

IMPROVING DIABETIC FOOT EVALUATIONS
AND PODIATRY REFERRALS IN PRIMARY CARE

by

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of

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ABSTRACT

Diabetic foot ulcers (DFU) are responsible for over 5% of diabetic deaths. DFUs can be prevented or delayed with early diagnosis and treatment of associated diabetic foot complications by utilizing annual comprehensive diabetic foot evaluations (DFE). Despite this, diabetics are not receiving evaluations per the American Diabetes Association's (ADA) recommendations on timeliness and completeness. The potential problem was identified and a needs assessment was undertaken to diagnose the need for change in practice. At one provider clinic in central Montana, less than two-thirds of diabetic adults received a DFE at their annual exam, compared to the national benchmark of 74.8%. Next, a literature review was utilized to gather and analyze evidence. The best solution was identified and a quality improvement project was proposed. Using the Plan-Do-Check-Act cycle, the outcomes were measured preintervention and weekly after implementation. Outcomes included: rates of Michigan Neuropathy Screening Instrument (MNSI), ADA risk assessment, DFE documentation, and podiatry referral completion. The 6-week project focused on nurse practitioner practice change including staff education, implementation of the DFE tools (MNSI and ADA risk assessment), documentation template, and new process flow. Podiatry referrals were included in the new process for patients who screened positive on the MNSI and ADA risk assessment. One hundred percent of patients received an MNSI, ADA risk assessment, documented DFE, and podiatry referral, when indicated. Only 96.67% of patients received an annual DFE that was congruent with the ADA guidelines, with one patient having an incomplete neurological exam documented in their chart. Improvement in rates of timeliness and completeness of DFEs and podiatry referrals were observed when utilizing these standardized assessments and processes. The project culminated in a reflective evaluation of how Montana State University's Doctor of Nursing Practice (DNP) program met the DNP essentials required for graduation.

CHAPTER ONE

IMPROVING DIABETIC FOOT EVALUATIONS IN PRIMARY CARE

Background

Over the past 13 years, the prevalence of diabetes has increased by 88%, rising to 463 million cases worldwide (Saeedi et al., 2020). With an estimated 11.3% of global deaths attributed to the disease, ramifications of diabetes are high rates of morbidity, mortality, and costs to the economy (Cowap & Parry, 2015; Saeedi et al., 2020). Diabetes, a disease of the pancreas or cells, results in elevated levels of glucose in the blood (Cowap & Parry, 2015). Elevated glucose produces systemic inflammation, causing widespread damage that results in complications including cardiovascular disease, kidney disease, peripheral neuropathy, and peripheral vascular disease (Cowap & Parry, 2015; Baltzis et al., 2016).

Diabetes resulted in over four million deaths globally in 2019 alone, accounting for one in nine deaths among adults aged 20–79 (Cowap & Parry, 2015; Saeedi et al., 2020). Additionally, nearly 50% of diabetic deaths occur in patients less than 60 years old, indicating diabetes is not only a fatal disease of the elderly (Saeedi et al., 2020). Diabetics are more likely to suffer from comorbid conditions including stroke, hypertension, and foot ulcers (Cowap & Parry, 2015). Diabetic foot ulcers (DFU) are responsible for one in five diabetic hospitalizations, and diabetic foot complications are predictors for further diabetic morbidity and mortality (Al-Maskari & El-Sadig, 2007; Al-Rubeaan et al., 2015; Baltzis et al., 2016). Indirect costs alone from premature death, diabetic disability, missed work, and unseen reimbursement total \$1.31 trillion annually (Saeedi et al., 2020).

Diabetic foot disease is defined as inflammatory damage to the nerves and blood vessels resulting in reduced sensation and circulation in the foot (Cowap & Parry, 2015). Peripheral neuropathy and vasculopathy are the first and third most common chronic complications seen with diabetic ulceration, gangrene, and amputation of the lower extremity (Al-Rubeaan e al., 2015). Affecting 30% to 50% of diabetics, peripheral neuropathy is damage to the nerves that results in the loss of protective sensation (LOPS) in the feet and alters the way diabetics walk (Cowap & Parry, 2015; Rinkel et al., 2017). In this way, peripheral neuropathy leads to unawareness of foot ulcers and foot deformity (Cowap & Parry, 2015).

Vasculopathy is damage to the vasculature that includes coronary artery disease, peripheral vascular disease, and cardiovascular disease (Al-Rubeaan e al., 2015). This damage results in reduced circulation of oxygen, nutrients, and antibodies throughout the body (Cowap & Parry, 2015). The resultant reduced circulation to sites of injury causes impaired wound healing and increased rates of infection (Cowap & Parry, 2015). Consequentially, peripheral neuropathy delays diagnosis and treatment of diabetic foot complications while vasculopathy increases severity and complicates treatment; in such, diabetic foot disease increases diabetic morbidity and mortality (Cowap & Parry, 2015; Miller et al., 2014).

As 80% of amputations start as a DFU, diabetes is the leading cause of nontraumatic foot amputation in the United States (Pocuis et al., 2017; Rinkel et al., 2017). Early diagnosis and treatment of DFUs is critical, not only due to their substantial morbidity, but diabetics have a 15% lifetime risk of developing a DFU (Rinkel et al., 2017). The lifetime risk of a DFU increased to 20% with concurrent diabetic peripheral neuropathy and 30% to 35% with comorbid foot deformity or peripheral artery disease (Buschkoetter et al., 2019; Pocuis et al.,

2017). Furthermore, over 5% of diabetic deaths annually in the United States are caused by DFUs (Rubio et al., 2020). The presence of a DFU has been shown to reduce the diabetic's life expectancy by 6 years, incurring a 5-year mortality rate of 40% (Rubio et al., 2017). Diabetic foot ulcers alone cost the United States \$10.4 to \$14.5 billion annually (Rinkel et al., 2017).

However, a potential preventative measure is diabetic foot evaluation (DFE). Diabetic foot evaluation includes a comprehensive diabetic foot examination and risk assessment (Boulton et al., 2008). The risk assessment guides the frequency of further DFEs and prompts a referral to podiatry, if appropriate (American Diabetes Association [ADA], 2022). Podiatry provides the patient with ongoing preventative foot care and lifelong surveillance for diabetic foot complications (ADA, 2022). Annual completion of DFEs increases the likelihood of early intervention and diagnosis of peripheral neuropathy and deformity (Pocuis et al., 2017). Early detection and treatment of diabetic foot complications found during routine DFEs reduces the rate of ulcers by 44% to 85% and amputations by 45% to 85% (Al-Maskari & El-Sadig, 2007; Pocuis et al., 2017).

Standards of Care

Per the American Diabetes Association (ADA), DFE should be performed annually, at a minimum (2022). The comprehensive diabetic foot examination portion of the DFE includes a patient history, review of systems, and a physical examination made up of a visual assessment and assessments of vascular and neurological function (ADA, 2022). Visual inspection should include inspection of the skin and assessment of the foot for deformity (ADA, 2022). Vascular assessment should include palpation of pulses (ADA, 2022).

Neurological exam needs to include a 10-g monofilament testing with either a pinprick, temperature, or vibration test (ADA, 2022).

The annual risk assessment takes into account the diabetic foot examination to determine the frequency of further DFEs and determine if the patient needs referral to podiatry (Boulton et al., 2008). Risk assessment indicating LOPS, with or without deformity, prompts an increase in DFE frequency to every 3 to 6 months (Boulton et al., 2008). Though the ADA indicates the DFE can be completed by primary care, a history of ulcer, amputation, or peripheral vascular disease, with or without LOPS, prompts a referral to podiatry for further evaluation (Boulton et al., 2008). Delays in podiatry referrals for diabetic patients with ulcers result in increased risk of lower extremity amputation and death (Lin et al., 2021).

The Advanced Practice Nurse

The ADA does not specify what level of education the generalist provider should have to perform DFEs. Advanced practice registered nurses (APRN) are registered nurses educated at the Masters or post-Masters level to provide care to patients by diagnosing and managing disease, promoting health, preventing disease, and educating and counseling patients on disease (National Council of State Boards of Nursing, n.d.). The nursing role is focused on improving quality of life and promoting wellness in their patients, placing DFEs within their scope of practice. Family Nurse Practitioners (FNP) are generalist APRNs who see patients across the lifespan. Studies show that outcomes, including diabetic hospital readmission rates, do not differ between those of physicians and FNPs in primary care (Geller et al., 2021). This indicates that not only are DFEs in the scope of the FNP, but they can effectively and safely manage chronic conditions and reduce hospital readmission rates related to diabetes.

Reimbursement

Additionally, diabetic foot examination performance is tied to provider reimbursement. Annual diabetic foot examination is a quality measure for Merit-based Incentive Payment System (MIPS)-eligible providers (Center for Medicare and Medicaid Services [CMS], 2021). To receive full reimbursement under MIPS, providers must meet a certain number of quality measures (CMS, 2021). To meet MIPS #126 criteria, the provider must perform a diabetic foot examination annually that includes neurological examination with 10-g monofilament plus vibration, pinprick, ankle reflexes, or vibration perception threshold (CMS, 2021).

Scope of the Problem

Diabetic foot evaluations have been proven crucial to diabetic care. Diabetic patients often underestimate the importance of foot exams, with less than 30% of patients performing self-exams, thus placing the onus on providers to examine their feet. Yet, diabetic patients only receive an annual DFE 12% to 20% of the time (Miller et al., 2014; Pocus et al., 2017). In addition to DFEs not being performed, the ones that are being performed lack timeliness and completeness, per ADA recommendations. An estimated 70% of diabetic patients receive a DFE, yet only 13% of completed exams meet the ADA recommendations (Pocus et al., 2017). In diabetic patients, only 16.7% of charts contain neurological documentation, 68.8% contain vascular documentation, and 89.6% contain visual exam documentation (Cooksey, 2020). This indicates that DFEs are not completed per guidelines and the failure to systematically and routinely complete DFEs has a detrimental impact on the diabetic patient's health.

Objectives

FNPs are meant to bridge the gap between the increasing need for healthcare and the physician shortage, especially in primary care and rural settings. This places them on the front lines of fighting chronic illness. There is an urgent need for FNPs to identify ways to ensure that annual DFEs are being completed. Low rates of annual, complete DFEs in diabetic patients results in increased concerns related to undiagnosed or untreated diabetic neuropathy, decreased circulation, and foot ulcers. This literature review aims to identify, review, and synthesize evidence related to interventions for improving rates of DFE.

Methods

Search Strategy

This review was performed using the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (Moher et al., 2009). The search was completed from September 1 to September 21, 2022, exploring research articles in the following six databases and search engines: Google Scholar, Cochrane, PubMed, Web of Science, ProQuest, and CINAHL. The search was filtered by peer reviewed and English-only articles. The search was limited to articles from January 1, 2014, to present. The search was conducted using the terms as follows: “DFE,” “diabetic foot examination,” “diabetic foot examination AND screening,” “diabetic foot examination AND improvement,” “DFE AND screening,” “diabetic foot exam,” “diabetic foot exam AND screening tool,” “foot exam AND screening tool,” “improving AND foot exam,” “improving AND diabetic foot exam,” “foot exam AND protocol,” “foot exam AND

algorithm,” “foot exam AND flowchart,” and “foot exam AND checklist.” An ancestral search was performed on all articles meeting eligibility criteria.

Eligibility

Articles that met the following inclusion criteria were included in this review. The articles chosen were peer-reviewed and in English to maintain the integrity of the quality of data. Articles eight 8 years old or newer were chosen to ensure the utilization of current evidence, while also being inclusive of a large body of literature to support or oppose intervention. Study designs or design protocols were excluded, so all reviewed articles reflected data with outcomes. Publications that included participants over the age of 18 years old with a diagnosis of type 1 or type 2 diabetes were included, as this best reflects the population of interest. The publications focused on a primary care setting to reflect the project location and that the interventions included more than education alone.

Study Selection

The principal investigator screened all articles for eligibility and duplicates. A total of 674 articles were identified in this search. After using the databases to filter for peer reviewed articles, English-only, and publication date, 354 articles remained. One hundred eighty-four duplicates were identified and removed. Abstracts and titles were screened on the remaining 170 papers, and the 16 articles that met inclusion criteria were chosen for further evaluation. Of those 16 articles, 14 were able to be retrieved. The retrieved articles were assessed for eligibility criteria and strength of evidence, with five meeting all inclusion criteria.

Citation searching was completed on the five articles meeting inclusion criteria, which uncovered 14 additional articles. Of those articles, 10 were able to be retrieved. These articles were assessed for eligibility criteria, as shown in Appendix A, resulting in an additional four articles. A total of nine eligible articles were found that met eligibility criteria. Studies were grouped by type of intervention as follows: paper screening tool or electronic health record (EHR) screening tool.

Quality Assessment

The Joanna Briggs Institute (JBI) checklist for quasi-experimental studies is an evidence-based tool to assess the rigor of studies (Joanna Briggs Institute, 2017). The JBI assessment score was utilized to appraise the quality of the included studies. The primary investigator completed the quality assessment on all included articles. Studies that met seven to nine criteria were deemed high quality. The studies that met four to six criteria were deemed medium quality. Articles that met three criteria or less were considered low quality and excluded. Based on the quality assessment, one study was excluded due to poor design. Though this study portrayed an increase in provider foot exam completion and referrals, it failed to examine the rates of exam completion prior to intervention, describe the study design in depth, or use appropriate statistical analysis (Kosgei, 2019). All other articles were included.

Results

Overview of Studies

Eight peer reviewed, primary quasi-experimental, before-after studies comprised the articles included in this literature review (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). Seven articles reported sample size, with a mean sample size of 44.1 patients for all studies with outliers of 197 and 538 removed (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). Three studies only included type 2 diabetics (Buschkoetter et al., 2019; Cooksey, 2020; Wilson, 2016); whereas, six studies included patients with all diabetes diagnoses (Ademola-Ojo, 2021; Allen et al., 2016; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014). Three articles used a mix of physicians and nurse practitioners (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020), one used only nurse practitioners (Wilson, 2016), one used only physicians (Edupaganti et al., 2019), and two did not specify what type of provider carried out their interventions (Richardson, 2017; Szpunae et al., 2014).

Six studies took place in primary care offices (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Laster, 2020; Richardson, 2017; Wilson, 2016), with two studies specifying the use of internal medicine providers (Edupaganti et al., 2019; Szpunae et al., 2014). One study was completed in a Veterans Health Administration Clinic (Laster, 2020). Two studies were completed in Texas, one in California, two in Michigan, one in Missouri, one in Arizona, and one at an unspecified clinic in the Midwest (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et

al., 2014; Wilson, 2016). One study utilized multiple sites for implementation of their intervention (Buschkoetter et al., 2019).

Description of Interventions

Seven studies utilized a paper DFE tool with provider education on the use of the tool (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Szpunae et al., 2014; Wilson, 2016). One study utilized a DFE tool in the EHR (Richardson, 2017). Additionally, one study incorporated a foot exam bundle that included a tuning fork, monofilament, and reflex hammer in every exam room (Cooksey, 2020). Two studies added reminders on the patient chart to perform DFEs (Szpunae et al., 2014; Wilson, 2016).

All eight studies utilized DFE tools with a component of risk assessment and foot examination (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). Two studies utilized the MNSI screening tool (Ademola-Ojo, 2021; Buschkoetter et al., 2019). Two studies utilized a screening sheet based on the ADA guidelines for DFEs (Edupaganti et al., 2019; Wilson, 2016). One used the Texas Department of State Health Services guidelines (Cooksey, 2020). Miller's 3-minute diabetic foot exam tool was utilized in one study (Laster, 2020). One study utilized the American Medical Association's performance improvement continuing medical education tool (Szpunae et al., 2014). The final article did not specify the tool used (Richardson, 2017).

Outcomes of Interventions

All eight studies examined rates of DFE completion as an outcome (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017;

Szpunae et al., 2014; Wilson, 2016). Seven studies saw improvements in the percent of DFEs completed annually (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Szpunae et al., 2014; Wilson, 2016). Four studies saw an increase in the number of DFEs being completed per the ADA recommendations (Buschkoetter et al., 2019; Cooksey, 2020; Richardson, 2017; Szpunae et al., 2014).

Seven studies used a DFE tool that included recommendations for podiatry referral, but only three measured referrals as an outcome (Ademola-Ojo, 2021; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). Two studies measured and saw an increase in the number of podiatry referrals made per the ADA recommendations (Ademola-Ojo, 2021; Richardson, 2017). One study utilized podiatry referrals as an outcome, but did not see an increase, as none of the patients in the study met referral criteria (Laster, 2020). Two studies examined and noted an increase in the number of foot abnormalities diagnosed with the intervention (Cooksey, 2020; Laster, 2020).

Quality of Studies

Study quality was appraised taking into account the JBI score and the specific components that make up the score. The quality score was then utilized to make recommendations based on these interventions. Six of the nine articles were evaluated as high quality (Ademola-Ojo, 2021; Cooksey, 2020; Edupaganti et al., 2019; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). Two studies were evaluated as medium quality (Buschkoetter et al., 2019; Laster, 2020).

Studies commonly included well-defined demographics for the intervention group, but no data on if the demographics of the before group were similar to those in the after group (Buschkoetter et al., 2019; Cooksey, 2020; Laster, 2020; Richardson, 2017; Szpunae et al., 2014).

None of the studies included a control group, as they were quasi-experimental, before/after design (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). Five studies did not include multiple measures of outcomes (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Edupaganti et al., 2019; Laster, 2020; Wilson, 2016). Strengths included that the studies demonstrated a clear cause-and-effect with well-defined and clearly described interventions, outcomes, and the use of valid tools (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016).

Discussion

Implementing a DFE tool into annual exams can improve rates of timely provider completion of DFE, per the ADA recommendations. A DFE tool could increase podiatry referrals. Additionally, though this was not the focus of the literature review, the use of a DFE tool could increase the rate of diagnosis of foot abnormalities. It was also shown FNP's are able to effectively utilize DFE tools in their primary care practice.

The intervention of adding a DFE tool to annual exams is low risk, but does incur the cost of educating staff and providing tools for exam in each room. Implementing a DFE tool into the EHR is time intensive and can be costly. Alterations to the EHR could be a poor use of resources, especially if the intervention fails to show results in the specific practice site. Due to this, it would be recommended to utilize a paper DFE tool prior to EHR implementation. Implementation of a DFE tool based on ADA recommendations could improve diabetic care, while improving MIPS quality care measures and potentially impacting future reimbursement for the practice.

Implications for Practice

There is a need to improve rates of DFE completion. This review identified DFE tools as a means to improve rates of DFE and, potentially, podiatry referral timeliness and completeness. Diabetic foot evaluation tools can improve patient outcomes while saving costs related to diabetic complications. Quality improvement resulting in evidence-based modifications in practice is needed. This should include implementation of FNP-led DFEs using a paper DFE tool. This can close the practice gap created by physician shortages and improve rates of timely completion of DFEs.

Implications for Future Research

No controlled studies were able to be found that were less than 8 years old, indicating a gap in recent research. There is a need for high quality, controlled studies that address interventions to improve DFE timeliness and completeness due to the formidable risks related to diabetic foot complications. There is also a gap caused by a lack of studies on improving referral rates to podiatry for further DFEs. Improving referral rates can mitigate ulcer severity and save lives. This quality improvement project will highlight the benefits of implementation a DFE tool to improve rates of timely completion of DFEs to highlight this gap in research.

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CHAPTER TWO

A PROPOSAL TO IMPROVE DIABETIC FOOT EVALUATIONS

Introduction

Diabetic foot evaluations are critical to diabetic care, specifically the prevention of foot ulcers. Diabetic foot ulcers are the primary cause of nontraumatic amputations, with 79.7% of the 276 lower extremity amputations performed in 2014 in Montana attributed to diabetes (Center for Disease Control and Prevention [CDC], n.d.; Rinkel et al., 2017). Yet, only 63% of Montanans report performing a diabetic foot self-exam, placing the burden on providers to perform DFEs (Department of Health and Human Services, 2020). Still, in 2015, only 82.7% of diabetic Montanans and 71.6% of Americans older than 18 years old had received an annual DFE from their provider in the previous 12 months (CDC, 2017).

Healthy People 2020's target is to have 74.8% of diabetics receiving an annual DFE from their provider (CDC, 2017). Although not met nationally, Montana has met this Healthy People 2020 benchmark for DFEs. Despite this, the incidence of lower leg amputations is higher in Montana than nationally, with 4.2 amputations per 1,000 diabetics, compared to 3.4 per 1,000 nationally (CDC, n.d.). This could be attributed to DFEs not being performed per ADA recommendations or at the recommended annual frequency, resulting in missed ulcers, neuropathy, or referrals to podiatry.

Problem Statement

DFEs are not being completed per the ADA recommendations for timeliness and completeness at one FNP-provider primary care site in Montana. Research shows that implementation of DFE tools containing foot exam and risk assessment improve rates of provider adherence to performing timely and complete DFEs and can increase podiatry referrals and diagnoses of diabetic foot complications. Based on practice recommendations, the intervention implemented at the practice site will be a new DFE completion workflow with utilization of a paper DFE tool.

Organizational Microsystem Assessment

The practice site's FNP provider specializes in family medicine and sees patients of all ages, with the majority being midlife and geriatric adults. Solely owned by the FNP, the practice site's staff include the FNP, two nurses, office manager, and a scanner/coder. The site has four exam rooms, each including an exam table, 10-g monofilament, reflex hammer, and tuning fork. The practice sees 901 active patients, 24.6% diagnosed with diabetes. Fifteen patients have diagnosed diabetic polyneuropathy. Of the patient population, 17.6% are on Medicare. The FNP does not see Medicaid patients; thus, the remaining 82.4% of patients have private insurance.

It was noted during patient follow-up appointments that DFEs had not been completed on all diabetic patients during their prior annual exam. Thus, a needs assessment was undertaken by collecting 4 months of data, from May 6, 2022 to September 6, 2022. Data, without patient identifiers to maintain privacy, were collected by utilizing ICD-10 codes E10.0, type 1 Diabetes with coma, through E11.9, type 2 diabetes without complication, to include all type 1 and type 2 diabetic patients.

During this time period, the FNP saw an estimated 11 patients a day, performing an average of 49.75 annual exams a month. Fifteen percent of annual exams were completed on diabetic patients. An average of 63.33% of diabetic patients received a DFE at their annual exam, performing well below the average in Montana of 82.7% and the Healthy People 2020 goal of 74.6% (CDC, 2017).

Of the practice site's annual exams including a DFE on diabetic patients during the 4-month needs assessment, 0% received a complete exam and 0% were referred to podiatry. Of the completed DFEs, 100% included the visual exam, vascular exam, and monofilament portion of the neurological exam, but 0% included a second measure of neurological integrity. This does not meet the ADA recommendations of performing annual DFEs that contain visual, vascular, and two measures of neurological examination (ADA, 2022).

The project site staff have clear job designations that avoid overlap and redundancy of tasks where all members understand their job expectations and work well together. Every staff member is viewed and treated as a key component of the team. The office strives to maintain a healthy work-life balance by limiting the patients seen daily so that staff can adequately meet patient needs while respecting outside commitments. The FNP maintains a positive environment with a culture that promotes evidence-based care and is open to practice change. Further, the FNP is very supportive of her staff. This culture and a history of previous student-led quality improvement enhances the staff's willingness to participate.

Rationale

This quality improvement initiative was developed using the Plan-Do-Check-Act (PDCA) cycle. The PDCA cycle starts with the “plan” where need for change is noted, data on the problem are collected, intervention evidence is accumulated, evidence-based recommendations are formulated, and intervention is planned (MacGillivray, 2020). The “do” stage focuses on piloting the intervention on a small sample to assess its efficacy at the specific practice site (MacGillivray, 2020). The “check” step involves collecting and analyzing data related to the outcomes expected from the intervention (MacGillivray, 2020). Last, the “act” step utilizes the findings from the “check” stage to determine if change should be enacted or if the “plan” phase needs to be revisited (MacGillivray, 2020). This framework was chosen as it promotes continuous improvement by returning to the “plan” phase if intervention was not successful, thus restarting the PDCA cycle (MacGillivray, 2020).

During the “plan” phase, it was found that DFEs were not occurring annually and were incomplete per ADA standards. The “plan” phase of the PDCA cycle aided in diagnosing the problem. During this phase, it was also found that no workflow existed for DFE completion and identifying the appropriate patients to be assessed. Additionally, the FNP was unaware that her DFEs did not meet ADA recommendations for timelines and completeness. The “plan” phase was completed in October 2022 and will lead into the “do,” “check,” and “act” stages (as shown in Figure 1) beginning December 2022 and continuing through March 2023.

It is assumed that the interventions will be effective based on their ability to result in improvement in similar settings, per the literature. As well, the FNP already performs DFEs and is eager to improve her DFE thoroughness. The workflows for referrals and utilizing paper

documents are already in place at the clinic and are able to be altered to include implementation of a paper DFE tool. The site already possesses all the materials needed to implement the intervention, adding little cost for the practice and further supporting its potential efficacy.



Figure 1. Proposed PDCA Cycle

Specific Aims

As the needs assessment at the practice site revealed DFE completion rates were below national and state benchmarks, it is imperative to improve DFE completion to positively

influence future diabetic morbidity and mortality. Reducing diabetic foot complications, severity of ulcers at diagnosis, hospitalizations attributed to diabetic foot complications, and amputations, while increasing podiatry referral rates and early treatment of diabetic foot complications are the ultimate project goals, yet these are beyond the scope of the initiative timeline. This quality initiative will implement a workflow change for DFE performance (see Appendix B) that utilizes a foot exam and risk assessment tool to prompt completion and guide podiatry referral. The purpose of this improvement initiative is to determine if integrating the use of an evidence-based, FNP-led toolset into practice will improve completion of DFE and podiatry referrals, when indicated, in primary care.

Context

A primary care practice, with a sole FNP provider and owner, located in Montana was selected due to the ability of the principal investigator to perform a quality improvement initiative at the site. Key stakeholders are the FNP/owner, nursing, and front-desk staff, along with diabetic patients. The primary nurse rooms the patient, takes their vital signs, completes necessary paper documents, and performs a brief history of present illness. The secondary nurse works as the receptionist where she checks patients in, preps charts, and completes patient referrals. Both nurses are trained to perform both positions, in case one is absent, so that the office can still run smoothly. The scanner/coder scans all paper documents into the appropriate areas of the EHR and submits codes to insurance.

As nearly 25% of patients cared for are diabetic, an ample opportunity to use and evaluate this new approach is anticipated during the project timeline. The FNP's aim is to

provide inclusive and holistic patient care to promote patient health in a warm and inviting environment. The culture of the practice site is patient-centered and focuses on quality and continuous process improvement.

Although the FNP has many workflows in place, there is not one in place for identifying patients for and completing DFEs, resulting in missed and incomplete annual DFEs.

Additionally, there is no workflow for when to refer to podiatry. A process for identifying patients can be easily added to the current workflow for using paper documents. The risk assessment assists in determining which patients need podiatry referral, which can prompt the FNP to begin the current referral process. A site strength for project implementation is that the current workflows can be altered and it does not incur a substantial amount of time, new tasks, or memorization.

The practice's EHR is intuitive, with easy to find information, and rarely unavailable for staff to use. The practice site currently uses some paper charting, i.e., paper PHQ-9, and has a workflow to complete and scan paper documents into the EHR. The EHR contains folders with scanned copies of all incoming labs, outside provider notes, and any paper documents completed during appointments. This process can be altered to implement a paper DFE tool. The EHR contains a provider Rolodex of local provider names and their fax numbers, which is utilized in their referral workflow. This Rolodex can be used to refer appropriate patients to podiatry with little added time.

Contrary to the culture promoting education and practice change, formal quality improvement is not often undertaken at the practice site, unless initiated by FNP students. This could be a weakness in some practice sites, but the FNP and staff are open to practice change and

regularly implement informal evidence-based practice change demonstrating their acceptance of project implementation. Additional project strengths include a strong team dynamic built on trust and distinct job designations, as well as that the interventions can be added to the current workflow, making transition to utilizing a paper DFE tool simple and intuitive.

Interventions and Implementation

This quality initiative will be implemented at the single FNP family practice clinic in central Montana with adult diabetic patients that present at the clinic for an annual exam during the 6-week initiative. Selected patients must have an ICD-10 code from E10.0 to E11.9. Figure 2 displays the timeline of the initiative including the pre-initiative planning and post-initiative assessment.

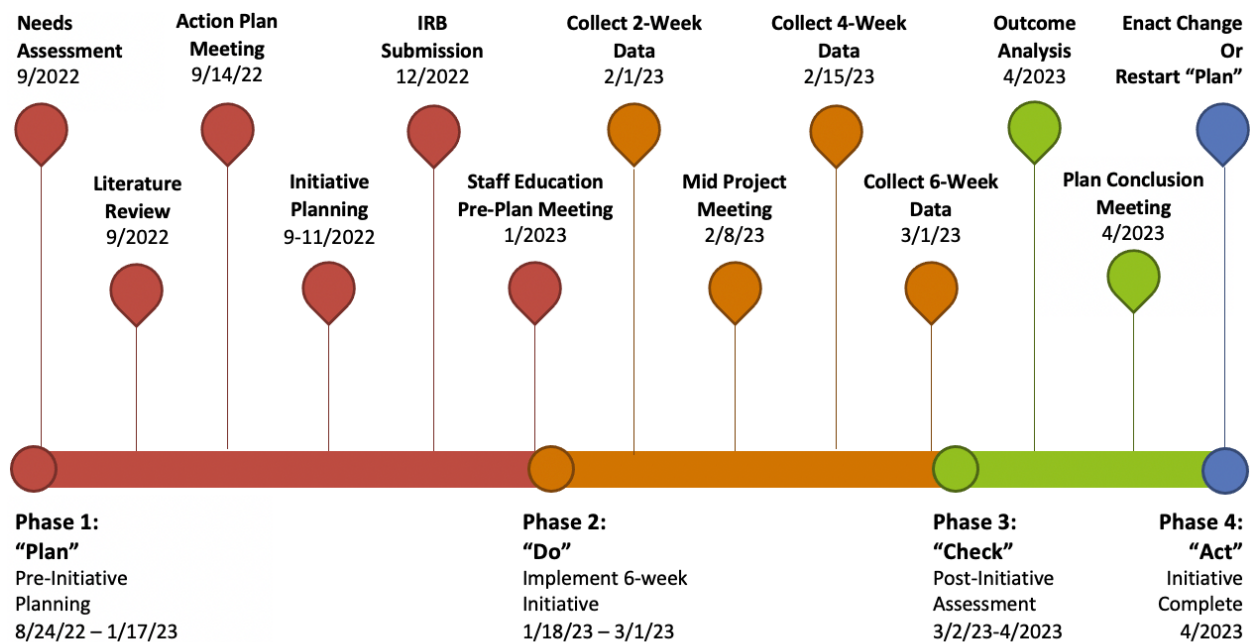


Figure 2. Proposed Timeline for the Quality Initiative

Necessary project implementation resources include a printer, exam room with a seat, 10-g monofilament, reflex hammer, and tuning fork, all of which the practice currently possesses. The budget for this initiative only includes printing the DFE tools, as staff have volunteered to receive education during their lunch. The estimated cost of a color copy is 15 cents a copy. With an average of 10 diabetic annual exams a month, the estimated cost for the initiative will be \$4.50. Extra copies will be printed, totaling \$6.00. Though implementation will increase the length of annual exams by a minimal amount, DFE exams per the ADA recommendations allow for use of additional ICD-10 billing codes and potential increases in reimbursement, which outweighs the increased time. An additional benefit to the small practice is the DNP student will volunteer 270 hours, which accounts for \$5,400 in savings when these hours are multiplied by an average hourly nursing rate of \$20.

During the “plan” phase, the interventions and specific DFE tools were selected. The MNSI was chosen due to its compliance with ADA recommendations and specificity in assessing for LOPS (Herman et al., 2012) (see Appendix C). The MNSI will be used to prompt the provider to perform a DFE at the appointment. An MNSI of greater than seven indicates LOPS and will automatically prompt podiatry referral (Herman et al., 2012). A positive answer on the ADA risk assessment will guide the FNP to refer to podiatry for all future DFEs (see Appendix D). Figure 3 displays a graphical representation of the interventions that will be implemented during the “do” phase.

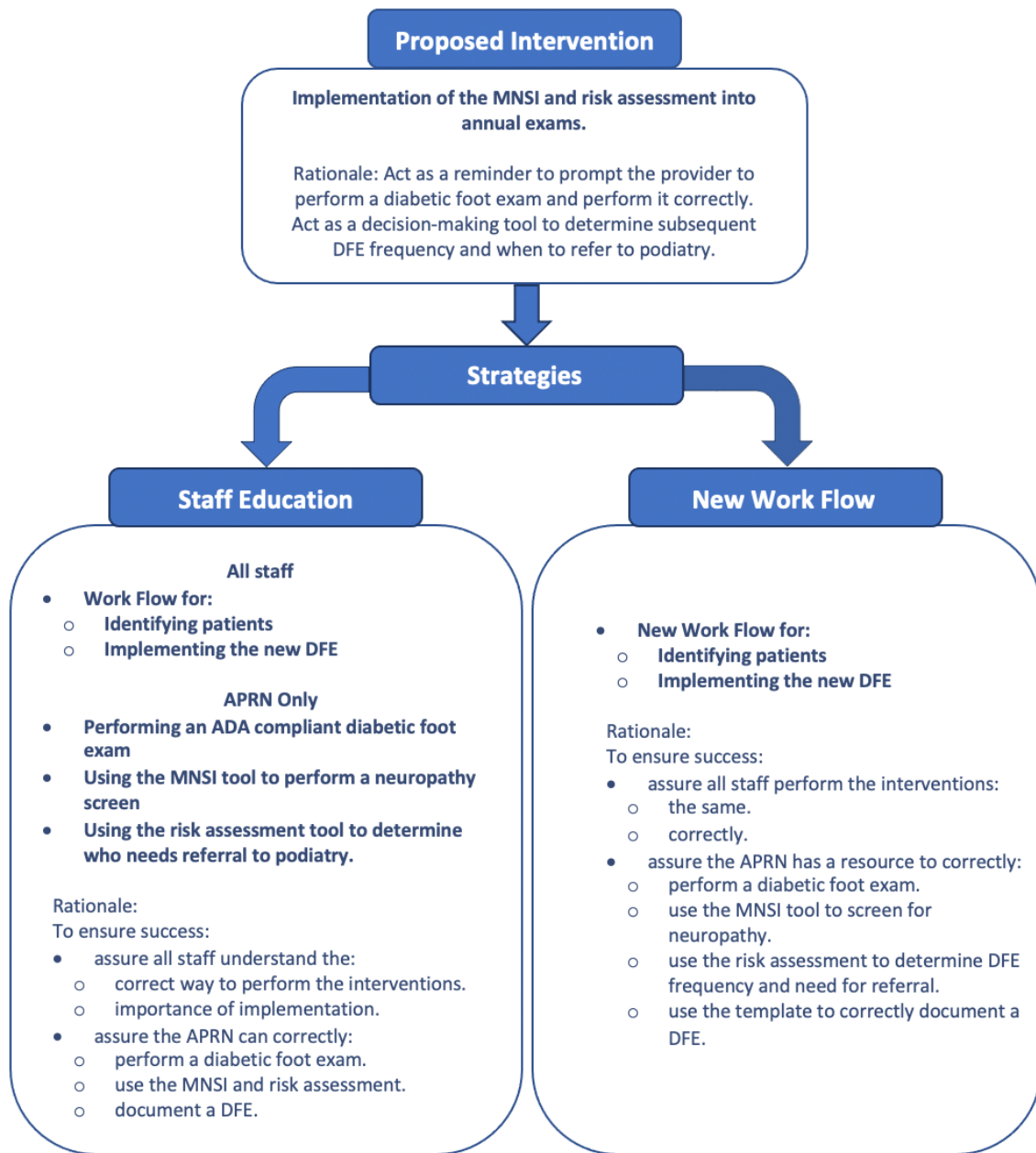


Figure 3. Proposed Quality Initiatives' Interventions

The first step in implementing this intervention was creating a new workflow. The process of identifying diabetic patients was added to the current work (shown in Figure 4). The alteration to the workflow includes the secondary nurse using the EHR to identify patients that

are diabetic, while prepping their charts, and clipping a paper MNSI and ADA risk assessment to the patient's chart.

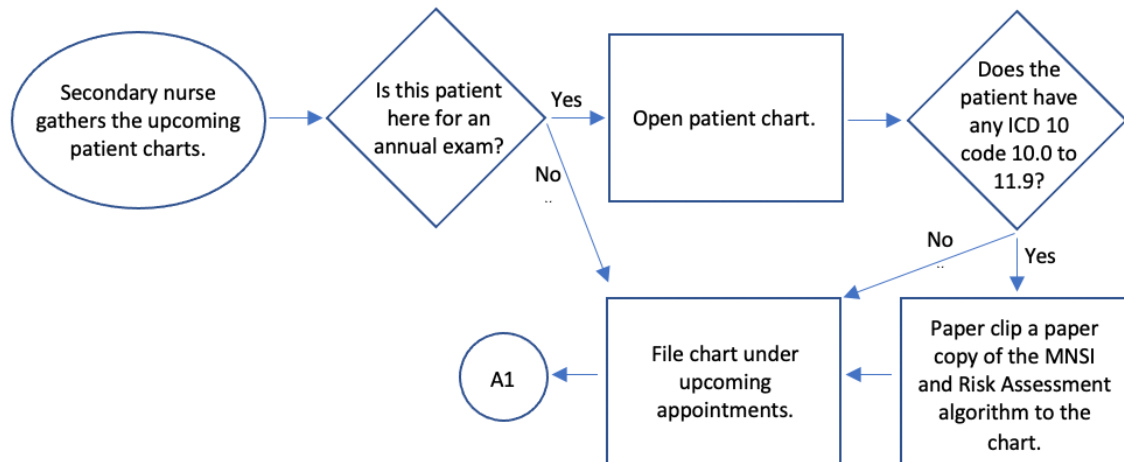


Figure 4. Proposed Workflow for Identifying Diabetic Patients

The FNP will then use the new workflow for implementing DFEs (shown in Figure 5). In this workflow, the FNP will use the MNSI to prompt a DFE and the ADA risk assessment to aid in deciding if podiatry referral is warranted. The risk assessment prompts a referral for MNSI > 7, as indicated previously, or if the provider answers yes to any of the questions about patient history and diagnoses (see Appendix D). A template for documenting DFE will be added to the EHR (Appendix E). The provider starts her SOAP notes while the patient is in the office. The MNSI will prompt a DFE and the template will remind her to perform any components she may have missed prior to the patient leaving.

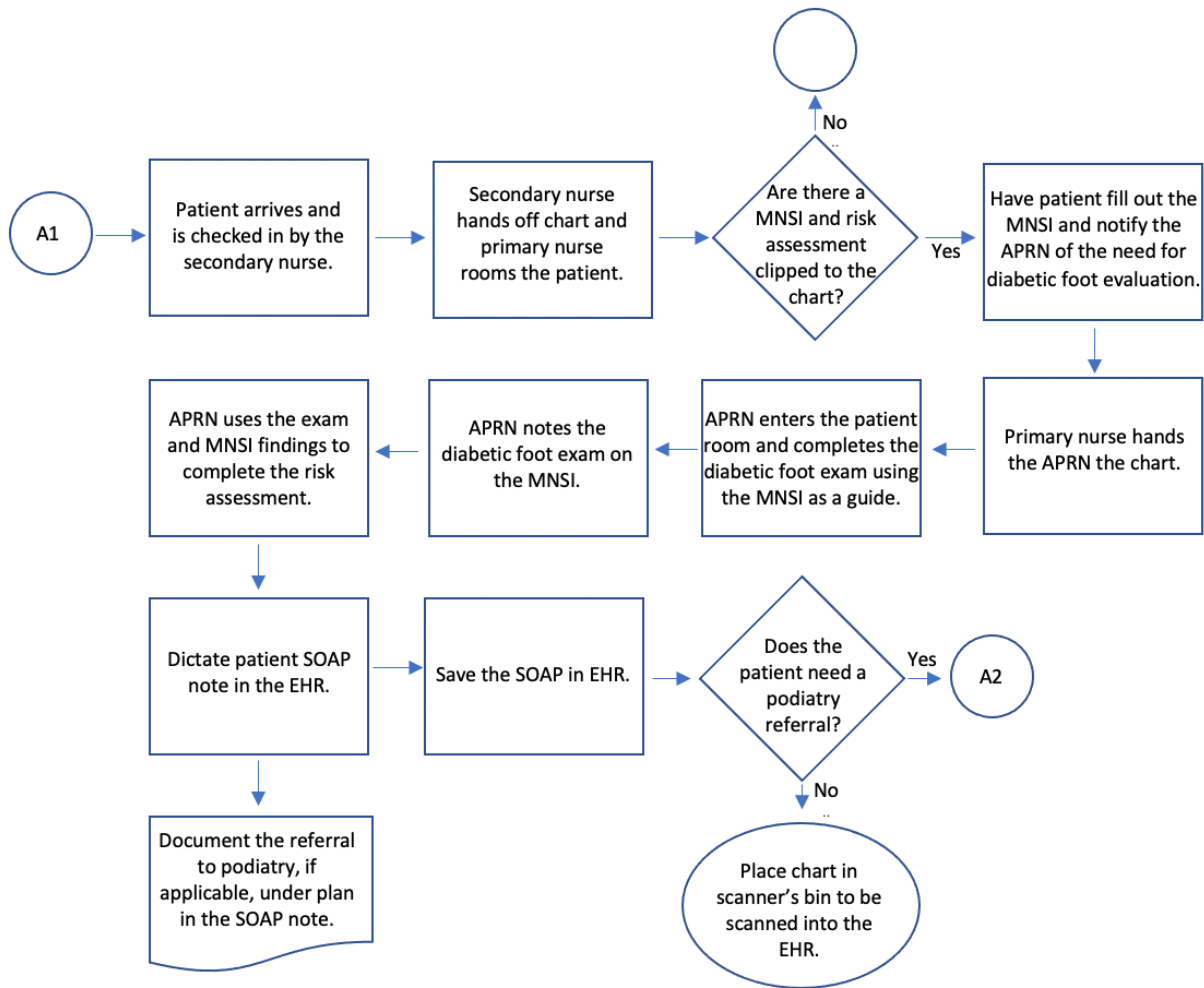


Figure 5. Proposed Workflow for Diabetic Foot Evaluations

If the patient is deemed to need podiatry referral per the risk assessment, the FNP will be prompted to start the existing referral workflow (Figure 6).

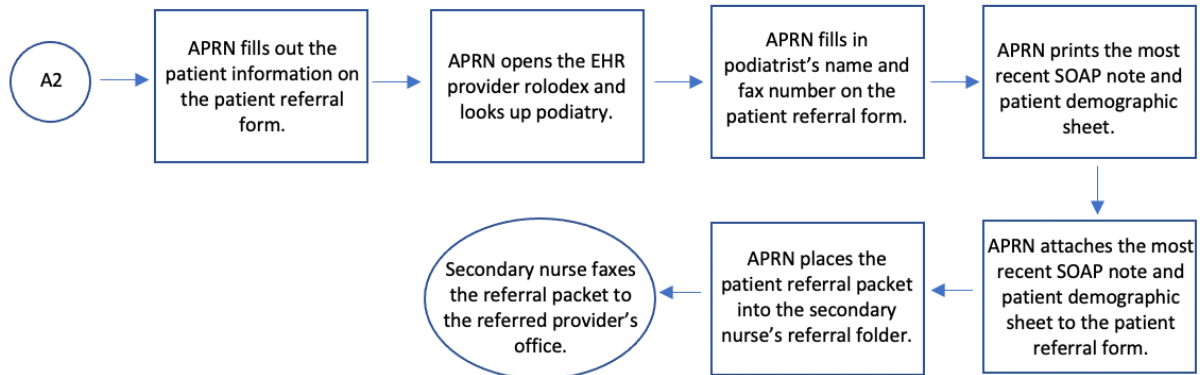


Figure 6. Current Workflow for Referrals

The final step in implementing the intervention included creating and providing education for staff (Table 1).

Table 1. Proposed Education Outline for Staff on Quality Initiative

Staff Involved	Education Topic
FNP	Using the MNSI and risk assessment tools.
FNP	Using the MNSI and risk assessment tools for referral to podiatry.
FNP	Performing an ADA-compliant diabetic foot exam.
FNP	Documenting diabetic foot exam findings.
All Staff	The new workflow for identifying diabetic patients.
All Staff	The new workflow for diabetic foot evaluations.
All Staff	The benefits of implementation, i.e., reimbursement and patient outcomes.

Staff education will precede implementation of the intervention, the MNSI and ADA risk assessment, into the practice workflow with anticipated delivery of early January 2023. During implementation, workflows will be posted and available for staff to reiterate the process outlined.

The materials needed to perform a diabetic foot exam are included in exam rooms, ready for the FNP to utilize.

Barriers

A potential barrier to long-term implementation of this project is that the practice frequently receives FNP students. With a constant new influx of students, it must be assured that each one is educated the same way. To achieve this, an outline of the FNP education will be provided to act as a step-by-step guide to educating new providers on implementation of the intervention. If a new FNP student were to arrive during the intervention, the FNP student would be educated in the same manner as the FNP to avoid bias.

Another barrier is that the FNP did not realize she was performing the exams wrong. Education on how to perform them per ADA standards will be given. As well, the provider may not be engaged or understand the importance of adding a second measure of neurological function to her DFE. Education on the impact of diabetic foot complications and the benefits of early detection will be completed to strengthen the urgency of this initiative.

A third barrier is that staff may be resistant to implement practice change, believing it time intensive and requiring major changes to the current workflow. The intervention can be implemented into the staff's current workflow with little change or time added. Education will be focused on drawing light to the small changes in workflow adding a DFE tool will incur.

Confidentiality

This initiative will be submitted in December 2023 to the Montana State University's (MSU) Institutional Review Board (IRB) to protect all patients involved in this initiative (see

Appendix F). The site does not have an IRB board, but the site representative consented to the needs assessment and participation in the initiative (see Appendix G). Implementation of the intervention included a change in office processes and poses no risk to patients. Participation by office staff is voluntary. As this is standard of care and focuses on staff processes, patient consent for treatment includes receiving evidence-based care. Patient privacy is maintained as no personal or identifying information will be removed from the site.

Evaluation

Every 2 weeks, on Thursday, data will be collected by the principal investigator on the outcome measures (see Table 2). The FNP will deidentify copies of all diabetic patients presenting for annual exam's charts and store them in a locked area of the office. The FNP will provide them to the principal investigator to assess what percent of patients received and had documented a comprehensive diabetic exam with podiatry referral, if indicated. The FNP will deidentify copies of the MNSIs and ADA risk assessments completed during the 6-week intervention and provide them to the principal investigator. The measured outcome criteria were created to assess attainment of the project goals.

Table 2. Quality Improvement Initiative's SMART Goals and Evaluation Methods

SMART Goal #1: By January 18, 2023, 100% of FNP's will be educated on: 1. use of the MNSI. 2. use of the ADA based risk assessment for referrals. 3. how to perform an ADA compliant diabetic foot exam. 4. how to document a diabetic foot evaluation using the EHR template. 5. where to store deidentified patient MNSI, ADA risk assessments, and SOAP notes on site, in a locked file cabinet. 6. implementing the new DFE with MNSI and ADA risk assessment into the current workflow for podiatry referrals and completing paper documents.
Description of strategies and resources used to accomplish goal. The principal investigator will: • develop the new DFE workflow on completing paper charts and referrals (Figure 5 and Figure 6). • print all MNSI and ADA risk assessments and make them available, in the filing cabinet, for use. • develop and create a template in the EHR for documenting a DFE under the physical exam and plan portion of the SOAP note. • develop and implement education (see Table 1): • implement the new DFE workflow utilizing the paper MNSI and ADA risk assessment: ○ into the existing workflow for completing paper documents. ○ into the existing workflow for referrals.

Table 2. Quality Improvement Initiative's SMART Goals and Evaluation Methods Continued

Data to be collected	Method of Collection and who is responsible	Planned data analysis
100% or 1 FNP/1FNPs receives education.	Principal investigator will keep track of all FNPs receiving education.	Principal investigator will document the percent of FNPs who received education.
SMART Goal #2: By January 18, 2023, 100% of staff will be educated on: 1. how to identify diabetic patient for this practice change. 2. implementing the new DFE with MNSI and ADA risk assessment into the current workflow for referrals and completing paper documents.		
Description of strategies and resources used to accomplish goal. The principal investigator will: • Develop and implement education on (see Table 1): ○ the new workflow on identifying diabetic patients (Figure 4). ○ the new DFE workflow on completing paper charts and referrals (Figure 5 and Figure 6). • Implement the addition of identifying diabetic patients into the existing workflow for completing paper documents. • Implement the new DFE workflow utilizing the paper MNSI and ADA risk assessment: ○ into the existing workflow for completing paper documents. ○ into the existing workflow for referrals.		

Table 2. Quality Improvement Initiative's SMART Goals and Evaluation Methods Continued

Data to be collected	Method of Collection and who is responsible	Planned data analysis
100% or 3 staff/3 staff receive education.	Principal investigator will keep track of all staff receiving education.	Principal investigator will document the percent of staff who received education.
SMART Goal #3: By March 1, 2023, 100% of diabetic patients presenting for an annual exam will have a comprehensive foot exam documented in their chart.		
Description of strategies and resources used to accomplish goal. The provider will use the MNSI (Appendix C) to prompt them to perform a comprehensive DFE and utilize the EHR physical exam and plan template (Appendix E) to document the DFE in the SOAP note. The documentation template includes a: 1. complete diabetic foot exam under physical exam. 2. Current referral recommendation under plan.		

Table 2. Quality Improvement Initiative's SMART Goals and Evaluation Methods Continued

Data to be collected	Method of Collection and who is responsible	Planned data analysis
1. Number of DFE templates/Total diabetic patients • Number of visual exams/Total diabetic patients • Number of vascular exams/Total diabetic patients • Number of neurological exams/Total diabetic patients	Every day the FNP will collect all SOAP notes for diabetic patients and deidentify them. The principal investigator will be provided the deidentified SOAP notes to keep a tally, on site, of the number of SOAP notes with a documented DFE. The individual components of a DFE, vascular, neurological, and visual, will also be tallied by the principal investigator.	Principal investigator will document the percent of DFE templates and visual, vascular, and neurological exams completed at 2, 4, and 6 weeks. A meeting will be done in person to display percentages in a run chart and obtain staff feedback.

Table 2. Quality Improvement Initiative's SMART Goals and Evaluation Methods Continued

SMART Goal #4: By March 1, 2023, 100% of patients will receive an MNSI and ADA risk assessment.		
Description of strategies and resources used to accomplish goal. The provider will utilize the MNSI (Appendix C) and ADA risk assessment (Appendix D) during annual diabetic exams and the scanner will scan them into the patient chart.		
Data to be collected	Method of Collection and who is responsible	Planned data analysis
1. Number of MNSI/Total diabetic patients 2. Number of ADA risk assessments/Total diabetic patients	Every 2 weeks the FNP will deidentify and copy all MNSI and ADA risk assessment forms. The principal investigator will be provided the deidentified MNSIs and ADA risk assessments to keep a tally, on site, of the number forms completed.	Principal investigator will document the percent of MNSI and ADA risk assessments completed at 2, 4, and 6 weeks. A meeting will be done in person to display percentages in a run chart and get staff feedback.

Table 2. Quality Improvement Initiative's SMART Goals and Evaluation Methods Continued

SMART Goal #5: By March 1, 2023, 100% of patients will receive a podiatry referral when indicated by an MNSI 7 or greater, or a “yes” to any question on the risk assessment.		
Description of strategies and resources used to accomplish goal. The provider will utilize the MNSI (Appendix C) and ADA risk assessment (Appendix D) during annual diabetic exams and refer to podiatry, if indicated.		
Data to be collected	Method of Collection and who is responsible	Planned data analysis
3. Number of patients with MNSI >7 referred/Number of patients with MNSI >7 4. Number of patients with “yes” on risk assessment referred/Number of patients with “yes” on risk assessment	Every 2 weeks the FNP will deidentify and copy all MNSI, ADA risk assessment forms, and SOAP notes. The principal investigator will be provided the deidentified MNSI, ADA risk assessment forms, and SOAP notes to keep a tally, on site, of the number forms completed.	Principal investigator will document the percent of referrals made based on MNSI, ADA and risk assessment forms completed at 2, 4, and 6 weeks. A meeting will be done in person to display percentages in a run chart and get staff feedback.

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CHAPTER THREE

IMPROVING DIABETIC CARE: IMPLEMENTATION OF DIABETIC FOOT
EVALUATION TOOLS IN PRIMARY CAREIntroduction

The United States' eighth leading cause of death, diabetes, affects approximately 11% of Americans and 10% of Montanans (American Diabetes Association [ADA], 2021; United Health Foundation, 2021). Costing the US \$1.31 trillion annually, diabetes is a disease of the pancreas that results in elevated levels of glucose in the blood (Cowap & Parry, 2015; Saeedi et al., 2020). This elevated glucose destroys the nerves and vasculature, increasing the risk of damage to the foot including ulceration and deformity (Al-Rubeaan et al., 2015; Cowap & Parry, 2015). Such nerve and vasculature impairment can prevent the diabetic from noticing the injury, due to poor sensation in the feet known as loss of protective sensation (LOPS), thus delaying treatment and diagnosis of resulting foot complications (Cowap & Parry, 2015).

Diabetic foot ulcers (DFU) are a major cause of diabetic morbidity and mortality, with 15% of diabetics developing a DFU in their lifetime (Rinkel et al., 2017). The lifetime risk of DFU development increases with concurrent neuropathy, vasculopathy, or foot deformity (Pocuis et al., 2017). Diabetic foot evaluations (DFEs) have been proven effective in preventing foot ulcers by promoting earlier diagnosis and treatment of diabetic neuropathy, vasculopathy, and deformity (Al-Maskari & El-Sadig, 2007; Pocuis et al., 2017).

The American Diabetes Association (ADA) has recommended provider guidelines for performing a DFE. DFEs should include a physical foot examination, neuropathy screen, and

risk assessment to guide the need for podiatry referral (ADA, 2022). The physical exam should contain the following three components: visual, vascular, and neurological inspection of the foot. First, the provider must visually inspect the foot for any abnormalities, such as ulceration or deformity (ADA, 2022). Next, a vascular exam should be performed noting temperature, capillary refill, and palpation of pulses (ADA, 2022). Last, neurological function testing must include a 10-g monofilament test with either pinprick, temperature, or vibration testing (ADA, 2022).

Though the ADA does not specify the level of education expected for the provider completing DFEs, the advanced practice registered nurse (APRN) is a nurse trained at the Masters or post-Masters level to diagnose and manage disease (National Council of State Boards of Nursing, n.d.). This places completion of a DFE within the scope of the APRN's practice. Family Nurse Practitioners (FNPs) are APRNs trained specifically to practice as a generalist seeing patients of all ages. With the shortage of primary care physicians, FNP's can be used to fill this gap left by the shortage where DFEs may be missed due to the burden of heavy patient loads.

At a single-FNP-owned primary care clinic in central Montana, 63.33% of diabetic patients were receiving an annual DFE, compared to the national benchmark of 74.8% (Centers for Disease Control and Prevention, 2017). Of those who did have an annual DFE, 0% of completed assessments had a neurological exam per the ADA guidelines. Additionally, the provider had no system in place to assess risk and determine the need for podiatry referral. This was exceptionally problematic, as 24.6% of the practice's patients had diabetes, placing their rates of diabetes at nearly three times that of Montana's. Despite the provider being aware of the

clear benefits of annual DFE for diabetics, comprehensive DFEs were not being completed annually at this site.

Available Knowledge

Intervention to improve timeliness and completeness of DFEs, per the ADA guidelines, is imperative. DFE tools have been utilized to improve rates and completeness of DFEs (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). In addition, DFE tools and staff education have been shown to improve podiatry referrals and, potentially, diagnoses of diabetic foot abnormalities (Ademola-Ojo, 2021; Cooksey, 2020; Laster, 2020; Richardson, 2017). Podiatry referrals are key in increasing ongoing preventative foot care and lifelong surveillance for diabetic foot complications (ADA, 2022). Effective DFE tools utilized a component of physical exam and risk assessment (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016).

Comprehensive DFE Screening Tools. The Michigan Neuropathy Screening Instrument (MNSI) and a risk assessment based on the ADA-provided guidelines were chosen as interventions due to their ability to improve rates of timely and complete DFEs and podiatry referrals, when indicated (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016). The MNSI (see Figure 7Appendix C) is a validated tool that is commonly used for measuring peripheral neuropathy, with good positive predictive value that is 99% specific in identifying

peripheral neuropathy for scores greater than 7 (Herman et al., 2012). In two studies, FNPs successfully utilized the MNSI to improve rates of comprehensive DFE completion, which met ADA standards for neuropathic screening (Ademola-Ojo, 2021; Buschkoetter et al., 2019).

The risk assessment is developed from the ADA guidelines for podiatry referral during a DFE. Being a current smoker, having a history of lower extremity complications, MNSI greater than 7, current foot deformity or ulcer, or peripheral artery disease prompts referral to podiatry on the ADA risk assessment (as seen in Appendix D). Though all studies utilized DFE tools with a portion of risk assessment, only three looked at their efficacy in increasing podiatry referrals. One study measured podiatry referrals as an outcome, but had no patients received a DFE meeting referral criteria (Laster, 2020). Two studies showed an increase in the number of podiatry referrals when indicated by an ADA-guided risk assessment (Ademola-Ojo, 2021; Richardson, 2017).

Rationale

The Plan-Do-Check-Act cycle was chosen as the framework for this quality improvement project. This framework seeks to improve processes and was chosen because it promotes continuous improvement by returning to the “plan” phase if intervention was not successful, thus restarting the PDCA cycle (MacGillivray, 2020). The “plan” phase involves diagnosing the problem, gathering evidence, analyzing it, and selecting the best solution (MacGillivray, 2020). The “do” stage involves piloting the interventions whereas the “check” stage involves collecting and analyzing data (MacGillivray, 2020). Lastly, during “act,” it is determined if one should continue implementation of the intervention or return to the “plan” stage (MacGillivray, 2020). The MNSI and ADA risk assessment were expected to be successful since other primary care

sites have successfully piloted them; many with the use of FNPs (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Richardson, 2017; Szpunae et al., 2014; Wilson, 2016).

Specific Aims

This diabetic foot care quality improvement project (QIP) was developed to improve rates of timely and complete DFEs and podiatry referrals by a FNP in a primary care clinic. Over time, the interventions aim to improve rates of early diagnoses and treatment of neuropathy, vasculopathy and deformity, while decreasing rates of delayed ulcer diagnosis, amputations, and hospitalizations. This QIP assessed the sustainability of utilizing DFE tools to improve rates of timely and complete DFEs and podiatry referrals.

Methods

Context

The practice site was a single-FNP clinic in central Montana. The FNP actively saw 901 patients at the time of the needs assessment, which was performed during the plan phase of the QIP. This accounted for an estimated eleven patients a day. Within the practice, nearly 18% of patients were on Medicare with the remaining patients covered under private insurance, and the FNP did not accept Medicaid patients. The FNP performed an average of 49.75 annual exams a month, with nearly 25% of the patient population diagnosed with diabetes, providing an ample opportunity to use and evaluate QIP interventions during the project timeline.

The clinic employed two nurses, an office manager, and a scanner/coder. The primary nurse was responsible for rooming the patients, setting up the room for DFE exam, and FNP

notification of forms that needed completion. The secondary nurse worked at the front check-in desk, prepped patient charts, and sent referrals. The scanner/coder scanned all paper forms into the EHR and coded the encounters. The practice site had four exam rooms, each including an exam table, 10-g monofilament, reflex hammer, and tuning fork, all of which were necessary for a comprehensive DFE. The practice utilized an electronic health record (EHR) that contains folders with scanned copies of all incoming labs, outside provider notes, and any paper documents completed during appointments. The EHR contains a provider Rolodex of local provider names and their fax numbers.

The FNP's aim is to provide inclusive and holistic patient care to promote patient health in a warm and inviting environment. The culture of the practice site is patient-centered and focuses on quality and continuous process improvement. Formal quality improvement is not often undertaken at the practice site unless initiated by FNP students; although, the FNP and staff are open to practice change and regularly implement informal evidence-based change. The office includes a strong team dynamic built on trust and distinct job designations.

Interventions

This quality initiative was implemented at the single-FNP family practice clinic in central Montana utilizing adult, older than 18 years, diabetic patients that presented at the clinic for their annual exam during the 6-week initiative. Selected patients had an ICD-10 code from E10.0 to E11.9, which includes all type 1 and type 2 diabetics. During this initiative, 30 diabetic patients presenting for annual exam were identified and received the QI interventions.



Figure 7. QIP PDCA Cycle

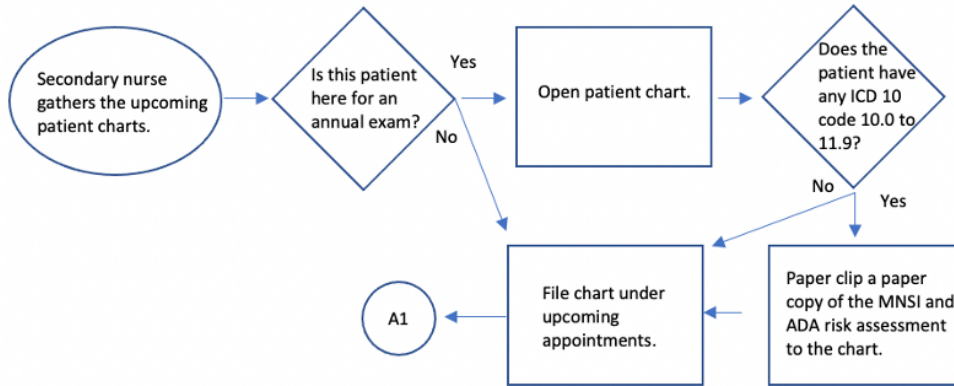
During the planning phase, staff education (shown in Figure 7) was performed at a meeting. The FNP and nurses were educated on the new process flows of identifying diabetic patients, performing DFEs, and benefits of this initiative. The FNP was educated on how to perform and chart an ADA-compliant foot exam using a documentation template, the MNSI and ADA risk assessment, and how to use the ADA risk assessment to determine need for podiatry referral. Next, a chart template was created by the FNP, with the principal investigator, and added to the EHR. Paper versions of the MNSI and ADA risk assessment were printed and

available to staff. Paper tools were chosen as editing the EHR was cost and time prohibitive, and the principal investigator wanted to assure the intervention was effective prior to implementing such change. After this, implementation of the QIP began on January 18, 2023 and continued through March 2, 2023.

Implementation. Implementation started with initiation of the new workflows (shown in Figure 8). The secondary nurse identified all patients with an ICD-10 code from E10.0 to E11.9 prior to their annual exam. She then placed an MNSI and ADA risk assessment paper form into the patients' paper charts when prepping them. When the patient arrived, she would check them in and hand the chart to the primary nurse. The primary nurse would then room the patient, take their vitals, have them fill out the patient's side of the MNSI, and inform the FNP that the patient needed a DFE. The FNP would enter the room, perform the physical exam, and fill out the MNSI and ADA risk assessment. If the score of the MNSI was greater than 7 or there was an answer of yes on the ADA risk assessment, the FNP was prompted to refer the patient to podiatry.

The FNP would then use the template in the EHR to chart the physical exam and podiatry referral, if indicated. The FNP was originally going to place the MNSI and ADA risk assessment in the scanner bin to be scanned into the patient charts by the scanner, but deemed there was little value in doing so. If podiatry referral was indicated, the FNP would use the Rolodex in the EHR to fill out a referral form. The FNP would print a copy of the patient's note and their face sheet, clip it to the referral form, and place it in the secondary nurse's folder to fax to podiatry.

Work Flow to Identify Diabetic Patients



Work Flow to Perform DFE

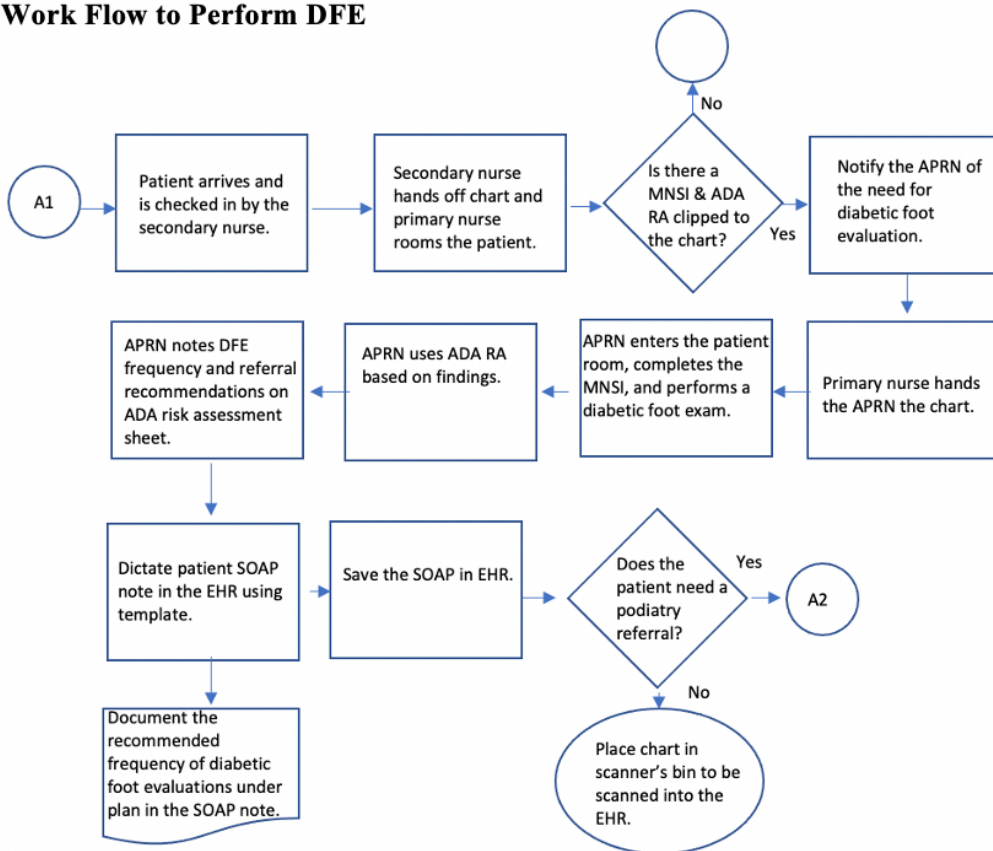


Figure 8. QIP Workflows

Evaluation

Measures. The outcomes were as follows: DFE documented in the EHR, individual components of DFE documented (visual, vascular, neurological), MNSI completed, ADA risk assessment completed, and podiatry referral, if indicated. Completion rates were chosen for MNSI and ADA risk assessment to determine if the tools were being utilized at the practice site. If the tools were not being used and improvements were appreciated, it would indicate improvement was not related to the interventions. Podiatry referral completion rates were utilized to show that the FNP can appropriately use the MSNI and ADA risk assessment to guide podiatry referrals in primary care and measure the percent of time they were appropriately used. Rates of DFE documentation and completeness of documentation were measured to show if the process flows and EHR template prompted the FNP to perform timely and complete DFEs.

Data Collection. Data were originally to be collected every 2 weeks due to the limited volume of diabetic annual exams the site performs weekly. However, due to an increased volume of diabetics presenting for annual exams during the initiative, data were altered to weekly collection. Midway through the project, a meeting was held to review progress, answer questions, and evaluate staff perception on the initiative. After summation of the QIP project, a meeting was held to review project results. Although only three formal meetings were held, the principal made weekly contact and was available via phone or email.

Analysis

Microsoft Excel was used to complete weekly run charts of the outcomes during the study phase of the PDCA. The outcomes were recorded as rates in the form of percentages, including

documented annual DFE, documented DFE component, MSNI completion, ADA risk assessment completion, and podiatry referrals.

Ethical Considerations

The principal investigator did not have contact with any personal identifying information (PHI). No patient charts were accessed during implementation, data collection, or analysis. The FNP deidentified copies of all diabetic patients' charts and stored them in a locked area of the office. The FNP deidentified copies of the MNSIs and ADA risk assessments completed during the 6-week intervention and provided them, with the charts, to the principal investigator for analysis. Data was stored in a secure Excel spreadsheet.

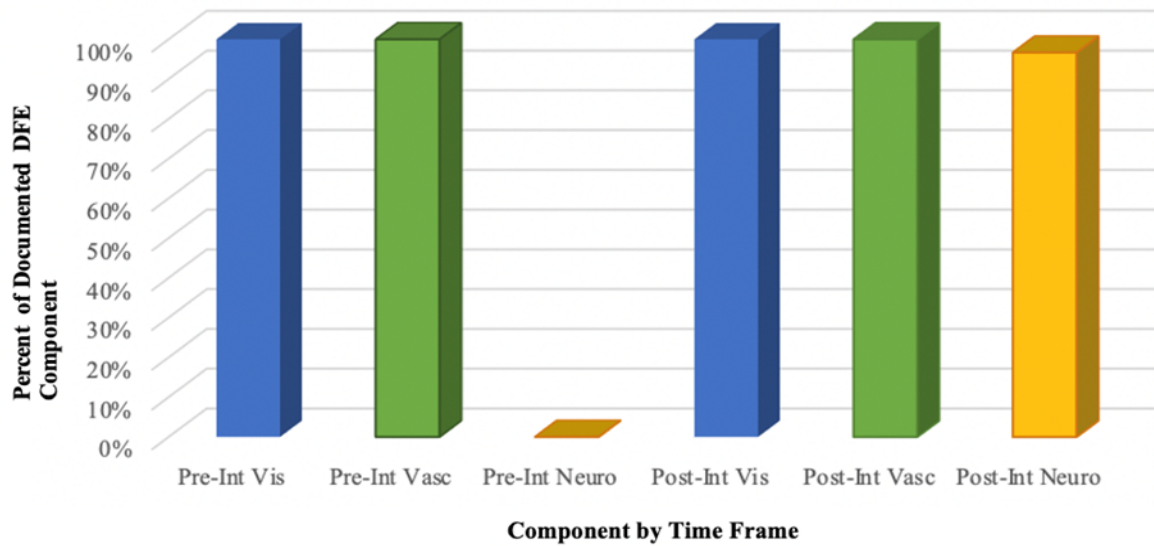
Participation by office staff was voluntary. As DFE are standard of care and the project focused on staff processes, patient consent for treatment included receiving evidence-based care. There was no harm to the patients. The Montana State University Institutional Review Board reviewed and approved the QIP proposal as exempt prior to implementation. Additionally, the practice site reviewed and approved the proposal prior to the needs assessment and project implementation.

Results

Prior to implementation, the EHR template was edited to include only data necessary to meet quality standards and inclusion of the MNSI and ADA risk assessment findings. There were no missing or incomplete data to report. Implementation was carried out by the FNP and two nurses.

One hundred percent of staff were educated during the planning phase of the QIP, meeting the goal of 100% of staff educated. The second goal, “100% of patients will receive an MNSI and ADA risk assessment,” was met by the end of the initiative. The goal of “100% of diabetic patients with an MNSI greater than 7 or an answer of yes to any question on the ADA risk assessment receiving a podiatry referral” was met.

Lastly, the goal of “100% of diabetic patients presenting for annual exam receiving an annual DFE” was met. Prior to the intervention, only 63.33% of diabetic patients received a DFE at their annual exam. This goal involved assessing if the DFE performed met the ADA guidelines by including a visual, vascular, and neurological exam. It was found that one patient did not have a neurological exam documented in their DFE. Even though 100% of diabetic patients received a visual and vascular exam, only 96.67% of patients received a neurological foot exam; thus, falling just short of the goal. However, this is a vast improvement as, prior to implementation, 0% of patients received a neurological exam (Figure 9).



Legend. DFE- Diabetic Foot Evaluation, Int=intervention, Vis=visual, Vasc=vascular, Neuro=neurological.

Figure 9. Diabetic Foot Evaluation Component Document in the Chart.

Discussion

The ADA recommends annual DFEs that include three portions: a physical exam, neuropathy screen, and risk assessment. Despite evidence, healthcare sites are still not performing DFEs per the ADA guidelines. This QIP aimed to bridge the gap of evidence to perform DFEs using DFE tools.

Consistent with the evidence, implementation was successful in improving timeliness and completeness of DFEs at the practice site (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey, 2020; Edupaganti et al., 2019; Laster, 2020; Szpunae et al., 2014; Wilson, 2016). Rates of annual DFEs improved from 63.33% to 100% post intervention. As well, rates of documented neurological exams, per ADA guidelines, increased from 0% to 96.67%. Data evaluation revealed a fully completed MNSI, yet the FNP did not include the ankle reflex portion of the

neurological exam in documentation. Through documentation template use, the FNP amended her data, demonstrating DFE tools can improve timeliness and completeness of DFEs performed in primary care.

The MNSI and ADA risk assessment proved helpful in guiding podiatry referrals. One hundred percent of those with podiatry referral indicated were referred to podiatry. This corresponds with the increase in podiatry referrals seen in studies when using DFE tools (Ademola-Ojo, 2021; Richardson, 2017). Additionally, during implementation, three patients were diagnosed with neuropathy with LOPS, three with neuropathy without LOPS, two with foot deformity, and one with peripheral vascular disease. This shows the potential for use of the MNSI and ADA risk assessment to improve rates of early diabetic foot complication detection. This is consistent with limited evidence that DFE tools can improve rates of foot abnormalities diagnosis in primary care (Cooksey, 2020; Laster, 2020).

Limitations

This project had a short duration of merely 6 weeks. The QIP relied on patients who presented for annual exams during that short duration, resulting in a small sample size of 30 patients. This practice location is rural, and the average age of diabetic patients presenting for annual exams was 70.9 years old. Thus, the clinic demographics limit the project's generalizability.

A limitation to validity is derived from no one auditing charts after summation of the QIP to assure that all diabetic patients received a documented DFE, MNSI, and ADA risk assessment. The principal investigator relied on the FNP to provide all data. The manual process of the FNP providing data could have resulted in missed patient documentation and inclusion of data. In

addition, the secondary nurse could have missed potential participants while identifying patients using the ICD-10 codes.

Conclusion

Implications for Practice

The project successfully integrated interventions into the current workflow that improved diabetic foot care. Efficacy in this small, single-FNP family practice in rural Montana, paired with a small sample size, limits its generalizability to similar settings. As well, the FNP saw many older patients, reducing the generalizability of these interventions to sites serving a more varied age group. Overall, this project utilized low cost and low risk interventions that can be successfully implemented at similar sites to improve rates of timely and complete DFEs, podiatry referrals and, potentially, diabetic foot complication diagnoses. This is key as diabetic foot complications lead to DFUs, a major cause of diabetic morbidity and mortality. Reducing ulcers holds potential to reduce diabetic amputations and hospitalizations.

Though successful, having two separate forms became tedious for the FNP implementing the QIP. In future studies, combining the neuropathy screen and risk assessment in a new, streamlined form would be advised. Designation of diabetic patients' charts would notify the provider to perform an annual DFE. Evidence supports patient chart markers in primary care to remind providers to perform DFEs (Szpunar et al., 2014; Wilson, 2016).

Implications for Advanced Practice Nursing

FNPs can effectively perform DFEs in primary care, and DFEs should be included in the quality care of patients with diabetes (Ademola-Ojo, 2021; Buschkoetter et al., 2019; Cooksey,

2020; Wilson et al., 2016). This QIP backs this assertion with successful utilization of the staff education, process flows, DFE tools, and EHR template in a single-FNP primary care office. The FNP denied the process change extended the burden of documentation or assessment. DFEs can be easily and quickly performed in a primary care office by FNPs. FNPs are on the front lines of disease prevention and management, placing DFEs well within their scope to perform DFEs.

Implications for Future Studies

Further QIPs should be undertaken to look at sustainability of the interventions. This could be performed with another PDCA cycle of a longer duration, thus increasing the QIP sample size. Designating a staff member to audit the charts of all patients presenting for annual exams during the initiative to assure all diabetic patients received intervention would improve validity of the project and support initiative sustainability after the initial PDCA.

Funding

There are no outside sources of funding to disclose. The minimal funding needed for this QIP was provided by the clinical site to print the DFE tools.

Conflict of Interest

There are no conflicts of interest to disclose.

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CHAPTER FOUR

A REFLECTION OF THE EDUCATIONAL JOURNEY

Doctor of Nursing Practice Essentials

The American Academy of Colleges of Nursing (AACN) established eight essentials that highlight the competencies that must be attained through an academic program to confer a Doctor of Nursing Practice (DNP) degree (American Academy of Colleges of Nursing [AACN], 2006). These essentials have been mastered, by virtue of Montana State University's DNP program, through various academic experiences. This array of educational experiences included the scholarly project, class projects, clinicals, and examinations.

Essential I: Scientific Underpinnings for Practice

Essential I, Scientific Underpinnings for Practice, uses scientific knowledge paired with previous undergraduate nursing knowledge to build upon and create a basis for the graduate nursing education (AACN, 2006). During discussion number one in Health Informatics (NRSG 610), nursing science was integrated with analytical, ethical, and organizational science knowledge. Analytical science was used through the logical reasoning of if, when, and how much we should trust artificial intelligence (AI) in nursing. This discussion touched upon the ethical implications of AI in nursing and the organizational science behind implementation of AI into an organization. The scientific principles of ethics and organizational science can be utilized in my practice to inform practice change.

In Design of Healthcare Systems (NRSg 608), we investigated the tools that can be utilized to evaluate healthcare systems, including fishbone diagrams and flow charts. This course culminated in a quality improvement project (QIP) paper that was produced using the aforementioned skills. This proficiency would later be used during the needs assessment of my scholarly project (NRSg 675) to diagnose the problem; as well, it can be used in the future for quality improvement at the organization where I will be employed.

Essential II: Organizational and Systems Leadership
for Quality Improvement and Systems Thinking

When working inside an organization, being aware of policy and procedures is key. The DNP needs to be able to assess for a problem and create healthcare approaches that meet the needs of the patient population, while ensuring quality of care and patient safety (AACN 2006). This is critical to Essential II, Organizational and Systems Leadership for Quality Improvement and Systems Thinking, and should be accomplished through quality improvement, taking into account the health policy, principle of business, budget, risk to patients, and diversity of the population (AACN, 2006).

Mastery was attained in Healthcare Informatics (NRSg 610) through the clinical practice problem project. A healthcare delivery plan on choosing measures to monitor health in type 2 diabetics was developed, including a theoretical implementation plan. Though evaluation was not conducted, it was taken into account when deciding upon measures for the implementation, thus bolstering the skills of data analysis and constructing practice recommendations. Budget and cost-efficacy analyses were performed during this assignment. This project incorporated organization and economic sciences by taking into account the organization structure and finances when

creating the intervention. These skills were reinforced while creating the proposal for the scholarly project (NRSG 675), as it took into account the principles of economics, business, and health policy. Additionally, I was able to save the clinic where my scholarly project was performed \$5,400 dollars by voluntarily performing the quality improvement project as a DNP student.

Essential II mandates that the DNP student develop strategies to assess and manage ethical dilemmas. This was developed, as well, through the clinical practice problem project for Healthcare Informatics (NRSG 610). We took into account the implications of the chosen measures on the diabetic community from both risk-benefit and financial standpoints. I will continue to strive for exceptional consideration of ethical dilemmas affecting the community by applying this learned ethical understanding to all patient care.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

Essential III, Clinical Scholarship and Analytical Methods for Evidence-Based Practice, focuses on the attainment of evidence-based practice theory. This is done through the analysis of literature, evaluation, application of findings to practice in an evidence-based manner using information technology, and disseminating the findings (AACN, 2006).

Mastery of Essential III was completed through Evidence Based Practice I (NRSG 604) and II (NRSG 605) PICO projects, the Scholarly Project Seminar (NRSG 674), and the Scholarly Project (NRSG 675). During all of which, literature reviews were performed and the articles appraised for quality of the study designs. During Evidence Based Practice I and II, appraisal was completed using the hierarchy of evidence and a variety of critical appraisal tools. In the Scholarly Project Seminar and Scholarly Project classes, the Joanna Briggs Institute tool for

critical appraisal was utilized. The best articles were selected based on these appraisal tools and evidence was gathered and analyzed to inform the projects. The best evidence was then used to inform proposed practice change. In Evidenced Based Practice II and Scholarly Writing Seminar, we learned how to disseminate our findings effectively.

During Scholarly Project (NRSg 675), a project was proposed, implemented, and evaluated at a practice site. The evidence found through our scholarly project was utilized to make recommendations and inform practice change at the site. As well, the information will be disseminated through an oral defense and poster presentation, with the option to submit our findings for publication. Utilizing this method to create evidence-based practice change, at a clinical site, led to mastery of DNP Essential III, and these skills will be utilized to create change where I am employed in the future.

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care

The first part of Essential IV, Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care, entails designing and evaluating programs that monitor outcomes of care and quality improvement (AACN, 2006). This was completed during the scholarly project, as discussed in Essential III. Part two of Essential IV warrants selecting, using, and evaluating electronic health records (EHR), which was completed by the optimizing patient portals (OPP) assignment and Selecting EHR certification in Healthcare Informatics (NRSg 610). The OPP allowed me to analyze and evaluate what should be considered for selecting and evaluating EHR. Both the OPP and Selecting EHR certification addressed the use and maximization of information systems and

patient care technology. The Selecting EHR certification included specifics on what is important when choosing, implementing, and evaluating EHR.

Another portion of Essential IV includes providing leadership in ethical and legal issues in healthcare (AACN, 2006). The final presentation for Ethics, Law, and Policy (NRSG 612) involved reading a book with ethical and legal implications. The project discussed the ethical and legal issues involved in the book and how to resolve them. I read *The immortal life of Henrietta Lacks*, a book about the donor of the HeLa cells used for in vitro experimentation (Skloot, 2010). In this case, the cells were taken without permission, violating multiple ethical guidelines. Additionally, the family were poor and illiterate and stated little understanding of what was happening to Henrietta's cells. In fact, this remained a mystery for years, until the author explained the process to them. This breaks the ethical principle of informed consent. This knowledge will allow me to apply the same ethical and legal knowledge to issues seen in practice, so I can be a leader of ethics in healthcare.

Essential V: Health Care Policy for Advocacy in Health Care

DNPs are at the front line of policy and policy change as advanced trained healthcare practitioners. Essentials V, Health Care Policy for Advocacy in Health Care, focuses on the ability to influence healthcare at the political level (AACN, 2006). The health policy issue analysis (HPIA) and advocacy letter in ethics, law, and policy assignments in Ethics, Law, and Policy (NRSG 612) assisted me in gaining this essential with mastery. The proposal critically analyzed healthcare policy related to Planned Parenthood funding and its related issues by advocating for social justice, equity, and ethical policies. This project addresses an at-risk

population, those unable to afford women's health services, and advocates for additional funding to fill the gap in care.

In addition, this assignment included and assessed stakeholder perspectives, such as those of Montana politicians and residents. Development of this policy change and advocacy letter displayed leadership with its potential to influence policy makers. This policy was shown to have the potential to improve outcomes in healthcare through evidence-based practice. This project illustrated my ability to develop, evaluate, and provide leadership in terms of healthcare policy. This policy proposal could shape the financing of healthcare through preventative funding and would require regulation change to help improve healthcare delivery in Montana.

Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes

Essential VI, Interprofessional Collaboration for Improving Patient and Population Health Outcomes, is mastered by using effective communication skills, leading professional teams in analysis of practice problems, and utilizing leadership skills in interprofessional teams (AACN, 2006). Through my clinical classes and scholarly project, mastery of communication and collaboration skills were gained by working with an interprofessional team and acting in a leadership role.

In clinicals, I worked with an interprofessional and intraprofessional team allowing me to master this essential by coordinating care and delegation. At the VA clinic, I was able to identify patients who needed immediate psychiatric assessment and utilize my behavioral health colleagues to perform an immediate assessment. During Scholarly Project Seminar (NRSG 674), I led a team to analyze a practice problem, assess it, and determine methods to address the

organizational issue. Further, I acted as a leader in an interprofessional team at the practice site through the enacted practice change led by my scholarly project.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health

Analyzing data to assess individual and population health is the first component of Essential VII, Clinical Prevention and Population Health for Improving the Nation's Health (AACN, 2006). This was mastered, in part, during the case study I created for Advanced Pathophysiology (NRSG 602) by assessing statistical, environmental, and pathological data on an individual. The next component addresses clinical prevention and population health, including the psychosocial and cultural dimensions, to address healthcare gaps (AACN, 2006). This was mastered in Vulnerability and Healthcare in Diverse Populations (NRSG 614) by completing the vulnerable populations group presentation.

In this project, a vulnerable group was identified and the psychosocial and cultural dimensions were assessed. Low-income women with poor access to women's healthcare was the population of interest. This essential was iterated in the Scholarly Project (NRSG 675) that focused on the vulnerable population of diabetic adults in rural Montana. This can be utilized in practice by assessing my patient population for vulnerable populations and unmet needs while enacting practice change to fill these gaps in care.

Essential VIII: Advanced Practice Nursing

Essential VIII, Advanced Practice Nursing, was mastered in many ways. First, the case studies in Diagnostic Reasoning (NRSG 607) and Advanced Health Assessment (NRSG 601)

presented complex clinical situations where comprehensive and systematic assessments were performed to assess the patient, while taking into account their diverse needs. The patients presented were of varying races and genders. Additionally, I have seen a varying population of patients in clinicals. My care plan for my transgender male patient, female at birth, involved PAP smears for cancer screening. This varies from my male at birth patients who do not require these particular routine screenings.

During Diagnostic Reasoning (NRSG 607), Advanced Health Assessment (NRSG 601), and the clinical courses, therapeutic interventions were implemented and, during clinicals, they were assessed. Assessing the patient, choosing, implementing, and evaluating interventions during clinicals portrayed advanced levels of clinical judgement. I diagnosed a protein abnormality, that on further examination, could be liver related. I selected appropriate testing and did a thorough assessment to uncover the diagnosis was hemochromatosis.

As important as clinical judgement is, creating therapeutic relationships is imperative to the nurse practitioner. Patients need to trust you to effectively evaluate them and have them follow your guidance. Relationships were created with patients and other professionals during clinicals to optimize patient care. In clinicals, I have created care plans, meeting patients where they are at, instead of making demands for them to change. This improves the likelihood of long-lasting positive change in patient's lifestyles. I had a patient who smokes and had not seen primary care in over 40 years that presented with drastic weight loss. I was able to get him in for a colonoscopy and low dose chest CT, in agreement that we would do all other labs and screenings at a later date. This allowed for clinical prioritization due to his cancer risk, while working with the patient where they are comfortable.

During my scholarly project (NRSB 675), for 6 weeks I guided an interdisciplinary team to strive for optimal care through staff education and new workflows, during the 6-week initiative. I analyzed and linked the organization, population, and fiscal issues by identifying a need, finding an intervention, and carrying out a QIP. This work will be disseminated through an executive summary and poster presentation to continue to impact the vulnerable population of diabetics and has implications for other APRN's practice. As shown by this reflection, my time at MSU not only concluded with a scholarly project, but attainment of all eight essentials. The scholarly project and clinicals clearly portrayed attainment of both the essentials and knowledge that was gained through the DNP program.

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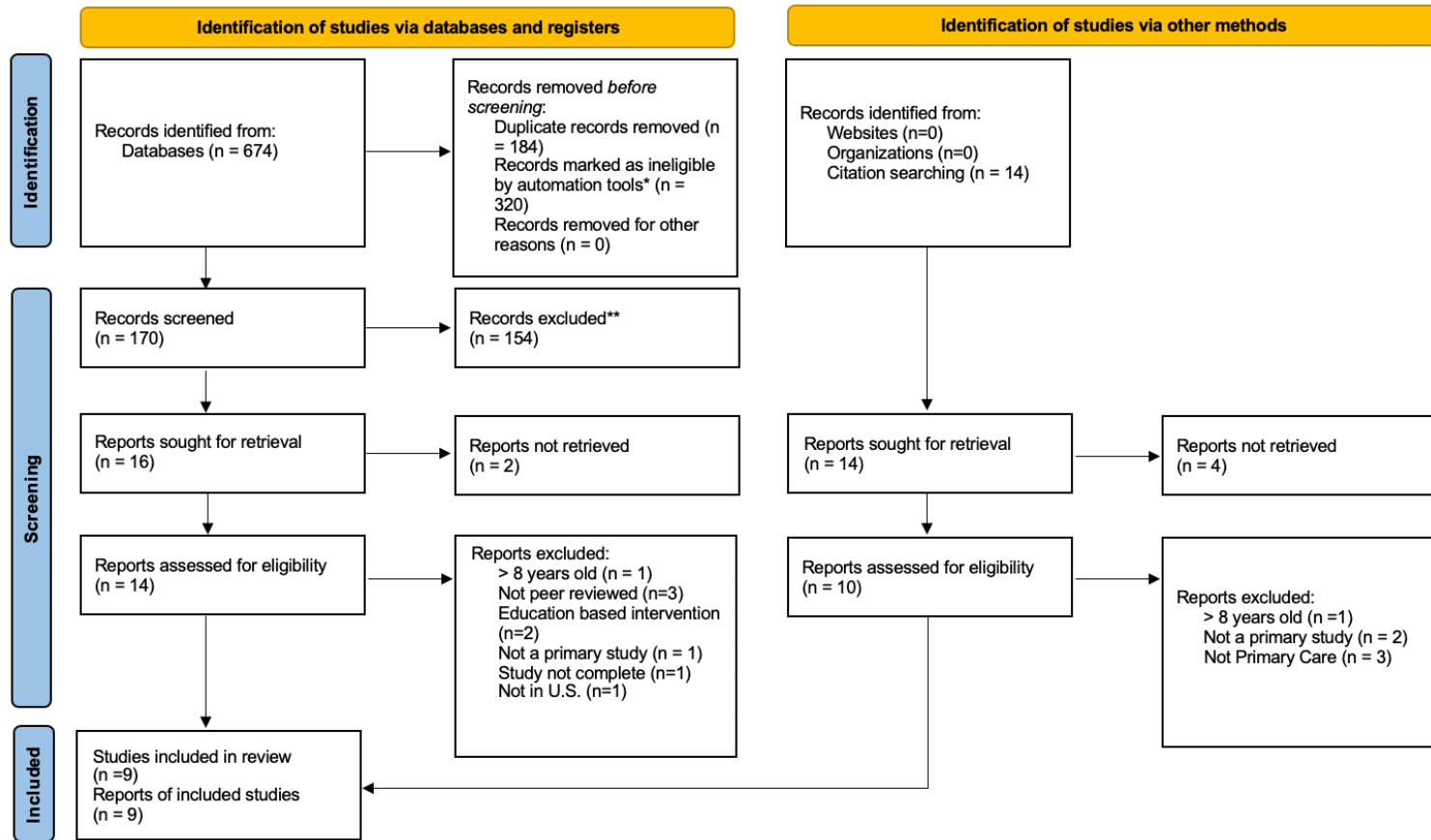
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APPENDICES

APPENDIX A

LITERATURE REVIEW PRISMA DIAGRAM

Appendix A: Literature Review PRISMA Diagram



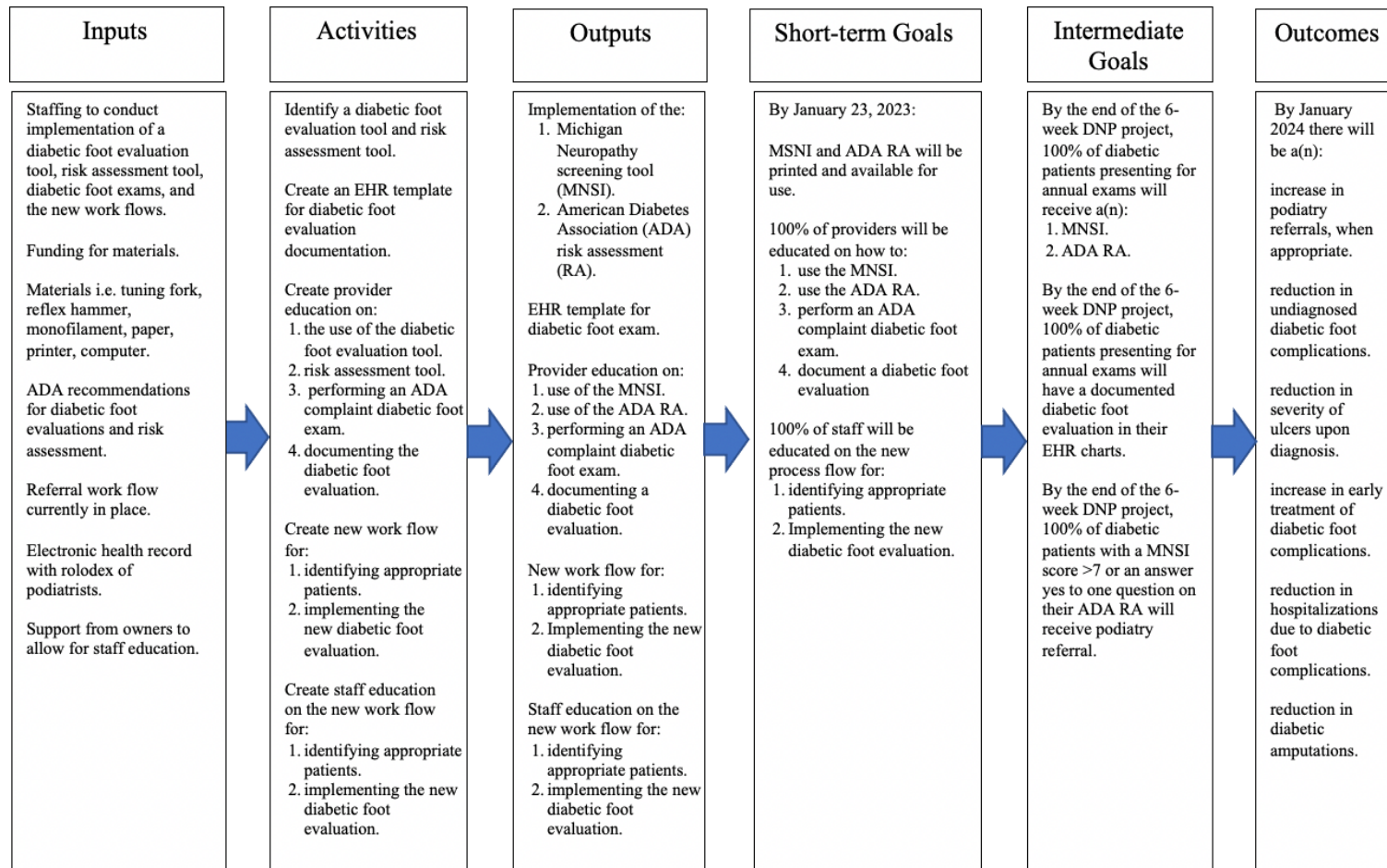
* Excluded using filters due to publication prior to 01/01/2014, not peer reviewed, or not in English

** Excluded by primary investigator through title and abstract screening.

APPENDIX B

LOGIC MODEL FOR IMPLEMENTING THE QUALITY INITIATIVE

Appendix B: Logic Model for Implementing the Quality Initiative



APPENDIX C

MICHIGAN NEUROPATHY SCREENING TOOL

Appendix C: Michigan Neuropathy Screening Tool

Patient Version**MICHIGAN NEUROPATHY SCREENING INSTRUMENT****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 you 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: _____

MICHIGAN NEUROPATHY SCREENING INSTRUMENT

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

1. Appearance of Feet

Right

a. Normal ☐ 0 Yes ☐ 1 No

b. If no, check all that apply:

Deformities ☐

Dry skin, callus ☐

Infection ☐

Fissure ☐

Other ☐

specify: _____

Right

Absent Present
☐ 0 ☐ 1

2. Ulceration

Left

Normal ☐ 0 Yes ☐ 1 No

If no, check all that apply:

Deformities ☐

Dry skin, callus ☐

Infection ☐

Fissure ☐

Other ☐

specify: _____

Left

Absent Present
☐ 0 ☐ 1

3. Ankle Reflexes

Present Present/
Reinforcement Absent
☐ 0 ☐ 0.5 ☐ 1

Present Present/
Reinforcement Absent
☐ 0 ☐ 0.5 ☐ 1

4. Vibration
perception at
great toe

Present Decreased Absent
☐ 0 ☐ 0.5 ☐ 1

Present Decreased Absent
☐ 0 ☐ 0.5 ☐ 1

5. Monofilament

Normal Reduced Absent
☐ 0 ☐ 0.5 ☐ 1

Normal Reduced Absent
☐ 0 ☐ 0.5 ☐ 1

Signature: _____

Total Score _____ /10 Points

APPENDIX D

RISK ASSESSMENT-REFERRAL TOOL

Appendix D: Risk Assessment-Referral Tool

Risk Assessment- Referral Tool

Does the patient smoke? ☐ Yes ☐ No

Does the patient have a history of lower extremity complications? ☐ Yes ☐ No

Does the patient have LOPS, indicated by an MNSI greater than 7? ☐ Yes ☐ No

Does the patient have foot deformity or ulcer on visual exam? ☐ Yes ☐ No

Does the patient have symptoms of PAD on vascular exam? ☐ Yes ☐ No

Answering yes to any of the above questions prompts a podiatry referral for future diabetic foot evaluations and treatment.

APPENDIX E

EHR DOCUMENTATION TEMPLATE

Appendix E: EHR Documentation Template

Objective:

Diabetic Foot Exam:

Vibration: Intact with tuning fork

Sensory: intact monofilament testing bilaterally

Ankle reflexes: 2+ bilaterally

Vascular: dorsalis pedis and posterior tibial pulses palpable bilaterally

Skin: toenails trimmed and not ingrown; skin intact without rashes, callus, or ulcerations

Skeletal: no bony deformities noted

Plan:

Patient referred to podiatry

APPENDIX F

MONTANA STATE UNIVERSITY IRB APPROVAL

Appendix F: Montana State University IRB Approval

Protocol Detail Report

Printed By: Holland, Courtney
1/17/2023 10:59:35 AM

Report Comments

Protocol Information

Version # 1

Reference Number: 501

Protocol Number: 2023-501-EXEMPT

Protocol Title: Improving Diabetic Foot Evaluations in Primary Care: A Quality Improvement Initiative

Protocol Type: Original

Principal Investigator: Holland, Courtney

Approval Date: 1/6/2023

Submittal Date: 12/18/2022

Effective Date: 1/6/2023

Author: Holland, Courtney

Renewal Date: 1/6/2028

Status: Approved

Next Review Date: 1/6/2028

Inactive Date:

Expiration Date: 1/6/2028

Protocol Information

1

Definition of Human Subjects Research

1.1

Only human subjects research studies require IRB review. If you have questions about whether your work qualifies as human subjects research, contact the IRB Office at 406-994-4706 or irb@montana.edu for determination assistance.

Human Subjects Research Qualification

1.2

Does the intent and scope of your proposed study meet the definition of **human subjects research**?

☒ Yes☐ No☐ Unsure - determination assistance requested

Yes

1.2.1

No

1.2.2

Unsure - determination assistance requested

1.2.3

Exempt Review

1.3

Use this form for research studies that will be reviewed at the *Exempt* level in accordance with 45 CFR 690.104(d).

>Some topics or methods are typically **NOT** eligible for *Exempt* Review - See Review Level Determination.

>Do not use this form for research that falls into an *Expedited* or *Full Committee Review (FCR)* category. See Types of Review.

>For students: Only certain in-class projects require IRB review. See Student Research and Class Projects.

Confidentiality Statement

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APPENDIX G

PROJECT APPROVAL FROM HUCKLEBERRY HEALTHCARE

Appendix G: Project Approval from Huckleberry Healthcare

Identification of Doctor of Nursing Practice Project Site Representative

Student Name: Courtney Holland

Project Site: Huckleberry Healthcare

Project Site Description: A one provider primary care office, in Great Falls, MT, that sees a majority of midlife and geriatric patients to manage their chronic diseases.

Project Site Address: 2517 7th Ave S, Great Falls, MT 59405

Project Site Representative: Denise Gresham

Proposed practice problem to be addressed: There is a need to improve rates and completeness of diabetic foot examinations.

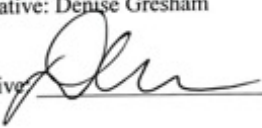
Potential Intervention: I plan to alter the existing workflow to utilize a paper algorithm for diabetic foot examination during annual exams on diabetic patients.

Proposed Site/Needs assessment (if applicable): Collect data on the number of patients actively seen in the practice, monthly on average, and daily on average. Collect data on the number of annual exams and diabetic annual exams performed monthly. Over the previous four months, collect data on how many diabetics received a diabetic foot examination and/or referral to podiatry, plan including follow up their diabetic foot examination frequency, and complete diabetic foot examination during their annual exam (per the ADA guidelines). Collect data on the percentage of patients seen in the practice that are diabetic, have diabetic neuropathy, poorly controlled diabetes, and are on Medicare. Data will be collected without patient identifiers to protect confidentiality. No personal health information will be removed from the site.

Due to the absence of an IRB at this site, MSU IRB approval will be accepted as the only IRB review process for project implementation

I agree to a needs assessment to be used for the development project goals and implementation.

Print Name of Project Site Representative: Denise Gresham

Signature of Project Site Representative  Date: 01/17/2023