b. If no, check all that apply:</p> <p>Deformities <input type="checkbox"/></p> <p>Dry skin, callus <input type="checkbox"/></p> <p>Infection <input type="checkbox"/></p> <p>Fissure <input type="checkbox"/></p> <p>Other _____</p> <p>Specify: _____</p>	<p>Left</p> <p>Normal <input type="checkbox"/> 0 Yes <input type="checkbox"/> No 1</p> <p>If no, check all that apply:</p> <p>Deformities <input type="checkbox"/></p> <p>Dry skin, callus <input type="checkbox"/></p> <p>Infection <input type="checkbox"/></p> <p>Fissure <input type="checkbox"/></p> <p>Other _____</p> <p>specify: _____</p>
--	---

Right Left

	Absent	Present		Absent	Present
2. Ulceration	<input type="checkbox"/> 0	1	0	<input type="checkbox"/>	<input type="checkbox"/> 1
	<input type="checkbox"/>				
	Present	Present/ Reinforcement	Absent	Present	Present/ Reinforcement
3. Ankle Reflexes	<input type="checkbox"/> 0	<input type="checkbox"/> 0.5	<input type="checkbox"/> 1	<input type="checkbox"/> 0	<input type="checkbox"/> 0.5
				<input type="checkbox"/> 1	
	Present	Decreased	Absent	Present	Decreased
4. Vibration perception at great toe	<input type="checkbox"/> 0	<input type="checkbox"/> 0.5	<input type="checkbox"/> 1	<input type="checkbox"/> 0	<input type="checkbox"/> 0.5
				<input type="checkbox"/> 1	
	Normal	Reduced	Absent	Normal	Reduced
5. Monofilament	<input type="checkbox"/> 0	<input type="checkbox"/> 0.5	<input type="checkbox"/> 1	<input type="checkbox"/> 0	<input type="checkbox"/> 0.5
				<input type="checkbox"/> 1	

Signature: _____
 MNSI, © University of Michigan, 2000

Total Score _____ / 10 Point

Appendix C

List of Educational Videos for Staff Training

HCA West Florida. (2016, May 3). *Patient education about diabetic foot care* [Video].

YouTube. <https://www.youtube.com/watch?v=aOrMYSfxja8>

Strong, E. (2014, October 16). *The diabetic foot exam* [Video]. You tube.

<https://www.youtube.com/watch?v=aVz-Ja9Gryg>

Weir, G. (2012, February 21). *60 Second diabetic foot Screening test – explained* [Video].

YouTube. <https://www.youtube.com/watch?v=4OBPHj3vhl>