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Managing Diabetic A1C at a Primary Care Center: A Nurse Practitioner Perspective

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MANAGING DIABETIC A1C AT A PRIMARY CARE CENTER:

A NURSE PRACTITIONER PERSPECTIVE

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This project, written by Jacqueline Nugent under direction of Dr. Mary D. Mites Campbell, Project Chair, and approved by members of the project committee, has been presented and accepted in partial fulfillment of requirements for the degree of

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Certification

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Abstract

Background: At a primary care center in Brooklyn, New York, approximately 27% of diabetic patients with abnormal Hgb A1C fail to return for follow-up appointments, as recommended by the Centers for Disease Control and Prevention (CDC). According to electronic medical records (EMR), healthcare providers demonstrated inconsistency in ordering and monitoring Hgb A1C and clinic follow-up appointments for patients.

Purpose: The purpose of this quality improvement project was to determine retrospectively the healthcare providers' ordering, monitoring, and follow-up appointments for adult diabetic patients with abnormal Hgb A1Cs; to develop and implement a standardized process for healthcare providers to monitor and follow these patients, especially those with possible nonclinic follow-up compliance and abnormal Hgb A1C; to determine prospectively healthcare providers' ordering, monitoring, and follow-up appointments; and to evaluate the prospective charts to determine if Hgb AIC results changed from abnormal to normal or elevation over time until the next follow-up appointment.

Theoretical Framework: The theoretical framework was the nursing practice model, which allows clinical systems to redesign operational processes associated with patient care for innovative clinical advancement outcomes.

Methods: Frequency tests were used to determine appointment adherence retrospectively and prospectively, with a convenience sample of seven healthcare providers and review of 99 retrospective and prospective medical records of diabetic patients who met inclusion criteria. A nonparametric quantitative paired *t* test was used to measure patients diagnosed with poorly controlled diabetes who were treated over two 3-month timespans.

Results: The difference in A1C scores between the two 3-month periods ranged from 4.5 to 2, with an average improvement of -1.32. These scores reflected an improvement in healthcare providers' ordering and monitoring of Hgb A1C after CDC-implemented standardized guideline and recommendations.

Conclusion: The lack of appropriate healthcare provider management of diabetic patients can lead to additional health complications. Monitoring of patients' Hgb A1C levels through prospective electronic medical record reviews is a simple yet viable approach. With this approach, healthcare practitioners can improve ordering and monitoring of Hgb A1C for normalcy and follow-up consistency after implementation of standardized practice.

Acknowledgements

I would like to express my appreciation to the people who have been part of this project right from the inception. The writing of this project has been one of the significant academic challenges I have faced, and without the support, patience, and guidance of the people involved, this task would not have been completed. It is to them I owe my deepest gratitude. The success of this project is a result of sheer hard work and determination by me with the help of my chair.

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Chapter 1

Nature of Project and Problem Identification

Diabetes rates in the United States (U.S.) have risen to epidemic proportions. In 2015, approximately 30.3 million people of all ages, nearly 10% of the population, were diagnosed for diabetes. In the same year, 33.9% of U.S. adults aged 18 years or older (84.1 million people) had prediabetes (Centers for Disease Control and Prevention [CDC], 2017). Diabetes affects individuals of all ages, but it is most prevalent among those 65 years and older (American Diabetes Association [ADA], 2016). It has been predicted that by 2050, diabetes will affect as many as one in three American adults.

In 2010, diabetes was identified as the seventh leading cause of death but, as diabetes leads to several severe comorbidities, it is listed as a contributing cause of death to many more. Comorbidities that frequently coexist with diabetes include hypertension, dyslipidemia, nonalcoholic fatty liver disease, cardiovascular disease, kidney disease, and obesity (Centers for Disease Control and Prevention [CDC], 2011). The disease process of diabetes damages blood vessels of all types and the organs to which blood flows. People who have diabetes are at a higher risk than nondiabetics for developing infections, cardiovascular disease, kidney failure, lower-limb amputation, and blindness. Other conditions such as nerve damage, damage to teeth and gums, and sexual dysfunction are additional comorbidities that result from diabetes

(International Diabetes Federation, 2017; National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK, 2014).

For diabetics, lack of proper monitoring of blood glucose levels leads not only to the diseases and conditions listed above, but also lack of proper blood glucose level monitoring can be fatal due to coma or hard-to-treat infections (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2017). The importance of monitoring blood glucose levels makes it imperative that blood not only be monitored daily but also should also be monitored based on how glucose is metabolized over a period of time. The incidence of complications of diabetes can be reduced through careful management directed at maintaining glycemic control in adult, non-gestational individuals with type 2 diabetes at a target Hgb A1C level of less than 7% (American Diabetes Association [ADA], 2014). This target level can be achieved with Hgb A1C testing, which can be enhanced through the use of a systematic/team approach.

Diabetes management requires the cooperative activities of an interprofessional healthcare team. Diabetes is a chronic disease that is increasing locally and globally and is a leading cause of disability. Diabetes is costly to society in terms of dollars and human suffering (American Diabetes Association [ADA], 2013**)**. The ill effects of diabetes can be largely reduced through consistent monitoring of Hgb A1C and the timely implementation of interventions to reduce the Hgb A1C among patients whose diabetes is poorly controlled.

Currently there is a lack of standardization in ordering Hgb A1C testing for diabetic management in a primary care center in Brooklyn, New York. As a result, patients do not receive timely modification of their treatment plans, the Hgb A1C

continues to be in the unacceptable range, and patients frequently suffer serious adverse consequences.

The investigator is a family nurse practitioner at this primary care center, in which healthcare providers serve a large population of Caribbean Americans at risk for various chronic diseases, especially diabetes. A challenge is evident with care continuity among these patients. The care of approximately 500 of these patients is undertaken by the family nurse practitioners (FNP) who partner with medical providers (i.e., medical doctors [MDs]). Of those patients seen and cared for at the clinic, 80% are diagnosed with type 2 diabetes mellitus (T2DM), and approximately 75% of these patients diagnostically have unacceptable Hgb A1C or fasting blood glucose levels. Some of these patients are 50 years old, but in many cases they have developed diabetic neuropathy, which is found in higher prevalence in the elderly population (Cleveland Clinic, 2018**)**. Furthermore, 60% of these patients (300) suffer from other comorbidities, including hypertension and high blood cholesterol levels.

In spite of diabetes and comorbidities, a portion of the patients do not adhere consistently to clinic follow-up appointments, and they sporadically cancel scheduled appointments. The gap associated with care inconsistency stems from missed follow-up appointments and the lack of required Hgb A1C testing, as recommended by the Centers for Disease Control and Prevention (CDC, [2016]) for standardization of healthcare providers' practice and patient outcomes. The gap revealed through providers' documentation in electronic medical records (EMR) that some patients' Hgb A1C tests were missed or inconsistently ordered, contrary to recommendations by the CDC (2016).

Problem Statement

Approximately 27% of patients with an abnormal Hgb A1C at a primary care center in Brooklyn, New York, fail to return for follow-up appointments within the recommended CDC 3-month period.

Purpose Statement

The purpose of this quality improvement project was to determine retrospectively the healthcare providers' ordering, monitoring, and follow-up appointments for adult diabetic patients with abnormal Hgb A1Cs; to develop and implement a standardized process for healthcare providers to monitor and follow these patients, especially those with possible nonclinic follow-up compliance and abnormal Hgb A1C; to determine prospectively healthcare providers' ordering, monitoring, and follow-up appointments; and to evaluate the prospective charts to determine if Hgb AIC results changed from abnormal to normal or elevation over time until the next follow-up appointment.

Project Objectives

The following were the objectives for this project:

1. Conduct a retrospective electronic medical record review of adult diabetic patients with abnormal Hgb A1Cs who failed to return for follow-up appointments between March 1 and May 31, 2017, at Week 1 after IRB approval.
2. Develop and implement a standardized process for healthcare providers to closely monitor and follow adult diabetic patients, especially those with possible nonclinic follow-up-compliance and abnormal Hgb A1C at Week 3.

3. Conduct a prospective electronic medical record review of the same Hgb A1C abnormal adult diabetic patients as the retrospective review. These patients attended follow-up appointments between June 1 and August 31, 2017, at Week 12.
4. Evaluate the EMR charts prospectively to determine if the diabetic patients' Hgb AIC results in changes from abnormal to normal or elevation over time until the next follow-up appointment at Week 16.

Theoretical Framework

The theoretical framework used for this project was the nursing practice model. This model allows clinical systems to redesign their operational processes associated with patient care for innovative clinical advancement outcomes.

Practice Model

A quality improvement guide (QI) published by the United States Department of Health and Human Services, Health Resources and Services Administration (USHRSA, 2011) was used for standardized nursing services at the patient care and nursing unit levels for organizational best outcomes. USHRSA (2011) defined the QI as "systematic and continuous actions that lead to measurable improvements in healthcare services and the health status of targeted patients" (p. 1). The QI guide assists organizations in using systems and processes that focus on patients, team building, and data analysis before and after changes. The model illustrates the outcomes of nursing service, practice, collaboration, communication, and professional development as related to patient-family-centered care.

As outlined in Figure 1, the model's principles frame the system approach used for this project. The QI guide describes the systems, processes, and resources which will be used; the activities or processes which will be carried out; and the projected results or inputs processes and outputs.

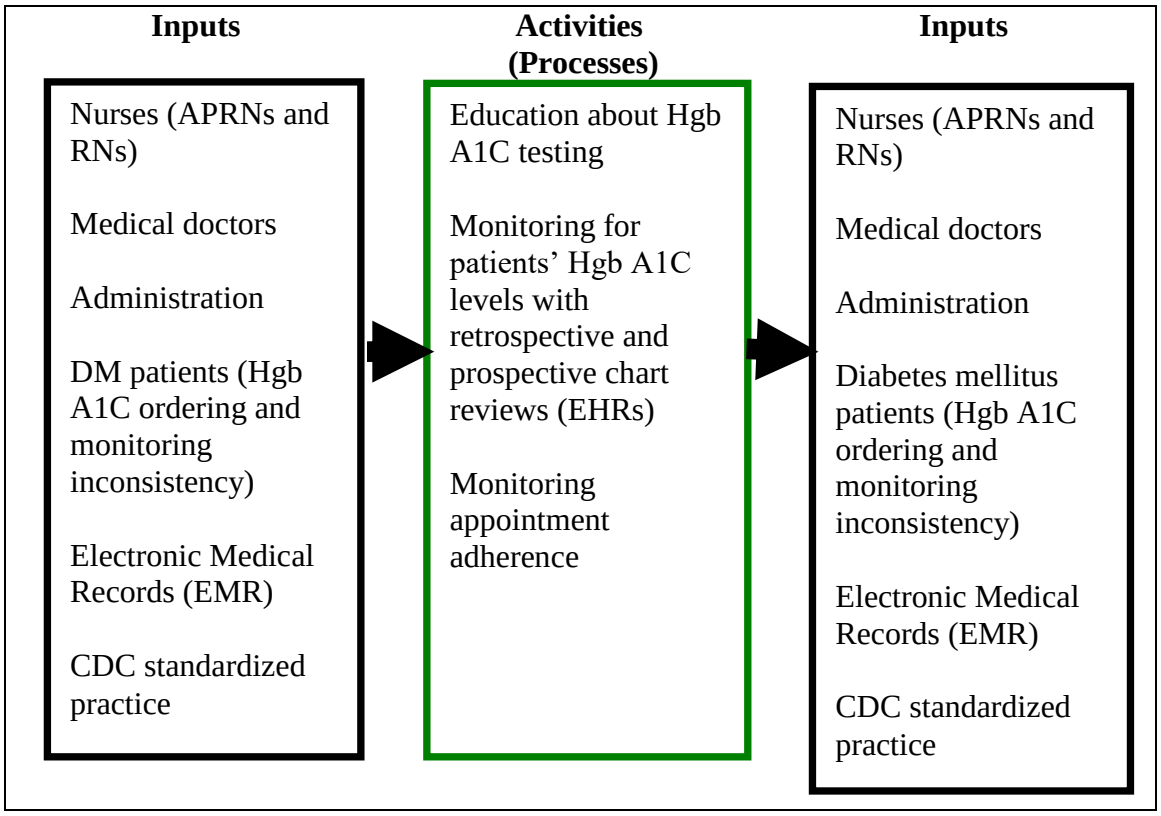

Figure 1. Inputs, processes, and outputs/outcomes. Adapted from USHRSA (2011), p. 2.

The Hgb A1C test is considered a safe and effective mechanism for testing blood glucose levels. According to the USHRSA (2011), "Hgb A1C testing is a well-established strategy to monitor glycemic control in patients with diabetes" (p. 3). The program will take advantage of this strategy.

According to the model, there is interdependency between the Inputs, Activities/Processes, and Outputs in the system design of the program. All Input individuals must be educated about Hgb A1C to understand the importance in glycemic

control. This is a part of the Activities/Processes component of the model. Once educated on the importance of Hgb A1C percentage for effective diabetes management, all Input stakeholders will apply the system appropriately for monitoring. This application should have a major effect on the Outputs of the project.

The USHRSA (2011) explanation applies to this project:

> Activities or processes within a healthcare organization contain two major components: 1) what is done (what care is provided), and 2) how it is done (when, where and by whom care is delivered) . . . the greatest impact for QI is when both are addressed at the same time. (p. 3)

Education to healthcare providers about the need for and use of Hgb A1C testing for monitoring are disseminated to the healthcare team as well as the patients, for inclusiveness and collaboration. Patients and healthcare providers are now a team.

Focus on patients. Effective QI programs must focus on patients. Proper focus on patients comprises three major aspects. The first is providing interventions which are safe and evidenced-based. The second is that delivery of the program must be culturally competent, linguistically relevant, literate appropriate, and supportive for patient engagement (USHRSA, 2011). The third is that focus on patient programs also connects patients to other providers, as needed.

The QI program developed for this project included these elements in its design through the use of materials targeted to the needs of the population served relating to culture, language, and literacy levels. The support for patient engagement is inherent in the process because of the need for constant communication between providers and patients for the program to be maximally effective.

Interventions to improve Hgb A1C levels, as examples of healthcare providers connecting patients to other providers, may also include the use of exercise therapists and dieticians or nutritionists as needed, based on patients' Hgb A1C levels.

Focus on being part of the team. The institutional use of teamwork is becoming more prevalent in all work environments (Mitchell et al., 2012, "Importance of interprofessional collaboration in healthcare," 2017*)*. For healthcare providers to focus on being part of the team means understanding the need for different perspectives and respecting the contributions of all team members. Teams are most effective when the process or system involved is complex, when solutions require creativity, when more than one person in the organization knows all the aspects of an issue, when the process involves more than one discipline, and when staff loyalty and buy-in are needed (USHRSA, 2011) and when the team adheres to standardized practice (CDC, 2016).

The elements of effective teams have been supported by research studies. In a literature review conducted by Lakhani, Benzies, and Hayden (2012) to examine the attributes essential for effective functioning of interdisciplinary teams, the researchers identified seven attributes; "team purpose, goals, leadership, communication, cohesion, mutual respect and reflection" (p. E260). The current project employed these characteristics in the program design in the following ways:

Team purpose. Effective teams have a well-defined team purpose that is progressive and well-defined (Lakhani et al., 2012). The mission statements of most healthcare organizations focus on a purpose statement that indicates progressiveness and well-defined consensus. These qualities lend support to the different activities of various teams and their purposes. The purpose for the team working on this project was to order

Hgb A1C, monitor results, and monitor follow-up appointments to improve outcomes for patients with diabetes and to standardize providers' practice in accordance with recommendations of the CDC (2016).

Goal. The primary goal was to standardize providers' practice in relation to diagnostic ordering, monitoring, and follow-up appointment consistency to obtain diabetic patients' Hgb A1C normalcy and clinic follow-up adherence.

Leadership. According to Lakhani et al. (2012), the leadership style for a program should be democratic to encourage collaboration as a valued attribute: "successful teams generally have a stable core" (p. E262). The leadership for this DNP project was nurse-driven (i.e., family nurse practitioner) with a collaborative intraprofessional team of experts in diabetic management. The nurse-driven leadership provided feedback, education, progress reports, coaching, and mentoring for providers caring for the diabetic population affiliated with the project.

Communication. The intraprofessional team was introduced to the communication system that guided this DNP project. To maintain continuous communication among all team members (FNPs, RNs, MDs, administration, and other healthcare providers), biweekly QI meetings were held. The communication was provided through various methods (emails, individual and/or group meetings, GoToMeeting conferences), which often required smaller ad hoc committee meetings. Figure 2 illustrates the nurse-driven (FNP) communication process, in accordance with the theoretical framework.

Theory Support

As outlined in Figure 2, a two-way communication system had previously existed between nurses (RNs), doctors (MDs), administration, and other team members. The nurse-driven leader (FNP) was responsible for providing continuous updates to the intraprofessional team on the quality improvement/DNP project status, in addition to implementing all team recommendations and modifications for project success. The institution's administration provided direct contact and needed resources for the project to meet the CDC (2016) standardized recommendations for adherence to diabetic practice and management.

Finally, the RNs networked with various referral services (i.e., other team members) to provide a foundation for providers to order and monitor the required services in accordance with regulatory standards. These procedures complied with the observation of Lakhani et al. (2012): "Exchanging information and ideas allows team members to share their expertise with one another" (p. E262). The leader of this quality improvement/DNP project strived to be consistent in these areas of communication and collaboration.

Cohesion. Meetings and retreats were two procedures inherent in this theoretical framework, and thus biweekly meetings (ad hoc and/or monthly intraprofessional) and one brainstorming retreat were implemented. The cohesion achieved from these meetings allowed the project team and work to progress at an all-time high. Suggestions and ideas were continuous, especially throughout project implementation. The continued eliciting of input from members of the group through suggestion boxes, ad hoc committee meetings, mini-assessments, and other means demonstrated that all team members agreed

with the project objectives and their importance and were satisfied with implementing practice change for diabetic patient management.

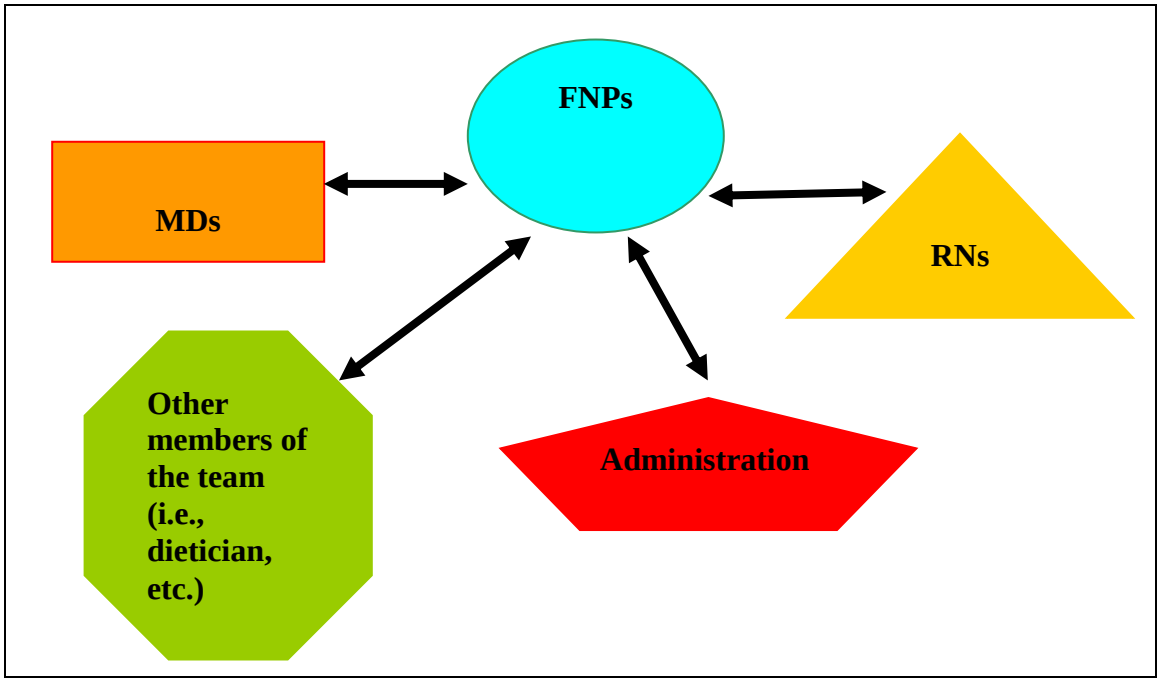

Figure 2. Communication network (investigator-designed).

Mutual respect. The DNP project team demonstrated mutual respect for each professional level of expertise, in accordance with the theoretical model. The team's respect denoted, according to the theoretical framework, the receptiveness or openness to the differences in skills, knowledge, talents, and beliefs in addition to recognition of the value of each member's input (Lakhani et al., 2012). The team decided at the onset that no tolerance would be given to disrespect, such as name calling, degrading, back-talking, rank-and-file authority, use of profanity, harassment, and other similar forms of behavior.

Reflection. The project team first discussed professional borders and acknowledged that various professional insights can prohibit the project's progression if "knowledge of self" and overwhelming personality traits were not eliminated. According to Lakhani et al (2012), the individual or team must consider that "reflection ranges from

thinking of an event to increased awareness of feelings, values and actions, for considering various solutions for a problem" (p. E263). It was imperative that the project team saw this project as an opportunity to enhance both patient outcomes and providers' increased knowledge and implementation of standardized practice through ordering and monitoring diabetic patients' Hgb A1C consistently for maintaining care continuity.

Focus on the use of data. The outcome of this DNP project demonstrated the need for diabetic Hgb AIC clinical practice modification and standardization by providers. The data provided an overview of how clinical processes at the primary care center worked or did not work, the need for change, and the changes that were were needed in order to meet the CDC's (2016) recommendations for diabetic management and practice standardization. In addition, the data revealed what was thought to be true existing clinical practice, established a baseline for knowledge enhancement, provided a vehicle for monitoring care continuity challenges, and provided a vehicle for measuring and comparing retrospective and prospective Hgb A1C performances to indicate what changes were working. The data also revealed, as USHRSA (2011), noted, which changes "Reduce[d]s the placement of ineffective solutions" (p. 4).

Project Significance

Nursing Practice

This project impacted how providers practice nursing. Through the implementation of new strategies and standards, providers successfully managed patients' Hgb A1C results and clinical follow-up appointment adherence at a primary care center in Brooklyn, New York. The project findings established the foundation for healthcare practitioners to standardize diabetic Hgb A1C management using the CDC (2016)

recommendations' in addition to incorporating evidence-based practice (EBP) to maintain care consistency in clinical practice.

In 2012, it was estimated that individuals diagnosed with diabetes cost $245 billion in direct medical costs and reduced work productivity among the working class. According to ADA (2013), calculation per patient with diabetes showed approximately $13,700 each year, which was 2.3 times higher than the amount spent for persons without diabetes. Through appropriate provider management, healthcare institutions' costs can be reduced through standardizing patient care and diagnostic monitoring and follow-up consistency. Nursing practitioners, especially APRNs, can serve as the first supporters of care continuity, as defined in the Institute of Medicine (IOM, 2014) annual report, through care standardization, ordering, and monitoring to eradicate diabetic care inconsistency and promote clinic follow-up adherence. These actions apply to the clinic at which this project was conducted.

Healthcare Outcomes

Diabetes management can be enhanced through standardized practice associated with appropriate regulatory requirements and recommendations. Healthcare providers who adhere to standardized practice increase patient healthcare outcomes (i.e., Hgb A1C), in addition to increasing health practice outcomes. At the primary care center where this DNP project was conducted, the lack of standardized healthcare outcomes was discovered by the project investigator through a retrospective review of diabetic patients' EMR. The lack of or insufficient ordering of Hgb A1C required by CDC (2016) recommendations and the inconsistency in scheduled follow-up appointment adherence among persons diagnosed with diabetes produced poor health outcomes and care

management irregularities. With changes in clinical practice, enhanced standardization, ordering, and monitoring of Hgb A1C at the center, patients' diagnostic outcomes according to a prospective electronic medical record (EMR) revealed an increase in health outcomes.

Healthcare Delivery

The healthcare delivery processes used for this project was extensive. The processes expanded the existing practice to incorporate the CDC (2016) standardized recommendations for consistent Hgb A1C ordering and technological monitoring for diabetic patient management by healthcare providers. The prospective EMR revealed that patients with elevated Hgb A1C levels who adhered to follow-up appointments and proper healthcare provider diagnostic monitoring demonstrated reliable outcomes throughout the delivery processes. The changes in healthcare delivery resulting from the components of the project enhanced interdisciplinary communication and relationships and promoted providers' and patients' active participation in clinical care.

Healthcare Policy

Healthcare policies are a changing paradigm that evolves as patient care needs evolve (Sepucha, Fowler, & Mulley, 2004). Those healthcare policies that prevent, restore, or maintain care for all healthcare arenas, especially chronic conditions such as diabetes, influences healthcare delivery, outcomes, and practice. The results of this project revealed that changes in existing Hgb A1C levels by integration of CDC standards and follow-up appointment consistency changed patients' and practice outcomes system wide.

Implementation of the practice changes can apply globally to other clinics and can reduce healthcare costs of standardize care and improve patient outcomes, particularly in diabetes, one of the most preventable health conditions (Harvard T. H. Chan School of Public Health, 2018). This DNP project demonstrated the significance of improvement of patients' Hgb A1C management through enhanced provider care standardization, monitoring, and follow-up appointment consistency.

Summary

Standardized practice, monitoring, and follow-up appointments are essential for care management of diabetic patients at a primary care center in Brooklyn, New York. This DNP project utilized technology (EMR) to identify gaps in care continuity and diagnostic monitoring inconsistency in practice. The healthcare providers' orders and monitoring of patients' diabetes mellitus Hgb A1C require incorporation of standardized ordering and monitoring of Hgb A1C and reduction of inconsistent follow-up appointments. These changes are paramount for positive practice outcome and care continuity. Over the past two decades, literature has shown that consistent Hgb A1C ordering and monitoring by providers is an essential procedure for diabetes management.

Chapter 2

Review of the Literature

The purpose of this quality improvement project at a primary care clinic in Brooklyn, New York, was to determine retrospectively the healthcare providers' ordering, monitoring, and follow-up appointments for adult diabetic patients with abnormal Hgb A1Cs; to develop and implement a standardized process for healthcare providers to monitor and follow these patients, especially those with possible nonclinic follow-up compliance and abnormal Hgb A1C; to determine prospectively healthcare providers' ordering, monitoring, and follow-up appointments; and to evaluate the prospective charts to determine if Hgb AIC results changed from abnormal to normal or elevation over time until the next follow-up appointment. For this project, several search strategies were used with a number of databases.

Search Strategies

A literature search was conducted using the following databases: Academic Search Premier, CINAHL-Complete, Cochrane Database of Systematic Literature Reviews, Health Technology Assessments, Medline, and Nursing and Allied Health Collections: Comprehensive. For search options, Boolean/Phrase, Apply Related Words, and Also Search within Full-Text of articles were set for Search Modes and Expanders. The type and year parameters were scholarly peer-reviewed journals and January 2009 through December 2016, as well as English language only. Additional

sources of information were obtained from government reports and articles with the use of Google and Google Scholar and the Joanna Briggs Institute database.

With these databases and settings, the following keywords were used alone and in various combinations: *A1C monitoring*, *A1C testing, blood glucose, diabetes guidelines, improved, intervention, management, nurses, nursing, patient outcomes,* and *type 2 diabetes*. All of these words are pertinent to the use of Hgb A1C as an assessment of blood glucose levels and the relationship of these levels to successful diabetes management. The overreaching themes identified in the literature were related to Hgb A1C testing, Hgb A1C monitoring, point of care interventions, self-management of diabetes, nurse-led interventions, hyperglycemic control, the effects of health education, and management of diabetes.

Hgb A1C Testing

Knowledge of patients' glycemic status as an essential component for diabetes care and management is acknowledged by healthcare practitioners worldwide (Holt, 2014; NIDDK, 2014; Perrota et al., 2014). In addition, monitoring of blood glucose levels is useful for diagnosing diabetes and prediabetes (ADA, 2014; Holt, 2014; NIDDK, 2014). The importance of testing blood glucose levels using the A1C test is related to the fact that in many cases damage is already present in the microvascular and macrovascular systems due to high blood sugar levels prior to diabetes diagnosis (Holt, 2014; Perrota et al., 2014).

Other forms of glucose testing cannot determine the long-term measurements of blood sugar levels as comprehensively as A1C testing (ADA, 2014; Holt, 2014; Jones, 2013; Zhou et al., 2010). Therefore, Hgb A1C testing is an essential approach for

improving nursing and healthcare delivery and results. Hgb A1C is an applicable diagnostic test for prediabetes and diabetes in adults (Jones, 2013). The usual course of aging comes with a higher rate of A1C; that is, aging is generally associated with increases in A1C levels, although diabetes can develop at any age (ADA, 2016). Therefore, there are significant disparities may take place between Hgb A1C-based diagnosis and fasting plasma glucose based in adults, a discrepancy influenced by gender and race (Meneilly, Knip, & Tessier, 2013). Hence, Hgb A1C testing at earlier ages in vulnerable populations may decrease the development of diabetes.

Hgb A1C Monitoring

Despite the effectiveness and recommendation for Hgb A1C testing for diabetes management by the ADA and others, no mandate exists at present for its use. According to the NIDDK (2014), Hgb A1C monitoring can be used to assess the blood glucose levels of patients with diabetes (both types 1 and 2), and information gained can be used for adjusting medications, as well as reduction of risks of lifelong complications. Because of the comprehensive ability of Hgb A1C testing to measure blood glucose levels in the long term, over the life of red blood cells (120 days), it is considered the "gold standard" and recommended for use in the management of diabetes (Holt, 2014; Perrota et al., 2014).

Point-of-Care Testing Intervention and Hgb A1C

According to the National Institutes of Health (NIH, 2013), point-of-care testing (POCT) "allows patient diagnoses in the physician's office, an ambulance, the home, the field, or in the hospital" (p. 1). With POCT, early diagnosis and treatment decisions can be made rapidly with the latest in information on patient status (Jones, 2013). NIH

(2013) considered POCT as a tool of empowerment for healthcare practitioners, not only as an enhancement of the ability to make time-sensitive decisions but also as a tool to limit health disparities.

POCT can provide pertinent diagnostic information in one session, a quality vital to diabetes management (Jones, 2013). Good glycemic control is indicated by a Hgb A1C value between 6.5% and 7.5% (48-58 mmol/mol), with the nondiabetic reference range 4.0%-6.0% (20-42 mmol/mol), providing the patients has no disabling hypoglycemic condition. The case for using Hgb A1C monitoring as a POCT strategy for managing diabetes is strengthened because patients can take action immediately on the results of this test, which also increases patient satisfaction (Yang et al., 2016). Jones (2013) conducted four observational studies involving more than 5,700 patients with diabetes, where immediate feedback of their Hgb A1C status was provided. Jones (2013) found significant reductions in Hgb A1C levels, with one patient maintaining appropriate A1C status for more than 4 years

According to Meetoo and Wong (2015), use of the Hbg A1C test for diabetes management is also fiscally sound. According to the results of studies conducted by Snellman and Eckerborn (1997) and Pluddemann, Heneghan, Price, Wolstenholme, and Thompson (2011), the benefits of implementing Hgb A1C testing at home were fewer clinic visits, reduction in labor costs and travel time, and overall reduction in the costs of diabetes management. As in the study by Jones (2013), Meeto and Wong (2015) found that use of the Hgb A1C test for monitoring of blood glucose levels also increased customer satisfaction and better adherence to treatment regimens. Both Jones (2013) and

Meetoo and Wong (2015) stressed administration of a Hgb A1C test every 3 months as essential for effective monitoring of diabetic patients as part of a POCT intervention.

Self-Management and Knowledge of Hgb A1C Test

Self-management of any disease is generally enhanced when patients understand the reasons why they should engage in a treatment or a test (Meetoo & Wong, 2015). For patients, management of a chronic disease requires knowledge, discipline, and encouragement from a team of professionals. Patients' knowledge of why they should engage in a test and the meaning of a test has been studied in relationship to self-care levels and knowledge of a disease and how it affects patient health.

Heisler, Piette, Spencer, Kieffer, and Vijan (2005) conducted a cross-sectional survey with a sample of 686 U.S. adults diagnosed with type 2 diabetes in five health systems. The hypothesis was that knowledge of their actual and target health outcomes (such as Hbg A1C values) was a prerequisite for effective patient involvement in management of chronic diabetes. The patients had checked in 6 months before the study and their Hbg AlC levels recorded.

Based on multivariate analysis, which analyzed patient characteristics, healthcare provider communication, and health system type, the results of the study showed that 66% of the respondents did not know their last Hbg A1C values, and 25% were able to accurately report their values. Respondents who did know their last Hbg A1C values were better able to accurately assess their diabetes control. Higher evaluations of provider communication ability were independently associated with knowledge of Hbg A1C. However, knowledge of Hbg A1C had no effect on self-efficacy or reported self-management behaviors in this study (Heisler et al., 2005).

Additional studies on knowledge of the meaning of Hgb A1C and the importance of knowledge of laboratory test with regard to self-care and successful glycemic control have also been conducted in other countries. In a cross-sectional survey conducted at 50 medical centers in various locations in China, researchers proposed that Hgb A1C knowledge is a prerequisite for effective self-management. Participants were asked "How long does A1c reflect average blood glucose level?" and "What is the recommended A1C level by Chinese Diabetes Society guideline?" (Yang et al., 2016, p. 4).

A higher quantity of patients with well-controlled diabetes was identified as having a "good understanding" of Hgb A1C (Yang et al., 2016, p. 9). In addition, patients in the "good understanding" group were more likely to perform self-monitoring of blood glucose than those in the "poor understanding" group and also reported higher average self-care scores in the preceding 7 days than the "poor understanding" group (p. 9).

In a similar study conducted in Trinidad and Tobago (Ezenwaka et al., 2014), 89 diabetic patients who knew nothing about A1C testing were tested for their knowledge of laboratory testing for monitoring glucose. These subjects were then randomly selected to participate in a study in which the objective was determine the difference in congenital heart disease risk between diabetic women who were provided with facilities for self-monitoring of blood glucose (intervention group) and diabetic women who were not provided the same facilities (control group). Women in the intervention group had significantly lower levels of A1C after 3 months than women in the control group (Ezenwaka et al., 2014). The researchers concluded that providing diabetic patients with

facilities to self-monitor blood glucose improved blood glucose levels and the congenital heart disease risk profile (Ezenwaka et al., 2014).

Nurse-Led Interventions and Diabetes Management

Nurses can use a number of interventions to assist patients with diabetes in improving blood glucose levels. Diabetes self-management and training programs (many times conducted by nurses) have demonstrated improved clinical and psychosocial outcomes for participants (Cook-Johnson, Parker, Clifton, Shams, & Young, 2012; Houweling et al. 2011; Massimi et al. 2017). Nurses also provide instruction on interpretation of laboratory results, medical compliance, foot care, and other aspects of treatment, which all contribute to successful diabetes management.

Cook-Johnson et al. (2012) identified additional information on the role nurses play in diabetes management. In this review, the effects of nurse-led interventions on blood glucose levels and associated comorbidities were examined. No evidence was found to suggest that nurse-led care improved Hgb A1C levels for patients with type 2 diabetes. However, evidence was found of significant improved outcomes, such as reduced blood pressure and LDL cholesterol levels (Cook-Johnson et al., 2012).

Gaps in Literature

Gaps in the literature are evident related to a standardized protocol for Hgb A1C monitoring as a tool for diabetes management. Although monitoring is respected as the gold standard for accurate monitoring of blood glucose levels and an essential component of effective diabetes management (Jones, 2013), the problem remains that currently no standardized protocol exists for how monitoring is used. The literature supports diabetes patient knowledge of the Hgb A1C test and laboratory testing for blood glucose as

improving their self-management and A1C levels (Heisler, 2005; Yang et al. 2014). However, despite such support, there are no systematic literature reviews for this monitoring tool for diabetes management.

Possible Reasons Why Hgb A1C May Not Be Used

Diagnostic criteria for Hgb A1C must be validated and conducted through a standardized procedure approved by the National Glycohemoglobin Standardization Program3 (Malkani & Mordes, 2011). Test results can be 0.5% lower or higher compared to a real percentage; a value of 7.0% Hgb A1C can be actually between ~6.5 and 7.5% (NIDDK, 2014). In addition, experts have cautioned about misleading results if the test is conducted on people with coexisting hemolytic anemia, iron deficiency, hemoglobinopathies, renal ailments, and/or acute hepatic (Goldenberg & Punthakee, 2013). Despite these cautions, Hgb A1C monitoring should be initiated as a standard of care. Notice can be given for people who are suffering from other ailments, and the Hgb A1C values obtained can be considered in diagnosis (Jones, 2013).

Summary

A guide that employs the use of Hgb A1C monitoring to manage diabetes and improve glycemic control continues to be necessary as diabetes becomes more prevalent. Such a guide is an easy, cost-effective way to achieve diabetes management goals where healthcare resources are limited. Hgb A1C testing to pinpoint blood glucose levels more precisely than other forms of glucose testing is highly effective and considered the gold standard, not only for diagnosis of diabetes but also for POCT and self-management.

With Hgb A1C monitoring, clinicians will discover, in real time, the status of patient blood glucose levels. Healthcare providers may then immediately modify

treatments and institute interventions, thereby reducing the devastating effects of comorbidities which may develop due to damage of the microvascular and macrovascular systems of the body. The current lack of a standardized protocol of Hgb A1C monitoring for diabetes management emphasizes the need for such a protocol.

Chapter 3

Methods

This chapter explains the methodology used to implement this DNP project. The methods were subdivided to address the focus and purpose of the project. The chapter provides information related to project design and the activities for subject selection and recruitment, in addition to how data were collected, managed, and analyzed; determine retrospectively the healthcare providers' ordering, monitoring, and follow-up appointments for adult diabetic patients with abnormal Hgb A1Cs; to develop and implement a standardized process for healthcare providers to monitor and follow these patients, especially those with possible non-clinical follow-up compliance and abnormal Hgb A1C; to determine prospectively healthcare providers' ordering, monitoring, and follow-up appointments; and to evaluate the prospective charts to determine if Hgb AIC results changed from abnormal to normal or elevation over time until the next follow-up appointment.

Approximately 75% of the diabetic patients at the primary care center attended clinic appointments and showed an improvement in blood glucose levels after the standardized guide was implemented. The investigator compared one dependent variable, Hgb A1C, to two independent variables that monitored Hgb A1C levels and clinic follow-ups prior to and following a standardized guideline for providers' implementation.

Project Design

To evaluate the quality improvement project, two data analysis methods were used: (a) a frequency test to determine appointment adherence retrospectively and prospectively; and (b) a nonparametric quantitative paired *t* test (two-tailed) to monitor patients diagnosed with poorly controlled diabetes who were treated in the clinic over the course of the 3-month time spans between March 1 through May 31, 2017, and June 1 through August 31, 2017. This approach was selected because the data were readily available, practical in terms of cost and time expended, and allowed for the collection of data from a relatively large number of cases.

Setting

The project took place at a family practice primary care clinic located in Brooklyn, New York. The clinic serves a multicultural population of low-income, high-risk chronic disease individuals, especially those with diabetes. Approximately 80% of the patients have been diagnosed with diabetes.

Population and Sample Selection

The project population consisted of two groups. Group 1 was comprised of with various levels of healthcare providers ($N = 7$), such as MD, APRN, RN, diabetic educator, nutritionist, and receptionist, with 5 or more years of diabetic experience and average age of 45. Group 2 was comprised of diabetic patients with abnormal Hbg A1C levels and inconsistent follow-up appointments ordered and monitored by providers ($N = 99$). The patients' records were reviewed retrospectively and prospectively.

Sampling Strategy and Determination of Sample Size

A convenience sample of healthcare providers and medical records that met the inclusion criteria was used in the QI. A priori calculation of sample size for the medical records was carried out with G*Power (Heinrich-Heine-Universität Düsseldorf, 2014) for dependent *t* test analysis. With input parameters of a two-tailed test, alpha = 0.05, power = 0.80, and an anticipated medium effect size, $d = 0.05$, the required sample size was a total of 99 records.

Inclusion Criteria

The inclusion criteria for this project for the first group was that the healthcare providers had to be MDs, APRNs, RNs, or similar licensed providers; and had to be employed for at least 4 weeks at the primary care center and render diabetic services. The inclusion for the second group was that the electronic medical records (retrospective and prospective) had to be of diabetic patients with abnormal Hgb A1C and inconsistent clinic follow-up appointments between March 1 through August 31, 2017, who were seen by the healthcare providers at the center.

Exclusion Criteria

The exclusion criteria for the first group applied to all healthcare providers who did not work for the primary care center in diabetic services and who worked less than 4 weeks at the center. The exclusion criteria for the second group was the electronic medical records of patients with normal Hgb A1C and consistent clinic follow-up appointments, as well as these characteristics for dates other than March 1 through August 31, 2017.

Ethical Considerations

This quality improvement project was reviewed by the Institutional Review Board (IRB) of Nova Southeastern University (NSU) and the human subjects' rights board at the primary care center where the project was conducted. A letter of exemption was granted by the NSU IRB (Appendix A) because human subjects were not used in the project implementation. A letter of support was provided by the primary care center (Appendix B).

Project Phases/Objectives

This project was structured to meet the following objectives:

Objective 1: Conduct a retrospective electronic medical record review of adult diabetic patients with abnormal Hgb A1Cs who failed to return for follow-up appointments between March and May 2017.

This objective was accomplished by a review of adult diabetic patients' electronic medical records ($N = 99$) with abnormal Hgb A1C and inconsistent follow-up clinic appointments between March 1 and May 31, 2017. The investigator conducted a frequency test to determine consistency.

Objective 2: Develop and implement a standardized process for healthcare providers to closely monitor and follow adult diabetic patients especially those with possible nonclinic follow-up compliance and abnormal Hgb A1C.

This objective was completed by incorporation of the CDC (2016) standardized diabetic management guideline to enhance providers' consistency with ordering and monitoring diabetic patients' Hgb A1C and follow-up clinic appointments.

Phase 1: A standardized diabetic guideline was developed to include the CDC (2016) standards for improving healthcare delivery and healthcare outcomes associated with Hgb A1C normalcy and follow-up consistency (Appendix C).

Phase 2: The standardized diabetic guideline was announced to the healthcare providers (Appendix D) and presented and implemented at the primary care center to increase diabetic management knowledge affiliated with ordering and monitoring Hgb A1C and clinical follow-up.

Objective 3: Conduct a prospective electronic medical record review of the same retrospective adult diabetic patients whose Hgb A1C was ordered and monitored between June 1 and August 31, 2017.

This objective was completed in two steps:

Step 1: EMRs (N = 99) were prospectively reviewed to determine if providers ordered and monitored Hgb A1C in conjunction with the implemented standardized diabetic guideline.

Step 2: EMRs (N = 99) were prospectively reviewed to determine if diabetic patients were consistent or inconsistent with clinic follow-up appointments. This step was accomplished by the investigator conducting a frequency test to determine prospectively if clinic appointments demonstrated consistency or not.

Objective 4: Evaluate the EMR charts prospectively to determine if the diabetic patients' Hgb AIC results in changes from abnormal to normal or elevation over time until the next follow-up appointment.

This objective was accomplished by review of the electronic medical records (N = 99) prospectively between June 1 and August 31, 2017, to determine clinic

appointment consistency and Hgb A1C normalcy. The investigator conducted a frequency test to determine appointment consistency and a nonparametric paired *t* test to determine Hgb A1C normalcy.

Timeline

The project took place over 16 weeks. Objective 1 was completed at the end of Week 1. Objective 2 was completed by the end of Week 3, including both the development and implementation phases of the standardized guideline. Objective 3 was completed by the end of Week 12, and Objective 4 was completed by the end of Week 16, including project phases and data analysis.

Resources/Budget

The project costs included an educational session that incorporated CDC (2016) standardized recommendations for diabetic management and diagnostic monitoring. Tokens of appreciation were given to all healthcare providers who participated in the project ($N = 7$). The total cost for the project was $310. Table 1 displays all itemized costs.

Summary

This chapter described the project methods. The purpose of the project was to determine retrospectively healthcare providers' ordering, monitoring, and follow-up appointments for adult diabetic patients with abnormal Hgb A1Cs; develop and implement a standardized process for healthcare providers to monitor and follow these patients, especially those with possible nonclinic follow-up compliance and abnormal Hgb A1C.

Table 1

Project Resources and Budget

Category	Item	Description	Quantity	Total
Printing Services	Paper, ink, and custom printing and binding	Guidelines for intraprofessional team and staff	15	$20.00
Staff Appreciation	Luncheon	Intraprofessional team and staff	$10.00 x 15	$150.00
	Appreciation token for staff	Gift card	$20.00 x 7	$140.00
Total Costs				$ 310.00

Additionally, the purpose was to determine prospectively healthcare providers' ordering, monitoring, and follow-up appointments; and evaluate the prospective charts to determine if Hgb AIC results changed from abnormal to normal or elevation until the next follow-up appointment. At a family practice primary care clinic in Brooklyn, New York, two groups were utilized: healthcare providers with experience treating diabetics (N = 7) and diabetic patients (N = 99).

Frequency tests were used to determine appointment adherence retrospectively and prospectively. A nonparametric quantitative paired t test was used to measure patients diagnosed with poorly controlled diabetes who were treated over two 3-month timespans. Ethical considerations were met: The IRB of Nova Southeastern University provided a letter of exemption because human subjects were not involved in project

implementation (Appendix A), and the primary care center provided a letter of support (Appendix B). The project was completed with four objectives and several steps.

Chapter 4

Results and Discussion

In accordance with the CDC (2016) recommendations, providers managing diabetic patients with standardized practice and best healthcare delivery systems can positively influence health outcomes. This quality improvement project reviewed adult diabetic patient's electronic medical records at two different periods, retrospectively and prospectively, to determine if healthcare providers ordered and monitored Hgb A1C and follow-up clinic appointments in accordance with standardized practice and whether patients improved.

Outcome Measures

Data Analysis Procedures

To ensure that the data were entered without error, a frequency table was generated to detect the margin of error + -5 values. When accuracy of data entry had been determined, the data were evaluated for outlying scores, defined as extreme individual scores that were at least three standard deviations above or below the mean of the group. These scores were detected by use of frequency distribution and box plots. Extreme scores were identified and retained.

Descriptive statistics were used to describe the sample and report the measures of central tendency of the variables. First, demographic information was analyzed and reported with frequencies and percentages. Then, a two-tailed paired *t* test was used to compare the retrospective and prospective scores. The results for the dependent variable healthcare providers' reports, were reported as measures of central tendency. Histograms for the distribution of scores for the dependent variable and the Kolmogorov-Smirnov (*K-S*) statistic were explored to assure the data met the assumption of normal distribution necessary for parametric testing. Levene's test was used to test of the assumption of homogeneity of variance.

Patients' Demographic Characteristics

Descriptive statistics were collected for patients' demographic characteristics related to diabetes. These were patients' ages at the time of data collection, ages at diagnoses of diabetes, and number of years living with diabetes. Table 2 illustrates the results.

The age range of the 99 patients at review varied from 17 to 83, with the median age 60; half the patients (50%) were above the age of 60. Three-quarters (75%) of the patients were above the age of 41.

The age at which diabetes was diagnosed ranged from 12 to 82, with the median age 47; half of the patients were diagnosed after reaching the age of 47. Three-quarters of the patients were diagnosed after reaching the age of 36.

The number of years patients were living with diabetes ranged from 0 (less than 1 year) to 28 years. The median years living with diabetes was 11; half of the patients had been living with diabetes for more than 11 years.

Table 2

Patients' Demographic Characteristics (N = 99)

Value	Patients' Age	Age Diagnosed	Years Living With Diabetes
Median	60	47	11
Range	66	70	28
Minimum	17	12	0
Maximum	83	82	28
25th Percentile	41	36	5
50th Percentile	60	47	11
75th Percentile	71	60	15

Outcome Variable

One outcome variable, Hgb A1C, for adult diabetic patients was measured and compared at two different periods: March 1 through May 31, 2017; and June 1 through August 31, 2017. The first period took place prior to the implementation of standardized practice for healthcare providers at the primary care center. The 3-month chart review of the EMR revealed an insufficiency in care standardization and healthcare provider follow-up for Hgb A1C and clinic appointments. The Hgb A1C test results are reported as percentages (Table 3).

Table 3

A1C Results, Retrospective: March 1-May 31, 2017 (N = 99)

Value	Patients' Age	Age Diagnosed	A1C
Median	60	47	
A1C Range	66	70	6
A1C Minimum	17	12	7
AlC Maximum	83	82	13
A1C Mean			8.17
Standard Deviation			1.33
25th Percentile	41.00	36.00	8.00
50th Percentile	60.00	47.00	9.00
75th Percentile	71.00	60.00	10.00

For the retrospective period March 1 through May 31, 2017, the A1C scores for 99 patients were recorded and ranged between 7 and 13 with an average of 8.17. Half of the patients' A1Cs were above 9, with three-quarters above 8. The data collected from the EMR were exported to an Excel spreadsheet and transferred to SPSS for analysis. Data analysis procedures followed Field's (2009) guidelines.

The second period took place following the implementation of standardized practice for healthcare providers at the primary care center. All 99 patients were given appointment dates for 3 months following their visits between March and May. The A1C scores for 62 of the 99 patients were recorded during the 3-month period of June 1 to

August 31, 2017, and 62.6% kept the appointments. The Hgb A1C test results are reported as percentages (Table 4).

Table 4

A1C Results, Prospective: June 1-August 31, 2017 (N =62)

Value	Patients' Age	Age Diagnosed	A1C
Median	60	47	
A1C Range	66	70	5.50
A1C Minimum	17	12	6.50
AlC Maximum	83	82	12.00
A1C Mean			9.28
Standard Deviation			1.03
25th Percentile	41.00	36.00	7.50
50th Percentile	60.00	47.00	8.00
75th Percentile	71.00	60.00	9.00

For the prospective period June 1 to August 31, 2017, the patients' A1C scores ranged between 6.5 and 12, with an average of 9.28. Half of the patients had A1C above 8; three-quarters had A1C above 7.5. The decrease in AlC levels indicated greater providers' utilization and patients' adherence to the recommended guidelines, and the increase in follow-up appointments indicated enhanced care continuity.

Testing the Data

In this quality improvement project, the investigator sought to determine if there was a difference in one dependent variable, Hgb A1C, measured at two points in time,

prior to and after the implementation of the standardized CDC guideline for healthcare providers' utilization for diabetic management and practice. The Hgb A1C was measured as continuous level data. The nonparametric *t* test was used to compare the electronic medical records retrospectively and prospectively of the same diabetic patients to determine if healthcare providers ordered and monitored Hgb A1C and clinic follow-up appointment with consistency. The prospective EMR review reflected healthcare providers' insufficiency in ordering and monitoring Hgb A1C between March 1 and May 31, 2017. Thus, a paired *t* test was used to determine the clinical practice outcome. The results were considered statistically significant with a probability value (*p*) of less than 0.05.

Differences in Scores

The differences in A1C scores between the two 3-month period was calculated from the EMR. Only scores for patients who attended the follow-up appointments were used. The total retrospective EMR reviewed were 135. However, 99 EMR met inclusion criteria between March 1 and May 31, 2017, which served as the project benchmark for CDC (2016) 3-month standards until normalcy and clinic follow-up appointment consistency.

Table 5 illustrates the differences in Hgb A1C scores. As the table shows, 29% showed no A1C improvement even with the healthcare providers ordering and monitoring. However, 71% of the follow-up patients' Hgb A1C scores improved in the June to August period when compared to their previous scores of the March to May period. The differences in Hgb A1C scores ranged from -4.5 to 2, with an average improvement in A1C score of -1.32.

Table 5

Value	Mar-May A1C	June-Aug A1C	Difference
Valid N	99	62	62
Missing N	0	37	37
Range	6.0	5.5	6.5
Minimum	7.0	6.5	-4.5
Maximum	13.0	12.0	2.0
Mean	9.28	8.17	-1.32
Standard Deviation	1.33	1.03	1.35
25th Percentile	8.00	7.50	-2.00
50th Percentile	9.00	8.00	-1.00
75th Percentile	10.00	9.00	0.00

Differences in Hgb AlC Scores Retrospectively and Prospectively

Of the 99 prospectively reviewed EMR between June 1 and August 31, 2017, 37 patients did not keep their follow-up appointments, and 66 patients kept their follow-up appointments, for a response rate of 63%. This percentage reflected an improvement in healthcare providers' ordering and monitoring of Hgb A1C after implementation of the CDC standardized guideline. Table 6 illustrates the differences in consistency of follow-up appointments.

Table 6

Differences in Follow-Up Appointments Retrospectively and Prospectively

Difference	Frequency	Percent	Valid Percent
Improved	44	44.4	71.0
Did Not Improve	81	18.2	29.0
Total	62	62.6	100.0
Missing	37	37.4	
Total	99	100.0	

Test for Significance

To test for significant differences between the two periods, a Wilcoxon Signed Rank Test (paired nonparametric *t* test) was conducted. Tables 7 and 8 illustrate the results. The *p* value was 0.00, which is less than the declared 0.05 *p* value. The *p* of 0.00 found showed that the difference is A1C scores of patients who attended their follow-up appointments was significant. Thus, it can be concluded that the difference in scores was associated with the intervention of the second 3-month period.

Table 7

Wilcoxon Signed Ranks Test for Significance: March-May and June-August

Ranks	N	Mean Rank	Sum of Ranks
Negative Ranks	2[a]	19.50	39.00
Positive Ranks	44[b]	23.68	1042.00
Ties	16[c]		
Total	62		

[a]Mar-May A1C < Jun-Aug A1C.
[b]Mar-May A1C > Jun-Aug A1C.
[c]Mar-May A1C = Jun-Aug A1C.

Table 8

Nonparametric Analysis

	Mar-May A1C – Jun-Aug A1C
Z	-5.512[a]
Asymp. Sig. (2-tailed)	0.00*

[a] Based on negative ranks.
*$p < .05$.

Discussion

The project results indicated success in the use of a standardized guideline for healthcare providers' monitoring A1C scores of patients. Hgb A1C scores went down for a significant number of patients with healthcare providers ordering and monitoring. The

providers' frequency of ordering and monitoring Hgb A1C and follow-up appointments improved. Based on the improvement of patients' A1C levels, the healthcare providers increased their ordering, monitoring, and follow-ups.

Limitations

Several limitations are acknowledged for this project**.** The data were collected at only one facility, and therefore the results cannot be generalized to a more global environment. The samples of the employees and EMR were not randomly selected, further limiting generalizability to similar conditions. Further, the implementation took place at a single point in time, lacking a longitudinal component for practice engagement. This limitation may have influenced providers' healthcare delivery and patients' healthcare outcomes.

Additionally, although healthcare providers' careful surveillance of Hgb A1C ordering and monitoring was investigated, other factors that influenced Hgb A1C results and clinic follow-up appointment consistency were not considered. These factors may have included the healthcare professionals' actual experiences with diabetic patients and accuracy of chart notations. Possibly also some healthcare providers ordering and monitoring may have been influenced by the investigator's clinical presence, which reminded providers to implement CDC standards and recommendations. The investigator's presence may have precipitated the Hawthorne effect (Goodwin et al., 2017), in which providers may have changed their behavior knowing they were being observed. This effect is not a new phenomenology, but can change the outcome of observed behaviors.

Strengths

Project strengths included the extended body of knowledge surveyed for healthcare providers, especially for nurses to incorporate standardized guidelines for care consistency at diabetic care clinic. The project's success also established a foundation for future clinic change through the utilization of theory and practice specifically for chronic diseases such as diabetes. The knowledge and results of this project can benefit future research and policy adaptability and feasibility for change in evidence-based practice. The changes apply especially to healthcare outcomes for Hgb A1C ordering, monitoring, and clinic follow-up appointments managed by healthcare providers in all areas of specializations.

Conclusion

Diabetes mellitus is a chronic disease for which there is no cure (NIDDK, 2016**)**. A major option is management (NIDDK, 2016**)**. Healthcare providers associated with this DNP project, including nurse practitioners, incorporated standardized practice for ordering and monitoring diabetic patients after the implementation of CDC (2014) standardized recommendations and guideline. A retrospective electronic medical records review revealed that healthcare providers were inconsistent in care management related to the ordering and monitoring for diabetic patients with abnormal Hgb A1C and inconsistent clinic appointment follow-ups. However, after intervention, both the Hgb A1C levels and appointment follow-ups improved.

The lack of appropriate healthcare provider management of diabetic patients can lead to other healthcare complications. The monitoring of patients for Hgb A1C levels with a prospective chart review was a simple yet viable approach that assisted healthcare

practitioner with helping patients to achieve blood glucose normalcy and clinic appointment follow-up consistency after the implementation of standardized practice.

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Appendix A

Nova Southeastern University Institutional Review Board Letter of Exemption

NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board

MEMORANDUM

To: **Jacqueline Nugent**

From: **Vanessa Johnson,**
Center Representative, Institutional Review Board

Date: **June 28, 2017**

Re: **IRB #: 2017-416; Title, "Monitoring Abnormal A1C Follow Up Appointments: A Nurse Practitioner Perspective"**

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt Category 4)**. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and Vanessa Johnson, respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

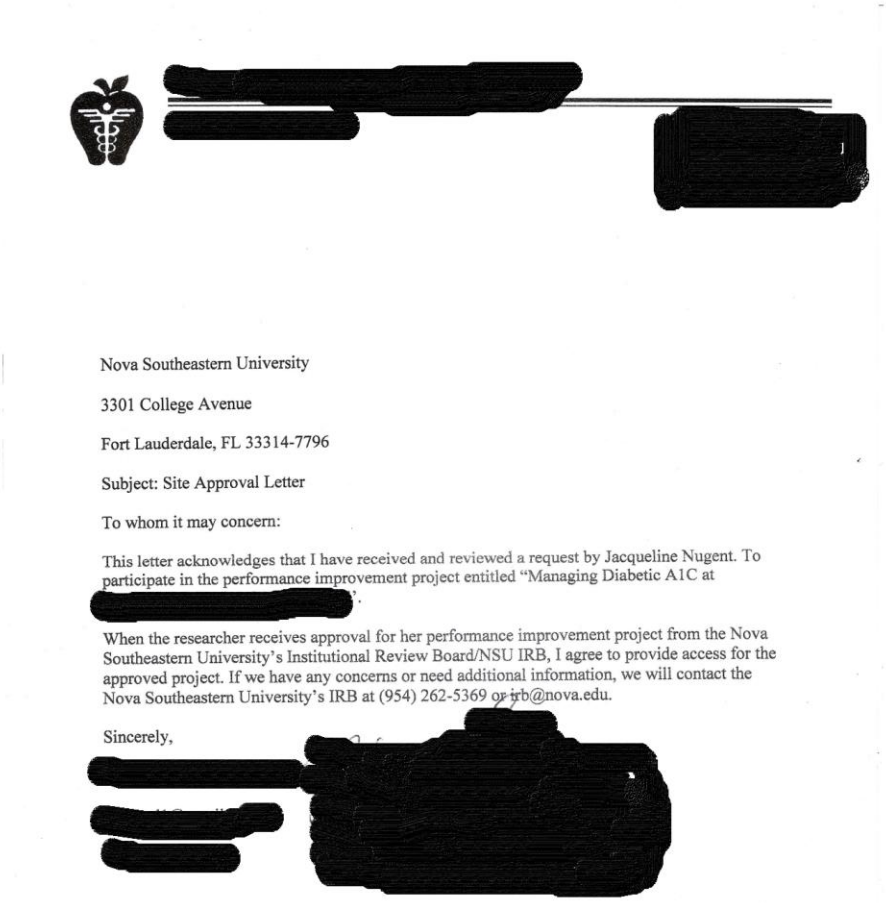
The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Mary D Mites-Campbell, PhD
Vanessa Johnson

3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 262-0000 • 800-672-7223, ext. 5369 • Email: *irb@nova.edu* • Web site: www.nova.edu/irb

Appendix B

Primary Care Center Letter of Support



[redacted]

Nova Southeastern University

3301 College Avenue

Fort Lauderdale, FL 33314-7796

Subject: Site Approval Letter

To whom it may concern:

This letter acknowledges that I have received and reviewed a request by Jacqueline Nugent. To participate in the performance improvement project entitled "Managing Diabetic A1C at [redacted]".

When the researcher receives approval for her performance improvement project from the Nova Southeastern University's Institutional Review Board/NSU IRB, I agree to provide access for the approved project. If we have any concerns or need additional information, we will contact the Nova Southeastern University's IRB at (954) 262-5369 or irb@nova.edu.

Sincerely,

[redacted]

Appendix C

Standardized Guide

MEDICAL URGENT PC- FAMILY PRACTICE

POLICY/PROCEDURE

Subject: Monitoring abnormal A1C follow-up appointment		
Effective Date: 3/3/2017	Revision Date:	Supers cedes:
Distribution: MD, DO, PA, APRN, RN		

PURPOSE:

To insure healthcare provider's incorporate CDC standards for ordering and monitoring adult diabetic patients Hgb A1C and clinic follow-up consistency.

POLICY:

Providers delivering care to adults diagnosed or at risk for diabetes must incorporate CDC standardized practice for ordering and monitoring Hgb A1C for both care continuity at clinic follow-up and self-management. The provider:

- Order and monitor abnormal Hgb A1C quarterly or frequently depending on the non-normalcy results.
- Help educate ways to reduce elevated Hgb A1C levels.
- Minimize patients' risk for abnormalcy by incorporating assessment, interventions, and surveillance.
- Community-based team interaction with primary care providers, pharmacist, dietitian, case managers, and educators to help improve patient's weight loss and A1C values.
- Integrate the three key objectives for care delivery: (1) optimize provider and team behavior; (2) support patient behavior change; & (3) change the system of care, especially to include ordering, monitoring, and clinic follow-up appointment consistency.
- Direct care in a timely manner based on evidence-based guidelines.
- Make sure the care model is based on a patient-centric approach that guides care consistency.

Documentation and Limitations

- All A1C management steps will be maintained through standardization competency.
- At the end of the clinical visit, the provider will distribute "The Diabetes Education Program – Understand Your A1C" brochure with cultural reflective insight for patient understanding and adherence; the documentation system or record will include cultural awareness language that drove patient's compliance; and at a minimum the provider should provide cultural references that incorporate standardize evidence-based practice.
- A follow-up process should be implemented by the provider that identify the patient's name, cultural preference, and/or identifier for enhancing care competence and treatment standardization.
- Educate staff regarding patient follow-up processes through the use of a standardized monitoring system.
- Consider conducting periodic chart review to evaluate the effectiveness of the established process for patient, case management driven.
- Staff should assess the clinical important of the appointment, the severity of the patient medical condition, and the risk(s) associated with the missed appointment to determine appropriate follow-up
- Develop a process for the follow-up of patients who have missed appointments.

The appropriate skills providers must be present for the use for A1C Management

- Provide a delivery services that include respect, health belief practices and linguistic needs of diver for patients.
- Integrate Diabetes Care Standards and principles for the care of person with or at risk for diabetes elevated or lower A1C
- Assess a patient's communication skills and belief systems prior to developing a treatment plan

PROCEDURE:

- Initial Assessment
    - Include cultural norms and ethical practices in conjunction with regulatory standards

- Monitor microalbumin as per standardized protocol

- Testing will be done as specified by regulatory standards implemented through the protocol:
    a. Annually for anyone diagnosed with prediabetes.

b. Twice a year for individuals with type 2 diabetes who do not use insulin and whose diabetes is within the goal set by their doctor.
c. Three to four times annually for individuals with type 1 diabetes.
d. Four times yearly for individuals with type 2 diabetes who use insulin and whose condition is not under control

- Patients will be disease managed especially those who have missed more than one appointment. A letter will be mail to remind them of a rescheduled follow-up visit.
- A patient-family centered care approach that provides information on diabetes, treatment rationale, importance of medical follow-up, and how to incorporate and/or avoid certain cultural meals that can reduce diabetic-related conditions but enhance quality of life and well-being.

RESOURCES:

Healthcare providers will include various educational resources. For patient-family best disease prevention, health maintenance, and quality of life sustainability; two-three resources will be provided. Resources will be provide based on patient/family social determinants: living environment; economic sustainability; age; educational level, etc.

- American Academy of Family Physicians: Management of Newly Diagnosed Type 2 Diabetes Mellitus in Children and AdolescentsExternal Link Disclaimer
- The American Association of Clinical Endocrinologists: Clinical Practice GuidelinesExternal Link Disclaimer
- American College of Physicians: Comparative Guideline Table: Screening for DiabetesExternal Link Disclaimer
- American Diabetes Association: 2016 Standards of Medical Care in DiabetesExternal Link Disclaimer
- American Heart Association: Diabetes MellitusExternal Link Disclaimer
- The American Geriatrics Society: Guidelines for Improving the Care of Older Adults with Diabetes MellitusExternal Link Disclaimer
- Endocrine Society: Clinical Practice GuidelinesExternal Link Disclaimer
- National Committee for Quality Assurance: Diabetes Recognition ProgramExternal Link Disclaimer
- U.S. Preventive Services Task Force: Published RecommendationsExternal Link Disclaimer

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EXECUTIVE APPROVAL

_____ _____

Chief Executive Officer (CEO) or Medical Director (MD) Date

Appendix D

A1C Flyer

A1C Flyer

Do You Know what is an A1C?

Do You know how To Better Care for patients?

If you answered YES to any of these question

See: Nurse Jackie!