IMPROVING DIABETIC NEPHROPATHY SCREENING IN A PRIMARY CARE CLINIC: A QUALITY IMPROVEMENT PROJECT

by

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ABSTRACT

Background: Diabetes affects people worldwide and multiple organ systems thus end-organ monitoring is needed to reduce mortality and morbidity. Diabetic kidney disease is the leading cause of end-stage renal disease and is easily identified by screening. There is treatment that can prevent complications and further progression to end-stage renal disease. Despite the guidelines, patients at the site, 442 out of 705, did not have annual screening completed as of August 2021.

Problem: The primary care site had not applied evidence-based practice guidelines as more than 60% of current patients with diabetes lacked urine protein screening completion from July 2020 to July 2021. Despite evidence indicating that early identification and intervention are critical, the project site did not know how many patients had early markers of chronic kidney disease and who needed treatment.

Methods: This project was a single-site quality improvement project focused on increasing ordering and completion of diabetic urine protein screening plan. The project included process development and training regarding the process. The outcomes expected include staff and providers' comfort and understanding regarding process and screening orders, improvement in current screening numbers, and ultimately, treatment of diabetic kidney disease with medications and referral to nephrology if disease was identified.

Results: Staff indicated comfort and knowledge with the process and correct ordering process through a survey regarding pre- and post-training. By the completion of this project, as a total 70% of patients (504 out of 720 patients; 62 patients during the 8-week project) have completed screening. Seventeen patients screened positive during the implementation of the process, and two were not on appropriate treatment of angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB).

Conclusions: Results indicated that increasing screening was successful based on implementation of a staff protocol, training regarding ordering, and use of EMR reminders to complete screening. Primary care providers have already treated 15 out of 17 patients who screened positive with ACE or ARB for a secondary condition, usually hypertension. This project was beneficial in increasing the focus on screening, which will promote prevention from the development of end-stage renal disease for patients at this clinic long-term.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

Introduction

Diabetes mellitus, a chronic condition, affects almost 400 million people worldwide, and the incidence rises yearly (McGrath & Edi, 2019). Diabetes affects multiple organ systems and is a significant risk factor for mortality and morbidity, leading to increased health care costs. Diabetes, when not controlled or before being diagnosed, leads to end-organ damage and dysfunction. Multiple organizations such as the American Academy of Family Physicians (AAFP) and the American Diabetes Association (ADA), along with the National Kidney Foundation (NKF), recommend assessing and treating early indicators of end-organ damage, so healthcare professionals will target meaningful changes and reduce devastating consequences (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021).

Background

One condition associated with end-organ damage from diabetes includes diabetic kidney disease. This condition affects about 25% of the patients who have diabetes. Diabetic kidney disease is the leading cause of end-stage renal disease in the United States (McGrath & Edi, 2019). End-stage renal disease costs the US healthcare system billions of dollars per year and is overwhelming for patients and families to live with and manage (ADA, 2002). For example, a patient needs to attend dialysis three times per week for several hours per session, follow specific diets, and take multiple medications to manage the disease. This condition severely shortens an

individual's life expectancy as the condition is fatal without frequent medical intervention. Thus, prevention of diabetic kidney disease is crucial and essential in preventing these consequences.

Clinical practice guidelines recommend annual urine protein screening for all people with diabetes (both type I and type II). Although this recommendation is from organizations, such as the ADA, NKF, and AAFP, many healthcare providers fail to perform screening due to a lack of knowledge, time constraints, or processes to ensure appropriate screening (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021). Microalbuminuria is the earliest sign of diabetic kidney disease (McGrath & Edi, 2019). Even patients with reasonable diabetic control or prediabetes may manifest microalbumin in their urine. Microalbumin develops due to diabetic microvascular complications in the renal system and affects 25% of patients with diabetes.

Microalbumin can be detected accurately through three methods of urine sample collection: timed collection, 24-hour collection, or spot collection. From these methods, different tests illustrate varying accuracy: urine dipstick for protein, albumin/creatinine ratio, or protein/creatinine ratio (Sumida et al., 2020; Wu et al., 2014). The most accurate form of sample test is the albumin/creatinine ratio, and the easiest and most likely to be utilized is the spot collection for albumin/creatinine ratio or the urine dipstick (Sumida et al., 2020). See the tables below for information on screening methods, advantages, and disadvantages.

Table 1. Review of Microalbumin Testing Methods

Method of Screening	Description	Advantages.	Disadvantages
Timed Collection	Completion of 4 hour or overnight collection of urine	Easier than 24-hour urine, attempts to adjust for time variations in albumin secretion.	Requires patient to collect 4 hours of urine and correctly store until analyzed.
24 Hour Urine Collection	Collection of all urine in 24 hours	Accurately measures creatinine clearance, adjusts for time variations in albumin secretion.	Requires patient to collect 24 hours of urine and store it correctly.
Spot Urine Collection	Completion of random urine collection	Cannot adjust for time variations in albumin secretion.	Not as accurate as due to random time collection, and clinician required to determine if time variation in the sample occurred.

Table 2. Review of Microalbumin Lab Testing Options

Type of Lab Test	Description	Advantages	Disadvantages
Urine Dip Stick for Protein	Indicator strips are dipped into the urine sample, and the clinician measures for a color change to indicate protein amount.	Easy to complete Lowest cost	Least accurate Requires estimate based on color. No specific quantitative number
Albumin/Creatinine Ratio	Ratio of albumin to creatinine to urine sample.	No conversion or calculation is required-easy to see if microalbumin is present. Most accurate.	Requires lab assessment and not performed in the clinic. More expensive than other tests.
Protein/Creatinine Ratio	Ratio of protein to creatinine to a urine sample.	Less expensive than albumin/creatinine ratio. When converted, it predicts microalbumin accurately.	Requires lab assessment and not performed in the clinic. More expensive than dipstick tests. Requires conversation to albumin/creatinine ratio.

Treatment of microalbuminuria is essential to reduce the progression of diabetic kidney disease and lower complications (McGrath & Edi, 2019). Treatment consists of reasonable diabetic control, blood pressure control, and specific medications. Multiple organizations such as ADA, AAFP, and NKF recommend using/prescribing angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARB) for diabetic patients to reduce vasoconstriction as renal protection. Other medications may be prescribed with specific renal benefits, and early referrals to nephrology are recommended.

These recommendations and guidelines by AAFP, ADA, and NKF indicate the importance of screening and treatment for diabetic kidney disease (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021). It is essential to explore facilitators and barriers that contribute to the failure to screen and prescribe treatment, as well as develop an evidence-based process for diabetic kidney disease in a primary care clinic. By creating a quality improvement project at a primary care clinic, staff and the DNP student implemented strategies to target urine protein screening and assessed for outcome improvement. The overall outcome goal was to capture 75% of diabetic patients to evaluate for diabetic kidney disease by urine protein screening by the end of the project. Ultimately, this will reduce end-stage renal disease in this clinic's population of diabetic patients over the long term.

Problem Statement

The site had not applied evidence-based practice guidelines as more than 60% of current patients with diabetes lacked urine protein screening completion from July 2020 to July 2021. Despite evidence indicating that early identification and intervention are critical, the project site did not know how many patients had early markers of chronic kidney disease that needed

treatment. In addition, this specific topic is a target for comprehensive diabetic care developed by the National Committee for Quality Assurance (NCQA) as part of the Healthcare Effectiveness Data and Information Set (HEDIS) measures program (NCQA, 2021). Diabetic nephropathy screening was utilized by the Merit-Based Incentive Payment System and increases reimbursement for quality care (Centers for Medicare Systems, 2019). Thus, this site failed to meet recognized quality standards for diabetes care and could have financial penalties for care.

Clinical Question

Using the PICOT (patient, intervention, comparison, outcome, and time) format, the clinical question of the project is as follows (Comparison of control will not apply to this project). (P) In primary care of diabetic patients empaneled to a specific primary care clinic, does (I) development and implementation of a clinical process and training for staff and providers, (O) improve diabetic nephropathy screening rates to 75% completed of 700 diabetic patients (T) when evaluated six weeks after the implementation?

CHAPTER TWO

LITERATURE REVIEW

Introduction

A literature review related to diabetic nephropathy and screening was conducted using the following databases: CINAHL, Cochrane Reviews, JBI EBP Database, and PubMed. Terms used for searching include "diabetes nephropathy," "screening," "barriers," "diabetic kidney disease," and "treatment." Articles were chosen based on the quality of evidence, level of evidence developed by Melnyk (2011), and research findings. Articles selected were written in English and published in 2012 or later. Different types of studies identified included systematic reviews, randomized controlled trials, meta-analyses, expert opinion, and clinical practice guidelines. This literature review was organized with these themes explored:

- Diabetic kidney disease (risk factors, pathophysiology, diagnoses).
- Screening for diabetic nephropathy.
- Increasing compliance and reducing barriers to screening.
- Treating diabetic kidney disease (diabetic management, cardiovascular health management, dietary management, pharmacology, referrals).

Diabetic Kidney Disease

As previously discussed, diabetic kidney disease is the leading cause of end-stage renal disease in the United States and is a leading cause of mortality and morbidity for patients with

diabetes (McGrath & Edi, 2019). Diabetic kidney disease affects as much as 25% of patients with diabetes. Prevention of renal complications is crucial for diabetic patients.

Risk Factors

There are specific risks indicated to lead to diabetic kidney disease (Alicic et al., 2017). In review, the authors found that demographic risk factors include older age, male sex, and African American, Hispanic, or Native American race. Comorbid conditions of obesity, hypertension, and tobacco use lead to more cases of diabetic kidney disease and increase the likelihood of progression. Poor control of diabetes is indicated both as a risk factor and a catalyst of diabetic kidney disease.

Pathophysiology

The process leading to the development of diabetic kidney disease is complex. Diabetes causes cells to be resistant to the effects of insulin or to decrease insulin production altogether (Alicic et al., 2017). This contributes to lack of regulation in blood sugar and leads to changes in metabolic function including how glucose is used in the body. Because metabolic changes affect all organ systems, diabetes has a direct effect on all body systems and can result in complications. Further, the pathophysiology of diabetic kidney disease is quite complex with various changes and factors. Specific metabolic factors known to alter kidney function include hyperaminoaciduria, which leads to hyperfiltration and hyperperfusion. Glomerular hyperfiltration may cause other arteries to dilate and increase production of angiotensin II, which in return causes vasoconstriction of the arteries. Combining these changes leads to high intraglomerular pressure and hyperfiltration all of which clinically displays as albuminuria.

Diagnosis

Diagnosis of diabetic kidney disease consists of persistent albuminuria greater than 30 mg/dL or reduced glomerular filtration rate (GFR) under 50 mL/min per 1.73m^2. Normal values are no albuminuria detected or less than 30 mg/dL, depending on which lab is utilized. Normal GFR is greater than 90 mL/min per 1.73m^2 (Alicic et al., 2017). Besides these two markers, it is essential to evaluate the patient for other conditions that can cause these changes in the labs above, including dehydration and urinary tract infections (McGrath & Edi, 2019). If these conditions are identified, evaluation for diabetic kidney disease will take place after resolution and recovery of these conditions.

Screening Tests and Guidelines

Guidelines from AAFP, ADA, and NKF indicate urine albumin/creatinine ratio as the preferred test to evaluate for diabetic kidney disease (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021). Urine albumin/creatinine ratio utilizes various sample collection methods: spot urine, 24 hr. urine, and timed sample collection. All the sample collection methods are effective according to guidelines; however, the spot urine is the easiest to obtain and most often used.

Compared with albumin/creatinine ratio, protein/creatinine ratio had moderate sensitivity to convert to albumin/creatinine ratio if the values of the protein/creatinine ratio were greater than 50 mg/dL (Sumida et al., 2020). Urine dipstick for protein level was translated to trace, +, ++ to stages of albuminuria of 30-299 mg/dL with less sensitivity or 300 mg/dL with moderate sensitivity. Sumida et al.'s (2020) research indicated that the albumin/creatinine ratio was the best test, but protein/creatinine ratio or urine dipstick can be used with the clinician

understanding that accuracy decreases at lower levels of albuminuria. Wu et al. (2014) found albumin concentration in urine to be less expensive than albumin/creatinine ratio. Since urine albumin concentration is accurate when describing the stage and progression of diabetic kidney disease, it can serve as a potential alternative for cost-effectiveness.

Increasing Compliance and Reducing Barriers to Screening

Two different research studies explored barriers and compliance with diabetic nephropathy screening. Anabtawi and Mathew (2013) conducted a retrospective review of improving compliance with microalbuminuria screening. They recommended several strategies to improve screening: electronic medical record (EMR) and computerized physician reminders, which showed mild improvement in screening rates. The researchers found when an automated alert indicating screening was due and required a clinician response, the requested test was usually ordered and completed. In another study, MacLean et al. (2013) implemented a decision support system in primary care organizations for diabetes care. Several conclusions from this implementation included healthcare providers' confusion about what test to order and errors in the labs reporting, which resulted in a lack of completion of screening. The recommendations from the researchers included limiting to only one test type, which will meet the screening requirements. They also recommended always using the albumin/creatinine ratio for accuracy (MacLean et al., 2013).

In addition, to assess barriers to target diabetic kidney disease, researchers focused on barriers to implementing change in a healthcare setting. In a Colquhoun et al. (2017) study, the researchers examined themes that emerged as necessary for implementing changes to behavior in individual healthcare providers' care of patients. They identified four major tasks for success.

Those tasks included exploration of barriers, intervention component mapping and planning, use of theoretical frameworks, and end-user engagement. Moreover, Shanbhag et al. (2018) conducted a similar systematic review to explore factors to improve healthcare implementation of guidelines. Even though the later authors reviewed guidelines for heart failure management, much of this applies to diabetic kidney disease. They identified that clinical pathways, multidisciplinary teams, and multifaceted interventions consistently increased guideline implementation. Other factors identified to improve successful guideline implementation consisted of assessing barriers, staff training, leadership commitment, and financial incentives (Shanbhag et al., 2018).

Prevention and Treatment of Diabetic Kidney Disease

Diabetic kidney disease is a complex complication of diabetes and has several strategies for both prevention and treatment. These include diabetic control, cardiovascular health, dietary changes, pharmacological interventions, and referrals to nephrology.

Diabetic Management

Diabetic control is key to the prevention and treatment of diabetic kidney disease (McGrath & Edi, 2019; Navaneethan et al., 2021). Recommendations from NKF and ADA include an A1C goal of 7–8% but report that goals should be individualized. A1C (average blood glucose over three months) numbers above 8% are associated with the progression of diabetic kidney disease.

Cardiovascular Health Management

Because atherosclerosis can worsen or lead to the progression of kidney disease, for both non-diabetic and diabetic individuals, aggressive cardiovascular health promotion is crucial (McGrath & Edi, 2019; Navaneethan et al., 2021). Clinicians should treat blood pressure to at least less than 140/90 mmHg. Lipid-lowering should be employed both by medications and dietary methods. Clinicians should advise smoking cessation to reduce the progression of diabetic kidney disease and atherosclerosis.

Dietary Management

Dietary management focuses on protein-restricted diets, as high protein levels can progress kidney disease (McGrath & Edi, 2019; Navaneethan et al., 2021). The recommended amount of protein for patients with kidney disease is less than 0.8 g/kg/day. Patients should limit added sugar and processed carbohydrates due to their effect on blood sugar. In addition, patients should follow low-sodium recommendations to lower the risk of hypertension.

Exploration of vitamin supplements to improve diabetic kidney disease demonstrates limited evidence. In a Bolignano et al. (2017) study, the researchers showed that supplementation with antioxidant dietary supplements reduced albuminuria but did not affect progression to end-stage renal disease or renal function. They suggested that the most beneficial effect on albuminuria was with vitamin E supplementation, and the least beneficial effect was with vitamin C supplementation.

Pharmacological Management

Research and guidelines recommend specific pharmacological interventions for patients with diabetic kidney disease (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021).

Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) can prevent and reduce the progression of diabetic kidney disease. Recommendations from ADA, NKF, and AAFP advise that these medications are prescribed for any patient with hypertension or evidence of microalbumin on screening urine tests. Glucose lowering medications need to be individualized depending on current kidney function. Metformin can be used as long as GFR is >30 mL/min/1.73m^2 and is considered the first-line medication for diabetes but should be discontinued when GFR is <30 mL/min/1.73m^2 (Navaneethan et al., 2021). Sodium-glucose cotransporter-2 inhibitors (SGLT2) demonstrate improved renal outcomes in patients with diabetic kidney disease and can reduce albuminuria (Lytvyn et al., 2019). Glucagon-like peptide-1 receptor agonists show decreased cardiovascular disease, which can ultimately improve diabetic kidney disease; in addition, they demonstrate significant glycemic control. Other medications have been evaluated with limited clinical benefit.

Referrals

A systematic review by Smart et al. (2014) found that early referral (at least six months before initiation of dialysis) to nephrology for patients with diabetic kidney disease demonstrated multiple health benefits and reduced mortality and morbidity. Specific benefits presented included reduced rates of anemia, lower creatinine levels, improved survival, and reduced hospitalization over five years.

In addition, Keely et al. (2018) found electronic consult is beneficial to primary care providers and reduces face-to-face visits while allowing nephrologists' input in care. This type of portal allows primary care providers to submit questions regarding general management, need for referral, or lab interpretation to a nephrologist who can quickly review this question and reply

to primary care providers. Research demonstrated improved efficiency of nephrology consultation as unnecessary visits were reduced.

Synthesis of Literature to Support Project Intervention

Based on the above literature and evidence, several recommendations and conclusions were drawn to apply to the DNP project site. First, understanding the risk factors allowed the practice to target these patients specifically (Alicic et al., 2017). Identified risk factors such as male sex, older age, smokers, concurrent hypertension, and obesity are applicable profiles. This primary care clinic site consisted of primarily white adult patients and approximately 700 diabetic patients. There is limited racial diversity, but there are several Native Americans in the practice, which is a population known to have higher rates of diabetes compared to those of other races.

Second, the literature supported using the spot urine albumin/creatinine ratio and was utilized in the proposed intervention. As Sumida et al. (2020) discussed, the spot urine albumin/creatinine ratio testing method is the best test, and other methods showed similar results but decreased accuracy. Wu et al. (2014) discussed using only the albumin concentration rather than reporting the ratio; however, based on the practice site ordering catalog, this test is not available individually and is reported as an albumin/creatinine ratio. Again, timed and 24 hr. urine are not feasible to accurately collect, so the spot collection will be used, which is well supported as accurate and cost effective (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021).

Third, a primary focus of this project intervention was addressing barriers and compliance with screening. The current practice site has an EMR that reminded providers of

diabetic urine protein screening, but no clinician response was required to proceed with chart review and patient care. In addition, as discussed in MacLean et al.'s (2013) study, they realized difficulties with ordering the correct test. Thus, to help alleviate this project barrier, only albumin/creatinine ratio was recommended for order choice, and the lab had a process to notify the provider regarding ordering errors. In addition, the intervention targeted staff, providers, and patients as patients received email and mail reminders that the screening is due, and staff could also see recommended screening tests (Anabtawi & Mathew, 2013).

In addition, the project intervention consisted of the four tasks identified in the Colquhoun et al. (2017) study, which improved healthcare provider adherence to the intervention. Those tasks are barrier identification (i.e., lack of staff/provider buy-in, order confusion, lack of attention to screening recommendations, EMR fatigue), intervention component design and mapping (i.e., use of the logic model for design and planning), use of theoretical framework (discussed further in chapter three), and end-user support (i.e., the DNP student's time and efforts and the site staff and provider buy-in to project). These four tasks helped the successful implementation of changes made by individual healthcare providers, with change in this project being an increase in completion of diabetic urine protein screening. Shanbhag et al. (2018) further assisted implementation of this project with evidence for reducing barriers identified early on, multidisciplinary team participation (lab/MA/provider), leadership support (site representative), staff training (part of intervention), and clinical pathway (development of EMR use for the screening as part of intervention). EMR was utilized as normal clinical practice and provided reminders for due screening tests, which was beneficial to the project implementation and site.

Finally, the project targeted screening of diabetic kidney disease for initial intervention as well as targeted ongoing treatment of diabetic kidney disease for secondary focus. The long-term goal for providers was to refer patients that demonstrate evidence of diabetic kidney disease and are treated with medications known to reduce the progression of diabetic kidney disease to a nephrologist. Referrals can also occur using e-consult, available in the practice site for general management questions from primary care providers to nephrology providers as a collegial practice. Literature supported these interventions (Keely et al., 2018; Navaneethan et al., 2021; Smart et al., 2014). Other interventions for clinicians to implement included aggressive cardiovascular interventions: smoking cessation, lipid reducing intervention, and aggressive blood pressure management to normal levels (McGrath & Edi, 2019; Navaneethan et al., 2021). Clinicians recommending lifestyle and dietary interventions, such as protein-restricted diets for patients with diabetic kidney disease, reasonable diabetic control, decreased salt intake, and consideration of vitamin E supplementation, all can improve diabetic kidney disease based on current literature (Bolignano et al., 2017). Due to the scope of this project, the intervention was to focus on screening and improving screening for diabetic kidney disease, rather than lifestyle interventions.

CHAPTER THREE

SETTING AND METHODS

Introduction

This DNP project focused on improving diabetic urine protein screening percentage to decrease the rate and progression of diabetic kidney disease. Prior to project implementation, the project site only had 40% of diabetic patients' urine protein screening completed within the last year. Due to the lack of screening, it was unclear how many patients already had diabetic kidney disease and were not receiving appropriate treatment.

Design

This project was a single-site quality improvement (QI) project focused on increasing ordering and completion of diabetic urine protein screening plans. This DNP project focused on the implementation of staff and provider training regarding the screening intervention and staff collaboration to ensure this newly developed clinical process was utilized correctly. The outcomes expected included increased staff and providers' comfort and understanding regarding process and screening orders, improvement in current screening numbers, and ultimately greater treatment of diabetic kidney disease with medications and referral to nephrology if disease was identified.

Setting

This project took place in a semi-rural primary clinic in Montana. This primary care clinic offers comprehensive care of all conditions and all ages. It is part of a larger health system with access to specialists, including nephrologists and an inpatient hospital to improve continuity of care. It currently serves approximately 8,000 patients that consists of primarily white patients. There is limited racial diversity, but several Native Americans are served by the practice. Five providers staff the clinic: three physicians and two advanced practice registered nurses (APRNs). In addition, there are four registered nurses (RNs), one licensed practical nurse (LPN), and four medical assistants (MAs) that assist in the care of patients. Based on reports from the EMRs, approximately 700 diabetic patients are empaneled to the five providers of this site.

Population of Interest

The ultimate population of interest was diabetic patients whose data were obtained from the site's EMRs. The initial report obtained on August 24, 2021, indicated that there was a total of 705 diabetic patients, including all ages and all types of diabetes, who have been diagnosed with diabetes mellitus. The EMR was then utilized to generate a report from these patients that currently were due for urine protein screening based on the health maintenance due list in patients' charts. Without a diagnosis of diabetes, the care gap is not indicated in the EMR, so the second report can accurately indicate the number of patients due for diabetes urine protein screening. The total number of patients listed on this report was 442 patients empaneled to the clinic site's primary care providers, which was thought to be the project's target population. As the project implementation took place, this target population varied as new patients were added

to patient panels and others were diagnosed with diabetes. Moreover, during 2021, the EMR was upgraded where the urine protein was added to health maintenance, causing staff to begin to complete these prior to the intervention. As a result, the DNP intervention helped encourage this completion.

Stakeholders

The project stakeholders included patients with diabetes, providers (5), management (2), clinical staff (9), healthcare informatics staff (1), and nephrology providers (2).

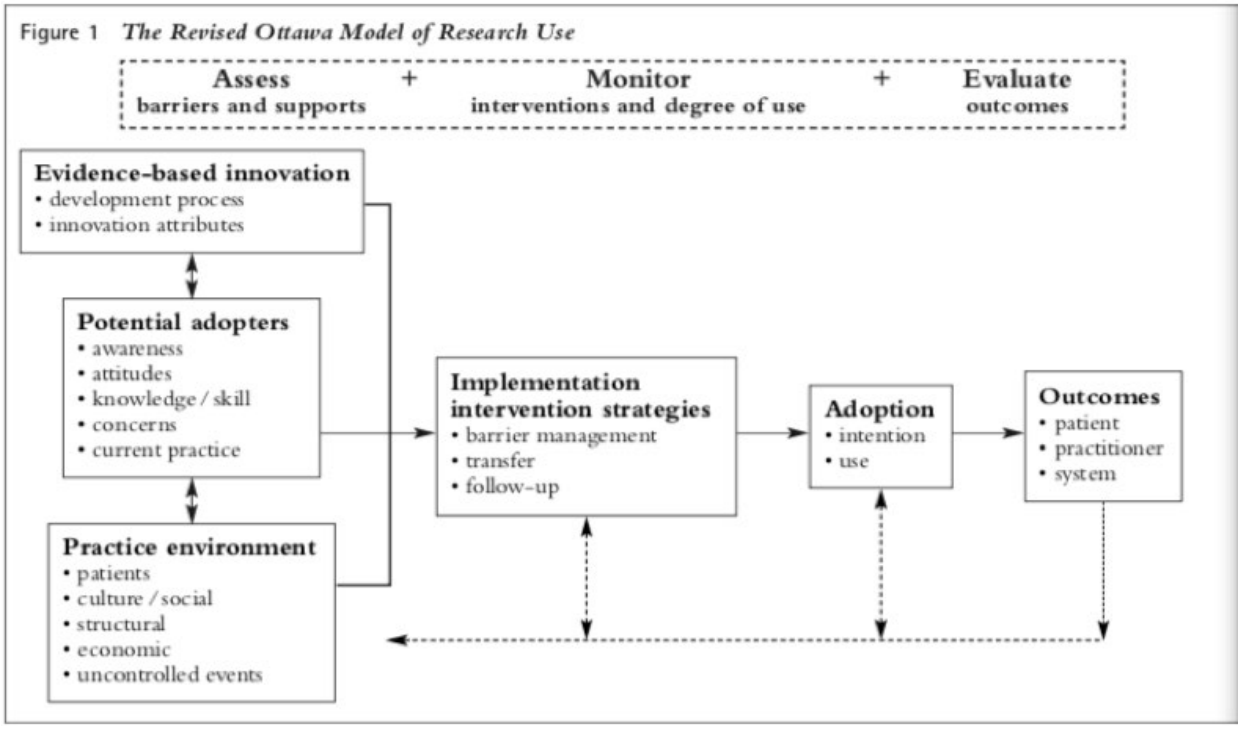

Figure 1. Theoretical Framework (Graham & Logan,2004, p. 94).

The theoretical framework that guided the project and intervention was the Ottawa Model of Research. This framework utilizes healthcare knowledge transfer and discusses how clinicians implement evidence-based change and how this affects outcomes in a healthcare setting. The

Ottawa Model of Research applies to an individual provider, clinic, or organization. This framework is helpful as it provides information that should be considered prior to project implementation, how to make changes, and how this change should occur. In addition, the model describes considerations on how to adjust interventions and information to improve transition and outcomes. The model consists of three primary focus areas: assessment, monitoring, and evaluation, with several different tasks and activities during these focus areas (Graham & Logan, 2004). This specific framework was chosen due to the predominant focus on the healthcare provider, not the patient, as the intervention target aimed to change the behavior of healthcare providers.

Assessment

The first stage of the Ottawa Model of Research is to assess (Graham & Logan, 2004). This focuses on the assessment of barriers and supports for planned changes. This consists of evidenced-based innovation (the practice to be implemented or changed), potential adopters (the current practice, attitudes, and knowledge of individuals for whom the intervention is targeted), and practice environment (patients, financial, and other events).

For the current project, the evidenced-based innovation was to increase urine protein screening on diabetes patients, which ultimately increased treatment and prevention of diabetic kidney disease. The test utilized was the albumin/creatinine ratio and was used prior to the intervention, but it was not used to the extent that is recommended by current guidelines. The adopters were the primary care clinic, providers, and clinical staff. Attitudes and opinions regarding change of both staff and providers were vital in helping with the success of the intervention. The practice environment refers to where the intervention occurs and what other

factors will play a role in successful implementation. Specific considerations in this intervention were patient compliance and COVID limitations due to the current pandemic situation, which led to an increase in virtual rather than in-person visits.

Barriers were explored while planning implementation, and several things were implemented to help manage those barriers, which overlaps the next stage of the monitor. Many patient visits to this site were virtual, limiting the ability to collect urine-protein samples; however, alternatives were considered for these patients, such as having these patients come for lab visits to collect urine samples.

The second barrier was buy-in from staff. Anytime current practice needs to be changed it can be difficult. This project was not part of current practice. An initial review showed that only 40–60% of patients had completed annual screening regardless of indications by multiple clinical practice guidelines, so obtaining pre-implementation support from leadership and several end-users was critical. Staff were not used to urine screening as part of diabetes visits and did not understand the importance or need for screening. Providers were initially not willing to allow clinical staff to order and complete the test, which was a barrier to clinical staff being the main driver of the intervention. With individual discussion with a single provider with stakeholders and the DNP student, the new practice of clinical staff to order and complete the test, according to the intervention guidelines, was allowed by the provider.

One unanticipated barrier was provider illness. One of the providers was diagnosed with COVID during implementation, causing multiple appointments to be canceled, which threatened improvement toward the project goal as fewer diabetic patients were encountered. Finally, a short timeline affected the results of the project. This project's scope was to implement

intervention and look for improvement in results; however, many of the diabetic patients did not come to the clinic during the implementation period. Consequently, a sustainable strategy was developed to continue screening annually.

There were several project site facilitators. First, the EMR had a recent upgrade, which allowed for notification of diabetic urine-protein screening through the health maintenance section of the patients' chart. Second, this screening was a target for comprehensive diabetic care developed by the NCQA as part of the Healthcare Effectiveness Data and Information Set (HEDIS) measures program. The HEDIS measures are utilized by national organizations, consumers, and payors to guide the quality of patient care (NCQA, 2021). This quality framework assisted to convince the provider mentioned above. Finally, diabetes nephropathy screening was also utilized by the Merit-Based Incentive Payment System, thus it had financial support for implementing project interventions (Centers for Medicare Systems, 2019).

Monitor

The second stage of the Ottawa Model of Research Use is monitoring (Graham & Logan, 2004). For this stage, the intervention was planned and barriers were managed for the proposed intervention. Using this model, the change agent, the DNP student, would examine obstacles to successful implementation and attempt to change, modify, or remove these barriers. Transfer strategies were then employed, which referred to how the adopters, staff, and clinicians learned and adjusted the innovation. In addition, the change agent anticipated the use of follow-up huddles to ensure that all adopters were aware of the innovation and how to implement it.

Transfer strategies refer to the training that took place with providers, staff, and lab staff so that they were aware of the project intervention and changes to be implemented. Follow-up

activities referred to the continued assessment of training and knowledge of the staff completing the intervention, which was part of the project's short-term outcomes.

Evaluation

The final step in the Ottawa Model of Research Use was evaluation (Graham & Logan, 2004). Evaluation included two different phases and consisted of adoption and outcomes. Adoption was the implementation of the evidenced-based innovation and was the intervention secured into future practice. It was essential to monitor the adoption of the intervention and the change desired. Outcomes referred to evaluating the effects of the innovation. One must evaluate the intervention and implementation to ensure that they were successful and changed patient outcomes for the better.

For this project, the adoption was the implementation of the training and EMR changes and monitoring of how staff and providers collected and encouraged completion of urine-protein diabetes screenings. The desired outcomes included 75% of the diabetic patients having screening completed by the end of the monitoring period and monitoring for 100% of patients having appropriate treatment of diabetic kidney disease if found by screening. Thus, described above, the Ottawa Model of Research fits well in this project through knowledge transfer, implementation of change, and outcome evaluation in a healthcare setting.

Table 3. Ottawa Model of Research with Project Operational Actions and Goals

Ottawa Model of Research Stage	Project Operational Actions	Goals/Outcomes
Assess	• Assessment of management support • Provider/Staff buy-in • Literature review of best evidence • Development of protocol and EMR adjustment	• Determine evidenced-based screening recommendations • Review current data regarding current state of practice.
Monitor	• Training completion and assessment of barriers and attitudes	• Successful completion of training with improved knowledge acquisition by survey • Successful implementation of lab process and protocol • Ongoing provider commitment to correct screening recommendations.
Evaluation	• Implementation of process and watching for barriers and difficulties	• 75% completion of diabetic urine protein screening on eligible patients. • 100% treatment of diabetic kidney disease if identified by screening.

Ethical Considerations

Institutional review board (IRB) approval by Montana State University was obtained as part of the QI DNP project, which was the project site requirement. The DNP student completed a privacy review form as another site requirement since it was anticipated that data would be shared outside the organization during dissemination.

Intervention

The intervention consisted of several different phases and activities. Flow-charts were created for each stakeholder's role and are listed in Appendices B–E. These interventions were organized under six SMART goals. Each SMART goal consists of interventions, measures, and an evaluation plan. First, there was training and protocol development. The DNP student worked with healthcare informatics staff to review the order process and settings in EMR. The protocol and adaptation of EMR guidelines were completed and input from management staff was received in November 2021. After obtaining IRB exempt approval in December 2021, the DNP student provided training during the monthly staff meetings and disseminated information and the protocol to clinical staff and providers regarding increasing urine protein screening.

SMART Goal #1

One hundred percent of site staff will understand and verbalize the importance of urine protein screening by completing a survey one week after training.

Intervention. The staff was given a survey to complete before the training and then following the training. As mentioned, the training occurred during scheduled staff meetings and by email, and a survey was sent to all staff following this training within one week. Because meetings were divided with providers, nursing, and clinical staff separately, training was not completed all on the same day. However, all training took place in December 2021.

Measures. The DNP student developed a survey tool to measure understanding of training content (see Appendix A). The survey consisted of five questions regarding the purpose of urine protein screening. The DNP student assessed this SMART goal to monitor survey

completion rates, reviewed the answers, and analyzed these answers for knowledge acquisition by comparing scores pre-training to post-training.

SMART Goal #2

Staff protocol and lab process will be implemented by January 1, 2022.

Intervention. The DNP student worked with healthcare informatics to implement order sets for a quick and correct ordering process during November 2021 and adjusted to develop a process that was implemented with staff during training in December 2021.

Measures. The survey described in SMART Goal #1 was used to measure understanding of the protocol and lab process. The primary focus of this intervention was the urine albumin/creatinine ratio. This test ID number is EMR Order Number 501329-title albumin/creatinine ratio, random urine. Utilizing the ARUP laboratories testing directory number 0050203, which the practice site uses, shows that the results were reported within 24 hours of collection and analyzed using quantitative immunoturbidimetry. The components of this test included the following:

- Creatinine, Random Urine
    - Reference range: none established
    - Units of measure: mg/dL
- Microalbumin, Quantitative, Urine
    - Reference range: none established
    - Units of measure: mg/dL
- Albumin/Creatinine

- Reference range: <30 mg/g
- Units of measure: mg/g
- Any value above 30 mg/dL will have a comment that indicates albuminuria detected. (ARUP, 2021).

SMART Goal #3

Seventy-five percent of screening for diabetic patients, based on EMR report, will receive provider orders by February 15, 2022.

Intervention. When seeing patients with diabetes that had not had annual urine protein screening, providers or staff per protocol ordered this screening during clinic visits. Eligibility was noted based on the review of EMR care gaps and alerts were on the diabetic flowsheet. In addition, the DNP student added a huddle note to the schedule to assist with reminding the staff to collect this screening.

Measures. The DNP student reviewed the weekly ordering of diabetic screening that was indicated on eligible diabetic patients' EMRs. The EMR reports function was used weekly for data analysis and placed on Google Sheets, but all data were de-identified despite demographic risk factors that were identified in the literature to protect patient information and saved with password security.

SMART Goal #4

Seventy-five percent of patients will have urine protein screening completed by February 15, 2022.

Intervention. Patient adherence to completion of urine protein screening during clinic visits that was ordered by clinic providers.

Measures. The DNP student monitored weekly the percent of patients who had completed urine protein screening using reports from the EMR. The goal was for 75% of the eligible diabetic patients to have completed screening by this date.

SMART Goal #5

One hundred percent of albuminuria will be treated by the clinic provider with ACE or ARB if appropriate, by chart review.

Intervention. ACE or ARB are indicated for any patient who had elevated albumin/creatinine ratio. If not prescribed or contra-indicated per chart review, the DNP student contacted the primary care provider for discussion.

Measures. The DNP student obtained reports using EMR for patients who had elevated albumin/creatinine ratios and performed a chart review to assess medication lists for a prescription for ACE or ARB. All data collected was placed in Google Sheets by the DNP student and this information was de-identified and stored with password security.

SMART Goal #6

When completing chart review, an increase of early referrals to nephrology will be noted for diabetic kidney disease patients that were identified by screening.

Intervention. Early provider referral to nephrology is recommended for patients with diabetic kidney disease. If a patient has not been referred and has signs of diabetic kidney disease, the DNP student contacted the primary care provider for discussion.

Measures. When completing chart reviews, the providers within the project site will review reports of diabetic patients with decreased GFR values or elevated albumin/creatinine ratio and will examine if the patient is appropriately treated with ACE/ARB or other renal protective medications and review that the patient has been given, or the provider considered, a referral to nephrology.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The overall purpose of this QI project was to increase screening rates of diabetic urine disease and in turn reduce the risk of end-stage kidney disease by initiating early treatment. The project implementation period was eight weeks, and data were collected weekly. The population of interest was diabetic patients whose data were obtained from the site's electronic medical records (EMRs). The initial report from the EMRs obtained on August 24, 2021, indicated that there were a total of 705 diabetic patients of all ages and all types of diabetes who had been diagnosed with diabetes mellitus, including the target population of 442 patients who were due for diabetic urine protein screening. On January 1, 2022, when this DNP project was implemented, the reports indicated a total of 713 diabetics, with 277 patients needing diabetic urine protein screening, which was 39% due or 61% completed in the last year. As the project implementation took place, this target population varied as new patients were added to patient panels and others were diagnosed with diabetes, which affected the denominator that was used to calculate the percent completed (numerator was patients completing urine protein screening in the last year divided by denominator of total diabetic patients). There were six SMART goals for this project, and the results are organized based on these goals.

Results

SMART Goals #1 and #2

SMART Goal #1: 100% of site staff will understand and verbalize the importance of urine protein screening by completing a survey one week after training. SMART Goal #2: Staff protocol and lab process will be implemented by January 1, 2022. The survey was utilized to evaluate understanding and knowledge acquisition by staff. This survey was sent prior to and following training by email. The following bar graphs show the percent of correct answers pre- and post-training (Figure 2). Survey questions are listed in Appendix A. One hundred percent of the 12 staff trained completed the pre-training survey and 7 of the 12 staff (58%) completed the post-training survey.

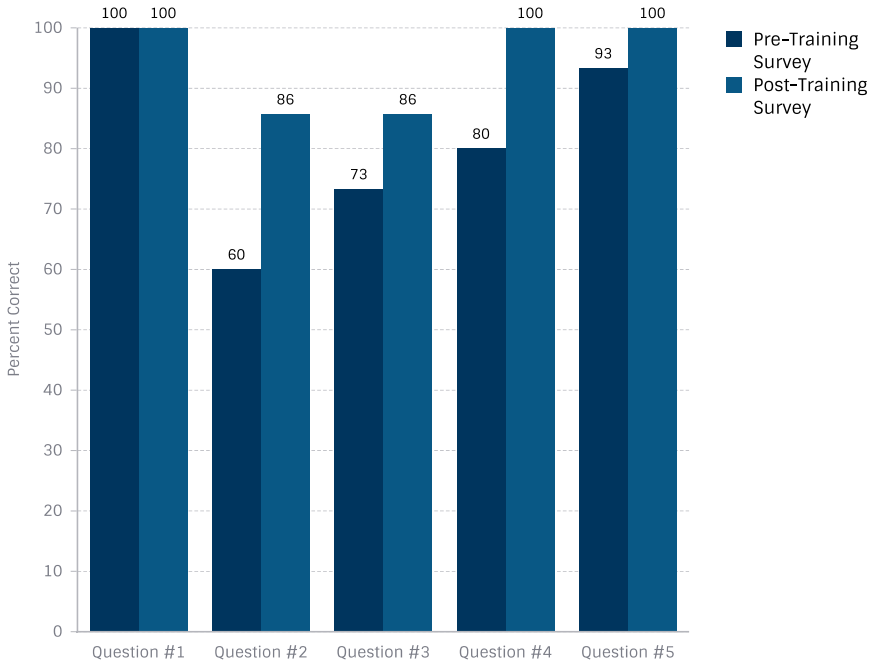

Figure 2. Pre-Training/Post-Training Survey Results-Percentage Correct

Evaluation of SMART Goal #1. One hundred percent of site staff will understand and verbalize the importance of urine protein screening by completing a survey one week after training. The staff answered significantly more questions correctly on the post-survey, and both Question #1 and Question #4 were critical to measure importance and understanding, which were indicated by accurate answers following training. This was the primary goal of the training and was used for evaluation to show successful completion of this goal. This result is simple ratio; however the comparison of pre-and post-survey may not reflect on statistical accuracy since the number of participants were not the same.

Evaluation of SMART Goal #2. Staff protocol and lab process will be implemented by January 1, 2022. Use of the survey showed improvement from pre-training in understanding of the protocol and process that was utilized indicating understanding by the staff and providers based on survey results and successful completion. During the implementation, it was noted that one MA was not completing her role in collecting urine screening as recommended during training. The DNP student worked with her to remind her about the and to review huddle notes prior to rooming the patient. We also explored strategies for when a patient was unable to urinate at their appointment and how to ensure completion, such as providing specimen containers for the patient to bring back to the clinic. Research indicated that samples were still viable as long as urine was stored in a specimen container at less than 18^{o} C for seven days or at 30^{o} C for two days (Herrington et. al, 2016).

SMART Goals #3 and #4

SMART Goal #3: 75% of screening for diabetic patients, based on EMR report, will receive provider orders by February 15, 2022. SMART Goal #4: 75% of patients will have urine

protein screening completed by February 15, 2022. Data were collected weekly and Google Sheets were used to organize deidentified data. See Figure 3 below for eight weeks of implementation and data collection and Figure 4 for the progress of Goal #4.

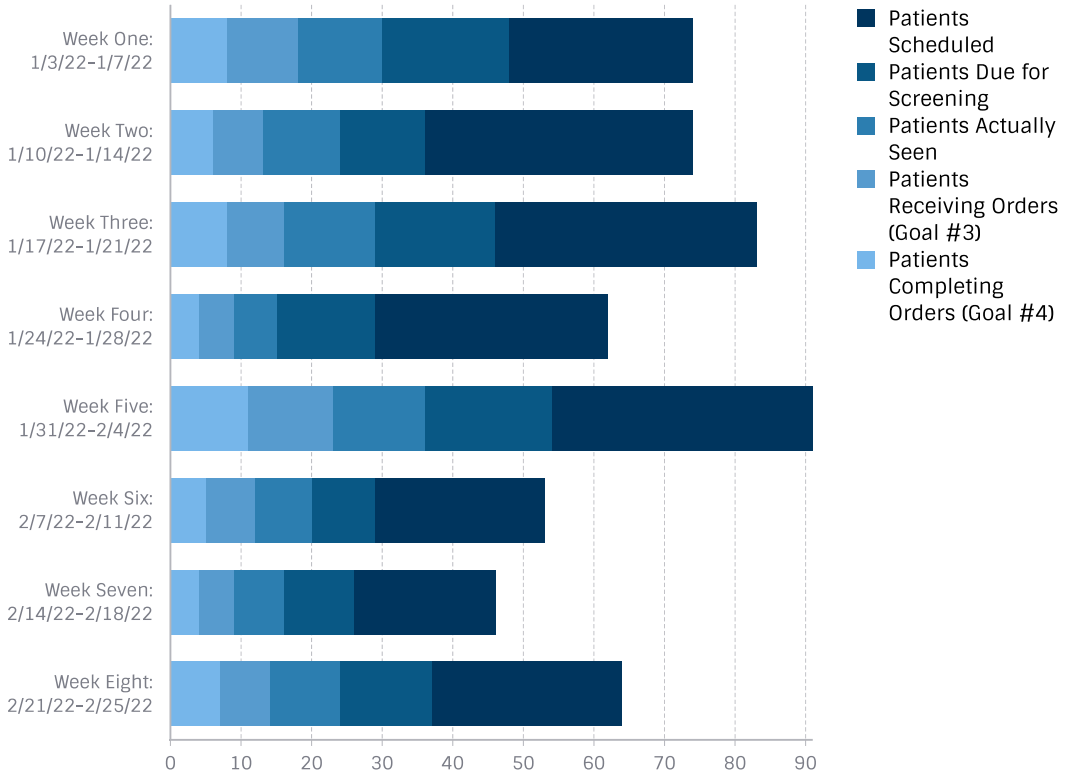

Figure 3. Table of patients scheduled, due for screening, seen, receiving orders, and completing orders

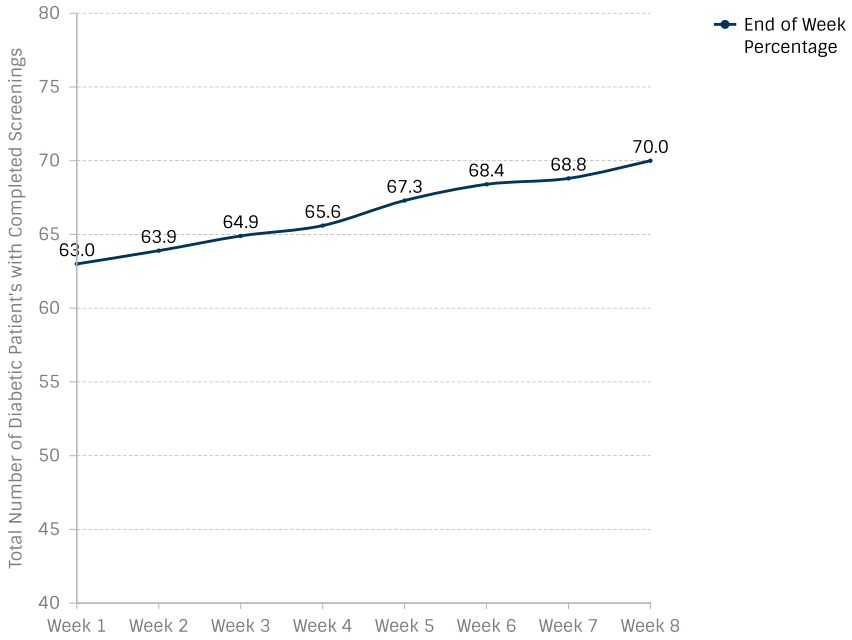

Figure 4. Run-in chart of patients who have completed diabetic urine protein screening by week of implementation (total number of patients with screening completed as numerator and total number of diabetic patients as denominator)

Evaluation of SMART Goals #3 and #4. Seventy-five percent of screening for diabetic patients, based on EMR report, will receive provider orders by February 15, 2022, and 75% of patients will have urine protein screening completed by February 15, 2022. Results indicated that the completion rates (70%) and ordering rates (71.1%) were less than 75% but equal to or greater than 70%, indicating movement toward but not the achievement of this goal. During the project implementation, eight patients received orders, but did not complete testing, mostly due to the inability to urinate at the time of the appointment. Patients were provided specimen cups to return to the clinic after collecting a urine sample at home; this practice can help with project sustainability and successful completion in the future.

SMART Goals #5 and #6.

SMART Goal #5: One hundred percent of albuminuria will be treated by the clinic provider with ACE or ARB if appropriate, by chart review. SMART Goal #6: When completing chart review, an increase of early referrals to nephrology will be noted for diabetic kidney disease patients that were identified by screening. Data were collected weekly and Google Sheets were used to organize de-identified data. See the summary of results below (Figure 5) for eight weeks of implementation and data collection.

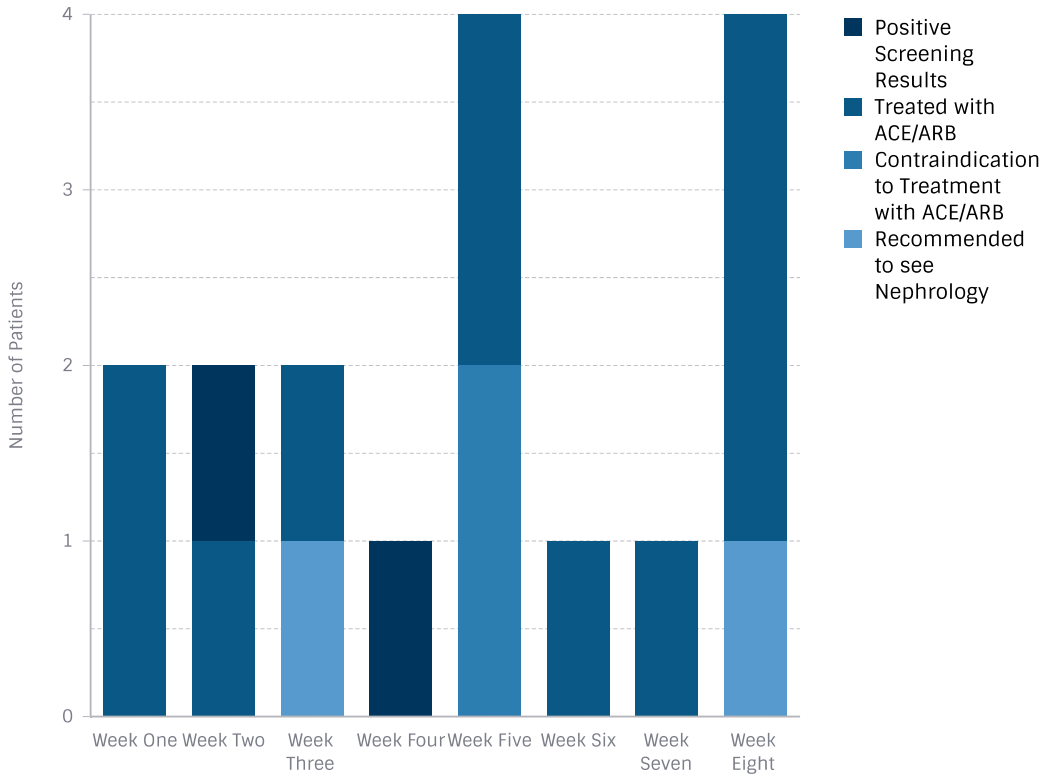

Figure 5. Table of positive screening results with treatment data and contraindications to treatment with ACE or ARB and/or recommendations to refer to nephrology

Evaluation of SMART Goals #5 and #6. One hundred percent of albuminuria will be treated by the clinic provider with ACE or ARB if appropriate and an increase of early referrals to nephrology will be noted for diabetic kidney disease patients that were identified by screening by chart review. Results indicated that the majority of patients who had diabetic kidney disease (17 patients total) were treated by providers already with ACE or ARB. Throughout the implementation, only two patients out of 17 who had albuminuria, did not have a contra-indication to treatment but not have treated, were recommended for considering treatment. The DNP student did discuss with the patient's primary care provider; however, he/she felt that treatment was not indicated at this time. Nephrology referral was also discussed with primary care providers for an additional two patients with decreased kidney function based on GFR (already treated with ACE/ARB); however, the primary care providers did not feel that this would add value to these patients and elected to not refer.

Discussion

The overall purpose of this QI project was to increase screening rates of diabetic urine disease and reduce the risk of end-stage kidney disease by initiating early treatment. Based on the corrected results above, the project site has made significant improvements in screening rates. When first researching this project (August 2021), the site only had 40% of patients with diabetic kidney disease screening completed, indicating a lack of attention to recommendations from clinical practice guidelines. On January 1, 2022, the reports indicated a total of 713 diabetics, with 277 patients needing diabetic urine protein screening, which is 39% due or 61% completed in the last year. These reports were utilized to evaluate screening completion rates at any time from the EMR to monitor adherence and performance of the project's intervention in

the future following the project finish. By the completion of this project, a total of 504 out of 720 patients, or 70%, had completed screening, with 62 completing screening during project implementation. In addition, two patients who have diabetic kidney disease were identified and recommendations for treatment were provided to the patient's primary care provider. Two other patients were identified who would be good candidates for referral to nephrology for ongoing management. These recommendations are well supported in clinical practice guidelines (ADA, 2002; McGrath & Edi, 2019; Navaneethan et al., 2021), but their final treatment plans at the site fell into the primary care providers' judgement who knew the individual patient history. Fifteen patients with positive screening tests were already treated with an ACE or ARB during this project intervention, and the providers expressed that they often had started these patients on specific drugs for hypertension if the patient was diabetic for specific kidney prevention, rather than only starting them in the setting of diabetic kidney disease, which is supported by clinical guidelines. In addition, it is still recommended to screen regularly regardless of treatment to watch for worsening or persistent albuminuria as this could be a sign of worsening kidney disease.

This intervention was focused on the healthcare provider, rather than the patient, and several applicable literature findings were consistent with these results. Anabtawi and Mathew (2013) recommended the use of EMR reminders to help improve screening percentage. This research showed an ordering percentage of 56.3% during the study, which was higher than the national average but less than this project rate. At the project site, the EMR received an upgrade prior to the project implementation in September 2021, overlapping when the project was initially planned in August 2021. This upgrade included the addition of a reminder to complete

diabetic urine protein screening as part of the patient's care gaps in the EMR. In August 2021, over 60% of patients were due for diabetic urine protein screening. By the start of the intervention period in January 2022, only 40% of patients were due for screening (approximately 140 patients had screening completed from August 2021 to January 2022), which indicates in accordance with research that EMR reminders do increase screening completion. During implementation, diabetic urinalysis (UA) was added to huddle notes, which are listed on the office schedule as the reason for visits through collaboration with stakeholders. Huddle notes are utilized by the practice to remind staff of what needs to be completed or addressed by clinical staff during a visit and may include things such as breast cancer screening, flu shot, diabetic UA, diabetic foot exam. Using both the EMR reminder and huddle notes increased screening percentage by 10%—over 62 patients captured during the eight-week implementation period. It does appear that utilization of both the EMR reminder and huddle notes increased screening completion more than EMR alone (144 patients in five months with EMR only and 62 patients in two months with both reminders).

MacLean et al. (2013) discussed the difficulties of order confusion and how to limit orders to improve compliance. The EMR had a simple way to order screening for staff. This was the way that staff was trained which limited order confusion and difficulties. Staff also did not express any concerns about what to order by utilization of this method of ordering. In addition, Shanbhag et al. (2018) recommended staff training and end-user support to reduce barriers. Staff all completed training (in person during meetings and provided in an email) and the DNP student was on site four days per week to help with end-user support and was available for questions if staff experienced any difficulties with screening completion. Survey completion, which

demonstrated improved knowledge on all five questions per post-intervention survey, helped ensure knowledge acquisition and demonstrated staff understanding of the project. Overall, staff and providers were supportive with the intervention as they appreciated the ease in ordering and found reminders helpful.

Colquhoun et al. (2017), conducted a systematic review of studies regarding design of interventions to change healthcare professional's behavior. The research indicated that it was essential to explore barriers, design intervention components, utilize theory-based research, and engage end-users. This research was implemented during the project by through exploration of barriers prior to the project start and during the implementation phase, utilization of step-by-step process for clinical staff to follow with screenshots for the intervention, use of Ottawa model of research, and frequent discussion with end-users to help with the intervention and process.

Lessons Learned

Several key takeaways were appreciated during this project. Those included EMR reminders were extremely beneficial to increasing screening completion and should be included, and support for clinical staff to complete intervention was critical; without this, the project was unlikely to be successful. The DNP student was required to spend several hours per week completing reports and reviewing results, which could be time consuming if this were implemented in a larger practice where it may require additional time to ensure that results are reviewed and addressed. Approximately three hours per week was spent in reviewing reports, results, and placing reminders, which if a staff member were required to do this, would have cost the facility approximately $600/month (3 hours/week x $25/hr.) if a paid clinical staff member completed this process. The site has established a system in place to continue this process in the

future by utilizing the EMR reminders and continuing to utilize the huddle notes to complete screening. In addition, the DNP student is employed by the facility as an APRN and will continue to provide education to staff and providers regarding the importance of treatment of diabetic kidney disease.

Limitations

As discussed above, the EMR had an upgrade prior to implementation, so much of the improvement in results was initiated prior to the project being implemented, which limits the ability to transfer the results and recommend other practice settings. In addition, it is difficult to generalize that end-stage renal disease was prevented due to the short timeline and would require long-term investigation. No data was collected on diabetic control and blood pressure because of the nature of the project to focus on screening and the narrow scope of the project and intervention.

Recommendations

To implement a QI project to improve diabetic urine protein screening rates, several recommendations are made. Those include the following:

1. Use of EMR reminders to indicate due for screening—this is the best way and well supported in literature to increase screening rates and was found to be highly effective in this practice. The site also found that the use of huddle notes was helpful and improved likelihood of completion, which will be added to the initial intervention plan.

2. Limitation of order type—as discussed in the literature review, multiple orders can be utilized, but this creates confusion on interpretation and ordering for clinical staff. Limiting the order to one and making this easy for staff improves the likelihood that screening will be completed.
3. Development of the process for reviewing results—because the goal of the project is to improve screening and reduce end-stage renal disease, only doing screening and then not addressing positive results is inadequate. Organizations will need to realize that this entire process is time consuming and requires an EMR that can easily provide reports with patients based on specific filters to ensure that results are addressed. For this specific site to improve sustainability, the DNP student, who is employed as an NP will continue to complete reports monthly that can indicate abnormal urine/creatinine ratio, monitor for treatment, and discuss with the primary care provider if indicated.
4. Provider education—a lot of this project hinges on provider engagement on ordering, management of positive results, and adjustment of management based on results. Organizations should provide provider education regarding how to interpret results, recommendations for treatment, and recommendations for referral to nephrology to ensure that providers feel engaged to implement these recommendations. There is a financial benefit to the clinic, but this is difficult to calculate due to the multiple clinical indicators utilized to calculate quality performance by a clinic.
5. No-show follow-up—multiple patients were due for screening, but then no-showed for appointments, which meant they were not seen and screening was not ordered.

Developing a process for outreach and no-shows would be beneficial, which is not currently done as part of the process.

6. Patient planning—several patients were unable to urinate at their appointments, resulting in patients receiving orders but not completing testing. The intervention was adapted to include a process to provide the patients with a specimen cup to take home that was labeled and returned to the clinic for processing within 24 hrs. of collection.

Conclusion

This QI project focused on increasing screening completion of diabetic urine protein testing and improving the treatment of diabetic kidney disease if identified. Results indicated that increasing screening to 70%, only slightly less than the goal of 75%, was successful based on the implementation of a protocol for staff to follow, training staff on how to order the correct test, and use of EMR reminders to complete this screening. Results indicated that very few patients (two total) screened positive that were not already treated with appropriate medication (ACE or ARB) for a secondary condition—usually hypertension. This project was beneficial in increasing the focus on screening, which hopefully will prevent the development of end-stage renal disease in this clinic's patients when measured long-term.

CHAPTER FIVE

APPLICATION OF DNP ESSENTIALS

Introduction

The DNP essentials define the competencies that all graduates of a DNP program should display and exhibit in clinical practice and scholarship. In addition, the DNP project can demonstrate the achievement of these essentials as the DNP student applies the knowledge and scholarship to demonstrate achievement of outcomes to change patient care (Moran et al., 2020). The eight essentials as cited in AACN (2006) are as follows:

1. Scientific underpinnings for practice
2. Organizational and systems leadership for QI and systems thinking
3. Clinical scholarship and analytical methods for evidenced-based practice
4. Information systems/technology and patient care technology for the improvement and transformation of healthcare
5. Healthcare policy for advocacy in healthcare
6. Interprofessional collaboration for improving patient and population healthcare outcomes
7. Clinical prevention and population health for improving the nation's health
8. Advanced nursing practice

As I completed my DNP education, the essentials were utilized in multiple classes, projects, and assignments. The DNP QI project shows comprehensive understanding and translation of the

essentials into a project that applies to patient care. The following demonstrates successful completion of each essential with examples from coursework.

Essential I: Scientific Underpinnings for Practice.

Essential I requires the DNP student to integrate nursing science with other science fields and uses this and theories to improve healthcare, evaluate outcomes and change practice. As I completed this project, I integrated information from underlying organizational theories/research to implement my project by researching and developing the best way to implement a new practice change in a primary care clinic. In addition, I developed a process for QI based on best practice data for healthcare and evaluated the outcomes of this change to further develop new recommendations and practices.

Essential II: Organizational and Systems Leadership for QI and Systems Thinking Competencies

Essential II indicates that the DNP student can develop care delivery approaches based on the needs of healthcare populations, while ensuring high quality and safety of patients. This essential is focused on system-based changes rather than individual changes that together improve the care of patients. This DNP project demonstrates this as this project focused on a process change to improve the care of diabetic patients in a primary care clinic. I chose a cost-effective change that was easy to implement and will likely reduce healthcare costs in the future by preventing the development of end-stage renal disease. This project also required me to use leadership changes to implement change with multiple staff members including patients, clinical staff, providers, and management staff.

Essential III: Clinical Scholarship and Analytical Methods for Evidenced-Based Practice Competencies.

Essential III requires the DNP student to review the literature and synthesize this into evidenced-based practice changes. The student is then required to disseminate this information and utilize data to develop practice-based changes that improve the care delivery system for patients. This DNP project is the goal of essential III where I reviewed gaps in care and recommendations from literature for practice changes. I then developed evidenced-based guidelines for changes and evaluated the outcomes of those changes. In an evidenced-based practice course (NRSG 605), I also demonstrated completion of this competency as I reviewed literature related to obesity management in primary care and provided recommendations for care. The DNP project took this process further as it required me to evaluate the recommendations that were made and evaluate the success of the QI.

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

Essential IV requires the DNP student to focus on the use of information systems and technology for the improvement and transformation of the healthcare system as a whole and the individual healthcare provider. This essential ensures that the use of information systems is used appropriately and understands the use of technology as to how it relates to the improvement of healthcare. To successfully demonstrate this essential, it is necessary to develop an information technology program that evaluates care and leads to QI in healthcare. In NRSG 610, the clinical practice problem focuses on examining data that can be obtained from an EMR that is then utilized to implement an intervention that is focused on the improvement of this data. As I reflect

on this project, it was necessary for me to have a large understanding of EMR data that would affect patient outcomes and what data would be used to evaluate the response to the intervention. This is similar to what was done for my DNP project; I utilized the EMR to develop reports that indicated gaps in data and then used the EMR to evaluate the QI project outcomes.

Ethical and legal issues related to information technology are essential to be understood. This was explored throughout my education, including security discussions related to HIPAA, appropriateness of medical records and documentation, how to share data and information, and how telemedicine creates different legal issues. Equality of resources and patient's autonomy are two ethical issues that were intertwined throughout the program and essential to the future practice as a nurse practitioner. To finally demonstrate this essential, one must understand and evaluate the consumer health information of how patients obtain information and how to discuss appropriate sources for patients to understand and utilize. The health literacy project in NRSG 610 required me to demonstrate a successful understanding of this topic. Patients often select websites and resources that are not credible and often believe the information that they are told by family and friends, rather than from healthcare professionals and reliable online sources, which means it is essential for healthcare providers to provide reliable online sources the printed resources for patients to utilize.

Essential V: Healthcare Policy for Advocacy for Healthcare Competencies

Essential V focuses on changes in healthcare policies to advocate improvement in patient care outcomes in current healthcare policies. This often involves leadership and advocacy at the system and government levels. This DNP project did not have a large policy component as much of the project was standard of care that needed to be implemented; however, allowing staff

members, rather than only providers, to order screening required advocacy regarding safety and importance to ensure all screenings were captured.

In NRSG 612, healthcare advocacy was specifically explored and demonstrated successful completion of this essential. In this class, I reviewed the current policy related to obesity, especially for Montana Medicaid patients. Current recommendations are for bariatric surgery referrals for patients with BMI >40. Montana Medicaid has bariatric surgery as an excluded benefit. Because Montana Medicaid does not pay for bariatric surgery, this is something that we have not been able to pursue for many of my patients due to lack of ability to pay. Montana Medicaid is designed for patients with lower incomes who do not have the means to pursue private pay options. I recommended that changes be made to add this surgery benefit to the Montana Medicaid benefits. I completed a letter to be sent to the chair of Health and Human Services that recommended that this be added to the Montana Medicaid covered services based on current data and guidelines. By completing this project, I demonstrated how to analyze current healthcare policies and how this affects patients who are limited by insurance or finances. In addition, I demonstrated a review of healthcare policies enacted by government policies and how to change these policies, which includes the education of policymakers (Montana government).

Essential VI: Interprofessional Collaboration for Improving Patient and Population Healthcare Outcomes Competencies

Essential VI focuses on interprofessional collaboration and changing of patient and healthcare outcomes. The requirements for essential VI include effective communication and collaboration, leading interprofessional teams to combat complex practice and organizational

issues, and then making changes by using leadership skills. The DNP project is a great example of collaboration between healthcare informatics, lab staff, providers, and clinical staff. In addition, the DNP project shows how I was able to make a change to improve the care of diabetic patients in the primary care clinic and implement a process that hopefully will continue in the future.

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

Essential VII focuses on clinical prevention and population health to ultimately improve the health of the entire population. This essential requires data analysis related to individual and population health and review of cultural factors and population health to implement QI related to population health. It also asks the student to evaluate care models related to this population's health. This DNP project was focused on diabetic population health and prevention of diabetic kidney disease and early treatment. This project was successful in improving the care provided in this clinic's population due to changes in the process and care that was provided. This project addresses a small number of diabetic patients in this clinic, however with 400 million people world-wide, this project is needed on a larger scale to improve the health of others. By exploring risk factors for both the development of diabetes and ultimately diabetic kidney disease, this project and be implemented to ensure that patients with specific ethnic backgrounds and those with more risk factors are specifically targeted. As I advance as a nurse practitioner, it would be beneficial to promote strict diabetic control and targeted pharmacological interventions to prevent diabetic kidney disease for males who are non-Caucasian as this is a high-risk population.

Essential VIII: Advanced Nursing Practice Competencies.

Essential VIII focuses on advanced nursing practice and incorporating advanced nursing science with other sciences to improve patient care and nursing practice. This essential focuses on how nursing graduates advance their knowledge and advance the profession. In addition, this essential describes all the assessments and applications of knowledge that are required for advanced nursing practice at the doctoral level. This essential also has a large focus on evidenced-based practice based on a variety of different factors. This essential describes the overall goal of advanced nursing practice, which is assessment (patient/society/culture), diagnosis (nursing/medicine/socioeconomic/cultural), planning (setting goals of care based on current literature, guidelines), interventions (evidenced-based guidelines, current literature), and evaluation (review of patient outcomes and how this changes the interventions). This essential describes the goal of the QI for a DNP project. For example, I evaluated the current population and care gaps, reviewed literature, and planned a change to the care that was provided to improve outcomes. This essential also explains that the DNP graduate should advance the knowledge of other professionals thru teaching and mentorship. In the project, I mentored other staff members to successfully implement this change in the primary care clinic.

The accomplishment of the DNP essentials was evident as I completed my DNP project in a primary care clinic and all required coursework. I was able to appreciate the holistic nature of the DNP education as it relates to patient care, advocacy, and evidenced-based practice and implement this into my project and likely future practice. This project also gave me insight into leadership skills to use in practice to help motivate other staff members, providers, and ultimately patients to improve healthcare outcomes. This DNP project gave me the confidence

and skills on how to tackle a problem that I encounter in healthcare practice and change the process based on evidenced-based guidelines and will prove invaluable in the future practice as a nurse practitioner. I currently serve as a provider member of the ambulatory pharmacy and therapeutics committee for my employer in which I am involved in implementing standardized formularies for clinics, reviewing changes, and providing education and feedback to other providers and clinical staff. Having the experience of complementing a quality improvement project empowered me as I prepare to assist with implementation of these changes in the future as a nurse practitioner.

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APPENDICES

APPENDIX A

PRE-POST STAFF TRAINING SURVEY

1. **Who needs urine protein screening?**
    a. All adult patients
    b. All hypertensive patients
    c. All diabetic patients
    d. Only type I diabetic patients

2. **How often should urine protein screening be completed?**
    a. Every clinic visit
    b. Yearly
    c. Every 6 months
    d. Once

3. **What is the correct test to order?**
    a. Urine Albumin/Creatinine Ratio
    b. POCT UA
    c. Urine Culture
    d. Microalbumin

4. **Why should this be performed?**
    a. To satisfy health maintenance gaps
    b. To identify kidney damage
    c. To identify poor diabetic control

5. **What are contraindications to screening?**
    a. Severe illness
    b. Urinary tract infection
    c. Menstruation
    d. Severe dehydration
    e. All of the above

APPENDIX B

CLINICAL STAFF (MA/LPN/RN) DECISION TREE FOR ORDERING DIABETIC URINE PROTEIN SCREENING

Appendix B-Clinical Staff (MA/LPN/RN) Decision Tree for Ordering of Diabetic Urine-Protein Screening

Image #1-Care Gaps-Screenshot

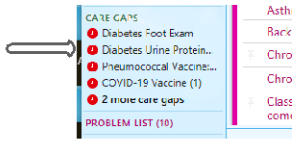


Image #2-Open Smart Sets

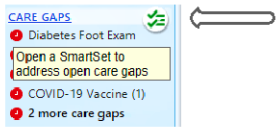


Image #3-Smart Set Ordering

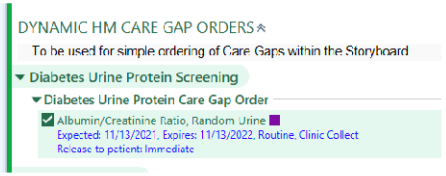
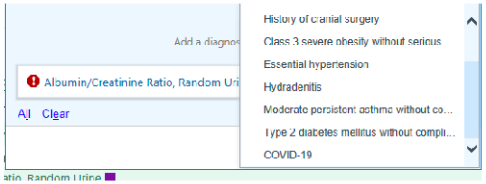
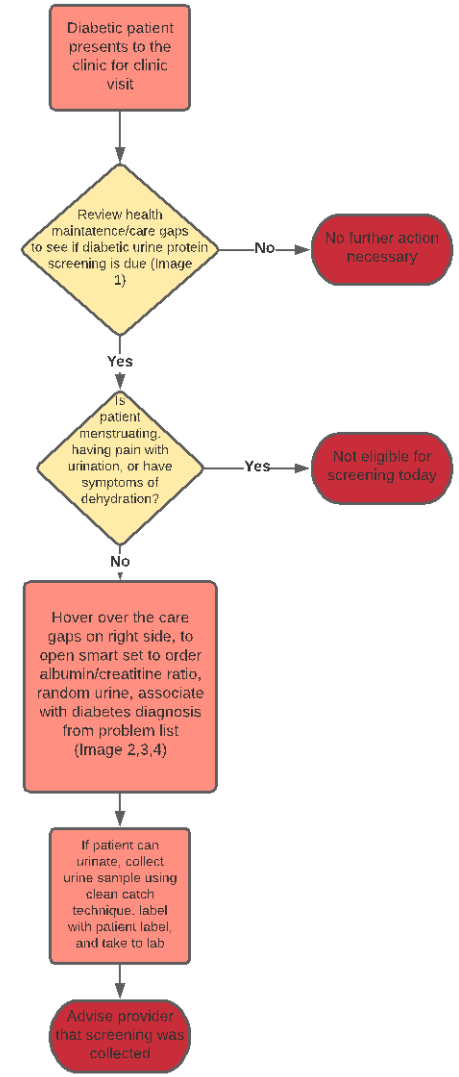


Image #4-Associate Diagnosis





APPENDIX C

PROVIDER DECISION TREE FOR ORDERING DIABETIC URINE PROTEIN SCREENING

Appendix C-Provider Decision Tree for Ordering of Diabetic Urine-Protein Screening

Image #1-Care Gaps-Screenshot

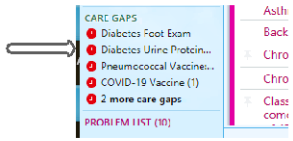


Image #2-Open Smart Sets

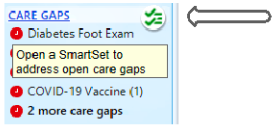
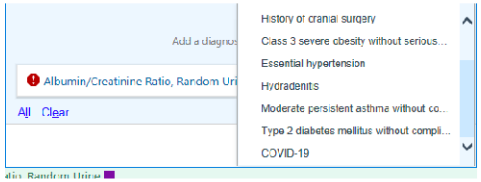
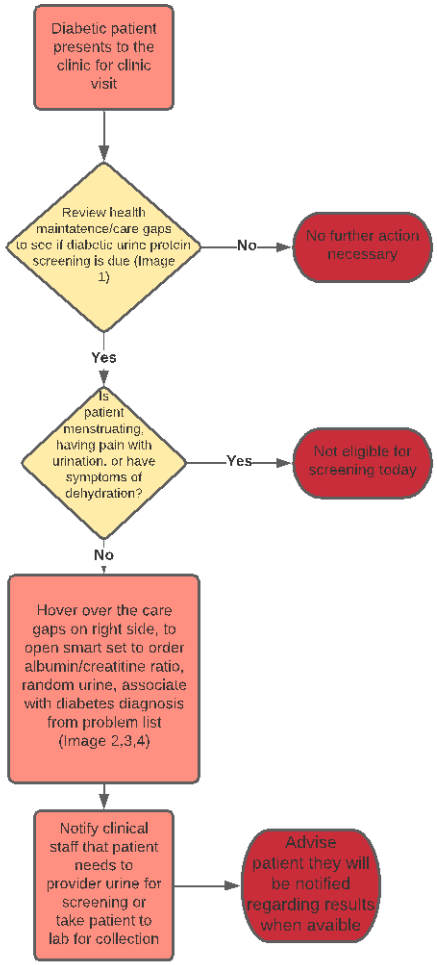


Image #3-Smart Set Ordering

Image #4-Associate Diagnosis

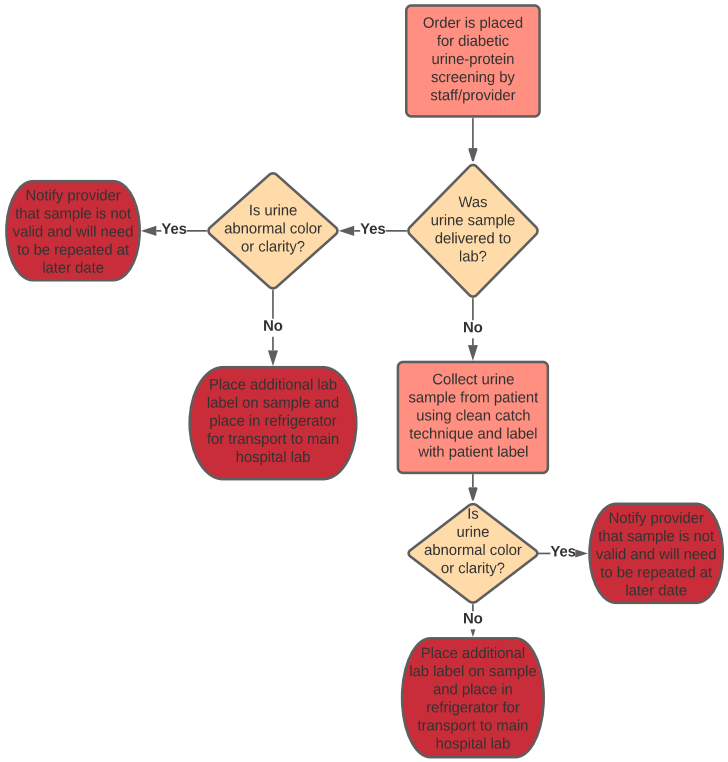




APPENDIX D

LAB PROCESS FOR DIABETIC URINE PROTEIN SCREENING

Appendix D-Lab Process for Diabetic Urine-Protein Screening



APPENDIX E

PROVIDER INTERPRETATION OF DIABETIC URINE PROTEIN SCREENING RESULTS

Appendix E-Provider Interpretation of Diabetic Urine-Protein Screening Results