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An Evaluation of the Screening and Management of Patients with Type 2 Diabetes

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DIABETES

DNP Practice Inquiry Project Report
An Evaluation of the Screening and Management of
Patients with Type 2 Diabetes

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College of Nursing

Fall 2016

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SCREENING AND MANAGEMENT OF PATIENTS WITH TYPE 2 DIABETES

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Abstract

Purpose: This purpose of this project was to evaluate preventive screening practices and adherence to guidelines for patients with type 2 diabetes (T2DM) as recommended by the American Diabetes Association (ADA) and United States Preventive Services Task Force (USPSTF) in the primary care setting. The specific aims were to: 1) determine the percentage of patients who received recommended screenings from the ADA, 2) determine the percentage of patients who received recommended screenings from the USPSTF, and 3) determine if the proportion of patients to receive the recommended screenings met established benchmarks set by Healthy People 2020 (HP2020).

Methods: A retrospective medical record review to assess the screening and management of patients with T2DM was performed. The medical records were reviewed for screening of ADA and USPSTF recommendations during routine office visits. A random sample of 100 patient medical records meeting inclusion criteria were chosen for review. Patient demographics and screenings were recorded in a spreadsheet and exported to SPSS to analyze the data.

Results: The results demonstrated that screening rates for hemoglobin A1C, cholesterol, obesity, blood pressure, tobacco use, and kidney function met or exceeded HP2020 goals. Preventive services that did not meet HP2020 goals included screening for cancers, osteoporosis, vaccinations, foot exams, and eye exams.

Conclusion: This study offers insight into possible gaps in managing T2DM in primary care, as well as areas that need further research. Providers should screen patients based on clinical practice guidelines to reduce the risk of developing complications associated with T2DM and prevention of other comorbidities. Additional research with larger, more diverse samples should

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be performed, as well as provider and patient focus groups to examine barriers in screening patients with T2DM in primary care.

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An Evaluation of the Screening and Management of Patients with Type 2 Diabetes

Introduction

Type 2 diabetes mellitus (T2DM) is a serious health concern and economic burden that affects more than 29 million Americans (American Diabetes Association [ADA], 2014). Patients with T2DM are at increased risk of having complications and comorbidities that affect morbidity and mortality. With preventive screenings according to guideline recommendations, many of these complications or comorbidities could be prevented, or detected early, when treatment works best. Primary care providers are in a key position to provide appropriate screenings to improve outcomes and decrease costs for patients with T2DM. Nationally, Americans receive preventive services at about half the recommended rate (CDC, 2015). This gap analysis was conducted to gain a better understanding of the screening practices and management of patients with T2DM in the primary care setting.

Background

In 2013, T2DM affects approximately 29 million people or 9.3% of the population in the United States (U.S.) and was the seventh leading cause of death (ADA, 2014). Based on reports from the CDC, the projected prevalence of T2DM is estimated to increase to 33% in 2050 in the U.S. (Boyle et al., 2010). In Kentucky, the incidence of adult T2DM increased from 3.5% of all adults in 1995 to 10.6% of adults in 2013 (KDR, 2015). The Louisville Metropolitan area is also above the national average with approximately 13.2% of adults diagnosed with T2DM in 2015 (KDR, 2009). In 2012, T2DM resulted in approximately \$245 billion in healthcare costs (ADA, 2014). Average medical costs for patients with T2DM are 2.3 times higher than patients without a diagnosis of T2DM (ADA, 2014).

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T2DM can lead to complications of retinopathy, nephropathy, neuropathy, limb amputations, and cardiovascular disease (ADA, 2015). These complications are primarily related to vascular changes caused by poor blood pressure, lipid, and glycemic control. Early detection and treatment of these modifiable risk factors can reduce the risk of developing complications (ADA, 2015). Screening and management according to national guidelines can significantly reduce cardiovascular risk factors and progression to end-stage T2DM.

Patients with T2DM are not only at increased risk of developing complications related to poor glycemic control, but they often have other chronic diseases or conditions as well. Most patients with T2DM have at least one chronic comorbidity and as many as 40% have three or more chronic health conditions (Piette & Kerr, 2006). The major comorbidities of T2DM are obesity, dyslipidemia, hypertension, chronic kidney disease, and cancers (AACE, 2016). Screening for comorbidities can help to detect conditions early when treatment is most effective (CDC, 2013).

ADA Screening Recommendations

The ADA Standards of Medical Care (2015) identified key components of quality care that have been shown to improve outcomes for patients with T2DM. The components identified include: monitoring the hemoglobin A1C at least twice yearly, cholesterol screening, yearly urinary microalbumin excretion, annual dilated eye exam, routine foot exams, yearly influenza vaccination, and pneumococcal vaccinations. Other recommendations to decrease cardiovascular risks include statin therapy and aspirin therapy, as well as the treatment of hypertension with an angiotensin-converting enzyme (ACE) inhibitor or an angiotensin receptor blocker (ARB).

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Glycemic Control. A1C has a strong predictive value for diabetes complications and it is recommended for patients to be tested at least twice yearly. Monitoring A1C is an indicator of glycemic control and a percentage point drop in A1C from 8% to 7% can reduce cardiovascular death by 45% (Eeg-Olofsson, 2012). This drop can lead to \$564 in cost savings per patient per year (Rui et al., 2010).

Cardiovascular Disease. Patients with T2DM are more likely to have hypertension and dyslipidemia leading to increased risk of cardiovascular disease. Blood pressure control reduces the risk of cardiovascular events by as much as 41% (Law, Morris, & Wald, 2009). Blood pressure should be measured at every visit and patients with blood pressure over 140/90 should be treated with an ACE or ARB as first line therapy. ACE and ARB medications have been found to prevent or delay diabetic kidney disease. Aspirin therapy is recommended for patients 50 years and older who are at increased cardiovascular risk to reduce the risk of a vascular event (i.e. myocardial infarction or stroke). Further, patients should have lipid levels measured at least yearly or more often as needed. All patients aged 40 and over and patients less than 40 with cardiovascular risk factors should be on at least moderate to high intensity statin therapy (ADA, 2015).

Nephropathy. Approximately 20-40% of patients with diabetes develop nephropathy compared to 3.3% of the general population (Chen, 2014). Abnormal levels of albuminuria are the earliest clinical evidence of nephropathy. Albuminuria and glomerular filtration rate should be screened yearly to assess for nephropathy. Treatment with an ACE or ARB should be initiated with elevated levels (ADA, 2015).

Neuropathy. The incidence of peripheral neuropathy in patients with T2DM is 59% compared to 2.4% of the general population (Hughes, 2002). Patients with diabetes are at an

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increased risk of foot ulcerations related to peripheral neuropathy and should be screened at least annually. The foot exam should include assessment of pedal pulses and monofilament testing (ADA, 2015).

Diabetic Retinopathy. Diabetic retinopathy is the leading cause of blindness in patients aged 20-74 (ADA, 2015). Screening for retinopathy can identify the condition early when treatment is more likely to prevent loss of vision. Patients should have initial dilated eye exam upon diagnosis and annual dilated eye exams to screen for retinopathy. After two years of normal exams, patients may consider lengthening that interval to once every two years (ADA, 2015).

Vaccinations. Patients with T2DM are at increased risk of preventable infectious diseases. Death related to influenza and pneumonia is four times more likely for patients who have diabetes than for those who do not (ADA, 2015). These patients should receive annual influenza vaccinations. In addition, they should receive pneumococcal vaccinations (i.e. pneumococcal conjugate vaccine 13 followed by pneumococcal polysaccharide 23).

USPSTF Screening Recommendations

Under the Affordable Care Act, insurance companies, including Medicare, provide yearly wellness exams at no cost to the patient. The purpose of the yearly exam is to identify an individualized preventive care plan for each patient. The preventive care plan is based on United States Preventive Services Task Force (USPSTF) recommendations. The USPSTF is a panel of experts that make recommendations for preventive screening based on evidence-based medicine (USPSTF, 2015).

USPSTF A or B grade recommendations were used to identify patients appropriate for screening in this study. A and B grade recommendations are given to services that provide a

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substantial to moderate benefit. Grade C recommendations are given to services that offer small net benefits and should only be offered to patients depending on individual circumstances.

Grade D recommendations are given to services that should be discouraged where the harm of the service outweighs the benefits. Grade I recommendations are given to services when there is insufficient evidence to conclude the benefits outweigh harms, and if the service is offered the patient should understand the uncertainty of the benefits (USPSTF, 2015).

The goal of the recommendations is to offer providers and patients strategies to prevent illness and improve health. Current recommendations for screening in all adults include: blood pressure, osteoporosis, obesity, tobacco use, and breast, colorectal, cervical, and lung cancer. These recommendations vary with age and gender (see Appendix A for information on USPSTF recommended screenings). Screening patients with T2DM according to current USPSTF recommendations is particularly important because these patients are at increased risk for developing comorbidities.

Blood Pressure. All adults should be screened for hypertension and measurements should be obtained from outside of the clinical setting before diagnosis and treatment. The goal for patients under the age of 60 is to maintain blood pressure under 140/90, and for patients over the age of 60 the goal is under 150/90 (USPSTF, 2015).

Cancer. While the exact mechanism is unclear, patients with T2DM have been shown to be at an increased risk of developing breast, colorectal, cervical, lung, and other cancers (Vigneri et al., 2009). Breast cancer is the second leading cause of cancer death and the most commonly diagnosed cancer for women after skin cancer (American Cancer Society [ACS], 2016). Patients with T2DM have a 20-27% increased risk for developing breast cancer (Boyle et al., 2012).

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Breast cancer screening is recommended every 1-2 years for all women age 50-74 (USPSTF, 2016).

Cervical cancer was once a leading cause of cancer death for women; however, with the increase in screening, the death rate has decreased by more than 50% (ACS, 2016). Cervical cancer screening is recommended every three years for women ages 21-65 with cytology or for women ages 30-65 every five years with combination cytology and human papillomavirus testing (USPSTF, 2012).

Colorectal cancer is the third leading cause of cancer deaths (ACS, 2016). Patients with T2DM have a 1.3-fold increased risk for colorectal cancer compared to the general population (Paul et al., 2015). Colorectal cancer screening is recommended starting at age 50 and continuing until age 75, or sooner for those with other risk factors such as family history (USPSTF, 2016).

Lung cancer is the leading cause of cancer death for men and women (ACS, 2016). The detection and treatment of early stage lung cancer can decrease morbidity and mortality. Screening is recommended for adults age 55-80 with a 30 pack-year smoking history. Counseling for tobacco cessation is the most important intervention for prevention of lung cancer (USPSTF, 2013).

Osteoporosis. Patients with T2DM are at increased risk of an osteoporosis-related fracture and should be screened and offered treatment to reduce this risk (Hamann et al., 2012). Women age 65 and older and younger women with increased risk factors should be screened for osteoporosis using dual-energy x-ray absorptiometry of the hip and lumbar spine. Other factors associated with increased risk for osteoporosis include smoking, alcohol use, and personal and parental history of fracture (USPSTF, 2011).

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Obesity. Obesity management can delay progression of T2DM and improve glycemic control (ADA, 2015). Obesity screening using body mass index (BMI) should be calculated regularly. Patients with a BMI >30 should be counseled by their primary care provider to include comprehensive weight management strategies. Also, referral to a nutritionist, an exercise therapist, a behavioral therapist or weight management programs have been found to be effective strategies (USPSTF, 2012).

Tobacco Use. Patients with T2DM who smoke are at higher risk for kidney disease, blindness, and circulatory complications leading to amputations (U.S. Department of Health and Human Services, 2014). All adults should be screened for tobacco use. Patients who do use tobacco should be advised to stop and provided behavioral interventions and pharmacotherapy for cessation (USPSTF, 2015).

Healthy People 2020

Many of the ADA and USPSTF recommendations have Healthy People 2020 (HP2020) goals set to increase the proportion of patients that are screened (see Appendix B for information on the national screening goals). HP2020 sets 10-year national objectives for improving the health of all Americans. It has established benchmarks and monitors progress of these objectives. The objectives are made in an effort to increase collaboration among healthcare providers, empower individuals to make informed health decisions, and measure the impact of prevention activities. The national rates for screening of preventive services fall below the target rate for all of the ADA and USPSTF recommended preventive screenings (HP2020, 2016).

Center for Medicare and Medicaid Services

In 2017, the Center for Medicare and Medicaid Services (CMS) will implement the Quality Payment Program that is part of the Medicare Access and CHIP Reauthorization Act of

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2015 (MACRA). This payment program will affect how providers will be reimbursed for the quality of services provided. The new payment model will replace previous reporting programs (i.e. Meaningful Use, Physician Quality Reporting System, and Value-Based Payment Modifier) but will continue to use similar measures of performance as used in the previous programs. Based on the quality of care provided in 2017, the program will use positive, neutral, or negative payment adjustments from 4% in 2019 up to 9% in 2022. Providing preventive services and evidence-based management of chronic conditions is key to this payment model, in an effort to improve the care and outcomes for patients (CMS, 2016).

Study Purpose

The incidence of T2DM continues to increase every year, and it is of the utmost importance to improve outcomes for patients and decrease costs associated with complications and comorbidities. The purpose of this study was to evaluate preventive screening practices and adherence to guidelines for patients with T2DM as recommended by the ADA and USPSTF in the primary care setting. The HP2020 rates were used as a benchmark for data comparison.

The specific objectives were to:

1. Determine the percentage of patients who received ADA recommended screenings and preventive services, including: hemoglobin A1C, cholesterol, kidney function, foot exams, eye exams, influenza and pneumococcal vaccinations, and medications to decrease cardiovascular risk (i.e. statin, aspirin, ACE, or ARB).
2. Determine the percentage of patients who have received USPSTF recommended screenings, including: blood pressure, cholesterol, osteoporosis, obesity, tobacco use, and cancer screenings as appropriate for age and gender.

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3. Determine if the proportion of patients to receive the recommended screenings met the HP2020 established benchmarks.

Methods

Study Design and Setting

A retrospective electronic medical record (EMR) review of 100 medical records was conducted to assess the percentage of patients with T2DM who received preventive screening measures according to national guidelines. The setting of the study was a rural primary care practice affiliated with a large healthcare system in a Midwestern city. This healthcare system includes five hospitals, 27 primary care practices, 13 urgent care centers, and many specialty offices. The screening rates at the practice site were compared to national benchmarks set by HP2020.

Study Population

The inclusion criteria consisted of patients from the ages of 18 to 89. All patients had a diagnosis of T2DM using International Classification of Diseases (ICD) codes (see Table 1 for list of ICD codes used for inclusion). All office visits were for routine follow-up care for diabetes from January 1, 2015 to December 31, 2015. There were no exclusion criteria.

Study Procedures

Permission for this study was obtained from the University of Kentucky's Institutional Review Board (IRB) and the Norton Healthcare Office of Research Administration (NHORA). Data collection began following IRB approval and included a retrospective electronic medical record review. No identifying information was obtained from patient records or reported in the record review. Only the Principal Investigator (PI) of the project had access to the data collected

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from the EMR review. A request for waiver of informed consent was requested because this study used existing patient medical records.

Medical records meeting inclusion criteria were identified by generating an electronic report. Systematic sampling started with the third medical record and included every third medical record until 100 medical records were selected. Each medical record was assigned a study number. A cross-walk table of the study numbers and their correlated medical record numbers was kept in a separate spreadsheet not available to anyone other than the PI. The records were kept in a personal password protected computer.

The record review and data collection were completed during August 2016. To evaluate screening recommendations and services provided, data collected included documentation of A1C, cholesterol, kidney function, foot exams, eye exams, vaccinations, medications to decrease cardiovascular risk, cancer screenings, blood pressure, obesity, tobacco use, and osteoporosis screening. Patient demographic data collected included age, insurance coverage, gender, and ethnicity.

Data Analysis

The de-identified data collected by the PI was entered into an Excel spreadsheet and exported to Statistical Package for the Social Sciences (SPSS) software for statistical analysis. Descriptive statistics including frequencies and means were used to assess demographics and screening recommendations. Screening rates for this practice were compared to national rates and target goals set by HP2020.

Results

Sample Characteristics

Demographics were analyzed to understand the characteristics of the randomly selected medical records (see Table 2). Of the 100 records selected for review, 51 (51%) were female patients and 49 (49%) were male patients. Age ranged from 29 to 88 with a mean age of 60 (SD 11.21). Seventy-nine percent were Caucasian, 15% were African American, and 6% were of other ethnicities. The majority of patients (56%) had Medicare or Medicaid insurance, 40% had private insurance, and 4% had other insurance plans.

ADA and USPSTF Recommended Screenings

The ADA and USPSTF screenings were evaluated to determine the percentage of patients meeting the national guidelines (see Table 3).

Obesity. Body mass index (BMI) was calculated on all patients at each visit in the medical record. BMI ranged from 18.7 to 59.5 with a mean BMI of 34.3 (SD 7.38). According to BMI results, 76% were obese with a BMI greater than 30 and 19% were extremely obese with a BMI over 40. Of those with obesity, only 16 patients (21%) had a diagnosis of obesity in their medical record.

Smoking status. All patients had documentation of screening for smoking status and 19% of patients were current tobacco users.

A1C. A1C levels were drawn on all patients at least once during 2015 and 77% of patients had A1C levels drawn two or more times during the year. The A1C levels ranged from 4.9 to 14.2 with an average of 7.7 (SD 2.0).

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Kidney Function. Ninety-five percent of patients received screening of glomerular filtration rate and urinalysis to evaluate microalbuminuria. This study did not evaluate abnormal results for kidney function.

Cholesterol. Cholesterol levels were obtained taken on all patients except one (99%). Seventy-six percent of patients had a diagnosis of hyperlipidemia. Eighty-one percent of patients were prescribed medications for hyperlipidemia. Seventy-five percent of patients were specifically treated with a statin medication as recommended by the ADA.

Blood Pressure. Blood pressure was measured on all patients. Eighty-four percent of patients had a diagnosis of hypertension and 90% of patients were prescribed medications for hypertension. Seventy-six percent of patients were prescribed an ACE or ARB as recommended by the ADA. Twenty-four percent of patients had an elevated blood pressure reading recorded in their record.

Foot and Eye Exams. Only 53% of patients had documentation of having a foot exam and 54% had documentation of an eye exam.

Vaccinations. Forty-three percent of patients received the flu vaccination. Of the 64 patients between the age of 18 to 64, nineteen patients (29.7%) received the pneumococcal vaccination. Of the 36 patients age 65 and older, twenty-six patients (72.2%) received the pneumococcal vaccine.

Cancer and Osteoporosis Screening. Thirty-nine women met the criteria for breast cancer screening and 29 women (74%) received appropriate exams. Eighty-one patients met the criteria for colorectal cancer screening and 51 patients (63%) received appropriate screening. Thirteen patients met criteria for lung cancer screening and four patients (30.8%) received appropriate screening. Twenty-eight women met the criteria for cervical cancer screening and 13

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patients (46.4%) received appropriate screenings. Twenty-five patients met the criteria for osteoporosis screening and 20 women (80%) received appropriate screening.

Discussion

The purpose of this study was to determine if specific preventive screening practices were documented for patients with T2DM and if ADA and USPSTF guideline recommendations were implemented. This study provided insight into the preventive screening practices and implementation of ADA and USPSTF recommendations for patients with T2DM. This study did not address lack of provider recommendation, patient nonadherence, or changes in treatment related to abnormal screening findings.

At this practice site, the results demonstrated that some of the ADA and USPSTF recommendations exceeded national and HP2020 goals while other goals fell short (see Appendix B). ADA screening recommendations that met or exceeded HP 2020 goals included A1C measurements twice per year, cholesterol, and kidney function. USPSTF screening recommendations that met or exceeded HP2020 goals included obesity, blood pressure, and tobacco use. ADA and USPSTF screening rates that did not meet HP2020 goals included all cancer screenings, osteoporosis, vaccinations, and foot and eye exams.

Screening rates that exceeded HP2020 goal rates could be in part related to the use of an EMR that utilizes clinical decision support tools (CDST). The use of EMRs with CDSTs has been shown to increase preventive services in the primary care setting (Friedman et al., 2016). This healthcare system implemented the EMR system, EPIC, in 2012 in their primary care practices. EPIC uses CDSTs that use best practice advisories for providers that auto-populate screening recommendations. The CDSTs are integrated into EPIC to identify patients due for preventive screenings. The CDSTs also have flowsheets for chronic diseases such as T2DM

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with checklists of condition-specific recommendations. However, providers must use the CDSTs and patients must adhere to the recommendations for screening rates to improve.

Of the screenings that exceeded HP2020 goals, this healthcare system currently has practices in place to implement some of these measures on a routine basis. Tobacco, obesity, and blood pressure screenings are obtained at each visit. It was noted that more patients were taking antihypertensive medications than had an ICD-9 diagnosis of hypertension. This could be related to patients taking ACE or ARB for kidney protection, or lack of documentation of the diagnosis code. Other measures that exceeded HP2020 goals included A1C, cholesterol, and kidney function. These rates could be higher related to the use of the CDST for chronic diseases.

Screening rates that did not meet the HP2020 goals could be related to documentation practices. Screenings were documented in various locations of the medical record to include the health maintenance section, visit encounter note, or other areas. For instance, colon cancer screenings were listed in the health maintenance section of some records and in some cases they were not documented at all, only scanned into a media tab; this could lead to falsely lower rates of screening.

Cervical cancer screening fell below the target and national average in this study. The low cervical cancer screening rates could be related to patients having the exam done at a specialist office or not meeting requirements (e.g. having had a hysterectomy), and providers not documenting this appropriately in the record. Foot exams also fell below the target and national averages. Low rates for foot exams could be related to documentation practices, as some providers documented this exam in the health maintenance section, while other providers included this exam in their visit encounter note.

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Additionally, this study did not assess patient factors associated with low screening rates. Research indicates that patient non-adherence to provider recommendations accounts for 40% to 70% of missed preventive services (Martin et al., 2005). Factors that affect patient adherence to provider recommendations include health beliefs, literacy, costs, and patient-provider relationship (Martin et al., 2005).

Limitations

The study was a retrospective medical record review and can only be used to identify gaps in the preventive screening rates of patients with T2DM. Study limitations include small sample size ($N=100$) from one primary care office, lack of diversity of patients, and the location of the practice. These limitations limit the study results from being generalizable to other primary care offices.

The current EMR was implemented shortly before this study was conducted. The providers had previously used paper medical records and might not have been as familiar with documenting in the EMR or using the CDST available. In addition, this study only considered documented screenings and did not assess for lack of provider recommendation or patients that did not adhere to recommendations.

Recommendations

Recommendations for future studies include further investigation of preventive screening practices of patients with T2DM in the primary care setting. For study results to be more generalizable to other practices in this healthcare system, studies should include offices throughout the region and include a larger, more diverse sample. To improve screening rates at this practice site, future studies should incorporate provider and patient surveys or focus groups to determine other barriers to preventive screenings.

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Interventions to improve screening rates should focus on increasing provider recommendations and improving patient adherence. Interventions to improve provider recommendations should include education of the guideline recommendations and CDST available on the EMR. Provider education may lead to a more uniform patient record amongst providers improving documentation and screening rates. Interventions to improve patient adherence should include patient reminders such as letters, postcards, or telephone calls. Letters sent as reminders to patients have been shown to be an effective method for increasing cervical cancer screening (Hitzeman & Xavier, 2012).

Patient education on the importance of preventive screenings is another key intervention that could lead to improved screening rates. Printed education is currently provided to patients at the end of each visit on an after-visit summary (AVS). The AVS includes educational material related to the visit diagnosis and can be individualized by providers. Preventive screening reminders and related information could be added to the AVS.

Patient education can also be done one-on-one with the provider or other office staff such as nurse navigators. Nurse navigators are being integrated into many of the primary care practices in this particular healthcare system, including the study practice site. The nurse navigators collaborate with the patient's care team to provide education and support services as needed.

Additionally, the majority of appointments in this study were scheduled as a chronic visit follow-up appointment. Providers have limited time to see each patient and can be overwhelmed by the chronic condition, comorbidities, screening and treatment needs of the patient with T2DM (Piette & Kerr, 2006). This leaves providers to prioritize services and defer some services to future visits (Yarnell et al., 2003). Scheduling appointments specifically for annual wellness

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visits could provide time to address preventive screenings. Future research is recommended to determine if adding these interventions would lead to improved screening rates.

Conclusion

T2DM is one of the leading health concerns for this nation. This serious health concern can lead to costly complications and comorbidities. Primary care providers are in a key position to help patients make informed decisions with regard to recommended screenings. Current guidelines recommend screening to prevent illness and improve health for patients with T2DM. The new CMS payment models will require preventive services as part of reimbursement.

The purpose of this study was to gain a better understanding of the current practices associated with screening recommendations for patients with T2DM in a primary care setting. While some areas of screening were above national goals, there were many areas where the goals were not being met. Further research is needed to identify gaps in preventive screening recommendations in the primary care setting. Identifying gaps and implementing interventions to improve screening of patients with T2DM will lead to improved outcomes and decreased costs.

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Table 1

ICD-9 Codes used for Inclusion Criteria

250.0 Diabetes mellitus without mention of complication
250.00 Diabetes mellitus without complication type 2 or unspecified type not stated as uncontrolled
250.02 Diabetes mellitus without complication type 2 or unspecified type uncontrolled
250.1 Diabetes with ketoacidosis
250.10 Diabetes mellitus with ketoacidosis type 2 or unspecified type not stated as uncontrolled
250.12 Diabetes mellitus with ketoacidosis type 2 or unspecified type uncontrolled
250.4 Diabetes with renal manifestations
250.40 Diabetes mellitus with renal manifestations type 2 or unspecified type not stated as uncontrolled
250.42 Diabetes mellitus with renal manifestations type 2 or unspecified type uncontrolled
250.5 Diabetes with ophthalmic manifestations
250.50 Diabetes mellitus with ophthalmic manifestations type 2 or unspecified type not stated as uncontrolled
250.52 Diabetes mellitus with ophthalmic manifestations type 2 or unspecified type uncontrolled
250.6 Diabetes with neurological manifestations
250.60 Diabetes mellitus with neurological manifestations type 2 or unspecified type not stated as uncontrolled
250.62 Diabetes mellitus with neurological manifestations type 2 or unspecified type uncontrolled
250.7 Diabetes with peripheral circulatory disorders
250.70 Diabetes mellitus with peripheral circulatory disorders type 2 or unspecified type not stated as uncontrolled
250.72 Diabetes mellitus with peripheral circulatory disorders type 2 or unspecified type uncontrolled
250.9 Diabetes with unspecified complication
250.90 Diabetes mellitus with unspecified complication type 2 or unspecified type not stated as uncontrolled
250.92 Diabetes mellitus with unspecified complication type 2 or unspecified type uncontrolled

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Table 2

Sample Characteristics (N=100)

Variable	<i>n</i> (%)	Mean (SD)
Age		60 (11.21)
Gender		
Male	49 (49)	
Female	51 (51)	
Ethnicity		
Caucasian	79 (79)	
African American	15 (15)	
Other	6 (6)	
Insurance		
Medicare/Medicaid	56 (56)	
Private	40 (40)	
Other	4 (4)	

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Table 3

Evaluation of ADA and USPSTF Recommended Screenings (N=100)

Variable	<i>n</i> (%)	Mean (SD)
BMI		34.3 (7.4)
Obese BMI ≥ 30	76 (76)	
Extremely obese BMI ≥ 40	19 (19)	
BMI diagnosis	16 (21)	
Hemoglobin A1C		7.7 (2.0)
A1C levels drawn once	100 (100)	
A1C levels drawn \geq twice	77 (77)	
ADA Specific Recommendations		
Kidney function	95 (95)	
Eye exam	54 (54)	
Foot exam	53 (53)	
Aspirin	43 (43)	
Blood pressure		
Screened	100 (100)	
Hypertension diagnosis	84 (84)	
Hypertension medication	90 (90)	
ACE or ARB	76 (76)	
Elevated blood pressure reading	24 (24)	
Cholesterol		
Screened	99 (99)	
Hyperlipidemia diagnosis	76 (76)	
Hyperlipidemia medication	81 (81)	
Statin	75 (75)	
Smoking		
Screened	100 (100)	
Smoker	19 (19)	
Non-smoker	81 (81)	
Vaccinations received		
Influenza	43 (43)	
Pneumococcal 18-64 (<i>n</i> =84)	19 (29.7)	
Pneumococcal 65 and older (<i>n</i> =38)	26 (72.2)	
Cancer Screenings		
Breast (<i>n</i> =39)	29 (74.4)	
Cervical (<i>n</i> =28)	13 (46.4)	
Colorectal (<i>n</i> =81)	51 (63.0)	
Lung (<i>n</i> =13)	4 (30.8)	
Osteoporosis Screening (<i>n</i> =25)	20 (80)	

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Appendix A

USPSTF Recommendations for Screening

Topic	Gender	Age	Recommendation
Blood Pressure screening	Male and Female	18 and older	Obtain measurements outside of the clinical setting for diagnostic confirmation before starting treatment.
Cholesterol	Men	35 and older	Screen for lipid disorders (total cholesterol and HDL-C) to identify asymptomatic men and women who are eligible for preventive therapy.
	Female	20 to 45	
	Male	20 to 35	Screen for lipid disorders (total cholesterol and HDL-C) if they are at increased risk for coronary heart disease to identify asymptomatic men and women who are eligible for preventive therapy.
	Female	45 and older	
Osteoporosis	Female	65 and older	Screen for osteoporosis using a dual-energy x-ray absorptiometry of the hip and lumbar spine and quantitative ultrasonography of the calcaneus.
Obesity	Male and Female	18 and older	Screen using BMI and offer obese adults referral to intensive behavioral interventions to improve weight status and other risk factors for important health outcomes.
Tobacco	Male and Female	18 and older	Ask all adults about tobacco use, advise them to stop using tobacco, and provide behavioral interventions and pharmacotherapy for cessation.
Breast Cancer	Female	50 to 74	Biennial screening mammography for women aged 50 to 74.
Colorectal Cancer	Male and Female	50 to 75	Screen using fecal occult blood testing, sigmoidoscopy, or colonoscopy.
Lung Cancer	Male and Female	55 to 80	Screen patients using a low-dose CT who have a 30 pack-year smoking history and currently smoke or who have quit within the past 15 years.
Cervical Cancer	Female	21 to 65	Screening with cytology every 3 years. (For women ages 30 to 65, may lengthen interval to 5 years with combination of cytology and HPV testing).

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Appendix B

Healthy People 2020 Current Screening Rate, Goal Screening Rate, and Study Practice Site Screening Rate

HP2020 Objective	National Rate	Target Rate	Study Rate
Proportion of adults with diabetes who have an A1C twice a year	64.6	71.1	77
Proportion of adults who have had their blood cholesterol levels checked within the preceding five years	74.6	82.1	99
Proportion of adults with diabetes who have a yearly eye exam	53.4	58.7	54
Proportion of adults with diabetes who have a yearly foot exam	68.0	74.8	53
Proportion of adults with diabetes who have a yearly urinary microalbumin measurement	33.6	37	95
Proportion of females aged 50-74 to receive breast cancer screening	73.7	81.1	74.4
Proportion of females aged 21-65 to receive cervical cancer screening	84.5	93.0	46.4
Proportion of adults aged 50-75 to receive colorectal cancer screening	52.1	70.5	63.0
Increase percent of tobacco screening in adults in ambulatory care setting	62.4	68.6	100
Increase the proportion of PCP who assess BMI	48.7	53.6	100
Increase the percentage of adults aged 18 and older who are vaccinated against seasonal influenza	38.1	70.0	43
Increase the percentage of high-risk adults age 18 to 64 who are vaccinated against pneumococcal disease	16.6	60.0	29.7
Increase the percentage of adults aged 65 and older who are vaccinated against pneumococcal disease	60.0	90.0	72.2