Importance of Patient Education on Hemoglobin A1C and Dietary Modifications

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Abstract

Research shows that only less than 25% of adult patients who are being treated for diabetes can recall their previous and most recent hemoglobin A1c levels. It is the providers' role to educate adult patients at every visit about their hemoglobin A1c levels and the benefits related to knowing the levels coupled with increase in physical activities and a plant-based diet. The purpose statement guiding this project is: In medical providers caring for adult patients diagnosed with DM2, does provider education on hemoglobin A1c and dietary modifications affect medical providers management of DM2? The project consisted of an educational intervention. The project utilized pre-and post-intervention surveys via Survey Monkey to assess the knowledge of the participants and to gather data known by the participants on the subject. Result from data analysis indicate that the educational session contributed to improvement in knowledge as well as a change in provider practice (t (14) = 1.76, p = .034). The results indicate that educating medical providers on the importance of knowledge of hemoglobin A1c levels by their adult patients diagnosed with diabetes coupled with increase in physical activities and plant-based diet may improve diabetes care.

Keywords: diabetes mellitus type 2, hemoglobin A1c, plant-based diet, physical activities, adult patients, medical providers.

Importance of Patient Education on Hemoglobin A1C and Dietary Modifications

Diabetes mellitus type 2 is a chronic condition that is increasing in adult patients worldwide and is one of the leading causes of death worldwide (Emami et al., 2020; Zibaeenezhad et al, 2016). This condition is mostly managed at both the primary care and specialist levels by medical providers. Managing diabetes requires providers to educate their adult patients at every visit about how to manage this condition.

Overview

Problem Description

Diabetes is one of the most common endocrine disorders (Emami et al., 2020). Type 2 diabetes mellitus (DM2) is a chronic health condition that is increasing worldwide and that carries risk factors for developing multiple other health conditions (Zibaeenezhad et al, 2016). As of 2017, an estimated 425 million adults had diabetes mellitus worldwide, and the number is predicted to rise to 629 million by 2045 (Gomes et al., 2019). DM2 is a group of metabolic diseases characterized by elevated blood glucose levels caused by defects in insulin secretion or action and is one of the most prevalent chronic diseases worldwide (Wang et al., 2022).

Diabetes care requires educating patients on diet, lifestyle, and other management areas and a lack of understanding of diabetes management targets is associated with negative disease outcomes (Gopalan et al., 2018). Patients' knowledge about diabetes may affect diabetes self-management (Nam et al., 2011). However, patient education on the condition and its management is deficient, which is an important factor in patients' inadequate knowledge and performance. Most patients diagnosed with diabetes do not understand the basics in the management of this chronic condition (Abaziri et al., 2012). For example, few patients understand what is the hemoglobin A1c, also known as glycated hemoglobin, glycosylated hemoglobin, HbA1c, or A1c, which is a blood test used to evaluate a person's level of glucose control, and it shows the average blood glucose control over the past 90 days (Eyth & Naik,

2022). Educating patients about their hemoglobin A1c lab values improves these numbers by promoting behavior modifications in these patients (Mahmoud et al., 2018). Hemoglobin A1c provides a liable measure of chronic glycemia and correlates well with the risk of long-term diabetes complications and is currently considered the test of choice for monitoring and chronic management of diabetes (Sherwani et al., 2016).

Diet is a critical aspect of diabetes management for adult patients who have type 2 diabetes mellitus. Sufficient reduction in calorie consumption will decrease adiposity and insulin resistance, thus achieving DM2 remission (Rosenfeld et al., 2022). Plant-based dietary elements (fruits, vegetables, legumes and grains) are recommended and have proven effective in achieving remission (Rosenfeld et al., 2022).

The problem statement guiding this project is the following: In medical providers caring for adult patients diagnosed with DM2, does provider education on hemoglobin A1c and dietary modifications affect medical providers management of DM2?

The outcomes that were measured in this project are providers' knowledge regarding educating patients with DM2 about current and previous levels of Hemoglobin A1c, physical activities and diet modification during each visit. This was measured by comparing pre and post-surveys obtained from the providers.

Available Knowledge

Type 2 Diabetes Mellitus

DM2 is a common metabolic disease with pathologically high blood glucose levels that cause damage to organs and nerves (Wang et al., 2021). This metabolic condition leads to excess sugar in the blood, which can result in serious health problems, including retinopathy, cardiovascular diseases, stroke, kidney disease, nerve damage, potentially leading to the need for amputation (Diallo et al., 2022). DM2, which is responsible for more than 90% of all diabetes cases, is usually seen in adult

patients if their bodies become resistant to insulin or do not produce enough of it (Nazarko, 2022). In 2019, about 463 million people worldwide aged 20-79 were living with diabetes, and this number is projected to increase to 578 million by 2030 and 700 million by 2045 (Moradinazar et al., 2022). Diabetes mellitus type 2 is considered to be a global public health burden as the number of affected people continues to increase (Goyal & Jialal, 2022). The condition is diagnosed in different ways, including oral glucose tolerance test, fasting plasma glucose and glycosylated hemoglobin A1c test. (Wang et al., 2021). DM2 is prevalent in the adult population worldwide. The condition is increasingly widespread in children and young people as well, a result of the impact of an increase in obesity worldwide (Soni, 2022).

DM2 is most commonly associated with being overweight or obese and insulin resistant. Therefore, reducing weight and maintaining a healthy weight are part of the condition's management. To slow or reverse the condition, investing in modifiable factors such as diet and weight control and increasing physical activity is recommended (Forouhi et al., 2018). While some guidelines for DM2 management use diet as a primary intervention for achieving remission, most organizations consider dietary intervention to be an important aspect of overall DM2 management (Rosenfeld et al., 2022).

Intervention

Research shows that nurse practitioners, physician assistants and physicians do not routinely provide health education to patients with different chronic conditions such as diabetes mellitus and others, possibly due to training differences (Ritsema et al., 2014). Periodic trainings of medical providers will improve their capacity to provide diabetes care (Ugwu et al., 2020). As part of medical team, nurse practitioners play a key role in educating adult patients diagnosed with DM2 about the condition, its treatment goals, and the need and benefits of diabetes control. (Bartol, 2012).

Managing diabetes is complex and has potential to overwhelm the US healthcare system. Multiple gaps exist limiting patients with diabetes to providers with expertise in diabetes management

(Shubrook et al., 2021). Due to inadequate attention to diabetes management during their studies, most physicians are unable to provide evidence-based care and need to upgrade their skills and knowledge regularly. (Mehra et al., 2022).

When patients understand their diabetes management targets, they are better able to promote glycemic control and improved diabetes self-care (Gopalan et al., 2018). Several studies have estimated that fewer than 25% of patients diagnosed with diabetes mellitus can accurately describe the meaning of hemoglobin A1c or recall their most recent values (Gopalan et al., 2018). There is measurable advantage in terms of hemoglobin A1c improvement for patients who know their current or most recent hemoglobin A1c value compared to those who do not (Fridman et al., 2021). Many clinics employ this test as Point-of-Care Testing (POCT) during each patient's visit, which facilitates the clinicians' decisions (Whitley et al., 2015). DM2 requires education for patients and their families/caregivers from their providers; however, most people with diabetes do not receive any formal education in diabetes (Abazari et al., 2012). During each visit with medical providers (primary care providers or endocrinologists), patients with DM2 should have correct knowledge of diabetes management targets, which is associated with improved glycemic control and diabetes self-care (Gopalan et al., 2018).

It is the medical providers' duty to educate adult patients diagnosed with DM2 about diet modifications will help improve the condition by helping them to incorporate the modifications into their daily diets. In recent decades, decreased physical activity and consumption of diets high in calories have caused increases in weight gain among men and women worldwide. (Ley et al., 2016). Nearly all adult patients diagnosed with diabetes and prediabetes would benefit from nutrition counseling that works towards improving or maintaining glycemic targets and achieving weight management goals (Evert et al., 2019).

Adult patients diagnosed with DM2, who understand their diabetes management targets in numbers, they are better able to promote glycemic control and improved self-care (Gopalan et al.,

2018). Most cases of DM2 are diagnosed by primary care providers during routine visits hospitalizations, or emergency room visits. In fact, primary care providers are at the forefront of diabetes care and should be supported in providing optimal diabetes care to prevent complications from the disease (Jingi et al., 2015). Educating patients with diabetes mellitus takes time and resources, which is why each primary care physician should have a dietician or diabetes educator available for referral to educate patients diagnosed with DM2 (Chester et al., 2018). Clinicians have the opportunity to use the hemoglobin A1c test as part of the clinical encounter to engage their patients, discuss their glycemic goals, and work together to improve diabetes self-management (Delamater, 2006). Patients should also be educated that further management includes diet, exercise, medications, daily monitoring of blood glucose, and hemoglobin A1c monitoring (Pawlak et al., 2019).

Rationale

The Iowa Model of Evidence-Based Practice was used for the implementation of this project, as this is a widely used framework for implementation of evidence-based projects in healthcare (Buckwalter et al., 2017). The first step was to identify the triggering issues or opportunities which could be a clinical or patient-identified issue, data, new evidence, or initiative at the organization, state or national level. The next step was to state the question or purpose, and, since this was a priority question, the next step was to form a team that will work on the project. The fourth step was to assemble, appraise, and synthesize the body of evidence. Since there was sufficient evidence, then the practice change was designed and piloted. If change was not appropriate for adoption in practice, then an alternative design was going to be considered. The last step of the model was to disseminate the results, which usually means publishing the results (Cullen et al., 2018).

Participants in this project were educated on the importance of dietary modifications, increase in physical activities and knowledge of previous and current levels of hemoglobin A1c during each clinic visit by their patients. In this project, the researcher aimed to determine if management of the condition

will be improved by educating medical providers of adult patients who are being treated for diabetes to remember their current and previous levels of hemoglobin A1c and to improve their dietary modifications and increase physical activities will improve the management of the condition.
The research literature was synthesized to support the intervention. The project was evaluated using pre- and post-education surveys. Findings will be disseminated to the clinics and potentially published.

Purpose

The purpose of this project was to increase providers' knowledge and modify their current practice in teaching their adult patients who have DM2 on the importance of knowing previous and current levels of hemoglobin A1c for better diabetes management and about dietary modifications and increase physical activities necessary for better diabetes control.

Methods

Context

The project took place in two cities in a state in Southeastern United States. Approximately 12.4% of the adult population (1,014,358 people) in the state have been diagnosed DM2, and almost 35% of the state's general adult population have pre-diabetes (American Diabetes Association [ADA], 2022). Additionally, an estimated 244,000 people have diabetes but do not know it, and almost $11 billion is spent on diabetes care every year in the state (ADA, 2022).

The project was implemented at two clinics from two different health institutions located in two cities of the state. One specializes in endocrine conditions management including diabetes mellitus in adult patients, and the other is a primary care office. The two clinics are about 55 miles apart, and medical providers at both clinics treat adult patients diagnosed with DM2. On average, together these two medical offices see more than 600 patients (new and established) per week, and more than 90% of their patients are adults.

The endocrinology clinic treats different hormonal conditions including diabetes (type 1, 2, and others), gestational diabetes, osteoporosis, osteopenia, hypogonadism, thyroid diseases and cancers, Polycystic Ovarian Syndrome (PCOS), vitamins and electrolytes disorders, adrenal disorders, lipid disorders, pituitary disorders, it also manages gender medicine. The clinic has four local offices in the state and receives referrals from different medical facilities and institutions in the state and from neighboring states. Medical providers at these endocrine clinics include physicians, nurse practitioners, and physician associates. The clinics provide other services, including classes on nutrition, diabetes education, and diet for adult patients diagnosed with DM2.

The primary care clinic is part of a large healthcare system that offers many health care services through its hospitals, outpatient clinics, urgent care settings, specialty clinics, rehabilitation centers and emergency rooms. Based on the 2021 US Census, there are 298,263 people living in this area. The racial and ethnic makeup of this population includes White (43.6%), Black (43.1%), Hispanic or Latino (8.4%), Asian (5.3%) (United States Census Bureau [USCB], 2020). A letter of support to conduct the project was received from each clinic.

Intervention

Training is an effective way to improve primary physicians' knowledge of diabetes and enhance standardized diabetes management in hospitals (Liu et al., 2022). Participants were asked to take a pre-implementation survey sent via SurveyMonkey prior to providing the educational intervention. The survey was sent to participants via their email. Following completion of the initial survey, the medical providers received education using a Power-Point presentation. The medical providers were then be asked to complete a post survey two weeks following the education. Consent to participate was obtained from the participants prior to taking the initial survey.

The educational session took place via Zoom Meeting where participants were educated using PowerPoint. The education presented to the medical providers was approximately 30 minutes in length.

The education consisted of information regarding the benefits of education for their adult patients diagnosed with DM2, specifically, of knowing previous and current levels of the trimonthly lab, what hemoglobin A1c was, when and how often it should be measured, and its reliability and normal ranges. In addition, the providers were educated on the importance of patients with DM2 adhering to a healthy diet.

The education regarding diet modifications included information about food options that contain carbohydrates, rich in fiber, and those containing healthy fats. They were also taught about the importance of the plate method, which is an effective, visual way to make sure patients get enough non-starchy vegetables and lean protein while limiting the amount they consume of higher-carbohydrate foods that increase their blood sugar (Centers for Disease Control and Prevention [CDC], 2023). The importance of increase in physical activities in adult patients with diabetes was also discussed with the participants. The post-survey was sent to all participants approximately 2 weeks following the intervention. Data was collected and transferred and analyzed using excel spreadsheet.

Study of the Intervention.

The impact of the intervention was evaluated by comparing pre-and post-surveys obtained via SurveyMonkey. The survey contained multiple questions and contained Likert scale responses. The surveys had an alphabetic code to determine if the participant gained knowledge or changed their practice. The comparison of the pre-and post-surveys identified if the participants incorporated the knowledge acquired from the educational session into their every-day-practice taking care of adult patients diagnosed with DM2.

Measures

According to Colbert et al. (2014), surveys can be powerful tools as physicians seek to enhance the quality of care delivered or the health care systems they work in. Pre-and post-test surveys were used to measure providers' acquired knowledge on teaching patients about the knowledge of their

hemoglobin A1c levels and healthy dietary incorporations. Each survey contained a total of 9 questions. Questions 1-2 collected demographic data. Question 1 asked about the first two letter of the participants' last names. Question 2 asked about how long the participants have been in the current role as medical providers managing DM2. Questions 3-6 focused on provider knowledge of the importance of hemoglobin A1c. Questions 7-9 focused on improving provider practice on subjects such as plant-based diet, nutrition that is low in calories and the benefits of increase in physical activities. Questions 3-9 had answers containing Likert scale with the options to choose answers using *very likely, likely, less likely* and *unlikely*. The tool was created specifically for this project thus there are no reliability and validity measures. However, the knowledge questions were based on current evidence-based practice.

Analysis

Data was collected from SurveyMonkey and transferred to an Excel spreadsheet, then analyzed using a dependent/paired samples t-test. Knowledge questions (questions 3-6) and change in practice questions (questions 7-9) were evaluated as a whole with aggregate mean scores. Likert scale ratings were translated to discrete data as 1 for unlikely through 4 very likely. Descriptive statistics was used to analyze the demographic data.

Ethical Considerations

Participants were at minimal risk of harm during this project's implementation. The doctoral student and faculty mentor completed the Collaborative Institutional Training Initiative (CITI) program. Participation was voluntary as the providers only completed the initial survey if they agree to participate, and they had the option to withdraw at any time. All data collected was stored on a password-protected computer that only the student had access to. While the student is employed at both clinics, there was no potential conflicts of interest foreseen in this project.

Results

A total of 18 providers were invited to participate in this project. Close to 85% of those invited responded to both surveys and completed the intervention. Out of the 15 participants who participated, 14 were female and 1 was male. The age range was 29-63 years (*M = 40.6*). Out of all the participants 14 worked as endocrinology specialists whereas only 1 worked in a primary care setting. Ten participants were Nurse Practitioners, four were Physician Assistants and one was a Medical Doctor. Both surveys show 40% of respondents have been at their current clinic between 0-1 year, 20% have been there between 1 and 5 years and 40% have been there for 5 years at least.

The goal of the study was to determine if the participants gained more knowledge in managing DM2 in adult patients after participating to the educational session. A dependent t-test was conducted and the results from pretest (M = 21.6, SD = 23.2666) and posttest (M = 23.2666, SD = 3.2) indicate improvement in knowledge among participants that participated in the intervention (t (14) = 1.76, p = .034). In addition, there was significant improvement in providers talking to patients about the importance of exercising and staying active at every visit with adult patients diagnosed with diabetes (t (14) = 1.76, p = 0.02). The analysis shows a statistically significant improvement suggesting participants (medical providers) gained knowledge by participating in the educational session and changed their practice.

Discussion

Summary

The result from this project suggests that provider education on the importance of hemoglobin A1c and a role of a plant-based diet coupled with physical activity is beneficial to patient care. The difference between Means obtained before and after the educational session demonstrated an improvement in the participants' knowledge managing DM2. It is hoped that information provided and knowledge acquired by participants in this project will improve patient care and diabetes management

among adult patients who suffer from DM2. Participants with less experience managing diabetes for adult patients were not sure on the importance of patients knowing their hemoglobin A1c levels during every visit. The pre-educational session activity showed participants understood more about the role of a plant-based diet and increase in physical activities in diabetes management than hemoglobin A1c knowledge.

Interpretation

An educational session was provided through presentation and pre and post-testing were done to verify each participant's understanding of the role of knowledge on hemoglobin A1c, plant-based diet and increase in physical activities in managing DM2 in adult patients. Literature reveals that patients who understood their current and most recent levels of hemoglobin A1c did well managing DM2 compared to those who did not (Fridman et al., 2021). This project showed improvement in knowledge related to DM2 management in the participants who attended the educational session. The intervention was linked to a statistically significant improvement in mean. Integrating this type of educational session (training) into the newly hired medical providers' curriculum could improve patient's care in those who have DM2. Participants were educated on the importance of educating their adult patients diagnosed with diabetes about the benefits of knowing their hemoglobin A1c levels coupled with increase in physical activities and plant-based diet. Learning from the session, participant's knowledge improved and participants were reminded about their role educating their adult patients as part of care.

Limitations

Of 18 providers invited, only 15 responded and were able to participate in this project's activities. DM2 is managed in different settings including primary care offices. The majority of new cases of DM2 in adult patients are first diagnosed at the primary care level. In this project, 14 participants worked as endocrinology specialists and only 1 worked as a primary care provider. In the future, similar projects will need to involve more primary care providers as they are the port of entry for diabetes

diagnosis and first management. Having a high number of medical providers including those who work at the primary care level to participate in such an important project may have shown different results.

To accommodate the organization's request, only 2 weeks were allowed between the education session and resurveying the candidates. Allowing the participants at least 5 weeks between the educational session and resurveying them may have been more effective in measuring long term change.

Conclusion

The revised standards for quality improvement reporting excellence (SQUIRE 2.0) was used as a framework for reporting this project. Medical providers who participated were educated on the importance of their adult patients diagnosed with DM2 knowing their current and most recent levels of hemoglobin A1c and the importance of a plant-based diet and increase in physical activities in managing diabetes. Providers who educate patients about hemoglobin A1c importance promotes behavior modifications in these patients (Mahmoud et al., 2018). Research shows that most organizations consider dietary intervention to be an important aspect of overall DM2 management (Rosenfeld et al., 2022). Similar projects are needed to educate providers, especially those who just entered the medical profession either at the primary care or specialist (endocrinology) level and who take care of adult patients with DM2.

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