

Improved Empowerment and Knowledge Among Patients with Type 2 Diabetes Mellitus by Implementing Diet Education Provided by Nurse Practitioners

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Received: April 17, 2024; Accepted: April 30, 2024; Published: May 04, 2024

ABSTRACT

Background: Diabetes is a disease that is the seventh leading cause of death in the United States [1]. Adults diagnosed with diabetes are not only at an increased risk for further complications and disability, but they are also at an increased risk for an earlier death. When patients have appropriate education, there is a decrease in complications, reduced health care costs, improved quality of life and patients seek out preventative care more frequently.

Problem: According to the Rural Health Information Hub, only 62% of individuals living in rural areas with diabetes have access to diabetes education and support [2].

Methods: A pre and post education survey were used to assess if participants have improved knowledge regarding healthy meal planning and feel more empowered to manage their disease after an education session provided by an advanced practice nursing student.

Implications: There is a need for improved diabetes education within rural communities. Nurse practitioners (NP) are becoming more prevalent within rural settings. When patients receive education from NPs regarding healthy meal planning for diabetes, this leads to improved knowledge, which in turn increases patient empowerment to manage their chronic disease.

Keywords: Diabetic Diet, Diabetes Education, Nurse Practitioner Empowerment, Meal Planning, Healthy Lifestyle, Diet for Diabetes

Background

Diabetes is the seventh leading cause of death in the United States [1]. Adults diagnosed with diabetes are not only at an increased risk for future complications and disability, but they are also at an increased risk for an earlier death. In the United States, over ten percent of the population has diabetes, including 34.1 million adults. Individuals living in rural areas have a 17% higher rate of diabetes and have less access to health care and diabetes education. According to the Rural Health Information Hub (RHI Hub), only 62% of individuals living in rural areas with diabetes have access to diabetes education and support [2]. When patients are given appropriate education, the risk for complications from diabetes decreases and patient outcomes improve. The Centers for Disease Control and Prevention (CDC) has published that only 59.8 percent of adults with diabetes have

attended a diabetes self-management course. When patients have appropriate education, there is a decrease in complications, reduced health care costs, improved quality of life and patients seek out preventative care more frequently.

Review of the Literature

Search Methodology

A systematic search for evidence was completed using databases which included, Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, Google Scholar, as well as the Wichita State Library "SmartSearch" bar. Inclusion criteria included articles published between January 2018 and March 2022, except for one article published in 2016 which provided information regarding a nurse practitioner (NP)-led education program and the positive outcomes that were yielded. Exclusion criteria were articles that included individuals under the age of eighteen, or with type 1 diabetes, and articles not available in full text. Keywords to identify applicable literature included diabetic diet, diabetes education, diabetes empowerment, nurse

Citation: Maggie A Ward, Hannah Schmidt, Belinda Childs. Improved Empowerment and Knowledge Among Patients with Type 2 Diabetes Mellitus by Implementing Diet Education Provided by Nurse Practitioners. *J Med Clin Nurs Stud.* 2024. 2(3): 1-6. DOI: doi.org/10.61440/JMCNS.2024.v2.48

practitioner, and rural communities. Using this search method, fourteen articles were acquired to support the problem and the purpose of this quality improvement project.

Addressing Diabetes in Rural Communities

The prevalence of type 2 diabetes is higher in rural areas in comparison to urban areas. One reason for this is that there is decreased access to both specialized care and diabetes education within rural communities, as well as less primary care providers, which decreases access to healthcare [2]. This can lead to a significant number of individuals, who are living with diabetes, undiagnosed. In addition, individuals in rural communities have increased risk factors for diabetes, such as obesity and decreased access to healthy foods. The RHI Hub 2020 identified that there is nearly a three percent difference in diabetes diagnosis between rural and urban areas. Environmental barriers also increase the likelihood of rural residents being diagnosed with diabetes mellitus. Many of the environmental barriers are related to access to health care, but factors such as limited access to public transportation can also affect care. Lack of transportation makes it more difficult to seek medical care or grocery shop for items that are appropriate for patients with diabetes. Lastly, limited access to adequate health insurance can lead to higher rates of individuals who are uninsured and unable to attend regular medical appointments where education could be provided.

The Role of Empowerment and Diabetes

Healthcare providers, especially NPs, play an integral role in providing patients with the appropriate education and resources to feel empowered to manage their chronic diseases [3]. Diabetes is a disease that is complex and places a substantial burden on a patient's everyday life. Individuals with diabetes are often at an increased risk of anxiety because of worrying about how diabetes will affect their life long term [4]. Patients with diabetes are constantly making decisions that will affect their disease process, including food choices, taking medications daily and incorporating exercise. The goal of patient empowerment is to provide patients with the appropriate knowledge, resources, and education to have the capability to competently make decisions regarding their disease and to manage their chronic condition [5,6].

The American Diabetes Association (ADA) recommends that individuals living with diabetes mellitus should be evaluated up to four times a year to assess the need for diabetes education, which has been shown to give patient's autonomy and improve patient empowerment [6]. A cross-sectional survey completed by 2,866 patients found that patients who participate in patient-centered care and have support from their community correlated with empowerment [7]. A review article published by the Journal of Diabetes Research demonstrated that empowerment had a positive influence in multiple areas in the life of a patient with diabetes [5]. The article found that empowerment was linked to improved quality of life, showed substantial reduction in HbA1c levels and lipid levels, and a reduction in long-term complications, specifically neuropathy.

Utilizing Nurse Practitioners for Primary Care and Diabetes Education

Nurse practitioners reduce health care costs and specifically improve outcomes for patients diagnosed with diabetes mellitus [8]. In a retrospective analysis, published in the American

Journal of Medicine, which compared the outcomes of patients with diabetes who are cared for by NP's and physician assistants to physicians. This analysis concluded that NP outcomes for patients with diabetes did not show a difference from their physician colleagues. Literature also demonstrates that when NPs are part of the primary care team versus physician only care teams, patients with type 2 diabetes are more likely to receive care that follows current clinical guidelines [9]. Nursing promotes evidenced based practice, and the Journal for Nurse Practitioners published a quality improvement project that evaluated the results of implementing a NP-led computer education session [10]. While the sample size was small, the results confirmed that when patients received diabetes education from a NP, three months after the intervention, lower A1c results were recorded. In addition, a systematic review of thirteen randomized control trials confirmed that incorporating NPs has a positive impact on managing chronic conditions [11].

With a shortage in healthcare providers in rural communities, NPs have started to fill in these gaps, increasing access to health care and improving outcomes [12]. It is estimated that nearly one in four providers in rural communities are NPs. A cohort study that reviewed 67,120 patients of NPs, revealed these patients have lower inpatient admission rates and lower emergency room use, which leads to overall decreased health care costs [13]. NPs can play a significant role in providing diabetes education to help individuals with diabetes become more autonomous and empowered to manage their condition.

Summary of the Literature

There is a lack of diabetes education as well as access to diabetes care and education in rural communities [2]. There is also a substantially higher rate of type 2 diabetes in rural communities when compared to urban communities. When diabetes education and care is provided by NPs there are improved patient outcomes and decreased overall healthcare costs [13]. Improved education amongst patients with diabetes results in increased empowerment. Increased empowerment causes patients to manage their chronic diseases, which then leads to improved patient outcomes and reduced secondary complications [5,6].

Guiding Conceptual Model

To promote healthy meal planning in patients with diabetes and improve patient empowerment, the Health Belief Model was the guiding conceptual framework for this project. This model can be used to assist in understanding behaviors that are related to health changes [2]. The two components of this theory include how much an individual desires change to avoid illness or to heal from illness, as well as believing and understanding health interventions to avoid, prevent or cure illness [14]. The Health Belief Model is then broken down into six constructs including: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and lastly, self-efficacy. This model can be used alone or in conjunction with other conceptual models. For this project, it was used alone. The goal was for patients to understand the complications associated with uncontrolled diabetes and that a poor diet will lead to disease complications sooner. In addition, understanding the benefits of following healthy meal planning including reduced risks and to empower the patient by providing them with education and knowledge that they want to take control of their disease.

Project Purpose and Questions

The purpose of this quality improvement project was to implement NP led diabetes education in a rural community to increase healthy meal planning knowledge with the goal to improve patient empowerment to manage their diabetes in type 2 diabetic patients. A PICOT question was developed to guide the project and the literature search: Do adults who are diagnosed with Type 2 Diabetes Mellitus, living in rural communities, have improved empowerment and healthy meal planning knowledge after receiving a single education session from an NP when evaluated by a pre/post-test knowledge survey? Additional questions that aimed to be answered by this project included:

1. Does a patient encounter with an NP to address nutrition related to diabetes improve patient perceived empowerment to manage their diabetes compared to pretest knowledge/empowerment?
2. Does a patient encounter with an NP to address nutrition related to diabetes improve ability to identify healthier options that could improve an individual's diabetes?
3. Does a patient encounter with an NP to address nutrition related to diabetes help improve perceived ability to shop for budget-friendly foods that could improve an individual's diabetes?

Project Methods

At initiation of this quality improvement project, potential participants were identified by Hermes Healthcare LLC staff, who checked patients in for their foot care appointment, which included receptionists and medical assistants, by reviewing patient demographics. Once patients with Type 2 diabetes were identified, the patients were then approached by a Doctor of Nursing practice (DNP) NP student and asked to participate in the quality improvement project. Individuals who were willing to participate signed a consent form to participate in an education session provided by the DNP NP student. In addition to the consent form, prior to education, participant demographics were collected to ensure appropriate follow-up including phone number and town of residence, as well as how long they have been diagnosed with diabetes and what medications they are prescribed to manage their diabetes. When the demographics form was completed, participants answered a six-question pre-survey which assessed the participants knowledge of healthy meal planning and empowerment towards managing their disease. Healthy meal planning education was provided utilizing the Diabetes Plate Method, which is published on the ADA website. By using a published education resource, patients can refer to the website after the education session was completed for reference. Participants were provided with a grocery list with average pricing of grocery items in their area that coincide with the Diabetes Plate Method to be able to plan meals according to their budget that are appropriate for a patient with diabetes. At the conclusion of the education session, participants were dismissed and informed that the DNP NP student would be contacting them by phone in one week, using the phone number that was provided on the demographics form. Over the phone, the same six-question survey that was administered prior to the education session was completed to determine if participants gained knowledge and felt more empowered. By contacting the patients one week after the education session by phone, participants had time to apply the education that was provided to them as well as potentially be able to go grocery shopping using

the grocery list provided to them during the education session. Contacting participants directly by phone ensured completion of the post survey and mitigated partial completion and data that is not useful to identify if the education session was beneficial. The participants who completed the pre/post education survey, were entered into a drawing for one of four twenty-five-dollar gift cards to a grocery store of their choice.

Study Population and Setting

This project included adult patients, over the age of 18, who have been diagnosed with type 2 diabetes mellitus and reside in a rural community in East Central Kansas. The RHI Hub defines a participant as living in a rural area as those who live in a nonurban area, consisting of less than 50,000 people [15]. Patients who live outside of a rural community were excluded due to the evidence that proves that diabetes education and resources are more prevalent in urban settings. Patients who met the inclusion criteria were approached by the DNP NP student and asked to participate in the quality improvement project. To ensure standardization, the same diabetes education was provided to patients by a single DNP NP student.

There is a lack of diabetes specialty clinics within rural communities and this quality improvement project took place at the Emporia, Kansas Senior Center in partnership with Hermes Healthcare LLC. Hermes Healthcare LLC provides foot care to individuals in Emporia and the surrounding communities once a week at the Emporia Senior Center. There are approximately 60 patients each week who receive foot care with a significant amount of these patients diagnosed with diabetes. Many of the patients seen have diabetes because individuals with diabetes are at higher risk for wounds due to neuropathy; therefore, foot and nail care is essential. This service assists in identifying wounds, preventing infection, mitigating limb loss and an opportunity to provide education.

Specific Methods and Procedures

Participants that were included in the quality improvement project were those who met the previously discussed inclusion criteria for a minimum sample size of thirty individuals. To meet a minimum sample size of thirty participants, the DNP NP student was present at the Senior Center to approach potential participants on three separate clinic days over a four-week period. Barriers to achieving the minimum sample size sooner included individuals who did not have time to stay for the education because of prior commitments and transportation having to leave immediately following their foot care appointment. There were also individuals who were not interested in receiving education and individuals who felt that they already knew how to manage a diet that supports diabetes.

After patients consented to participate in this quality improvement project and participant demographics were collected, participants completed the pre-education survey, which evaluated their current knowledge regarding a diet appropriate for a patient with diabetes, how comfortable they are making diet choices, if they feel that they are able to stick with a budget with grocery shopping for items that support a healthy diet, and lastly if they feel empowered to manage their chronic disease. Participants were given a folder with educational materials that review the diabetes plate method, and a grocery

list with the average cost of items in Emporia, KS that coincide with the diabetes plate method. The session ended when all education was provided, and materials were given. A follow-up phone call was completed within one week after the education session and the post-education survey was completed over the phone to ensure complete data collection. If a participant did not answer their phone, a message was left, when possible. Participants who did not answer the initial follow-up phone call were contacted up to two additional times. In the case that the post-survey was not able to be completed after three attempts to contact the participant the data was considered incomplete and no further attempts to contact the participant were made. Once all the participants were contacted, the participant number of all those who completed both of the pre and post-survey were entered into <https://wheelofnames.com> and four participants were selected to win a \$25 gift card to a grocery store of their choice. Those participants were contacted, their address was obtained, and the gift card was mailed to their home address.

The data collected from the pre-education survey and the post-education survey for each participant was then compared to evaluate for improved knowledge and empowerment. To begin the statistical analysis, variables including age, gender, number of years diagnosed with diabetes, the number of medications taken to manage diabetes, and all pre and post-survey questions were labeled and entered in the statistical analysis program, Statistical Package for the Social Sciences (SPSS) for each participant. For the variables, age, gender, number of years diagnosed with diabetes, and number of medications taken to manage diabetes, descriptive statistics were completed to determine the means of each variable. For the remaining variables, a Wilcoxon Signed-Rank test was completed for each pre and post-questions to determine the level of significance of the results. The level of significance was set at 0.05.

Ethics and Human Subjects Protection

To initiate this quality improvement project, collaboration with Hermes Healthcare LLC, for access to participants was secured. In addition to collaboration with Hermes Healthcare LLC, communication was facilitated with the Senior Center Director through email to conduct education at the Emporia Senior center and approval was received. When site securement and collaboration were complete, an application for Institutional Review Board (IRB) approval was submitted to the Wichita State IRB on May 9, 2022. On May 23, 2022, IRB approval was given to proceed with this quality improvement project. At initiation, all consent forms and patient demographics, once filled out, were in possession of the DNP NP student. All forms were maintained and reviewed by the DNP NP student. Forms were kept in the DNP NP student's bag and the bag remained with the student. If the bag was not with the DNP NP student, it was locked in the DNP NP student's home.

Resources Needed and Budget

This quality improvement project required minimal resources and had a low budget; therefore, the project has the capability to be easily recreated in the future. A budget of \$200 dollars was set and provided solely by the DNP NP student. The SPSS program was available to be used without spending money from the budget because there was a free trial through the IBM website. \$100 was needed to purchase the gift cards for the four participants

who won and received gift cards for completing both the pre and post-survey. Additional items that were purchased included stamps, envelopes, and the cost of printing all forms including educational materials. Other resources included the tables and chairs at the Senior Center which were available at no cost.

Results

Descriptive statistics were run using SPSS to determine the means of the gender, age, number of years diagnosed with diabetes, and the number of medications used to manage diabetes of the participants in the project. With a sample size (N) of thirty participants, 17 were males and 13 were females. The range of participants' age is 35-99, the average age range (M) of the participants was between the ages of 61-80 T and the age group 71-80 included twelve participants, which was the largest group. Two participants were unable to remember which medications they were taking to manage their diabetes. The average number of medications that individuals took was M= 2.16, eight participants took one medication, eight participants took two medications, and seven participants took 3 medications to manage their diabetes.

Lastly, descriptive statistics were run using SPSS to determine the average number of years the participants have been diagnosed with diabetes. Again, two participants did not complete this component of the demographics form lending an N of 28. For simplicity, the years of diagnosis were separated into groups and assigned a number to make calculation and readability simpler. The years of diagnosis were grouped and assigned accordingly:

- 1 = 0-5 years of diagnosis
- 2 = 6-10 years of diagnosis
- 3 = 11-15 years of diagnosis
- 4 = 16-20 years of diagnosis
- 5 = 21+ years of diagnosis

Statistics yielded an average, M = 2.96, indicating that on average participants had been diagnosed with diabetes for 6-15 years. Eight participants reported being diagnosed with diabetes for 16-20 years and 7 had been diagnosed for 0-5 years.

A Wilcoxon Signed-Ranks Test was used to analyze the data in SPSS for the pre and post-survey questions. This test is appropriate when comparing two related samples using a Likert scale to answer the questions on the pre- and post-education survey. The answers on the Likert scale were labeled as follows when input into SPSS:

- 5 = Strongly Agree
- 4 = Agree
- 3 = Neutral
- 2 = Disagree
- 1 = Strongly Disagree

After receiving education from the DNP NP student, participants identified that they had received specific education regarding healthy meal planning, $z = -3.166$, $p < .05$, $M = 4.89$, $SD = .315$. It was determined that after participants received education from the DNP NP student, they were able to identify diabetic-friendly foods that fit within their budget, $z = -3.167$, $p < 0.05$, $M = 4.71$, $SD .460$. What could be argued as the most important objective of this quality improvement project: the difference in patient empowerment before and after participant education was

statistically significant at the highest level, $z = -3.337$, $p < .001$, $M = 4.54$, $SD = .508$. In addition to improved empowerment, participants' meals resembled the diabetes plate method after receiving education from the DNP NP student. More participants had half of a plate of non-starchy vegetables, $z = -3.145$, $p < .05$, $M = 4.18$, $SD = .945$, one-quarter of their plate consisted of protein foods, $z = -3.066$, $p < .05$, $M = 4.75$, $SD = .441$. However, healthy meal planning education did not have an influence on if a participant's plate had one-quarter of carbohydrate foods which includes fruits, starchy vegetables, and grains, $z = -1.809$, $p = .07$, $M = 4.07$, $SD = 1.016$.

Nursing Implications

This quality improvement project's goal was to demonstrate that education improves patient knowledge and empowerment. Education is at the core of nursing and nurses have consistently been identified as patient advocates [3]. Giving patients educational materials and continuously providing education, nurses can contribute to patients making a change in their lifestyle. NPs can play an integral role in providing patient education as demonstrated by the results, especially in rural communities. Since more and more NP's are being employed in rural settings, it is important for NPs to assess a patient's knowledge and educate them regarding a healthy diet that supports diabetes [12].

Table 1: Patient Demographics

Age	18-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Number of Participants	0	1	0	4	9	11	4	1
Males	0	1	0	3	4	6	2	1
Females	0	0	0	1	5	5	2	0

In the future, if this project were to be replicated or continued, finding an additional location to provide education where the average age of patients was more variable would benefit the project and be applicable to more individuals. Changing the time frame of when participants are contacted and how should be reevaluated. While 28 out of 30 participants completed the post-survey; finding another form of communication other than a phone call would be beneficial.

Conclusion

Type 2 diabetes is a chronic medical condition with serious consequences, including death, if not managed appropriately [1]. Individuals who live in a rural community are at a higher risk for disease complications because of a lack of specialized care and diabetes education [2]. In collaboration with Hermes Healthcare, LLC and the Emporia Senior Center, in Emporia, KS, a DNP NP student provided participants with education regarding healthy meal planning. Prior to the education session, a pre-survey was completed by 30 participants and after the education was completed, a post survey was completed by 28 participants. The results from the pre and post-surveys were analyzed using the Wilcoxon Signed Rank Test in the SPSS program. Overall, NPs have an important role in providing patient education. When NPs provide education regarding healthy meal planning, patients feel more empowered to manage healthy meal planning and can identify foods that are appropriate for a diet that is supportive of a diagnosis of diabetes.

Discussion

Collectively, the data reveals that NPs have a positive impact on patient empowerment and knowledge. NPs have been shown to improve patient outcomes and are one in four of the providers within rural communities. The location of the project allowed the DNP NP student to gather information from participants in rural communities. Since the participants were going to the Senior Center for their foot care appointment the general population of the sample was older adult to elderly which is a limitation (Table 1). In addition, the sample size was small. The project started with 30 participants and was completed with 28 participants. One of the individuals who did not complete the post-survey did not answer their phone and the second participant's phone number was disconnected by the time a post-education phone call was attempted. The sample size is a limitation, but over a longer time frame more participants would have been able to participate if presented with the opportunity. During the post-education phone calls multiple participants verbalized that the education provided to them was simple, yet thorough and easy to understand. A strength of this project included that the education provided to the participants was the same and the same DNP NP student provided education to all the participants using the same materials. Participants also verbalized that since they received education, they had been trying to choose foods that were more supportive of their diagnosis of diabetes.

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