

## Improving T2DM Outcomes in Primary Care

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### Abstract

**Background:** In the United States (US), over 34 million Americans have diabetes mellitus and 90% - 95% of these individuals have Type 2 diabetes mellitus (T2DM) (Centers for Disease Control and Prevention [CDC], 2021). In March 2018 the American Diabetes Association (ADA) estimated the annual costs of diabetes in the US had risen from \$245 billion in 2012 to \$327 billion in 2018 – a 26% increase in five years (ADA, 2018). To help reduce these healthcare expenditures and improve the health of individuals with T2DM, participation in Diabetes Self-Management Education and Support (DSMES) programs is fundamental due to its potential to help individuals reduce their hemoglobin A<sub>1</sub>C up to 1%, reduce diabetes complications, reduce hospital admissions and improve their quality of life (CDC, 2018).

**Objective:** To increase primary care provider participation in the establishment of diabetes self-management goals for patients diagnosed with T2DM.

**Methods:** Participating providers completed the Assessment of Primary Care Resources and Supports for Chronic Disease Self-Management (PCRS) survey before and after project implementation to assess for gaps in the provision of care regarding T2DM management. The Diabetes Self-Management Questionnaire (DSMQ) was used to assist providers in establishment of self-management goals for patients diagnosed with T2DM for a three-month period.

**Results:** All participating providers completed the PCRS prior to and following implementation of project. During implementation, 86 patients were seen for follow-up of T2DM and the DSMQ was initiated with all 86 patients.

**Discussion:** The DSMQ served as a valuable tool to assess patients' self-care behaviors and eased the establishment of diabetes self-management goals. The providers will continue to implement the DSMQ for all patients diagnosed with T2DM. A future goal of the practice is to include a smart phrase link in the electronic medical record platform for review of the DSMQ at every visit for patients diagnosed with T2DM.

**Key words:** diabetes, type 2 diabetes, diabetes education and support, diabetes self-management, diabetes goal setting, diabetes questionnaires, diabetes primary care

### **Improving T2DM Outcomes in Primary Care**

Diabetes is one of the most prevalent chronic health conditions worldwide. The World Health Organization (WHO) has estimated 422 million people worldwide suffer from diabetes and attributes 1.5 million deaths to diabetes annually (WHO, 2022). In the United States (US), over 34 million Americans have diabetes and 90% - 95% of these individuals have Type 2 diabetes mellitus (T2DM). (Centers for Disease Control and Prevention [CDC], 2021). If current trends continue, one in three Americans will develop diabetes in their lifetime (CDC, 2021).

Without adequate diabetes management, long-term health complications associated with diabetes, including blindness, kidney disease, heart disease, stroke and lower limb amputations, may occur (WHO, 2021). To reduce the risk of developing such adverse complications, providers should continuously strive to reach the goal of successful diabetes self-management, strengthen patient autonomy, improve health conditions, reduce the use of healthcare services, and consequently reduce the financial pressure on the healthcare system (Lenzen et al., 2017).

The financial burden of diabetes is also compelling, impacting the individual with diabetes, their families and community, and the health care system. In March 2018 the American Diabetes Association (ADA) estimated the annual costs of diabetes in the US had risen from \$245 billion in 2012 to \$327 billion in 2018 – a 26% increase in five years (ADA, 2018). Despite the epidemic of diabetes, the impact of the disease on morbidity and mortality of patients, and the accompanying economic burden, there are gaps that remain in clinical practice to achieve optimal diabetes management.

Most of the physical and economic costs associated with a diagnosis of diabetes can be attributed to lack of glycemic control, leading to a high risk of complications from the disease (Andreozzi et al., 2020). There is ample evidence that strong glycemic control can delay or prevent the progression of complications associated with diabetes (Shrivastava et al., 2013). Achieving optimal self-care for patients with diabetes (PWD) is often difficult due to the complexity of making the day-to-day decisions of food

intake, physical activity and medications that more effectively manages this chronic disease (Andreozzi et al., 2020; Powers, et al., 2020; Shrivastava et al., 2013).

Patients with T2DM need a foundation of education and support from healthcare providers regarding how to most effectively manage their diagnosis and to optimally care for themselves. Education programs for diabetes self-management and support (DSMES) facilitate the knowledge, skills and abilities that allows PWD to optimally care for themselves and improve their quality of life and health outcomes (Whitehouse et al., 2022; Powers et al., 2020; Powers et al., 2015). An effective DSMES program comprehensively addresses the patients' health beliefs, cultural needs, current knowledge, physical limitations, emotional concerns, family support, financial status, medical history, health literacy, numeracy and any other factors that impact a patient's ability to manage their diagnosis of T2DM (Powers et al., 2015).

Patients diagnosed with diabetes are likely to be unaware of how to operationalize these self-care behaviors and need the support of their healthcare providers to fully embrace optimal self-care behaviors (Andreozzi et al., 2020). Diabetes education and reinforcement of the need for patient's self-care behaviors from healthcare providers is an essential step in the optimization of self-care behaviors (Shrivastava et al., 2013). Evidence shows the positive health benefits of participating in DSMES programs, including lowering hemoglobin A<sub>1</sub>C (A<sub>1</sub>C) by as much as 1%, leading to a decrease in complications of diabetes. Additionally, there is a concurrent decrease in hospitalizations, readmissions and in acute care visits, contributing to economic impact on patients and on the health care system. Reduction in the physical effects and economic cost of complications through improvement in self-management is considered the most effective way to improve the quality of life of PWD and to reduce both the individual and overall cost of the diabetes epidemic (Mensing et al., 2021).

Conversely, the number of PWD who receive adequate support for making these complex care decisions regarding management of a diabetes diagnosis is very small. Recognizing obstacles and facilitators to diabetes self-management and addressing such issues is of the utmost importance in achieving favorable health outcomes (Khairnar et al., 2019). With adequate training and freely available

tools, healthcare providers can evaluate their own commitment to teaching self-care behaviors and reinforce the ability of PWD to manage their self-care (Shrivastava et al., 2013).

There is ample evidence that in most healthcare practices teaching and following up patient self-management support is not a priority (Brownson et al., 2007). In order to establish an effective DSMES program in primary care, healthcare providers must commit to initial screening and routine follow-up care of PWD. Awareness of community resources for referral of patients is essential. Very few assessment tools exist for this type of needs assessment and gap analysis of primary care practices. One such validated tool is the Primary Care Resources and Supports for Chronic Disease Self-Management (PCRS) created by the Diabetes Initiative from the Robert Wood Johnson Foundation (RWJF). This tool is specifically designed to assist primary care organizations in quality improvement related to support of PWD or other chronic illness. The RWJF recommends primary care practices consistently use the PCRS tool for quarterly or semi-annual evaluation of competence in sustaining self-management to improve patient outcomes (RWJF, 2002). Effective self-care behaviors has been proven to be the most crucial element of optimizing health for PWD, so it is reasonable that support and monitoring of self-care behaviors by healthcare providers should be standard of care for these patients (Schmitt et al., 2022; Whitehouse et al., 2022; Mensing et al., 2021; Powers et al., 2020).

For this quality improvement project, the PCRS was utilized to measure provider and system support of self-care management prior to the start of the project and following the culmination of the project. The PCRS was adopted by the practice as an ongoing commitment to support self-care management in their patient population.

The 2020 Consensus Report and Joint Position Statement on DSMES from the ADA, the American Association of Diabetes Care and Education Specialists (ADCES), the Academy of Nutrition and Dietetics, the American Academy of Family Physicians (AAFP), the American Academy of Physicians Assistants (AAPA), the American Association of Nurse Practitioners (AANP) and the American Pharmacists Association (APA) states DSMES improves health outcomes, quality of life, is cost effective and that it is the right of PWD to have access to DSMES. Their recommendations include

discussions with PWD regarding the benefits and value of sustained DSMES, to ensure referral for PWD to DSMES at time of diagnosis, then annually or when not meeting treatment goals; when PWD develop complications; and when transitions in life occur. The recommendations also state providers should ensure interprofessional coordination with DSMES providers, medical nutrition therapy, medications and physical activity on a regular basis and to address barriers that prevent participation in these activities (Powers et al., 2020).

There exists a number of tools used to improve provision of health education for PWD in self-care management. One systematic review identified 21 instruments for the measurement of diabetes self-management that were available in various languages but of those 21, only ten were available in English and only five were considered adequately validated by the authors (Yan et al., 2016).

In 1997 the Centers for Medicare and Medicaid (CMS) asked the American Association of Diabetes Educators (currently known as the ADCES) to identify strategies to measure, monitor and manage diabetes education and care. The task force was able to identify seven self-care behaviors that should be the foundation of diabetes self-care management. These self-care behaviors for PWD have been shown to significantly improve outcomes for these patients. These seven behaviors include healthy eating, physical activity, routine monitoring of blood glucose levels, and compliance with medications, good problem-solving skills, healthy coping skills and risk reduction behaviors. In updates to the ADCES7 since origination, recommendations have evolved to ensure a patient-centered approach to diabetes education and self-care and a focus on quality of life (Mensing et al., 2021).

In 2013, Schmitt and associates published the Diabetes Self-Management Questionnaire (DSMQ) in response to the opinion that previously published tools did not consistently measure glycemic control and variations in A<sub>1</sub>C. The 16-item DSMQ questionnaire has been validated in several trials. One systematic review published by Wee et al., (2021) named the DSMQ one of only three tools for diabetes self-management to meet the consensus-based standards for the selection of health measurement instruments (COSMIN) guidelines. The DSMQ can be used to screen for and to diagnose barriers that impact control of the glycemic indices for PWD (Schmitt et al., 2013).

For this quality improvement project, the DSMQ was selected as the tool to be deployed for use by the participating providers. The goal was to select a brief instrument that could easily be implemented by providers and would simultaneously provide data to show improvement in self-care behaviors for PWD.

### **Review of Literature**

Dorothy Orem defined self-care as “the performance or practice of activities that individuals initiate and perform on their own behalf to maintain life, health, and well-being” (Khademian et al., 2020). When applied to PWD, self-care refers to the ability of patients to maintain health, well-being and quality of life through day-to-day attention to diet, exercise, medication adherence, monitoring of blood glucose, maintaining a regular schedule of appointments with their healthcare team and risk-reduction behaviors (Yan et al., 2016). The goal of self-care management for PWD is to improve glycemic control through behaviors known to improve glycemic control and improve health outcomes (Popoviciu et al., 2022). These self-care behaviors are the cornerstone of self-care and key to achieving glycemic control, maintaining optimal health and prevention of complications from the diabetes diagnosis (Schmitt et al., 2022).

Numerous systematic reviews have shown effective self-management interventions have the greatest potential to improve self-management and reduce complications from poorly controlled diabetes (Zimbudzi et al., 2018). Particularly, collaborative goal-setting efforts between patients and providers have been recognized to improve diabetes outcomes, promote behavior change, increase self-efficacy and improve patient-provider relationships (Klinkner et al., 2017).

A systematic review and meta-analysis of 42 randomized controlled trials (RCTs) ( $n = 13,017$ ) looked at how DSMES affects all-cause mortality and found 159 participants in the DSMES group died (2.3%) while 187 participants in the usual care group died (3.1%), reflecting a reduced risk of mortality in the DSMES group. Additional findings reflected better outcomes when PWD had more than 10 hours of diabetes self-management education, for patients who had repeated education encounters, and for patients



who received in-person DSMES, leading to an estimate of four fewer patient deaths per 1000 person years (He et al., 2017).

Research related to improving self-care behaviors for all chronic disease continues in an effort to reduce morbidity and mortality from this chronic disease. Most, but not all, findings reflect a high correlation of improved self-care behaviors and decreased rates of morbidity and mortality. While not specific to the impact of DSMES, Seidu et al., (2016) conducted a meta-analysis, looking at intensive glycemic control and multi-factorial interventions for PWD and the outcomes for all-cause mortality. Their evidence reflected that, with the exception of non-fatal myocardial infarctions (MIs), intensive glycemic control and multi-factorial interventions had no association with reduced or increased risk of cardiovascular events or mortality. Conversely, Zimbudzi et al., (2018) conducted a meta-analysis of eight studies on PWD and concurrent kidney disease ( $n = 835$ ) that demonstrated reminders from providers regarding self-management of their disease improved outcomes. Ernawati et al., (2021) conducted a systematic literature review assessing for the effectiveness of completing DSME for patients with T2DM. Their findings from 15 articles showed that engaging in DSME increased patient knowledge and adherence to diet, medication, physical activity, glucose monitoring, wound care, and improved their self-management behaviors and self-efficacy for diabetes management. Overall, they noted the effectiveness of DSME on lifestyle changes and self-care was impacted by the education and support the PWD received from their providers.

Research findings show collaborative goal-setting practices are beneficial to promote behavior change but this practice continues to be underutilized in the primary care setting. In some cases where patients identified self-management goals with their providers, their progress towards goal-attainment were not periodically reviewed or documented appropriately in the electronic health record (Klinkner et al., 2017). Additionally, Duncan et al., (2011) analyzed private insurer databases to find that only 6.8% of insured patients with newly diagnosed T2DM had participated in any type of DSMES. Andreozzi et al., (2020) conducted a systematic review of literature spanning from 1994-2017 that relates to “clinical inertia,” which they define as the lack of primary, secondary and tertiary interventions by healthcare

providers in the management of PWD. Their findings indicate the cause of the inertia related to support of self-care behaviors is multi-faceted and is impacted not only by individual provider choices but also is impacted by the healthcare system, as well as patient motivation and patient social and economic factors (Andreozzi et al., 2020).

Under-utilization of DSMES was measured in a study in the Detroit metropolitan area ( $n = 3796$ ) to look at the demographics of PWD who were successful in managing self-care behaviors versus those who had limited or no success. This study was conducted in a large health system with unlimited access to resources for PWD to learn self-management behaviors. The study focused on identification of barriers to participation in DSMES for PWD and found that >60% of PWD had not achieved their glycemic goals. Their findings further reflect a failure of providers to refer PWD to DSMES and failure of patients to follow through with enrollment. The identification of barriers to enrollment in DSMES is a vital step in engaging all PWD in self-management behaviors that lead to improved quality of life and decreased morbidity and mortality (Perkins et al., 2021).

A 2016 systematic review investigated instruments used in assessing self-care behaviors for PWD. The search was limited to instruments published in English in the 20 years prior to the review. Twenty-one instruments were found that addressed the multi-faceted aspects of self-care behaviors for PWD and nine others that were focused on one aspect of self-care, such as diet or exercise. A majority of the instruments had been developed within ten years of the review and only a few had been developed and tested with rigor (Yan et al., 2016).

The research supporting the ADCES7 2021 update illustrates the importance of collaboration between PWD and their health care team in optimizing health and quality of life for these patients. Ongoing research regarding self-care for PWD and other cardiometabolic conditions is essential. Scientists have embarked on a systematic review of the use of the ADCES 7 framework to identify the impact of DSMES on the economic and health care utilization of diabetes (Whitehouse et al., 2022).

Development of the DSMQ instrument is based in Germany and was originally designed as a two-part study to measure behaviors that correlated with glycemic control for patients with both Type 1

diabetes mellitus and T2DM. Originally there were 37 items included in the study instrument but analysis of the data in the first part of the study led to the final 16-item instrument (see Appendix A). The DSMQ was specifically designed for use in measuring psychosocial barriers to self-care and to measure glycemic control in PWD so healthcare providers can easily screen and diagnose barriers to self-care management (Schmitt, et al., 2013).

A recent study set in Romania measured self-care behaviors using the DSMQ questionnaire translated into Romanian ( $n = 159$ ). Their results showed a significant improvement in self-management behaviors that led to a decrease in A<sub>1</sub>C. This study further confirms the importance of patient education regarding self-management behaviors such as physical activity, dietary changes for healthy eating and other lifestyle interventions that improve quality of life for PWD (Popoviciu et al., 2022).

Most recently an update to the DSMQ has been published but was not available at the time of implementation of this project. The 2022 version of the DSMQ is titled the DSMQ-R and is a 27-item instrument, as opposed to the 16-item original version. The new version was validated in five clinical studies ( $n = 1447$ ). The authors state the reasons for the update were updated care recommendations and technological innovations for care of PWD since initial publication in 2013. They invoke advances such as continuous glucose monitoring and insulin pumps and changes in terminology associated with care of PWD as the purpose for the update (Schmitt et al., 2022).

### **Rationale for project**

One of the recommendations for care of PWD in the 2020 National Standards for DSMES is for providers to identify barriers that impact participation in a DSMES program (Powers et al., 2020). An existing barrier for the clinical site of this quality improvement project was the lack of access to an accredited DSMES program within the community. The absence of this valuable resource for PWD reinforced the need for the providers to engage in the delivery of diabetes self-management education and to work with PWD in identifying self-management goals.

Current guidelines recommend providers collaborate with patients and families to establish short- and long-term self-management goals. The goals should be specific to the patient's preferences, their

needs, and progress towards goals should be periodically reviewed. During office visits, providers should assess, facilitate and encourage patient adherence to positive self-care behaviors (Koenigsberg & Corliss, 2017).

### **Theoretical framework**

The Knowledge to Action Framework (KTA) was used to help guide the decision-making process and implementation of this quality improvement project. In efforts to provide safe and effective health care services, the KTA framework is a conceptual framework aimed to guide and reduce the challenges of translating evidence-based research into practice (Field et al., 2014). The KTA framework consists of two components: Knowledge Creation and an Action Cycle, each consisting of various phases. Knowledge creation consists of three phases, beginning with knowledge inquiry/performing research, then synthesis of knowledge/evaluating research findings, and finally creation of products and tools to be used (Straus et al., 2009). The Action Cycle consists of seven phases that outline the activities required for knowledge to be used in practice, these include: 1) identify problem, identify, review, select knowledge, 2) adapt knowledge to local context, 3) assess barriers to knowledge use, 4) select, tailor, implement interventions, 5) monitor knowledge use, 6) evaluate outcomes, and 7) sustain knowledge use (Straus et al., 2009).

This framework was easily adaptable to this quality improvement project. The background research, review and synthesis of literature related to self-management behaviors for PWD and the decision to use the PCRS and DSMQ instruments for the project established the foundation for the project and the knowledge creation phase of the KTA cycle.

Implementation of the problem addressed the phases of the action cycle, beginning with all participants completing the PCRS evaluation tool and using those results to assess gaps in care for this rural practice. Education was provided in the use of the DSMQ, with the principal investigator (PI) monitoring use of the DSMQ throughout the implementation period. The project culminated in the evaluation of outcomes and the feasibility of the practice sustaining the use of the DSMQ.

### **Purpose**

The purpose of this project was to increase the level of self-management support and education for PWD among primary care providers in a rural North Carolina practice with the aim to establish a formalized program to educate and encourage self-management behaviors for PWD. The specific aims include improvement in the experience of care and self-management for PWD through education and implementation of the DSMQ protocol, as well as increasing the rate of healthcare provider participation in enabling PWD to establish self-management goals.

## **Methods**

### **Context**

This quality improvement project intended to demonstrate improved provider implementation of self-management support for PWD, through implementation of the DSMQ during initial and routine follow-up appointments. The project was implemented over a three-month period. Descriptive statistics was obtained via surveys, questionnaires and the electronic medical record (EMR).

### **Intervention**

This quality improvement project was implemented in the setting of a rural primary care practice in North Carolina. All healthcare providers working at the implementation site were eligible and invited to participate in the project. Participation was voluntary and refusal to participate or answer any particular question did not result in any penalty. Participants had the right to refuse, withdraw or discontinue participation without consequence or prejudice at any time prior to submission of their data. The healthcare provider participants were made aware that failure to complete the Primary Care Resources and Support for Chronic Disease Self-Management (PCRS) survey or attend the Diabetes Self-Management Questionnaire (DSMQ) educational program made them ineligible to participate in the project.

The project began with the administration of a standardized survey of the participants using the PCRS survey. This survey is freely available from the Robert Wood Johnson Diabetes Initiative (RWJF, 2002) and was utilized without any changes. The survey consists of 16 questions on characteristics of self-management support separated into two categories: Patient Support and Organizational Support.

Following completion of the PCRS survey and assessment of the findings from the survey, a one-hour educational program was presented to all participants on the use of the DSMQ. The DSMQ is a freely available and validated tool used to measure self-care behavior among patients diagnosed with diabetes (Schmitt et al., 2013). The tool was utilized without any changes to content. Each participant used the DSMQ to screen all PWD for patient self-care behaviors that impact diabetes care, identify areas of improvement and helped individuals establish self-management goals.

### **Measures**

This project began and concluded with each participant anonymously completing the PCRS survey. Each participant had a unique ID that did not contain any personal identifiers. The participants used the same ID for both the pre- and post-intervention surveys to ensure fidelity. The initial survey reflected on care delivered prior to project implementation and the second survey reflected care provided during and following project completion. Results from this survey served as a guide to assess for gaps in the provision of care of PWD.

The PCRS survey consisted of four levels of performance A, B, C and D. Level D is the lowest level of performance and level A is the highest level of performance. To determine the levels of performance, the participants rated themselves and the organization on each of the 16 characteristics using a scale of 1-10, with 1 being the lowest and 10 being the highest score. The performance levels are the following: Level D: score of 1, indicates inadequate non-existent activity; Level C: scores 2-4, indicates implementation is sporadic or inconsistent; patient provider interaction is passive; Level B: scores 5-7, indicates implementation is done in an organized and consistent manner using a team approach; services are coordinated and Level A: scores 8-10, indicates meeting level B criteria plus system-wide adoption and integration of that aspect of self-management support (RWJF, 2002).

The DSMQ tool consisted of 16 questions. Patients rated themselves on their diabetes self-care behaviors over the past eight weeks using a four-point Likert Scale ranging from 0-3. For example, ‘applies to me very much’ = 3 points and ‘does not apply to me’ = 0 points. The questions consists of five different areas of diabetes self-management including dietary control; glucose management, including

glucose monitoring and medication adherence; physical activity, and health care use (Schmitt et al., 2016).

During the implementation period the electronic medical record (EMR) was used to collect the following data:

1. Demographic information for each PWD seen during the implementation period (age, race and gender)
2. Clinical data points for each PWD seen during the implementation period (body mass index [BMI] and A<sub>1</sub>C)
3. Number of PWD seen by each participant for follow-up appointments
4. Number of DSMQ surveys utilized by participants during follow-up appointments
5. The number of diabetes self-management goals established by each participant during follow-up appointments

The final step of project implementation concluded with a second administration of the PCRS to all participating providers.

### **Analysis**

Descriptive statistics was used to evaluate the PCRS survey results and the participants' demographical data, clinical data points and the number of completed diabetes follow-up appointments, completed DSMQ and number of established goals by each PCP. Frequencies and percentages were calculated for each nominal variable and summary statistics were calculated for interval and ratio variables (see Tables 1-4).

Data was collected and stored on a password and firewall protected personal computer. Analysis of data was completed using Intellectus Statistical<sup>®</sup> software. Intellectus<sup>®</sup> is password protected and uses a variety of physical, technical, and administrative measures to safeguard information against loss, theft, unauthorized use, disclosure, and modification and uses encryption and hashing to help protect sensitive information during both transmission and storage.

**Ethical considerations**

The Institutional Review Board (IRB) at Lenoir-Rhyne University reviewed this project and determined the project to have exempt status. Compliance with HIPAA regulations was strictly maintained throughout preparation, implementation and dissemination of this project. A duplicate data set will be stored on a password-protected external drive to ensure safety in the event of damage to the original information. Data will be stored for five years after project completion and then destroyed.

There was no funding for this project. The utilization of the PCRS instrument and the training on the use of the DSMQ was a system change for this facility. The training materials will be retained by the facility for use during orientation for all new employees in the future.

**Results**

During the implementation period, all participating providers ( $n = 3$ ) implemented the use of the DSMQ for PWD who presented for their routine follow-visit concerning diabetes management. A total of ( $n=86$ ) patient participants diagnosed with T2DM presented for their routine diabetes follow-up visits during the implementation period. Provider A followed up with 40 patients, Provider B followed up with 17 patients and Provider C followed up with 29 patients during the implementation period. All 86 patient participants completed the DSMQ to assess diabetes self-care behaviors. All participating providers reviewed the completed DSMQ with each patient during their follow-up visits and initiated support and education for the establishment of self-management goals.

Demographic profiles of the patient population of this practice are summarized in Table 1 and Table 2. Demographic information revealed the average patient age was 62 years, the average BMI was 37.76 and the average A<sub>1</sub>C was 7.0% (see Table 1). Race and gender statistics show white males were the most frequent PWD seen (see Table 2).

All project participants completed the PCRS survey prior to and following project implementation to assess their level of performance in the category of Patient Support and Organizational Support. Following the implementation of the project, the final PCRS level of performance scores increased in all 8 characteristics of self-management support for the Patient Support category. The



greatest score increase was noted for collaborative goal setting/action planning and individualized assessment of patient's self-management educational needs (see Table 3).

Following project implementation, the final PCRS level of performance scores also increased in most characteristics of self-management support for the Organizational Support category. The greatest score increase was noted for system for documentation of self-management support services and patient input (see Table 4). These findings appear to demonstrate that each provider participant improved their level of performance in the delivery of diabetes care for PWD both at the individual and organizational level following project implementation (see Table 3 and Table 4).

A two-tailed Wilcoxon signed rank test was conducted for the category of Patient Support and Organizational Support to examine whether there was a significant difference between the initial pre-project implementation PCRS survey scores and the final PCRS survey scores following project implementation (see Figure 1 and Figure 2).

Likely due to a small sample size, the Wilcoxon analysis results for the PCRS Patient Support scores were not significant based on an alpha value of .05 and  $p = .109$ . This indicates there is insufficient evidence to conclude that the differences between the initial PCRS Patient Support score (Mdn = 65.00) and final PCRS Patient Support score (Mdn = 72.00) are significantly different before and following project implementation. Figure 1 presents a boxplot of the ranked values.

Possibly as a result of a small sample size, the Wilcoxon analysis results for the PCRS Organizational Support scores were also not significant based on an alpha value of .05 and  $p = .102$ . This indicates there is insufficient evidence to conclude that the differences between the initial PCRS Organizational Support score (Mdn = 67.00) and final Organizational Support score (Mdn = 71.00) are significantly different before and after project implementation. Figure 2 presents a boxplot of the ranked values.

## Discussion

This project had a significant impact in this practice regarding how and when self-management behaviors would be taught and supported for all PWD through the use of the DSMQ. Data from this project confirms providers in this practice embrace the use of the DSMQ for this purpose. Ongoing support and encouragement in self-management has a significant impact on patient morbidity and mortality, as well as a significant impact on the financial burden of this chronic disease. The providers in this practice are committed to ongoing use of the DSMQ to support the overall health of their PWD.

The ability of this practice to support self-care behaviors in their PWD is essential in this community where no other resources are available for PWD. This disparity in resources makes this commitment from these providers even more essential. The ongoing dedication to individual and organizational review using the PCRS will support the implementation of diabetes self-management education programs into clinical practice.

### **Limitations**

This quality improvement project and the limited period of implementation prevented assessment of the use of the DSMQ on patient outcomes. Due to specificity of the population being rural and without any other resources, the results may not be generalizable to all populations. Another limitation is the small sample size of the primary care provider participants. The small sample size may have led to bias, impacting the validity of the project findings.

Initially, the DSMQ tool was to be uploaded to the current electronic medical record (EMR) platform used by the practice to enable easy access. This was not feasible due to time constraints required to embed the DSMQ in the EMR. As a result, a paper copy of the DSMQ was provided to each patient participant upon checking-in for their routine follow-up visit. While in the waiting room, patients filled out the DSMQ prior to meeting with their provider. This method was to allow more time for the patient and provider to review and discuss the results of the DSMQ and collaboratively establish diabetes self-management goals. The ability to create an electronic copy of the DSMQ that is readily available in the EMR would most likely facilitate the use of the DSMQ for each PWD seen by the providers.

In 2022, the DSMQ was updated to the DSMQ-R. This new version of the DSMQ has 27 items and was updated because the authors felt some items needed amending and wording updated and 11 items were added. New items included information and care related to technological innovations not commonly seen at the time of creation of the DSMQ. Added items addresses factors such as continuous glucose monitoring and automatic insulin delivery, as well as more specific self-management points for self-care. The PI will recommend to the clinical practice site that implementation of the DSMQ-R be considered for future care of PWD (Schmitt et al., 2022).

### **Conclusion**

Participation in DSMES programs offers continuous support, encouragement in achievement of self-management goals and empowers individuals with the knowledge, skills, and confidence for enhanced diabetes self-management (Powers et al., 2020). Rural residents face the obstacle of not having access to DSMES programs or have limited or absent support for self-care behaviors through diabetes self-management education. Efforts should be made to acknowledge the barriers and facilitators to optimal management of PWD.

The challenges that healthcare providers face in managing PWD in primary care include time constraints to adequately address the patients' self-management needs during routine office visits, the patient's inability to cover the costs of medications, treatment supplies, and healthy food options, the patient's lack of interest or motivation to adhere to the recommended treatments, and the patient's denial of secondary complications that can occur with poorly managed T2DM (Khairnar et al., 2019). More research is needed to assess and support the benefits of collaborative goal-setting with patients to better manage the complex health care needs of this patient population.

### References

- American Diabetes Association (2018). Economic costs of diabetes in the U.S. in 2017. *Diabetes Care*, 41(5), 917–928. <https://doi.org/10.2337/dci18-007>
- Andreozzi, F., Candido, R., Corrao, S., Fomengo, R., Giancaterini, A., Ponzani, P., Ponziani, M.C., Tuccinardi, F., & Mannino, D. (2020). Clinical inertia is the enemy of therapeutic success in the management of diabetes and its complications: A narrative literature review. *Diabetology & Metabolic Syndrome*, 12(52). <https://doi.org/10.1186/s13098-020-00559-7>
- Brownson, C.A., Miller, D., Crespo, R., Neuner, S., Thompson, J., Wall, J.C., Emont, S., Fazzino, P., Fisher, E.B., & Glasgow, R.E. (2007). A quality improvement tool to assess self-management support in primary care. *The Joint Commission Journal on Quality and Patient Safety*, 33(7), 408-416. [https://doi.org/10.1016/S1553-7250\(07\)33047-X](https://doi.org/10.1016/S1553-7250(07)33047-X)
- Centers for Disease Control and Prevention. (2021). *Diabetes*. <https://www.cdc.gov/diabetes/basics/type2.html>
- Centers for Disease Control and Prevention. (2018). Diabetes self-management education and support (DSMES) toolkit: Return on investment. <https://www.cdc.gov/diabetes/dsmes-toolkit/business-case/roi.html>
- Duncan, I., Ahmed, T., Ojuran, E.L., Stetson, B., Ruggiero, L., Burton, K., Rosenthal, D., & Fitzner, K. (2011). Assessing the value of the diabetes educator. *Diabetes Educator*, 37(5), 638-657. <https://journals.sagepub.com/doi/10.1177/0145721711416256>
- Ernawati, U., Wihastuti, T. A., & Utami, Y. W. (2021). Effectiveness of diabetes self-management education (DSME) in type 2 diabetes mellitus (T2DM) patients: Systematic literature review. *Journal of Public Health Research*, 10(2), 198–202. <https://doi.org/10.4081/jphr.2021.2240>

Field, B., Booth, A., Ilott, I., & Gerrish, K. (2014). Using the knowledge to action framework in practice:

A citation analysis and systematic review. *Implementation Science*, 9(172).

<https://doi.org/10.1186/s13012-014-0172-2>

He, X., Li, J., Wang, B., Yao, Q., Li, L., Song, R., Shi, X., & Zhang, J.A. (2017). Diabetes self-

management education reduces risk of all-cause mortality in type 2 diabetes patients: A

systematic review and meta-analysis. *Endocrine*, 55(3):712-731. [https://doi.org/10.1007/s12020-](https://doi.org/10.1007/s12020-016-1168-2)

[016-1168-2](https://doi.org/10.1007/s12020-016-1168-2)

Khademian, Z., Kazemi Ara, F., & Gholamzadeh, S. (2020). The effect of self-care education based on

Orem's nursing theory on quality of life and self-efficacy in patients with hypertension: A quasi-experimental study. *International Journal of Community-based Nursing and Midwifery*, 8(2),

140–149. <https://doi.org/10.30476/IJCBNM.2020.81690.0>

Khairner, R., Kamal, K. M., Giannetti, V., Dwibedi, N., & McConaha, J. (2019). Primary care physician

perspectives on barriers and facilitators to self-management of type 2 diabetes. *Journal of*

*Pharmaceutical Health Services Research*, 10 (1), 117–123, <https://doi.org/10.1111/jphs.12280>

<https://doi.org/10.2337/cd17-0029>

Klinkner, G., Yaeger, k., Brenny-Fitzpatrick, M., & Vorderstrasse, A. (2017). Improving diabetes self-

management support: Goal setting across the continuum of care. *Clin Diabetes*, 35(5), 305–312.

<https://doi.org/10.2337/cd17-0029>

Koenigsberg, M., & Corliss, J. (2017). Diabetes self-management: facilitating lifestyle change. *American*

*Family Physician*, 96(6), 362-370. <https://www.aafp.org/afp/2017/0915/p362.html>

Lenzen, S. A., Daniëls, R., van Bokhoven, M. A., van der Weijden, T., & Beurskens, A. (2017).

Disentangling self-management goal setting and action planning: A scoping review. *PLoS ONE*,

12(11), 1–22. <https://doi.org/10.1371/journal.pone.0188822>

Mensing, C., Tomky, D., Moss-Barnwell, L., Colberg, S.R., Davidson, P., DeCoste, K.C., D'Hondt, N.,

Duker, P.N., Kolb, L., LeBow, E., Maryniuk, M., McElwee-Malloy, M., Miller, D.K., Peeples,

M., Rinker, J., Sauter, C., See, M.B., & Sisson, E. (2021). An effective model of diabetes care

- and education: The ADCES7 self-care behaviors. *The Science of Diabetes Self-Management and Care*, 47(1). 30-53. <https://doi.org/10.1177/014572172097815>
- Perkins, D.W., Milan, P., Miazek, K., Havstad, S., & Wegienka, G. (2021). Identifying factors affecting diabetes education program participation within a metro Detroit integrated health system. *Preventive Medicine Reports*, 24(101646), 1-8. <https://doi.org/10.1016/j.pmedr.2021.101646>
- Popoviciu, M.S., Marin, V.N., Vesa, C.M., Stefan, S.D., Soica, R.A., Serafinceanu, C., Merlo, E.M., Rizvi, A.A., Rizzo, M., Busnatu, S., & Stoian, A.P. (2022). Correlations between diabetes self-care activities and glycaemic control in the adult population: A cross-sectional study. *Healthcare (Basel)*, 10(1), 1-10. <https://doi.org/10.3390/healthcare10010174>
- Powers, M.A., Bardsley, J., Cypress, M., Duker, P., Funnell, M.M., Fischl, A.H., Maryniuk, M.D., Siminerio, L., & Vivian, E. (2015). Diabetes self-management education and support in Type 2 diabetes: A joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *Diabetes Care*, 34(2), 1372-1382. <https://doi.org/10.2337/dc15-0730>.
- Powers, M.A., Bardsley, J.K., Cypress, M., Funnell, M.M., Harms, D., Hess-Fischl, A., Hooks, B., Isaacs, D., Mandel, E.D., Maryniuk, M.D., Norton, A., Rinker, J., Siminerio, L.M., & Uelman, S. (2020). Diabetes self-management education and support in adults with Type 2 diabetes: A joint consensus report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy of Family Physicians, the American Academy of Physician Assistants, the American Association of Nurse Practitioners, and the American Pharmacists Association. *Diabetes Care*, 43(7):1636-1649. <https://doi.org/10.2337/dci20-0023>
- Robert Wood Johnson Foundation. (2002-2009). *Assessment of Primary Care Resources and Supports for Chronic Disease Self-Management*. Diabetes Initiative. <http://www.diabetesinitiative.org/build/PCRS.html>

- Schmitt, A., Gahr, A., Hermanns, N., Kulzer, B., Huber, J., & Haak, T. (2013). The Diabetes Self-Management Questionnaire (DSMQ): Development and evaluation of an instrument to assess diabetes self-care activities associated with glycaemic control. *Health and Quality of Life Outcomes*, 11(138), 1-14. <http://www.hqlo.com/content/11/1/138>
- Schmitt, A., Reimer, A., Hermanns, N., Huber, J., Ehrmann, D., Schall, S., & Kulzer, B. (2016). Assessing diabetes self-management with the Diabetes Self-Management Questionnaire (DSMQ) can help analyse behavioural problems related to reduced glycaemic control. *PloS One*, 11(3), e0150774. <https://doi.org/10.1371/journal.pone.0150774>
- Schmitt, A., Kulzer, B., Ehrmann, D., Haak, T., & Hermanns, N. (2022). A self-report measure of diabetes self-management for Type 1 and Type 2 diabetes: The Diabetes Self-Management Questionnaire – Revised (DSMQ-R): Clinimetric evidence from five studies. *Frontiers in Clinical Diabetes and Health Care*, 2(823046). <https://doi.org/10.3389/fcdhc.2021.823046>
- Seidu, S., Achana, F.A., Gray, L.J., Davies, M.J., Khunti, K. (2016). Effects of glucose-lowering and multifactorial interventions on cardiovascular and mortality outcomes: A meta-analysis of randomized control trials. *Diabetes Medicine*, 33(3), 280-289. <https://doi.org/10.1111/dme.12885>
- Shrivastava, S.R., Shrivastava, P.S., & Ramasamy, J. (2013). Role of self-care in management of diabetes mellitus. *Journal of Diabetes and Metabolic Disorders*, 12(14). <https://doi.org/10.1186/2251-6581-12-14>
- Straus, S. E., Tetroe, J., & Graham, I. (2009). Defining knowledge translation. *CMAJ: Canadian Medical Association Journal*, 181(3/4), 165–168. <https://doi.org/10.1503/cmaj.081229>
- Wee, P.J.L., Kwan, Y.H., Loh, D.H.F., Phang, J.K., Puar, T.H., Østbye, T., Thumboo, J., Yoon, S., & Low, L.L. (2021). Measurement properties of patient-reported outcome measures for diabetes: Systematic review. *Journal of Medical Internet Research*, 23(e25002). <https://doi.org/10.2196/25002>
- Whitehouse, C.R., Haydon-Greatting, S., Brady, V., Bzowycy, A.S., Smith, T., Srivastava, S.B.,

- Kauwetuitama, A.I., Blanchette, J., Cedrone, M., & Litchman, M. (2022). Economic impact and healthcare utilization outcomes of diabetes self-management education and support interventions for persons with diabetes: A systematic review protocol. *JBIE Evidence Synthesis*, 20(1), 238-248. <https://doi.org/10.11124/JBIES-20-00550>.
- World Health Organization. (2021, 10 November). *Key Facts. Diabetes*. <https://www.who.int/news-room/fact-sheets/detail/diabetes>
- World Health Organization. (2022). *Diabetes*. World Health Organization. [https://www.who.int/health-topics/diabetes#tab=tab\\_1](https://www.who.int/health-topics/diabetes#tab=tab_1)
- Yan, L., Xu, J., Zhao, W., & Han, H.R. (2016). Measuring self-care in persons with Type 2 diabetes: A systematic review. *Evaluation & the Health Professions*, 39(2), 131-184. <https://doi.org/10.1177/0163278715588927>
- Zimbudzi, E., Lo, C., Misso, M. L., Ranasinha, S., Kerr, P. G., Teede, H. J., & Zoungas, S. (2018). Effectiveness of self-management support interventions for people with comorbid diabetes and chronic kidney disease: A systematic review and meta-analysis. *Systematic Reviews*, 7(84), 1-14. <https://doi.org/10.1186/s13643-018-0748-z>



**Table 1****Table 1.** Summary of patient participants demographic averages

Variable	average
Age	62.21
BMI	37.76
A1C	7.0%

**Table 2****Table 2.** Patient participants demographics and number of DSMQ completed and goals established

Variable	<i>n</i>	%
Gender		
Male	53	61.63
Female	33	38.37
Race		
White	81	94.19
Hispanic	5	5.81
Number of DSMQ completed	86	100.00
Number of Goals Established	86	100.00

**Table 3**

Summary statistics of the participants PCRS level of performance scores can be found below.

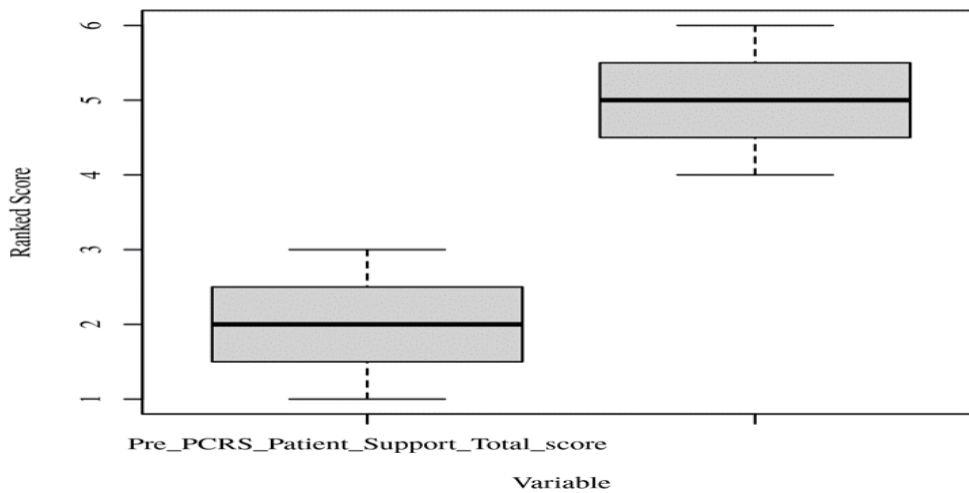
**Table 3.** Provider PCRS level of performance scores for Patient Support characteristics

variable	Initial PCRS Score			Final PCRS Score		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Individualized assessment	8.00	0.00	3	9.00	0.00	3
Self-management education	8.33	0.58	3	9.00	0.00	3
Goal-setting/action planning	5.33	0.58	3	8.67	0.58	3
Problem-solving skills	8.67	0.58	3	9.00	0.00	3
Emotional health	9.00	0.00	3	9.67	0.58	3
Patient involvement	8.67	1.15	3	9.33	0.58	3
Patient social support	9.00	1.00	3	9.33	0.58	3
Link to community resources	8.33	0.58	3	8.67	0.58	3

*Wilcoxon difference significance level: p = .109*

**Figure 1**

**Figure 1.** Wilcoxon signed ranked value of initial and final PCRS scores for Patient Support



**Table 4**

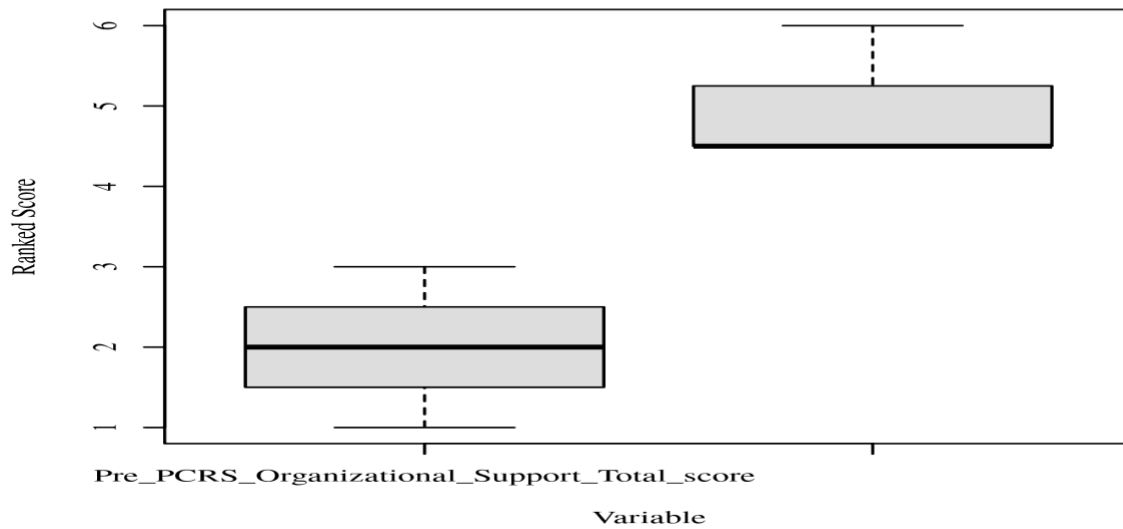
**Table 4.** Provider PCRS level of performance scores for Organizational Support characteristics

Variable	Initial PCRS Score			Final PCRS Score		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Continuity of care	10.00	0.00	3	10.00	0.00	3
Coordination of referrals	6.67	0.58	3	7.33	0.58	3
Ongoing quality improvement	8.33	0.58	3	9.00	0.00	3
Systems for documentation of SMS	7.67	0.58	3	9.00	0.00	3
Patient input	8.33	0.58	3	9.33	0.58	3
Integration of SMS into primary care	8.00	0.00	3	8.67	0.58	3
Patient care team	10.00	0.00	3	10.00	0.00	3
Education and training	8.00	0.00	3	8.00	0.00	3

*Wilcoxon difference significance level: p = .102*

**Figure 2**

**Figure 2.** Wilcoxon signed ranked value of initial and final PCRS score for Organizational Support



## Appendix A

Diabetes Self-Management Questionnaire (DSMQ)					
The following statements describe self-care activities related to your diabetes. Thinking about your self-care over the last 8 weeks, please specify the extent to which each statement applies to you.		Applies to me very much	Applies to me to a considerable degree	Applies to me to some degree	Does not apply to me
1.	I check my blood sugar levels with care and attention. <input type="checkbox"/> <i>Blood sugar measurement is not required as a part of my treatment.</i>	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
2.	The food I choose to eat makes it easy to achieve optimal blood sugar levels.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
3.	I keep all doctors' appointments recommended for my diabetes treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
4.	I take my diabetes medication (e. g. insulin, tablets) as prescribed. <input type="checkbox"/> <i>Diabetes medication / insulin is not required as a part of my treatment.</i>	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
5.	Occasionally I eat lots of sweets or other foods rich in carbohydrates.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
6.	I record my blood sugar levels regularly (or analyse the value chart with my blood glucose meter). <input type="checkbox"/> <i>Blood sugar measurement is not required as a part of my treatment.</i>	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
7.	I tend to avoid diabetes-related doctors' appointments.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
8.	I do regular physical activity to achieve optimal blood sugar levels.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
9.	I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
10.	I do not check my blood sugar levels frequently enough as would be required for achieving good blood glucose control. <input type="checkbox"/> <i>Blood sugar measurement is not required as a part of my treatment.</i>	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
11.	I avoid physical activity, although it would improve my diabetes.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
12.	I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets). <input type="checkbox"/> <i>Diabetes medication / insulin is not required as a part of my treatment.</i>	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
13.	Sometimes I have real 'food binges' (not triggered by hypoglycemia).	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
14.	Regarding my diabetes care, I should see my medical practitioner(s) more often.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
15.	I tend to skip planned physical activity.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
16.	My diabetes self-care is poor.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

Schmitt, et al., 2013