

Utilizing English and Spanish Multimodal Low Literacy Diabetes Self-Management Education to Improve Diabetes Knowledge: A Quality Improvement Project in a Low-Cost Clinic

Kamasha L. Stinson

Lenoir-Rhyne University DNP/FNP Program

DNP 690.70-DNP Scholarly Project III

Author Note

Kamasha Stinson, DNP, RN, FNP <http://orcid.org/0000-0003-0881-0377>

Carla Fallas, DNP, RN, FNP-BC <http://orcid.org/0000-0002-2012-2836>

Reatna Taylor, MPH, RDN, LDN <http://orcid.org/0000-0003-1590-6166>

Kerry Thompson, RN, MSN, PhD <http://orcid.org/0000-0001-7228-845X>

There are no conflicts to disclose.

Correspondence concerning this article should be addressed to Kamasha Stinson, Douglasville,

GA 30134. Email: kamstinson22@gmail.com

Abstract

Background

Health literacy is a vital competence when working toward successful management of Type II Diabetes (T2D). The ability to understand, assess, and apply health information in order to make judgements and decisions every day to maintain or improve quality of life is important.

Sufficient health literacy is linked to an individual's knowledge, motivation, and self-efficacy resulting in better health conditions and self-efficacy in people with T2D (Finbraten et al., 2020).

Objective

This quality improvement project aimed at initiating health literacy screenings and utilizing English and Spanish multimodal low literacy diabetes self-management education (DSME) to increase diabetes knowledge in adult patients with T2D.

Methods

A Registered Dietitian health educator in the health and wellness program of a community health center administered the Brief Health Literacy Screening (BHLS) and a pre-intervention Spoken Knowledge in Low Literacy in Diabetes Scale (SKILLD) to 20 adult patients with T2D to screen literacy levels and diabetes knowledge prior to their DSME session. The DSME was then offered in English and Spanish with low literacy handouts and audiovisual videos. A post-intervention SKILLD survey was conducted one week after the DSME to test the association between low health literacy DSME and diabetes knowledge.

Results

Thirty-four patients signed up to participate in the DSME group session, but only twenty-four patients attended the low literacy screening and low literacy DSME session. The BHLS screening indicated that 41.7 % of the participants had adequate health literacy, 37.5 % had moderate health literacy, and 20.8 % had limited health literacy. A two-tailed sample t-test was

conducted to examine whether the mean difference of the pre-intervention SKILLD survey and the post intervention SKILLD survey were significantly impacted by the language specific low literacy DSME session. An alpha value of .05, $t(23) = -4.10, p < .001$ revealed that low literacy DSME educational handouts and audiovisual videos significantly improved diabetes knowledge in the participants of this intervention.

Conclusion

The primary outcome of administering health literacy screenings on patients with T2D was successful. Evidence of limited health literacy and diabetes knowledge were noted in several participants prior to the DSME session. The post-intervention SKILLD survey revealed significant improvements in diabetes knowledge with the utilization of language specific multimodal low-literacy DSME.

Keywords: diabetes; diabetes knowledge; diabetes-self management education; adults; health literacy; self-efficacy

Utilizing English and Spanish Multimodal Low Literacy Diabetes Self-Management Education to Improve Diabetes Knowledge: A Quality Improvement Project in a Community Health Center

Type 2 Diabetes (T2D) is one of the most common chronic conditions in the United States, affecting 34 million adults and continues to be a national healthcare issue ranking as the seventh leading cause of death and the leading cause of blindness (CDC, 2020). Diabetes causes microvascular and macrovascular complications when blood glucose levels are elevated long term (Negash & Yismaw, 2020). Poor self-care management is a vital factor resulting in mortality among people who have diabetes (Masoompour et al., 2017). In 2016, there were 16 million ED visits in the United States for hyperglycemic and hypoglycemic concerns among adults over age 18 years. Hospitalizations included 1.7 million for cardiovascular issues, 130,000 lower extremity amputations, and tens of thousands for stroke, diabetic ketoacidosis, and hyperosmolar hyperglycemic syndrome (CDC, 2020). The prevalence rate of diabetes and diabetes-related complications are expected to increase from 8.8 percent to 10.4 percent by the year 2040 (Marciano et al., 2019). Diabetes self-management education (DSME) has been proven an important tool for improved self-care management and the prevention of complications (Negash & Yismaw, 2020). Studies have found that health literacy and diabetes numeracy, the ability to read, understand and apply information and perform basic numerical operations has a positive correlation with self-efficacy and diabetes self-care management (CDC, 2021).

Practitioners have found that diabetes self-management education alone does not significantly improve self-care management and that lack of understanding leads to self-care management neglect (Okan et al., 2019). Health literacy screenings are vital in diabetes management but are not a part of the initial comprehensive assessment. Research has found that

most patients only remember 30 percent of what a healthcare provider says and only 50 percent of the retained information is remembered correctly (Heinrich, 2012). Other studies have found a direct correlation between health literacy, self-efficacy, and self-care management (CDC, 2021). The American Diabetes Association (ADA) recommends that all patients with diabetes receive a health literacy screening during the initial comprehensive assessment (American Diabetes Association, 2019).

This quality improvement project aimed at improving diabetes knowledge in a community health center by initiating health literacy screenings and utilizing English and Spanish multimodal low literacy DSME. All participants were screened for health literacy by completion of the Brief Health Literacy Screening Tool (BRIEF) Haun et al., (2017) and for diabetes knowledge by completion of a pre and post Spoken Knowledge in Low Literacy in Diabetes scale (SKILLD), (Hu et al., 2020).

Review of Literature

A systematic review of literature was conducted using CINAHL and PubMed, to evaluate the effectiveness of health literacy screenings and low literacy DSME on diabetes knowledge and self-care management of patients living with diabetes.

Diabetes Self-Management Education and Support (DSMES)

The American Diabetes Association (ADA) recommends that the management of diabetes be accomplished by using a multidisciplinary team who elicits the patient's preferences and beliefs, assesses literacy, numeracy, day-to-day activities, and provides diabetes self-management education and support (DSMES). Diabetes self-care management consist of self-monitoring and testing of blood glucose, eating healthy, medication management, exercising on a regular basis, and foot care. Utilizing DSMES to educate appropriate self-care management is

proven to significantly reduce diabetes-related complications as well as improve the patient's problem-solving skills, decision-making skills, use of resources, and the self-efficacy to perform self-care activities (Hailu et al., 2019). Despite many medical advances in education, T2D is still a prevalent and progressive disease with new cases increasing substantially in the last 10 years in the youth and young adult populations (CDC, 2020). The problem identified in countless systematic research articles is failure to detect low health literacy (Okan et al, 2019). To make education more patient-centered, DSMES should be multicultural and provided in the patient's native language.

Health Literacy

Healthcare professionals and researchers have found that the newest vital sign is health literacy (AADE, 2019). Health literacy and numeracy determines the extent, to which, a person is able to access the information needed to make informed decisions, the ability to interpret blood glucose numbers, nutrition labels, carb-to-insulin ratios, and to know how to manage high or low blood sugar levels (Zaugg et al., 2014). Health literacy also includes, reading and writing health-related materials, knowledge of their own health and the healthcare world, and the ability to listen and communicate with provider effectively (Heinrich, 2012). To date, health literacy screenings are not a part of assessment (AADE, 2019).

Evidence has proven its importance in the patient's self-efficacy, disease management, and life expectancy (AADE, 2019). A study conducted by Masoompour et al., (2017), found that 70 percent of people who live with diabetes lack adequate communicative health literacy, making it difficult to obtain health information and identify with various forms of communication. They assessed 299 individuals to determine the relationship between health literacy, self-efficacy, and self-care behaviors. Mean scores of communicative health literacy,

self-efficacy, and self-care behaviors were 63.6 ± 20.7 (score range: 17 and 100), 146.3 ± 22.9 (range: 54 to 190), and 61.4 ± 14.3 (range: 24 to 115). Proving a significant and positive correlation between communicative health literacy and self-care behaviors had occurred ($p=0.04$, $r=0.1$). As health literacy increases, an improvement in the patient's self-care behaviors also increases (Masoompour et al., 2017). Since communicative health literacy has a direct correlation with self-care behavior, multiple studies (Masoompour et al., 2017; Mann et al., 2019; Watts et al., 2017) agree that a reduction in hospitalizations, and prevention of short- and long-term complications occur if patients are given low literacy education (Gehlawat et al., 2019).

Risk of Low Health Literacy

Disease prognosis and prevention of long-term complications depends on the self-care behaviors of the patient. Thus, inadequate self-care practices lead to disability and mortality (Marciano et al., 2019). Mann et al., (2019), evaluated 170 participants with diabetes to assess if low literacy is associated with progression of disease. Results revealed that 71% of participants were unable to understand nutritional labels, 20% of those could not read or write, and 30% were only reading at 5th grade level (Mann et al., 2019). This study found a direct correlation between low numeracy, self-efficacy, poor management skills, and inadequate control of blood glucose levels (Mann et al., 2019). Further investigation of participants found that 61% had microvascular complications, indicating that people with low literacy have a 2.15 percent increased risk of developing complications than those with high literacy (Mann et al., 2019).

Other difficulties with portion control and overconsumption of carbohydrates, misinterpretation of food labels and blood glucose levels, along with medication errors resulting in more emergency department visits and hospitalizations in comparison to those with high health literacy (Watts et al., 2017). Common areas where people who have diabetes encounter

self-care challenges are attending routine appointments, calculating carbohydrates, identifying when glucose levels are within normal range, calculating insulin-to-carbohydrate ratio's, weighing, and reducing risks, and glucose monitoring (AADE, 2019). A study conducted in a primary clinic found that self-efficacy is associated with better self-care behaviors, while improvement in health literacy and numeracy is associated with improved self-efficacy (Watts et al., 2017).

Low health literacy is also linked to disorientation in the healthcare system, especially with the older population. Knowledge of who to contact for certain health problems is unknown as well as how to access health information needed to make important decisions. These findings are often linked to depression and more hospitalizations (Okan et al., 2019). Fewer preventative measures are utilized with people who have limited health literacy regarding diabetic foot care, “sick day” care, annual vaccinations, and screenings (Okan et al., 2019).

Another study exploring the connection between health literacy and diabetes management looked at 408 people with T2D and found that people with lower health literacy were two times more likely to have limited blood glucose management skills resulting in a hemoglobin A1C of greater than 9.5 % (AADE, 2019). People with low health literacy have greater challenges understanding medical instructions, provide worse subjective data and history of presenting problems, and have a lesser life expectancy than those with higher health literacy (AADE, 2019). Another study reported that limited health literacy might also result in medication errors, missed doctor appointments, unfavorable medical outcomes, and lower patient satisfaction (Watts et al., 2017). Low health literacy is also associated with higher health care costs and the inability of most health systems to accommodate the needs of patients with low health literacy (Wallston et al., 2014)

Health Literacy Screenings

Health literacy screenings are viewed as the newest vital sign and the Standards in Medical Care in Diabetes recommends screenings during the initial comprehensive assessment on all patients with diabetes (American Diabetes Association, 2019). Literacy screenings should encompass social and cultural components to empower individuals to perform self-care that maintains or improves quality of life (Okan et al., 2019). There are many different tools that are used for health literacy screenings, but the screening tool used in this study was found to be both reliable and culturally appropriate for diverse populations.

The BRIEF survey has been utilized in many studies to assess the correlation between health literacy and diabetes knowledge, self-efficacy, and diabetes self-care. Researchers found that the BRIEF survey proves reliability and validity in assessing for low literacy and is accurate at identifying inadequate health literacy skills by demonstrating a 95 % sensitivity rate for detecting low literacy (Huan et al., 2017).

Assessing Diabetes Knowledge in Patients with Low-Literacy

Many diabetes knowledge tests exist; however, there are only two published diabetes-related knowledge (DRK) test specifically designed for individuals with low literacy: the SKILLD scale (Rothman et al., 2005) and the SKILLD scale that measures diabetes knowledge among Hispanics with T2D (Hu et al., 2020). The SKILLD is a 10-item orally administered test that was developed to assess core patient knowledge about diabetes self-care issues including glucose management, appropriate lifestyle modifications, the recognition and treatment of acute complications, and appropriate activities to prevent long-term consequences of uncontrolled disease (Rothman et al., 2005). The questions are based on concepts shown to enhance comprehension among patients with low-literacy and limited reading comprehension.

The SKILLD was tested for reliability and validity and proven to be a good measuring tool for the assessment of critical diabetes knowledge and diabetes self-care activities in patients who have T2D. (Hu et al., 2020). Utilization of the SKILLD tool along with patient centered low literacy education proved to have a significantly high correlation with diabetes self-care skills and diabetes knowledge in people with T2D (Hu et al., 2020). In the study conducted by Rothman et al., (2005), the SKILLD demonstrated good internal consistency and revealed knowledge deficits in the participants. In this study, participants with low SKILLD scores were unaware of the symptoms of high or low blood glucose levels.

Low Literacy DSME

Detection of low health literacy and providing low literacy DSME has been shown to significantly improve the patient's diabetes knowledge and self-efficacy, leading to increased participation in treatment plans and better glycemic control (Okan et al., 2019; Masoompour et al., 2017). Diabetes knowledge is an important factor when performing self-care activities and health literacy is an important factor in a person's ability to learn, comprehend, and apply the diabetes knowledge in the management of T2D (Wolfe et al., 2015). The Partnership to Improve Diabetes Education (PRIDE) toolkit was created to provide diabetes education and support at a low literacy level in both Spanish and English to assist in the management of diabetes (Wolfe et al., 2015). The PRIDE toolkit was created using the recommendations made by the ADA and the National Standards for Diabetes Self-Management Education, to include material that was adapted for cultural influence, education about comorbidities, designed to be interactive, and addressed the patients' health literacy (Wolfe et al., 2015). This outcome resulted in modules that encouraged behavior change, Spanish acculturation, and education about how diabetes affects blood pressure, cholesterol, and medication adherence (Wolfe et al., 2015).

Purpose

The primary purpose of this QI project was to utilize a health educator within a community health center to assess adult patients with T2D for health literacy during their initial group DSME session. The secondary outcome of this QI project was to provide English and Spanish multimodal, low literacy DSME that would subsequently improve diabetes knowledge within a community health center in western North Carolina.

Methodology**Context**

This was a quantitative method QI project where a health educator from a community health center utilized the BRIEF screening to detect low literacy during an initial English and Spanish multimodal low literacy group DSME session. The group DSME session involved assessing diabetes knowledge with a pre and post SKILLD test.

Participants and Setting

A registered dietician health educator in the health and wellness program of a community health center was the primary participant of this QI project. Other staff members that participated in the preparation, DSME group session, and data collection included a videographer, a nurse practitioner, and an intern. Only one group DSME session was held at the community health center.

Intervention

This QI project required participation of various inter-professional roles to prepare the English and Spanish multimodal DSME intervention. During the planning stage of the project, the primary investigator (PI) prepared low-literacy audio-visual video scripts that were based on

the PRIDE toolkit. With the assistance of the community health center's videographer, the PI and bilingual nurse practitioner created the following English and Spanish low-literacy audio-visual DSME videos:

1. Blood Glucose Monitoring,
2. How to Read a Nutritional Label,
3. Administration of Anti-hyperglycemic Medications,
4. Recognizing and Treating Hypoglycemia and Hyperglycemia,
5. Common Diabetes-Related Complications and Prevention.

The 3–5-minute videos were edited by the community health centers videographer and then returned to the PI for use during the group educational sessions.

This QI project also required training of the primary participant, the registered dietician, in how to utilize and implement the BRIEF survey, SKILLD tests, PRIDE toolkit, and audiovisual DSME video clips. The registered dietician was trained via a recorded ZOOM conference meeting. English and Spanish modules from the PRIDE toolkit that were related to the videos were also reviewed, printed, and provided as handouts. During the training, the PI expressed the importance of health literacy and numeracy screenings among people who have diabetes and how to address health literacy, numeracy, and self-management in a culturally sensitive manner.

After obtaining the Institutional Review Board approval the group DSME educational session was scheduled. Secured text message English and Spanish flyer invitations were sent to all adult patients, 18 years of age and older, with diabetes in the community health center.

Patients were asked to confirm via text if they wanted to attend the event. A clinic intern was

assigned the responsibility of calling and confirming the attendees a few days prior to the session.

The day of the group DSME session, the patients were asked to sign-in and complete the English or Spanish BRIEF health literacy screening. They were also individually administered the English or Spanish pre-intervention SKILLD test to evaluate their baseline knowledge of diabetes. During the English and Spanish multimodal group DSME session the patients were provided culturally sensitive written educational handouts from the PRIDE toolkit along with a text link of the audio-visual video clips. All patients received gift bags with English or Spanish handouts, a hypoglycemia symptom magnet, a continuous glucose monitor (CGM), CGM sensor pack, and a monofilament foot screen test. The bilingual registered dietician and nurse practitioner verbally demonstrated use of the gift bag supplies and discussed the educational content in-depth providing time for questions and answers. A post-intervention SKILLD test was administered via phone by the registered dietician one week after the group DSME session had passed.

All patient demographics were collected from the eClinical Works electronic health record (EHR) and securely documented in an excel spreadsheet accessible only by the PI and registered dietician. Access to the eClinical Works EHR program was granted by the clinic administrator and password protected. The patient BRIEF survey and pre-and-post intervention SKILLD test scores were also securely documented in the same excel spreadsheet. All data was de-identified to protect patient confidentiality.

Study of the Intervention

The primary outcome was to utilize a health educator within a community health center to assess adult patients with T2D for health literacy during their initial group DSME session. The

secondary outcome was to provide English and Spanish multimodal, low literacy DSME that would subsequently improve diabetes knowledge. Process measures included a comparison of pre- and post-implementation SKILLD test scores to evaluate for diabetes knowledge.

Measures

To measure the primary outcome of assessing patients with T2D for health literacy during their initial group DSME session, the BRIEF survey was administered. Quantitative data was collected on the BRIEF survey scores. The scores assisted the registered dietician in individualizing the DSME based on the patients' health literacy level.

To measure the secondary outcome of providing English and Spanish multimodal, low literacy DSME that would subsequently improve diabetes knowledge a log was kept of how many patients participated in the session. Quantitative process measure data was collected on the pre- and post-implementation SKILLD test scores to evaluate for diabetes knowledge.

Evaluation/Data Analysis

Descriptive statistics was used to illustrate the projects frequency and percentages of appointments, BRIEF health literacy scores, as well as patient demographics including age, race, and identified gender. A paired t-test was conducted to assess whether the utilization of English and Spanish multimodal, low literacy group DSME was effective in improving diabetes knowledge. All quantitative statistical analysis were computed using the Intellectus Statistics software.

Ethical Considerations

This QI project was approved by the Institutional Review Board (IRB) at Lenoir-Rhyne University in Hickory, North Carolina. The QI project was implanted at a community health center in North Carolina. Patients were not coerced into participating but instead invited to

ensure voluntary participation. All patient data was presented in aggregate form to protect confidentiality, information remained anonymous, and no identifiable data was released. Patients were represented by a number in the Intellectus Software. Data collected was password protected and only accessible by the registered dietician, bilingual nurse practitioner, and the PI. There were minimal risks associated with this QI project

Results

Patient Demographics

Twenty-six patients agreed to participate in the group low-literacy DSME session. Of those 24 patients, attended the DSME educational session. Demographics were collected on the participants including attendance, sexual orientation (male/female), age, and race.

There were a greater number of females (n=20, 83.33 %) who participated in the project. Age varied from 40 to 65, with an average age of 53.71 years.

BRIEF Health Literacy Scores

The results of the BRIEF showed that 20.8 % of the participants (n=5) had limited health literacy levels with an average score of 10. Moderate health literacy was noted 37.5 % of the participants (n=9) and adequate health literacy was noted in 41.7 % (n=10) of the patients (Table 1).

Table 1*Mean Performance Scores of Participants with Different Literacy Scores*

Variable	M	SD	n	SEm	Min	Max	Skewness	
BHLS limited 4-12	10.00	2.00	5	0.89	7.00	12	0.63	
BHLS moderate 13-16	14.78	1.39	9	0.46	13.00	17.00	0.12	
BHLS adequate 17-20	19.00	1.15	10	0.37	17.00	20.00	-0.91	-0.05

Note: '-' indicates the statistic is undefined due to constant data or an insufficient sample size. This table is showing average literacy scores for each category, limited, moderate, and adequate.

Correlation of Health Literacy and Diabetes Knowledge

No correlation was found with the level of health literacy and baseline diabetes knowledge. The participants who had limited literacy levels scored in the same ranges as those in the marginal and adequate literacy levels on the Pre SKILLD. Cohens standard was used to evaluate the strength of the relationship, coefficients between .10 and .29 represent a small effect size, coefficients between .30 and .49 represent moderate effect, and coefficients above .50 indicate large effect. The result for correlations between the limited health literacy and the pre-SKILLD survey was an alpha value of .05, showing no significant correlation (Table 2). The results for marginal health literacy and the pre-SKILLD had an alpha score of .05, indicating no significant correlation (Table 3). The results for adequate health literacy and the pre-SKILLD had an alpha value of .05, also showing no significant correlation (Table 4).

Table 2*Pearson Correlation Results Between BHLS limited literacy and SKILLD Pre-Intervention*

Combination	r	95.00% CI	n	p
BHLS limited	.19	[-.83, .92]	5	.763

Table 3*Pearson Correlation Results Between BHLS marginal literacy and SKILLD Pre-Intervention*

Combination	r	95.00% CI	n	p
BHLS limited	.23	[-.51, .77]	9	.557

Table 4*Pearson Correlation Results Between BHLS adequate literacy and SKILLD Pre-Intervention*

Combination	r	95.00% CI	n	p
BHLS limited	.35	[-.80, .36]	10	.317

Pre and Post SKILLD Paired *t*-test

The result of the two-tailed paired sample *t*-test was significant based on an alpha value of .05, $t(23) = -4.10$, $p < .001$, revealing that low literacy DSME education significantly improved diabetes knowledge based on the scores obtained from the Pre and Post SKILLD scale (Table 2). This finding suggests the difference in the mean of the SKILLD pre-intervention and the mean of SKILLD post intervention was significantly different from zero. A bar plot of the means is presented in Figure 1. The results of the two-tailed Wilcoxon signed rank test were significant based on an alpha value of .05, $V = 14.00$, $z = -3.13$, $p = .002$ indicating that the

differences between SKILLD pre intervention and SKILLD post intervention are not likely due to random variation. The median of SKILLD pre intervention ($Mdn = 0.80$) was significantly lower than the median of SKILLD post intervention ($Mdn = 0.90$). These findings show an increase in diabetes knowledge after using low literacy DSME to educate the participants about diabetes care and management (Figure 1). The pre intervention SKILLD scores revealed low diabetes knowledge in this group of participants (Table 2). The items of the SKILLD scale that showed the lowest level knowledge were (question 2) describing signs of low blood sugar; (question 7) knowing the signs of high blood sugar; (question 6) how often should you see the eye doctor and why; (question 8) what is a normal fasting blood glucose; and what is a normal Hgb A1C reading (Table 3).

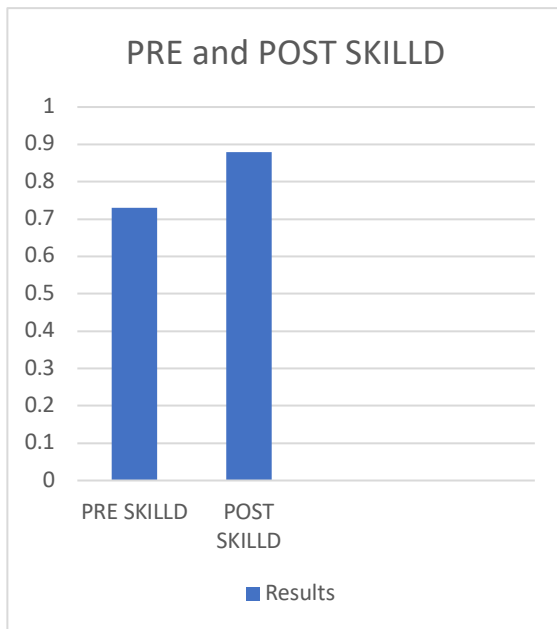
Table 2

Two-Tailed Paired Samples t-Test for the Difference Between SKILLD pre intervention scores and SKILLD post

Intervention scores

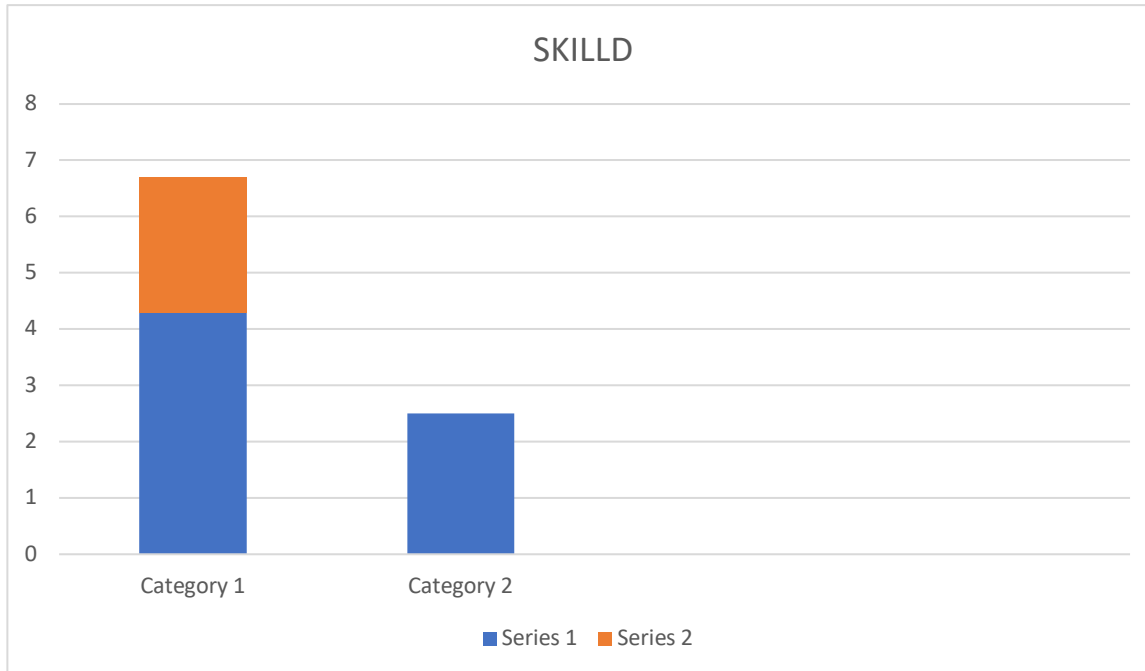
SKILLD PRE_INTERVENTION		SKILLD_POST_INTERVE NTION		<i>t</i>	<i>p</i>	<i>d</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
0.73	0.20	0.88	0.10	-4.10	< .001	0.84

Note. N = 24. Degrees of Freedom for the *t*-statistic = 23. *d* represents Cohen's *d*.

Figure 1*Mean Pre and Post Intervention SKILLD Scores*

Note: Figure 2 presents a boxplot of the ranked values of SKILLD pre intervention and SKILLD post intervention scores. The results of the two-tailed Wilcoxon signed rank test were significant based on an alpha value of .05, $V = 14.00$, $z = -3.13$, $p = .002$. These findings show an increase in diabetes knowledge after using low literacy DSME to educate the participants about diabetes care and management.

Figure 2*Ranked values of SKILLD Pre Intervention and SKILLD Post Intervention*



Most participants scored the lowest on (question 13) knowing what a normal fasting blood glucose is. Many participants also had little knowledge of what a normal Hb A1C is (question 8).

Table 3

Frequency Table for Nominal Variables

Variable	<i>n</i>	%
Question_1		
Missed	6	25.00
Correct	18	75.00
Question_2		
Missed	8	33.33
Correct	16	66.67
Question_3		
Correct	23	95.83
Missed	1	4.17
Question_4		
Correct	19	79.17
Missed	5	20.83
Question_5		
Correct	16	66.67
Missed	8	33.33
Question_6		

Frequency Table for Nominal Variables

Variable	<i>n</i>	%
Missed	12	50.00
Correct	12	50.00
Question_7		
Missed	13	54.17
Correct	11	45.83
Question_8		
Missed	9	37.50
Correct	15	62.50
Question_9		
Correct	23	95.83
Missed	1	4.17
Question_10		
Correct	22	91.67
Missed	2	8.33

Note. Due to rounding errors, percentages may not equal 100%.

Discussion

In this study, the primary outcome was successfully met by utilizing a health educator within a community health center to assess adult patients with T2D for health literacy during their initial group DSME session. The secondary outcome was also successfully met by providing English and Spanish multimodal, low literacy DSME that would subsequently improve diabetes knowledge.

Screening for health literacy helped the primary participant identify that 20 -36 % of the participants of the group session had limited-moderate health literacy levels. Data shows that despite literacy level, the scores obtained on the Pre intervention SKILLD survey were similar in each category, limited, moderate, and adequate. Even though the Pre- SKILLD showed diabetes knowledge deficits and many participants scored low on recognizing high and low blood sugar, only one participant reported having no knowledge of how to treat a low blood sugar. Providing

low literacy DSME improved SKILLD scores, indicating an improvement in diabetes knowledge. The results of the paired t-test revealed that language specific, multimodal low literacy DMES education significantly improves education retention among people with diabetes who have lower literacy levels.

Limitations

Low literacy DSME education is extensive. One limitation encountered was time. Due to clinical scheduling time constraints, the community health center was only able to schedule one educational session. This schedule affected the amount of time spent on each educational handout and resulted in sharing the low literacy audiovisual videos via a text link versus live during the DSME session. The initial plan was to have the group of participants watch each of the five (5) videos along with each handout, but we found the information in the handouts provoked many questions that needed to be addressed before moving on to the next topic. To make sure each participant had an opportunity to view the videos, each participant was sent a secure message containing a link to view the videos. Additional time was built in the schedule for questions and answers. Another limitation was found during the planning phase of this QI project; there are limited resources available for this population. Currently, there is a limited amount of screening tools and diabetes education that encompass both cultural preferences and low literacy. The small sample size of the participants was also a limitation in this QI project.

Conclusions

The results found in this QI project were similar to what has been found in similar populations in the United States. Failure to recognize signs of low blood sugar or high blood sugar and not being able to distinguish the difference will lead to mistreatment or injury (CDC, 2019). The results from the pre SKILLD test revealed significant knowledge deficits in diabetes

self-care management and the post- SKILLD revealed a significant improvement in diabetes knowledge after the educational session. Hu et al., (2020), found in their research that Hispanics in the United States have very low knowledge of normal A1C levels and believe it is partly due to language barriers and the lack of publicized resources available to the Hispanic population with low literacy. Detecting low literacy and providing low literacy DSMES education proves to be vital to ensure people living with diabetes are empowered to adopt sufficient self-care management skills.

References

- American Association of Diabetes Educators. (2019). *Cultural and Health Literacy Considerations with Diabetes*. American Association of Diabetic Educators: <https://www.diabeteseducator.org/docs/default-source/practice/educator-tools/cultural-and-health-literacy-considerations-with-diabetes.pdf?sfvrsn=2>
- American Diabetes Association. (2021). *Type 2 Diabetes: Life doesn't end with type 2 diabetes*. American Diabetes Association: <https://www.diabetes.org/diabetes/type-2>
- American Diabetes Association. (2019). Standards of Medical Care in Diabetes-2019 Abridged for Primary Care Providers. *Clinical Diabetes*, 37(1), 11-34. <https://doi.org/10.2337/cd18-0105>
- Centers for Disease Prevention and Control. (2019). *Type 2 Diabetes*. Centers for Disease and Prevention: <https://www.cdc.gov/diabetes/basics/type2.html>
- Centers for Disease Prevention and Control. (2020). *National Diabetes Statistics Report, 2020*. Centers for Disease Control and Prevention: <https://www.cdc.gov/diabetes/library/features/diabetes-stat-report.html>
- Finbraten, H. S., Guttersurd, O., Nordstrom, G., Petterson, K.S., Trollvik, A., & Wilde-Larsson, B. (2020). Explaining variance in health literacy among people with type 2 diabetes: The association between health literacy and health behaviour and empowerment. *BMC Public Health*, 20(1), 161. <https://doi.org/10.1186/s12889-020-8274-z>
- Gehlawat, M., Lakshminarayanan, S., & Kar, S.S. (2019). Structured diabetes education program for improving self-care behavior in primary care settings of Puducherry: Evidence from a randomized controlled trial. *Indian Journal of Community Medicine*, 107-112. [doi:10.4103/ijcm.IJCM_192_18](https://doi.org/10.4103/ijcm.IJCM_192_18)

- Hailu, F. B., Moen, A., & Hjortdahl, P. (2019). Diabetes self- management education (DSME) – Effect on knowledge, self-care /behavior, and self-efficacy among type 2 diabetes patients in Ethiopia: A controlled trial. *Diabetes, Metabolic Syndrome, and Obesity: Targets and Therapy*, 12, 2489-2499. <https://doi.org/10.2147/DMSO.S223123>
- Heinrich, C. (2012). Health Literacy: The sixth vital sign. *Journal of American Academy of Nurse Practitioners*, 24(4), 218-233. <https://doi.org/10.1111/j.1745-7599.2012.00698.x>
- Hu, J., Amirehsani, K. A., McCoy, T. P., Wallace, D. C., Coley, S. L., & Zhan, F. (2020). Reliability and validity of the spoken knowledge in low literacy in diabetes in measuring diabetes knowledge among Hispanics with type 2 diabetes. *The Diabetes Educator*, 46(5), 465-474. [doi: 10.1177/0145721720941409](https://doi.org/10.1177/0145721720941409)
- Huan, J., Noland-Dodd, V., Varnes, J., Graham-Pole, J., Rienzo, B., & Donaldson, P. (2017). Testing the BRIEF health literacy screening tool. *Federal Practitioner*, 24-31. Center of Innovation on Disability & Rehab Research. [doi: 10.1177/0145721720941409](https://doi.org/10.1177/0145721720941409)
- Mann, B. K., Singh, S.A., Dabas, R., Davoudi, S., & Osvath, J. (2019). Evaluation of effects of health literacy, numeracy skills, and english proficiency on health outcomes in the population of people with diabetes in east Harlem. *Clinical Diabetes*, 37(2), 172-175. [doi: 10.2337/cd18-0068](https://doi.org/10.2337/cd18-0068)
- Marciano, L., Camerini, A.-L., & Schulz, P.J. (2019). The role of health literacy in diabetes knowledge, self-care, and glycemic control: A meta-analysis. *Journal of General Internal Medicine*. 34, 1007-1017. [doi: 10.1007/s11606-019-04832-y](https://doi.org/10.1007/s11606-019-04832-y)

- Masoompour, M., Tirgari, B., & Ghazanfari, Z. (2017). The relationship between health literacy, self-efficacy, and self-care behaviors in diabetic patients. *Evidence Based Care Journal*, 7(3), 17-25. <https://doi.org/10.22038/ebcj.2017.24826.1551>
- Negash, Z., & Yismaw, M. (2020). Management practice and contributing risk factors for chronic complications among type 2 diabetes mellitus adult patients in follow-up at a tertiary care, teaching hospital. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 13, 3969-3976. [doi: 10.2147/DMSO.S275677](https://doi.org/10.2147/DMSO.S275677)
- Okan, O., U., Levin-Zamir, D., Pinheiro, P., & Sorensen, K. (2019). International handbook of health literacy research, practice, and policy across the lifespan. Chicago: North America office: Policy Press. [eISBN978-1-4473-4452-0](https://doi.org/10.1007/978-1-4473-4452-0)
- Rothman, R. L., Malone, R., Bryant, B., Wolfe, C., Padgett, P., Dewalt, D. A., Pigone, M. (2005). The spoken knowledge in low literacy in diabetes scale. *The Diabetes Educator*, 31(2), 215-224. [doi: 10.1177/0145721705275002](https://doi.org/10.1177/0145721705275002).
- Wallston, K. A., Cawthon, C., McNaughton, C. D., Rothman, R. L., Osborn, C. Y., & Kripalani, S. (2014). Psychometric properties of the brief health literacy screen in clinical practice. *J Gen Intern Med*, 29(1), 119-126. [doi: 10.1007/s11606-013-2568-0](https://doi.org/10.1007/s11606-013-2568-0)
- Watts, S., Stevenson, C., & Adams, M. (2017). Improving health literacy in patients with diabetes. *Nursing*, 47(1), 24-31. [doi: 10.1097/01.NURSE.0000510739.60928.a9](https://doi.org/10.1097/01.NURSE.0000510739.60928.a9)
- Wolfe, K., Chambers, L., Bumol, S., White, R. O., Gregory, B. P., D., & Rothman, R.L. (2015). The PRIDE (Partnership to Improve Diabetes Education) toolkit: Development and evaluation of novel literacy and culturally sensitive diabetes education materials. *The Diabetes Educator*, 42(1), 23-33. [doi: 10.1177/0145721715620019](https://doi.org/10.1177/0145721715620019)

