Culturally Sensitive Diabetes Education for Hispanics

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Abstract

Background: Type II diabetes mellitus (T2DM) is a growing issue globally. Social determinants of health (SDH) play a crucial role on patients' outcomes and complications from the disease. Hispanics are twice as likely to suffer from T2DM when compared to non-Hispanic whites, and they often rely on federally qualified community health centers (FQCHC) for their medical needs. These centers are then faced with high volume of patients with high acuity, which leads to limited time and resources to provide diabetic education.

Methods: The Purnell model of cultural competence will be used as a framework to provide unbiased, culturally tailored (CT) education to improve patients' outcomes. The advancing research and clinical practice through close collaboration (ARCC) model will be used as it focuses on evidence-based practice (EPB) implementation that is sustainable across the system.

Purpose: The purpose of this EBP project is to promote culturally tailored (CT) DSME at a low-income FQCHC in greater Phoenix to improve diabetes outcomes and decrease complications from the disease. Consequently, decreasing the costly effects of diabetes complications to patients, FQCHC, and the state of Arizona.

Conclusion: Evidence suggest that diabetes self-care management education (DSME) is successful, independent of the format of delivery, in improving diabetes outcomes and patients' self-care. However, it is underutilized in the United States even though it is a covered Medicare service.

Keywords: Hispanics, Latinos, diabetes, culturally tailored, DSME, A1C, self-care, community health clinic, group education.

Culturally Sensitive Diabetes Education for Hispanics

T2DM is a chronic disease linked to obesity and physical inactivity that causes disabling complications and high rates of mortality. As obesity rates increase globally, so does the rates of T2DM. Certain ethnic and racial groups are found to be at increased risk for the disease, which may be attributed to cultural practices regarding food, levels of activity, and/or genetics. Hispanics are twice as likely to have diabetes than non-Hispanic whites. (Centers for Disease Control and Prevention [CDC], 2019). Many factors place the Hispanic population at higher rates for the disease, including low socio-economic status, immigration status, limited access to healthcare, diet, and low levels of literacy, which has been shown to be an important factor in diabetes prevalence (Contreras, 2018). The low levels of education can result in lack of engagement to promote healthy behaviors, no trust in healthcare provider, lack of understanding on the seriousness of the condition, and non-compliance with treatment plan to achieve goals (Kane et al., 2016). This population most often relies heavily on federally qualified community health clinics (FQCHC) for their primary care needs, which often face staff shortages and high demand for services (Lewis, Getachew, Abrams, & Doty, 2019). Therefore, the patients might not receive appropriate education regarding their disease, its implications, risks, and how to improve their outcomes.

Purpose and Rationale

As aforementioned, the Hispanic population suffers with high rates of T2D and limited access to care. They are the fastest growing group in the U.S., and this growth is expected to be accompanied by increase in diabetic incidence, prevalence, and medical expenses (Arroyo-Johnson et al., 2016). This projected growth in population and diabetes needs to be accompanied by proper care to prevent progression of the disease and its complications. Community health

clinics (CHC) try to fill the gap in care by offering comprehensive primary care and preventative services to the most vulnerable at a low cost; therefore, diminishing the utilization of emergency services and hospitalizations (Lewis, Getachew, Abrams, & Doty, 2019). The strategies delineated by the Arizona health improvement plan for the year of 2020 includes increasing the utilization of a team-based approach, promote the use of established guidelines, increase participation in DSME, and increase awareness of prevention and management practices for diabetes and pre-diabetes (AZDHS, 2019). As the main avenue for primary care for Hispanics, FQCHC play a major role in providing chronic disease care; therefore, it is important for FQCHC to provide cost-effective and efficient education for patients to manage diabetes. As T2DM is linked to obesity and physical inactivity, it is critical to provide the necessary tools for patients to make the changes to decrease their weight and improve activity levels. The purpose of this EBP is to create a CT curriculum to provide DSME to the Hispanic patients and explore how CHC improve the lives of Hispanics who are diabetics and pre-diabetics through DSME.

Background and Significance

Diabetes Amongst Hispanics

Hispanics or Latinos are the largest racial/ethnicity in the US, and they are unfortunately 50% more likely to die from diabetes than whites (CDC Office of Minority Health and Health Equity, 2015). It is important to understand when speaking about Hispanics, that there are subgroups within the Hispanic communities, and their cultural and health practices may vary. Therefore, depending on the subgroup, the health risks might be higher or lower. Hispanics are also three times more likely than Caucasians to be uninsured (CDC Office of Minority Health and Health Equity, 2015). Another contributing factor is the socio-economic status (SES) and education of these individuals. Diabetes prevalence varies significantly based on education, with

highest incidence amongst those with less than high-school education (CDC, 2017). Low levels of educations can result in lack of understanding, inability to follow directions, mistrust from medical professionals, and limited compliance (Kane et al., 2016).

Annual individual income is also lower in the Hispanic population when compared to non-Hispanic blacks or whites, consistent with annual income less than $35,000. (Arroyo-Johnson et al., 2016). Another consideration with this population is their immigration status. Undocumented immigrants are excluded from governmental programs such as the Affordable Care Act (ACA) and Medicaid. This translates into undocumented Latinos having the worst access to care, using the Emergency Department (ED) as the primary source of care, and being less likely to use primary care services (Ortega et al., 2018). Diabetics with less access to care, lower levels of education, and lower SES develop higher rates of mortality and morbidity, and have poorer health outcomes (Hughes, Yang, Ramanathan, & Benjamins, 2016).

Diabetes Self-Management Education

The American Association of Diabetes Educators (AADE) define self-care behaviors for diabetics as including healthy eating, exercise, compliance with medication, self-monitoring of blood glucose levels, problem solving, and reducing risks such as not smoking, and foot self-examination (Mayberry et al., 2016). Nonetheless, estimates reflect that only 7% of insured patients and 5% of Medicare patients newly diagnosed with diabetes receive DSME (Chrvala, Sherr, & Lipman, 2016). The CDC provides lifestyle management programs that are paid by the patient, and they do attempt to include culturally appropriate education, but as Hispanics have cultural subsets, it is challenging to consider each culture individually. The AZDHS has initiatives in place to decrease the burden of diabetes in Arizona, including DSME classes for patients. These classes are provided in specific centers that are scattered throughout the Maricopa

metropolitan area, making accessibility a possible barrier to many of these patients. Moreover, one of the goals from Healthy People 2020 is to have an increase in formal education for patients diagnosed with diabetes (AZDHS, 2019). Therefore, it is important to utilize CHC to provide the necessary education to diabetic patients.

Healthcare Provider Driven Education

FQCHC are organizations that serve populations with limited access to care, and they are widely viewed as providing culturally competent care, as they treat the underserved populations. The Hispanic/Latinos population account for 35% of patients in FQCHC, with 40% being treated for diabetes (Ortega, Rodriguez, & Vargas-Bustamante, 2015). FQCHC aims to close the gap in care and minimize the amount of ED visits, which consequently minimizes the costs in healthcare. These FQCHC strive to increase access to care and improve technology and innovation. However, they face many challenges, particularly with staffing (Lewis, Getachew, Abrams, & Doty, 2019). These staff shortages pose a challenge to these centers to meet the growing demands of patients, and chronicity of diseases. The providers are left seeing more patients without the needed support from ancillary staff. Diabetes has high prevalence in FQCHC and affects 19% of the patients who utilize their services. Additionally, many of these patients live below 200% of the poverty level (Koonce et al., 2015). Moreover, providers have reported more barriers to providing high quality care and education to uninsured Hispanics, and more challenges with providing timely referrals (Ortega, Rodriguez, & Vargas-Bustamante, 2015). All these factors combined put a strain on these centers and leave them with very limited opportunities to provide DSME to diabetic patients.

Culturally Tailored Diabetes Self-Management Education

The principles of cultural competence include interpretive services or education in ones' primary language, cultural awareness and knowledge, family involvement in decision making, and incorporation of specific values and attitudes for health promotion (Babalola et al., 2021). DSME that is CT has the most impact on improving knowledge scores and clinical outcomes in socially underprivileged populations such as the Hispanics (Kline et al., 2016). The lack of culturally sensitive education leads to poor outcomes such as nephropathy, neuropathy, heart disease, vision, and limb loss in Hispanics (Babalola et al., 2021). Another aspect to consider is that effective education does not only rely on the patients' understanding about the subject, but on whether the patients will integrate the information and recommendations given into their lifestyle and daily diabetes management routine (Wolff et al., 2015). This only adds to the importance of building a rapport with patients and having cultural sensitivity to understand their motivators and barriers.

Internal Evidence

There are many factors playing a role on the lack of proper diabetic management for Hispanics. A FQCHC in the Phoenix area faces the same issues to provide the CT education to their patients, who are mostly Hispanics. Although there is no hard data available, the clinic staff shared their observations on the degree of attrition for their diabetic classes, and how the patients progressively stop going to the five weeks series of classes on DSME. The issue then becomes patients' lack of knowledge on modifiable risk factors to control their diabetes, which keeps the patients from participating in their care and feel empowered to change. The gap is the lack of provider time during visits and patients' social and financial barriers, which usually prevent them from participating in the diabetes classes. The staff does not know why the patients stop going to classes, but there is a belief that SDH may play a role as some patients lack transportation,

childcare, or inability to participate in classes due to work schedule or multiple jobs. The ideal scenario provides time-effective education where the patient would learn about their disease and modifiable risk factors to participate more actively in their care. The internal and external evidence leads to the clinically relevant question: In the Hispanic population attending a community health center(P), how does diabetes self-management education (I) as compared to in-clinic provider driven education (C) affects the patients' knowledge in a 8-week period?

Search Strategy

Databases

The databases searched during this extensive literature review included PubMed, Cochrane, and Cumulative Index to Nursing and Allied Health Literature (CINAHL). These databases were chosen due to their rigor and contributions to the medical field, and their relevance to the topics explored in this PICOT question.

The databases were searched using the combinations of the key terms addressing the PICOT questions, including *Hispanic* or *Latino*, *diabetes self-management or management, education, A1C, and glycemic control*. The filters applied included date of publication from 2015 to 2020, English language, and peer reviewed. Mesh terms were used to broaden the search.

An initial search on Pubmed included words such as *Latino or Hispanic, and diabet*, and A1C or weight* produced a high number of items over 31,000. Additional search excluded the word *weight,* and used terms such as *diabetes, self-management, Latino or Hispanic, and A1C* and yielded 239 matches. The related articles were reviewed and generated 8 new results.

The initial search on Cochrane was performed using the PICO search for *diabetes education, and A1C* only produced one result that was not relevant to the PICO question. An advanced search was performed using words such as *diabetes, education, Hispanics, and A1C*

yielded 22 results, and only 3 were relevant to the PICO question. The Mesh terms were not successful in adding to the search, as it did not allow for searches including the key terms.

The search on the CINAHL database included words such as *diabetes, self-management or self-care, education, Hispanic or Latino, and A1C or glycemic control or hga1c*. The alternate terms for each category were indicated on their database and the search produced 101 results. After inclusion/exclusion criteria was applied 24 studies were reviewed. The other searches were excluded as they included words such as *weight, and low-economic status.*

Critical Appraisal and Synthesis of Evidence

The Melnyk and Fineout-Overholt's (2019) rapid critical appraisal was used to evaluate the quality of the 10 articles selected for the literature review. The 10 studies were evaluated and synthesized (see Appendix A). Two studies were level I, systematic review/meta-analysis, three studies were level II, randomized-control trial, four studies were level III, quasi-experimental design matched with non-randomized matched control group, one study was a level VI (qualitative), phenomenological analysis. Considering the high number of studies, these are best suited to answer the PICOT question. All the studies took place in the US from 2015-2020 among diabetic Hispanics who receive some type of DSME. Only six of the studies reported their funding sources, and possible bias was identified on seven of the studies either related to study design, possible provider/researcher bias, or response bias. The sample size was widely variable, ranging from 9 to 11,854 participants. Most of the participants were Spanish speaking females across the studies. The mean age ranged from 48 to 58.5 years-old among nine studies and one did not report mean age. The measure outcome of A1C ranged from baseline 8.3% to 9.9% with qualitative study not having A1C as an outcome. The setting varied amongst studies,

and some studies took place in various settings, ranging from CHC, FQHC, patient's homes, PCP's office, and churches.

There was heterogeneity in measurement tools and demographics. Measurement tools included: A1C levels, SKILLD diabetes knowledge scale, CIRA family support scores, CES-D for depression assessment, SDSCA, PHQ-9, and PAM for diabetes self-efficacy scale (Appendix A). The educational level and socio-economic status (SES) were low across the studies, which is consistent with the overall findings in the literature review. There was a general improvement across studies on A1C levels independent of the mode of education. Moreover, patient's self-awareness, quality of life (QOL), and self-care behaviors showed improvement among the studies who measured these outcomes along with A1C levels. High quality of reliability, validity, and measurement tools were used on all studies. The studies with small sample sizes accounted for potential bias by performing a power analysis. Therefore, it led to the conjecture of solid validity and reliability of the selected studies.

Conclusion of Evidence

The evidence suggests that CT education is effective in decreasing A1C levels amongst Hispanics, independent of the mode of delivery. The interventions that were longer in duration or had booster education sessions were more successful in sustaining their results. Moreover, when the researchers measured other variables such as, patients' feelings of self-efficacy, empowerment, self-awareness, depression, and QOL improvement, they also found a positive correlation with DSME. Consequently, education can improve many aspects of diabetic patients' lives. The studies' heterogeneity is consistent with effectiveness with a variety of approaches to DSME, but it is important to note that a due to the sub-groups within the Hispanic population, one specific intervention will not be effective for every population. One important aspect found

across the literature is consistent with the employment of CT education that fits the population's SES, literacy, language, and incorporates specific cultural elements.

Theoretical Framework

The Purnell Model for Cultural Competence (see Appendix B, figure A1) will help framework the culturally tailored (CT) educational program targeting underserved population of Hispanics in a metropolitan underserved community. Culture emphasizes on a patient's beliefs and heritage when developing the plan of care (Albougami, Pounds, & Alotaibi, 2016). Purnell's theory identifies the importance of providing unbiased, CT education to improve patient's outcomes. The schematic of the Purnell's model focuses on providing a foundation to understand the many attributes of different cultures and allowing the healthcare provider to understand patients' notion of healthcare and illness (Albougami, Pounds, & Alotaibi, 2016). The Purnell model focuses on 12 domains: culture and heritage, communication, family roles and organization, workforce, bio-cultural ecology, high-risk behaviors, nutrition, pregnancy, death rituals, spirituality, healthcare practices, and perceptions and roles of traditional and folk healthcare practices (Albougami, Pounds, & Alotaibi, 2016). These domains encompass the holistic person and how the healthcare provider can understand the cultural perceptions of diabetes and DSME. Although many diabetes studies focus on chronic care model when studying diabetes, the inclusion of culture is essential for the success of educational programs.

Implementation Framework

The Advancing Research and Clinical Practice through Close Collaboration (ARCC) model (see Appendix B, Figure A2) was chosen to guide this project. This framework focuses on EBP implementation that is sustainable across the system (Schaffer, Sandau, & Diedrick, 2012). The model has five steps, which would align with the goal of the project. They include: (1)

assessment of organization's culture and readiness; (2) identify the strengths and barriers within the organizations; (3) identify the mentors; (4) implementation of EBP within organization; and (5) evaluation of the outcomes from EBP project (Schaffer, Sandau, & Diedrick, 2012). The organization already has the DSME, but the attrition is high, so learning the organizational culture followed by identifying the issues and strengths would lay the foundation for the EBP. The third step would create a team approach that is more sustainable as the group can be accountable for the outcomes. Therefore, the implementation would include a system wide methodology, and evaluation could be performed as a group regarding sustainability and changes that are needed to improve patients' outcomes.

Methods

Setting

This project was implemented at a FQCHC that has been serving the Phoenix area for more than 70 years and has two locations with multiple services being offered. The patient demographics in the area include many Hispanics and patients who are uninsured or underinsured. They treat patients from neonatal to geriatric age, and they also provide maternal prenatal services with affiliation to local hospital for labor and delivery. Moreover, they provide specialty clinics such as vasectomy, Hansen's disease, women's health services such as Pap Smears and colposcopy, and preventative free breast and cervical cancer screening.

Administrative staff includes a chief executive officer (CEO), a chief financial officer (CFO), a chief development officer (CDO), a chief operating officer (COO), a chief medical officer (CMO), and a medical director. The center also has ancillary staff in the clinic such as medical assistants, front office, interpreters, and IT staff. Healthcare providers include NPs, MDs, DOs, a mental health counselor, and a DPM. Each medical clinic is attached to a

community center that provides services such as enrollment in governmental programs like women infant care (WIC) and Medicaid health plans. They also provide group classes for physical activity and childcare, including summer programs.

As a FQCHC, the funding for the clinic comes from government grants and private sector, donations, and Medicare and Medicaid funding. The clinics work with a sliding scale payment method based on patients' income for those who are uninsured and have a chronic disease program with a very low visit fee of ten dollars for those being followed for chronic diseases like diabetes and hypertension.

Ethics

The project was approved by the Institutional Review Board (IRB) at Arizona State University (ASU). A recruitment letter will not be necessary, as the quality improvement project will be directed at the FQCHC. The diabetes education provider was informed of the materials and meetings with staff was conducted to promote buy-in and feedback on the information given. As the classes will be conducted in an online group setting, prior to each class, the instructor will introduce disclosures to avoid sharing of personal information and/or information outside the group. Moreover, the patients will be made aware that the class is not a substitute for an appointment with their provider.

Intervention

A CT diabetes self-management protocol was created and provided to the FQCHC to be used in their 8-week online DSME classes. The protocol contained the syllabus for the classes, pre and posttest loaded into an online platform for each class based on the DSME subject discussed during individual classes, attendance sheet, and a booklet for patients with all the information regarding DSME for reference. The DSME instructor used the materials for the class

as needed and followed the syllabus. The FQCHC sent a message a few weeks prior to the start date for the classes asking diabetic patients who would be interested in participating in the virtual classes. A total of 144 patients answered stating that they would be interested. A mass text message with the link to the classes were then sent to those patients weekly for 8 weeks a few minutes prior to the start of the class. The patients who were able to join the class, would then click on the link to join. Meetings were conducted after each session with the stakeholders for continuous improvement of teaching material or how to improve participation from patients.

The curriculum was based on the diabetes education online classes and quizzes created by the University of California, San Francisco as a request from the FQCHC. The topics were analyzed, and simple modifications were made to fit the Hispanic communities. The pre and posttests questions stemmed from their topic questions. The syllabus included topics on DSME program by the ADA: introduction to diabetes, diabetes symptoms and A1C goals, hyperglycemia and hypoglycemia, diet and lifestyle, exercise, complications from diabetes including foot care, eye care and other preventative measures that patients need to take, medication management, and psychological aspects of living with a chronic disease.

Project Outcome

Diabetes Knowledge

Diabetes self-management knowledge can motivate patients to feel empowered in their own care. The pre and post tests will give information regarding overall learning from patients. The test delivery had to be changed on week 3, as patients showed difficulty in using a system where they had to be on the online meeting and change to a different screen to vote for the tests. After discussion with the stakeholders, the test questions were transferred to the same online platform as the classes, so patients did not have to leave the application to participate. The tests

were anonymous, so patients would be more inclined to participate eliminating the fear of having the wrong answer. The test questions were discussed throughout the class and rationales explained prior to patients taking the post test. The time allotted for questions was also increased during week 5 to allow patients to respond to questions, as educators noted that some patients needed more time to answer them.

Attrition Rates

The clinic identified attrition rates as one of the issues during classes that were provided in person. The clinic assigned each patient a number and tracked each person's attendance in an identified document. However, each class subject was independent of each other, so patients could join or leave the class at any time, which made it challenging to calculate attrition rates as the numbers varied from week to week. Instead, we will provide the overall attendance based on the number of classes each patient attended during the 8-week period.

Budgeting Plan

The budget for direct costs includes development of DSME, hiring of a Spanish translator to back-translate the materials, printing of materials. The indirect costs will include the engagement of staff and their time spent in patient education, meeting, creating a technology platform to accommodate group charting. The funding was obtained through personal primary investigator funding (see Appendix C). The center will integrate the project into their budget after EBP is finalized.

Results

Analysis

The analysis of diabetes knowledge was analyzed, but a paired t-test was not possible due to the inability to identify sample error, as the test results were anonymous. The results from pre

and post tests were shown in a graph for each week of class (see Appendix D). The classes were independent of each other and participants could join at any point; therefore, the attrition rates were not calculated as attendance varied each week, including different patients joining and leaving the class. Instead, the results were analyzed for the number of participants that participated in a certain number of classes (see Appendix E).

Participants

Unidentified data was shared with investigators regarding the participants in the class who benefited from the protocol developed. A total of 27 patients participated in at least one class. The participants were all patients of the FQCHC, over 18 years of age, and Spanish speakers. The center tracked baseline Hemoglobin A1C (Hgb A1C), which is an average of the patients' blood glucose within the past three months. They reported that 5 patients had Hgb A1C lower than 7%, 8 patients between 7% and 8%, 2 patients between 8% and 9%, 3 patients between 9% and 10%, 3 patients between 10% and 11%, 4 patients between 11% and 12%, 1 patient between 12% and 13%, and 1 patient between 13% and 14%. Considering a goal of Hgb A1C less than 7% for most patients to be considered controlled, only 18.5% of the patients in this group would fall into the controlled diabetes category. The patients who had their Hgb A1C checked within the last 3 months were equal to 13, between 3-6 months were equal to 6 patients, within 6-12 months were equal to 6 patients, and more than 1 year were equal to 3 patients.

Outcome Results

Class Attendance. Overall attendance in the class varied between 21% to 46% of the total patients that participated in the classes during the 8-week period. There was not one patient that attended all 8 classes. One patient attended a total of 7 classes (87.5%), one patient attended 6 classes (75%), five patients attended 5 classes (62.5%), six patients attended 4 classes (50%),

four patients attended 3 classes (37.5%), one patient attended 2 classes (25%), and nine patients attended only 1 class (12.5%). The attrition rate was not calculated due to the unpredictability of patients' attendance.

Diabetes Knowledge. The pre and posttest scores were not consistent based on the results. During the first three weeks, the patients had difficulty participating, as they had difficulty operating the platform to answer questions on their phone and be on the class meeting at the same time. The format was changed on week four, and more patients were able to participate. A paired t-test was not possible as the standard error cannot be calculated due to anonymity of the tests. We were unable to identify the answers for each participant and if it improved or not. A total of 38 questions were asked over the eight weeks that required a correct answer, and the patients were able to improve their score in 47% of the question, and the answers were correct in pre and posttest in 21% of the answers showing that the patients already knew the right answer in the pre-test (see Appendix D).

Discussion

Implementing different formats of education will allow patients to have a variety of resources and be effective to different literacy levels and learning styles. This pilot project is undergoing improvement processes to allow patient to learn and disseminate the information amongst their families and peers. The online platform helps eliminate some of the SDH faced by this population such as transportation, childcare, and work schedules, as they can participate in the classes remotely. However, there are other SDH to consider such as literacy, and access to technology plus ability to operate it. These SDH were evident during the intervention as patients were unable to operate two programs at the same time (virtual class and the interactive poll application) during the first three classes and the tests had to be loaded on only one platform.

Moreover, the patients took an average of 5 minutes to answer 4-6 questions that were presented during the classes, which shows literacy concerns.

Many factors may have played a role in the pre and posttest scores. The online platform allows patients to be anywhere, which may contribute to divided attention and inability to be fully present during the class, making them more prone to miss important information. The literacy and understanding may also have played a role in understanding the questions and ability to answer it appropriately, as discussions during the class were consistent with patients understanding the information when teach back was required. Additionally, some patients would participate in either the pre or posttest due to arriving late, leaving early, or have technical issues that hindered that participation on one of the tests. The unanimity of the answers also impeded the assessment of personal growth and understanding from each patient. It also hindered the ability to perform statistical analysis to ascertain the significance of intervention.

The variability in attendance may also be related to SDH. During the classes some patients reported work schedule and personal or family health issues to be a deterrent in class attendance. The clinic had a pool of 144 patients that had shown interest in the diabetes classes but not every patient was able to participate consistently. For instance, three patients joined the class during the last week. A survey with individual patients would need to be conducted by the FQCHC to assess for specific limitations to participate in the complete series and try to eliminate some of the SDH that may have played a role in attendance.

The classes were implemented in a group setting which was able to enhance the program. The community is important for the Hispanic population, and the patients could learn from each other's experiences and questions. The participants were able to discuss their own disease management and their personal barriers to comply with their treatment plan. The instructor

provided open dialogue opportunities and discussion amongst the students, which sometimes prevented the full curriculum designed for the classes to be discussed. The patients also had the opportunity to use teach back, which improves their information retention and help them practice dissemination of knowledge amongst their family and peers.

The individual accomplishment from each patient is important, but each patient's contribution to the community will have a bigger impact. The FQCHC plans for the class includes a "buddy" program where a patient that has gone through the classes can help another patient. The project was implemented with a small number of patients out of a whole sample of 144 patients. An option for better control and retention is to focus on specific smaller groups, so the staff or volunteers can follow-up each patient more closely to help them attend all the classes in the series. Moreover, discuss subjects that patients identify as their main struggle or main gap in knowledge.

The providers are beneficiaries of such program as well, as they can focus on the clinical concerns and only reinforce the information given during the classes, rather than trying to provide individual education to the patients during a twenty-minute visit. Moreover, the patients will receive uniform information, rather than differing information from each provider that might have their own biases and/or preferences. As a result, the providers would be able to decrease the number of medications the patients are receiving, thus decreasing side-effects. Moreover, reducing diabetes complications will decrease the number of visits to the E.D and hospitalizations, which would decrease the state's cost.

The most common measurement outcome used in diabetes studies is the Hgb A1C level, which is an objective measurement of the blood glucose levels within the past three months. Patients who follow their diabetes plans and control their A1C levels have better outcomes and

experience less complications from the disease. Many studies reviewed prior to this EBP are consistent with improvement in A1C, quality-of-life, self-care behaviors, knowledge, and feelings of empowerment. Moreover, according to the U.K. Prospective Diabetes Study (1998), for every percentage point decrease in A1C levels translated to a 35% reduction in microvascular complication (diabetic nephropathy, neuropathy, and retinopathy). The mean and median A1C for the patients attending ≤ 25% of the classes was 9.9% and 10.5% respectively; for patients attending between 25%-50% of the classes, the mean and median were 8.4% and 7.55% respectively, but there was an outlier of 13.8%; for the patients with ≥ 50% attendance, the A1C mean and median were 8.5% and 7.9% respectively. This shows that the patients who needed to participate the most, attended only 1-2 classes. The investigation of these patients' barriers to participate in more classes could be further explored and this group of patients could be targeted for future classes.

The classes will continue, and the FQCHC will add English classes, as some English-speaking patients are interested in reaping the benefits of the education. The class will be sustainable with the buy-in from the staff, and the utilization of medical students from a local university who will assist in the class. The two providers who are the educators will continue to teach the class and plan to have presenters for special presentations and topics when necessary. The feedback from patients will be applied to future classes for continuous improvement. During the exit survey, 86% of the patients expressed that they felt empowered after the classes. Moreover, all the patients changed at least a little bit in their lifestyle. The patients also expressed that they would like more information on nutrition and exercise during future classes. Another aspect that could improve the class is telephonic follow-up with patients to assess their needs and address them before they stop participating in the class. Moreover, advanced practice

students that will be participating in further classes can answer patients' questions they might have after the completion of the class.

Limitations

Due to the recent pandemic, many changes had to be made to the original project. The limitations included the inability to obtain consent from patients and have a more direct contact with them during intervention. The greatest limitation was the patients' abilities to operate the online system used for meetings, which mainly in the first three classes had an impact on participation on the pre and posttest. Moreover, the inability to know patients' individual answers to the questions hindered the investigators' ability to determine standard error for the sample, which in turn prevented the investigator from performing a paired t-test to determine the significance of pre and posttests.

Another limitation was the inability to have a closer follow-up with patients due to the lack of personnel. The clinic relies on two providers to teach the class and volunteers from the school of medicine at a local university and advance practice students, which may be variable. The biases from each provider and/or presenter may influence patients' attendance and compliance. Another limitation was that patients' literacy was not assessed, and some patients might not have participated in the surveys due to the inability to understand or read the questions. Additionally, after a few classes, the provider noted that patients needed more time for the answers than what was being allotted, which may have skewed some of the results of the pre and posttest in the earlier weeks.

The clinic checked the patients' A1C prior to class, but this measure is usually performed depending on the patients' levels, which would be every three months for uncontrolled diabetes and every six months for controlled diabetes. The post class A1C will not be obtained until the

patients have their levels checked on a timeline that fits their current state (controlled or uncontrolled). The clinic can use this measurement as an indicator of class efficacy.

Conclusion

The implementation of CT education for different populations has been shown in previous studies to be beneficial in improving patient's outcomes in the treatment of chronic diseases, such as diabetes. Although there were limitations to the implementation of the EBP during the pandemic, the patients had positive feedback to provide in the exit survey, and the patients have the option to learn about their condition and providers can use the in-clinic time to focus on reinforcement and treatment of their clinical concerns. Improving knowledge and empowerment are key aspects in the management of diabetes, but it is underutilized. The implementation of such programs will improve communities and overall health outcomes, while minimizing the impact of diabetes in society.

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Appendix A

Evaluation and Synthesis Table

Table A1

Evaluation Table Quantitative Studies

Citation	Theory/ Conceptual Framework	Design/Method	Sample/Setting	Major Variables/ Definitions	Measurement of Variables	Data Analysis	Study Findings/Results	Decision for Use/Application to Practice
Chrvala et al., (2016). Diabetes self-management education for adults with type 2 diabetes mellitus: A systemati	SCDT	**Design:** RTC **Purpose:** Evaluate the impact of DSME compared with usual care or a minimal educational intervention on A1C levels.	**N:**120 **n:** 11,854 (IG) **n:** 11,093 (CG) **Setting:** Solo or team provider DSME. **Sample:** Mean age 58.5 yr (IG); 58.7 (CG). Median baseline A1C 8.4 for IG and CG.	**IV:** DSME **DV:** A1C	Changes in A1C with DSME. Standardized structure evidence table analysis by 2 researchers. Sts calculated from data extracted from each study of changes in A1C from baseline to f/u.	Qt for A1C levels and duration of interv. Pearson Chi-Square analysis for changes in A1C	M reduction in A1C for all participants randomized to DSME was 0.74 (SD, 0.63). Range of 0.6 to -2.50 and median of -0.60 vs a mean ↓ of 0.17 (SD, 0.50), range 1.5 to -1.7, and median of -	**LOE: I** **Strengths:** Well-designed RCT, IG effective in DV, outcome findings consistent with other previous research. **Weaknesses:** heterogeneity. Blinding of assessor, potential for contamination

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c review of the effect on glycemic control. **Funding** AADE **Bias:** None recogniz ed **Country** U.S.A			**Inclusion:** Interv that focused on DSME with A1C as an end-goal.				0.12 for all CG participants. Pearson chi square did not find proportions significantly different P=0.08.	b/w IG and CG, unintended co-interventions, failure to describe strategies to properly conceal study group allocation. **Conclusions:** all methods of DSME, delivered by either solo or team provider achieved > reductions in A1C compared to CG participants. **Application:** applicable to PICOT and clinic setting, similar patients, need more

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								research on appropriate DSME style
Hildebrand et al. (2020). Effect of diabetes DSME on glycemic control in Lat adults with T2D: A systematic review and meta-analysis. **Funding:** No grants from	CCT by Leininger presumed to be the theoretical framework.	**Design:** SR & MA **Purpose:** Evaluate the effectiveness of DSME in reducing A1C levels in adult Lat with T2DM	**N:** 23 SR; 18 MA **n:** 3969 (SR) **n:** 3540 (MA) **Setting**: Various **Sample:** Lat or descendant, bilingual/monolingual SS. **Inclusion:** RCT or QES Pilot of feasibility study with matched CG with no active DSME.; adult Latinos with DSME; usual care including usual PC or minimal education intervention;	**IV:** DSME **DV:** A1C **AR:** among studies varied from 6-20%. Common reasons: lack of transportation, childcare, time, illness, and/or lack of interest	Duration of DSME, initial A1C, interventionist, and mode of DSME.	Egger's regression for bias; Q-statistics c/w moderate heterogeneity Inverse variance index Funnel plot = tx effects of DSME Pooled estimate effect of DSME.	CT DSME programs reduce A1C levels in adult Latinos. No bias on Egger's regression. Greatest ↓ was in studies that were ≦6mo (0.274% [99% CI = -0.510, -0.039], p = 0.007). A1C > 8.5 had > reductions (-0.236%, [99% CI = -0.446, -0.026], p = 0.002). Participants in	**LOE:** I **Strengths:** DSME helps improve A1C. **Weaknesses:** # of RTCs meeting their criteria; setting or professional providing DSME not considered. Mesh terms overlooked. # of studies limits generalization. **Variation** b end of study and A1C measurement. **Conclusion:** DSME is

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funding agencies in the public, commercial or not-for-profit sectors. **Bias:** none identified. **Country** U.S.A			reporting of A1C levels				team approach experienced >A1C reductions (-0.295%, [99% CI = 0.505, 0.085], p = 0.010). Mode of DSME: Cochrane Q ↓, and p-value ↑ in all subgroups. Indiv programs had > A1C ↓ (-0.422%, [99% CI = 0.618, 0.227], p = 0.160)	beneficial to improve A1C; difficult to find a specific I for the Lat population d/t the amt of subgroups. **Application:** The study dit not identify a specific method for Lat, which makes it hard to apply specific interventions. However, it did show that DSME is effective.
Ferguson et al., (2015). Does diabetes	CCT by Leininger's is presumed to be the	**Design:** SR & MA; PRISMA Guidelines	**N:** 13 **n:** 2976 **n:** 2784 (His)	**IV:** DSME **DV:** A1C	Changes in A1C. REM – pooled effect across studies = -0.25	PRISMA Data Analysis. CCT for assessing	Moderate improv in A1C. Best to use MM approach.	**LOE:** Level I **Strengths:** Identification of most successful design & how to

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self-management education in conjunction with PC improve glycemic control in Hispanic patients? **Funding** none mentioned **Bias:** none identified **Country** U.S.A.	theoretical framework.	**Purpose:** Eval effectiveness of DSME & PC in His with T2DM	**Setting:** CHC/PCP office. **Sample:** Lat, age mean = 47.9-70.3. Diab Dx 6 mo-16yr. A1C 7.4-11.8. **Inclusion:** Com or PCP education; pts on regular PCP schedule.		(95% CI, -0.42 to -0.07, P= .01) Heterogeneity b/w & within studies high (Cochran Q= 45.8, P < .001, I2=78.2). SA range of CA from .25 to .75. Pooled AR b/w -0.25 (95% CI, -0.57 TO -0.10) AR: 6%-54%. 8 studies ≤20%	risk of bias in RCT to eval the quality of included studies.	Subgroup analysis = most successful interventions were CT, in person, multidisciplinary, and with low AR. Primary mode as telephone & telemedicine alone not successful.	sustain A1C overtime. **Weakness:** limited to published studies; F/u only 6 mo in half of the studies; only 1 outcome – A1C; heterogeneity. **Conclusions:** DSME in PCP office moderately improve A1C; Most successful DSME is CT. MM education can be effective; **Applications:** DSME that is CT; MM education, different

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								providers/education
Ramal et al. (2017). Impact of plant-based diet and support on mitigating T2D in Lat living in MUA **Funding** None Reported **Bias:** Possible	SCT inferred	**Design:** RCT **Purpose:** **Method:** 5-week education program with 1, 3, and 6 mo post-education. ↑ fiber and ↓ fat diet to control T2D. DSMEP. Focus Group Intervention **Setting:** CHC in MUA	**N:** 3 **n:** 15 (CG) **n:** 17 (IG) **Inclusion criteria:** Lat/His; living in SB; attend 3/5 DSMEP; A1C > 6.5% **AR:** 15% **Baseline A1C:** 9.57 (CG) & 8.53% (IG). **Age:** 52.9 (CG) & 53.3 (IG). **Sex:** 78% female	**IV:** Plant-based diet; F/u FGS vs. no FGS **DV:** A1C, anthropometric measures, QOL, SEE	Standard labs for A1C; anthropometric measures, Diabetes QOL, SEE, mDSMA, fat and fiber intake.	Homogeneity = independ t-test, contingency tables. Reliability mDSMA (split ½ reliability), Cronbach alpha for each ½. Spearman Brown coefficients to correlate between 2 groups. Correlation analysis of A1C at 6mo with	ANOVA – diet & A1C significance (F1, 30=5.43, p= .027); IG superior to CG (F1, 30= 10.90, p= .002). Diet intervention for A1C (F1, 30 = 4.18, p= .50). DQOL (F1, 27= 21.41, p< .001). Diet/Hip Circumference (F1, 29=5.34, p=.28). Fat intake (F1, 30 = 5.35, p=.31) Split 1.2 reliability (Cronbach >.7)	**LOE:** II **Strengths:** Improvement in A1C, hip circumference & self-care behavior. ↑ fiber with + effect on A1C; . ↑ fat with – effects on A1C. **Weakness:** rely on dietary recall from patient, information bias, limited generalizability, limited SaS, ↑ AR, lack of statistical power. **Conclusions:** f/u on DSMEP

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response diet **Country** U.S.A						nutritional analysis of mean fat intake, using Pearson correlation. ANOVA changes in fat and fiber intake. 2 way Repeated-measures Anova. To analyze change in SEE and QOL.	for SEE, mean fat scale, fiber scale (base 6mo); mfat & fiber with A1C (r= .122, p=.507). Fiber intake (r= -.132, p= .571).	improv A1C. Education + HCP support are c/w better outcomes. **Applications:** the specific plant-based diet might be challenging for PICO site d/t low SES, education, and inability to f/u on every patient.
Hu, J. et al. (2016) A family based, CT Diabetes	Theory of Holism implied d/t the impact of family in a person's health.	QES IG – 8 wk sessions on general health info and 2 sessions on DM.	**N:** 186 **n:** 51 (IG) **n:** 41 (CG) Family Members **n:** 52 (IG) **n:** 42 (CG)	**IV:** DSME CT and generalized **DV:** A1C, DM knowledge, QOL scores	Growth curve analyses p propensity score adjustment. Longitudinal comparison using growth curve modeling;	Priori PA. SS of 35 pts per group at the end of the study allowed detection of a ↓ in A1C of	COT: pts SKILLD DM knowledge ($p< 0.001$) and at 1 mo (IG M = 7.7 vs. CG M = 6.5, p=0.016), DSE scores	**LOE:** III **Strength:** Interv pts and family improved in DM knowledge and DM self-efficacy over time. A1C improvement.

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interventi on for Hispanic s and their family members . **Bias:** r/t study design. **Funding** none identified **Country** U.S.A.		9 mo-long Data collected at baseline, p intervention, and at 1 & 6 mo. Median times of data collection. 1 – Baseline 2.5 mo post-interv (max = 3.9). 3.5 mo for 1 mo f/u (max = 5.3) and 8.8 mo for 6 mo f/u (max = 10.2)	**Sample:** His patients with T2DM & their family members recruiter from CHC and churches. **Inclusion Criteria:** T2DM, Com dwelling, His, >18 y/o, brought the same family member to sessions. **Setting:** 6 sites in NC (clinics, physician offices, churches).	**AR –** 18% IG; 15% CG	Descriptive stats for attendance, f/u rates, and pt & family characteristics. AR compared using Chi-square test. MBTP to asses difference overtime for significance	at least 10% with 80% power, assuming a two-sided Type I error of 0.05. Baseline characteristic s differed regarding printed DM materials (IG 37% vs. CG 76%, p<0.001) SBP IG M 128.6 vs. CG 133.1, p=0.031), A1C IG M (8.5% vs. CG= 9.5%m o=0.021) CIRA family support	(p=0.07) with (IG M =8.5 vs. CG 7.3, p = 0.004), and CIRS scores (p=0.028). No significant behavioral outcome. IPAQ MET min/ week (p=0.096), fruit/veggie consumption (p=0.934), SDSCA to meds (p=0.946), BS testing (p=0.268), foot care (p=0.083), and general diet (p=0.061). Change QOL (p=0.678), mental health	**Weakness:** improvement not sustained at 6 mo f/up. **Conclusion:** The study focused on too many variables and had many non-significant results. The improvement in A1C was not sustained. **Applications:** the study did answer the PICO question; however, it would not be applicable to the project due to the lack of sustainability.

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						scores (IG M = 1.4 vs. CG M= 1.7, p=0.002), & SKILLD DM knowledge score (IG M = 2.9 vs. CG M = 4.2, p = 0.011)	QOL (p=0.154). Significant Change in A1C (p<0.001) COT: family SKILLD (p<0.001), A1C (p=0.002), QOL (p=0.01)	
Hughes, et al., (2016). Com-based diabetes com health worker interventi on and an underser	SCDT	Quasi-experimental. CHW Educated participants on DSM practices, created action plans for behavioral changes, and offered referrals resources for	**N:** 2 (neighborhoods) **n:** 459 **AR:** 25% Exclusion Criteria: <18 y/o, T1D, GD, mental illness. **Inclusion:** Dx of T2DM	**IV:** Lifestyle management and education program based on NDEP. **DV:** A1C Controlled DM = A1C <7% A1C ≤ 0.5% clinically significant.	A1C measured in the home at baseline and f/u. Three blood pressure readings. BMI calculated. Self-reported height and wt. Survey on additional topics: depression, social support, DSM activities, DM knowledge, med	Baseline and f/u summary measures were calculated. T- test for continuous variables and McNemar's test for dichotomous variables. Bivariable logistic	Reduction in A1C was statistically significant. The M reduction in A1C was 0.5% (p=0.01). Absolute ↑ in % of participants with controlled DM (p<0.01). ↓ in depression, ↑	**LOE:** III **Strength:** Low intensity intervention. Significant outcomes and reduction of A1C.. **Weakness:** Inability to compute the number of referrals made and used. Self-

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ved Chicago populatio n. **Funding** BCBS Illinois. **Bias:** none identified **Country** U.S.A		DSME and support groups for diabetics.	M age 57 y/o; 71% female. **Setting:** pts homes		adherence, and insurance coverage.	regression to assess clinically significant ↓ in A1C. P value <0.05 = clinically significant. Analysis in Stata/SE.	med compliance, report of higher social support, higher DM knowledge score. Improvement in BG testing, diet, foot care. No improvement in exercise. Best outcomes and younger, His who had lower DM self-care and were diagnosed with uncontrolled DM	reported height and wt. Intervention and two communities my affect generalizability. **Conclusion: +** changes in A1c and other behavioral and psychosocial outcomes. Interv is low intensity. CHW can be an effective tool **Application:** this is one of the forms to ↓A1C levels and is applicable to the PICO question.
Kaltman et al. (2016).	CCM & Empowermen t Theory	Integrative Intervention; BHA, MI.	**N:** 2 **n:** 18	**IV:** Individual Education;	CES-D SDSCA PAM	Descriptive Analysis: sample stats;	**Treated sample:**	**LOE:** III **Strength:** Improvement in

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Citation	Theory/ Conceptual Framework	Design/Method	Sample/Setting	Major Variables/ Definitions	Measurement of Variables	Data Analysis	Study Findings/Results	Decision for Use/Application to Practice
T2D and Depression: A pilot trial of integrated self-management Interv for Lat Immigrants **Funding** N/A **Bias:** r/t providers selection of pts. **Country** U.S.A		6 individual sessions + 2 booster sessions	**Inclusion:** A1C > 8; PHQ-9 > 10. Exclusion: medical condition that would interfere with results. Impaired Mental status; sub abuse <6mo, hx bipolar, psychosis, SI @ recruitment **AR:** 17% **Setting:** PCP office **Age:** 49.7 (M) **A1C:** 9.6% (M) **Sex:** 56% female	**DV:** A1C levels; depression; DSM behaviors, patient activation. Diabetes related SE; open-ended feedback on interv.	Lorigs DSES	Paired t-tests for change A1C, depression, DSM behaviors, pt activation, Diab self-related efficacy; subsample analysis. Cohen's D-effect size Qualitative semi-structure interviews transcription to SP	Depression (t= 3.97, p=.03) DSES: (t= 5.79, p<.001) PAM (t=5.59, p<.001) A1C (t= 2.19, p=.049) Depression (t= 5.18, p<.001) DSES (t=4.55, p=.001) PAM (t= 5.17. p<.001).	overall pts DSM behaviors, A1C, diab related SE, and depression interv **Weakness:** sample and design small; no control/comparison group. Convenience sample decrease generalizability. Inability to measure A1C beyond study. **Conclusion:** education empowered pts to care for their health & therefore improved many of the outcomes. **Application:** applicable to

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								PICO as this intervention was done with similar group represented @ site of interest.
Noya, C. E. (2019). Shared medical appt: An innovative model to reduce health disparities among Latinxs with T2DM.	CCM	Quasi-experimental design c nonrandomized matched control group. SMA referred to as ALDEA (*Latinxs con Diabetes en Acción)*	**N:** 1 **n:** 30 (IG) **n:** 60 (CG) CG- nonrandom, matched sample. **Setting:** FQHC Inclusion Criteria: SS Lat, > 18 y/o, T2DM, who attended at least 3 SMA sessions. Referred by PCP, recruited by flyers, and phone	**DV:** CT SMA program **IV:** A1C reduction, LDL, and BP.	Effect size of 0.667 based on M (SD) of 1.48%. nQuery Advisor Power Program- effect size = 0.0667, using a t-test, 80% power, and two-tailed alpha of .05. TSS= 84.	SPSS 19. Descriptive statistics - summarize data and identify outliers. T-test for independent groups, chi-square or Fisher exact tests. Variables dichotomizes and coded as on target or not on target.	24 SMA sessions x's 6 mo. M 7 pts/class with M 13 and median 7 SMA sessions total. IG vs. CG = significant change in A1C at 6 mo for IG, but not at 3 mo. Reduction in A1C by 0.55% (b= -0.55, t= -1.48, p= .14), from baseline to 3 mo and	**LOE:** III **Strength:** First to study SMA model to improve glycemic control among Lat. **Weakness:** lack of RCT, provider bias, difficult generalizability, small care team and small sample. **Conclusion:** this is the first study to document a CT SMA

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Funding information N/A **Bias:** self-selection bias **Country** U.S.A			calls using DM registry at FQHC.			ITT analysis for 40 and 30 participants. Linear regression analysis for A1C measurement.	reduction of 0.83% (b= -0.83, t= -2.25, p= .03). ITT analysis = > reduction in A1C in IG at 6 mo (b= -0.81, t= -2.46, p= .02), but not at 3 mo (b= -0.52), t= -1.63, p= .11). IG & CG = target BP, 65% SMA vs. 50% CG on tarfed with LDS at 6mo. 32% ofIG vs. 15% CG met all three goals p= .24	program with low income and underserved SS led by nurse practitioners that showed a significant ↓in A1C at 6 mo post intervention **Application:** the study was successful at reducing A1C at 6 mo and is applicable to the PICO question. However, more studies are needed of this kind with this population
Perez-Escamilla, P.	Behavioral change theory	RCT, block randomization computer	**N:** 211 **n:** 106 (CG) **n:** 105 (IG)	**IV:** CHW-led intervention	A1CNow POC, venipuncture for biomarkers, kg,	Controlled V- linear regression	A1C -SS ↓ in 18mo (3,6,12,18 mo	**LOE:** II **Strengths:** RCT, quarterly f/u,

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Citation	Theory/ Conceptual Framework	Design/Method	Sample/Setting	Major Variables/ Definitions	Measurement of Variables	Data Analysis	Study Findings/Results	Decision for Use/Application to Practice
(2015). Impact of a com health workers lead structure program on glucose control among Latinos with type 2 diabetes: The DIALBEST Trial **Funding** NIH Min Health & Health Dispariti		generated binary assignment. Impact of the CHW-led intervention for glycemic control in Lat vs. standard clinic care. Home-based visits.	Inclusion: Dx T2DM for > 12 mo, >21, lived in Hartford, CT, A1C ≥ 7%, Hisp, Lat. **Exclusion:** preg/BF, RF, CA, hepatitis, cirrhosis, ESLD, cognitive impairment, dementia/Alzheimer, mental health issues, CV disease in past 12 mo, physical activity limitations. **Setting:** CHC in CT CHW home visits	**DV:** A1C, Glu, lipid panel results, wt, BP	sphygmomanometer.	Categorical V- logistic regression Baseline comp b/w arms- X^2 and ANOVA	respectively), p= 0.043, 0.050, 0.021, 0.009) compared to CG	eval sustainability, strong internal validity, A1C reduction. **Weaknesses:** 2 ethnicities, medical plan not discussed. CG had the data collected, and IV did not which may lead to bias. **Conclusions:** indirect relationship b/w wt and A1C in CG. Home visits with positive impact. **Application:** may be applicable for clinic d/t cost and patient's choice. Could be

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es Institute **Bias:** N/A **Country** U.S.A.								used for guidance for DSME.

Abbreviation Key: **AR-** attrition rate; **AR1**- affect range; **BF-** breastfeeding; **BHA-** behavioral health activation; **b/w-** between; **BMI-** body mass index; **Com-** community; **CA** – correlation assumptions; **CCT-** Cochrane Collaboration Tool; **CES-D** – Center for Epidemiologic Studies-Depression; **CG-** control group; **CCM-** culturally competent model; **CDE-**certified diabetes educator; **CER-** comparative effectiveness research; **CHW-** community health worker; **CI-** confidence interval; **COT-** change over time; **CT-** culturally tailored; **CCT-** cultural care theory; **DM-** diabetes mellitus; **DSMA-** diabetes screener for Mexican-American; **DSES-** diabetes self-efficacy scale; **DSME-** diabetes self-management education; **DSMESEM-** the diabetes self-management support empowerment model; **DV**-dependent variable; **dx**- diagnose(d); **eval**- evaluation; **FBG-** fasting blood glucose; **FGS-** focused-group support;**FQHC**- Federally qualified health center; **FG-** focused group; **FPL-** Federal poverty level; **F/u**- follow-up; **GD-** gestational diabetes; **Glu**- glucose; **His-** Hispanic; **I-** intervention; **IG**- intervention group**; Independ** – independent; I**nterv-** interventions; **ITT-** intention to treat; **IV**- independent variable; **Lat**- Latino; **LHL**- low health literacy; **LOE**- level of evidence; **M-** mean; **MM-** multi-modal; **MA-** meta-analysis; MBTP- model-base time point; **Med**- medication; **Min**- Minority; **MI-** motivational interviewing; **MLRM-** multiple linear regression model; **MM-** multimodal; **mo-** months; **MXA**- Mexican American; **N**-number of studies; **n**- number of participants; **N/A-** not available; **NC-** North Carolina; **NDEP-** National diabetes education program; **p-** after; **PA-** power analysis; **PAM-** patient activation measure; **PC-** primary care**; PCC-** primary care clinics; **PCORI-** patient centered outcomes research institute**; PRISMA-** Preferred Reporting Items for SR and MA; Preg- pregnant; **Prg-** program; **pts**- patients; **PCM-** patient centered model; **PLCM-** performance liquid chromatography method; **QES-** quasi-experimental study; **Qt-** quartile; **QOL-** quality of life; **RCT**- randomized controlled trials; **REM-** random effect model; **SA-** sensitivity analysis; **sat-** satisfaction; **SBP-** systolic blood pressure; **SCDT –** self-care deficit theory; **SD-** Standard deviation; **SDH-** social determinants of health; **SDSCA** – summary of diabetes self-care activities; **sec-** secondary; **SE**- self-efficacy**; SEE-** self-efficacy exercise; **SMA-** shared medical appointments**; SP-** Spanish; **SR-** systematic review; **SaS-** sample size; **SoS-** social support; **StS-** statistically significant; **SS-** Spanish-speaker; **T2DM**- Type II Diabetes Mellitus, **T1D-** type I Diabetes; **trig**- triglycerides; **tx**- treatment; **UC**- usual care; **Unin**- uninsured; **V-** variable; **Wt-** weight; **#-** number; **yr-** year;

Table A2

Evaluation Table Qualitative Studies

Citation	Theory/ Conceptual Framework	Design/Method	Sample/Setting	Major Themes Studied and definitions	Measurement Instrumentations	Data Analysis	Findings/Themes	Decision for Use/Application to Practice
Brunk, D.R. (2017). A culturally appropriate self-management program for Hispanic adults with type 2 Diabetes and low health literacy skills **Funding:** University VA School	PCM that incorporates theories of behavioral change that are commonly used with DSME within a patient-centered approach.	Phenomenological analysis **Purpose:** Assess how patients with T2C and LHL skills feel about DSME	**n:** 9 **Inclusion:** T2D, SS, >/= 18y/o, not pregnant **Setting:** rural CHC in an undeserved area **AR:** 0	The themes were related to the major 4 nodes: 1 Information and knowledge 2 Motivation and barriers to behavior change 3 Pts experiences with new SM behaviors. 4 Personal responsibility for disease management.	**Descriptive Clarity:** Four 2 hr class and focus group sessions. Feedback was recorded around 4 themes that were transcribed and placed in appropriate nodes. **Procedural rigor:** recorded digitally; 2 hr classes x's 4; participants discuss experiences; interactive format; group	Hermeneutical phenomenology approach. *Mest interpreters* translations unintelligible and unnecessary items omitted. Transcribed by Nvivo-10 for common concepts. 4 major nodes	Pts lack of knowledge regarding disease Pts feelings of empowerment Pts knowledge providing the avenue to be participants in their care.	**LOE: VI** **Strengths:** Self-awareness improvement, valid took, attempt to ensure rigor, AR low, findings c/w previous research in DSME. **Implications:** integration of DSME that is culturally appropriate at the pts levels

Abbreviation Key: **AR-** attrition rate; **AR1**- affect range; **BF-** breastfeeding; **BHA-** behavioral health activation; **b/w-** between; **BMI-** body mass index; **Com-** community; **CA** – correlation assumptions; **CCT-** Cochrane Collaboration Tool; **CES-D** – Center for Epidemiologic Studies-Depression; **CG-** control group; **CCM-** culturally competent model; **CDE-**certified diabetes educator; **CER-** comparative effectiveness research; **CHW-** community health worker; **CI-** confidence interval; **COT-** change over time; **CT-** culturally tailored; **CCT-** cultural care theory; **DM-** diabetes mellitus; **DSMA-** diabetes screener for Mexican-American; **DSES-** diabetes self-efficacy scale; **DSME-** diabetes self-management education; **DSMESEM-** the diabetes self-management support empowerment model; **DV**-dependent variable; **dx**- diagnose(d); **eval**- evaluation; **FBG-** fasting blood glucose; **FGS-** focused-group support;**FQHC**- Federally qualified health center; **FG-** focused group; **FPL-** Federal poverty level; **F/u**- follow-up; **GD-** gestational diabetes; **Glu**- glucose; **His-** Hispanic; **I-** intervention; **IG**- intervention group**; Independ** – independent; **Interv-** interventions; **ITT-** intention to treat; **IV**- independent variable; **Lat**- Latino; **LHL**- low health literacy; **LOE**- level of evidence; **M-** mean; **MM-** multi-modal; **MA-** meta-analysis; MBTP- model-base time point; **Med**- medication; **Min-** Minority; **MI-** motivational interviewing; **MLRM-** multiple linear regression model; **MM-** multimodal; **mo-** months; **MXA**- Mexican American; **N**-number of studies; **n**- number of participants; **N/A-** not available; **NC-** North Carolina; **NDEP-** National diabetes education program; **p-** after; **PA-** power analysis; **PAM-** patient activation measure; **PC-** primary care**; PCC-** primary care clinics; **PCORI-** patient centered outcomes research institute**; PRISMA-** Preferred Reporting Items for SR and MA; Preg- pregnant; **Prg-** program; **pts**- patients; **PCM-** patient centered model; **PLCM-** performance liquid chromatography method; **QES-** quasi-experimental study; **Qt-** quartile; **QOL-** quality of life; **RCT**- randomized controlled trials; **REM-** random effect model; **SA-** sensitivity analysis; **sat-** satisfaction; **SBP-** systolic blood pressure; **SCDT –** self-care deficit theory; **SD-** Standard deviation; **SDH-** social determinants of health; **SDSCA** – summary of diabetes self-care activities; **sec-** secondary; **SE**- self-efficacy**; SEE-** self-efficacy exercise; **SMA-** shared medical appointments**; SP-** Spanish; **SR-** systematic review; **SaS-** sample size; **SoS-** social support; **StS-** statistically significant; **SS-** Spanish-speaker; **T2DM**- Type II Diabetes Mellitus, **T1D-** type I Diabetes; **trig**- triglycerides; **tx**- treatment; **UC**- usual care; **Unin**- uninsured; **V-** variable; **Wt-** weight; **#-** number; **yr-** year;

of Nursing award. **Bias:** Facilitator was SS. **Country:** U.S.A	discussion facilitation	of literacy to ↓ complications. **Limitations:** Small n, pts LHL causing adjustments throughout study. Pt self-selection of pts ↑ bias. **Application:** similar pts/clinic, repeated sentiments in both settings, nodes are applicable in DSME education.

Abbreviation Key: **AR-** attrition rate; **AR1**- affect range; **BF-** breastfeeding; **BHA-** behavioral health activation; **b/w-** between; **BMI-** body mass index; **Com-** community; **CA** – correlation assumptions; **CCT-** Cochrane Collaboration Tool; **CES-D** – Center for Epidemiologic Studies-Depression; **CG-** control group; **CCM-** culturally competent model; **CDE-**certified diabetes educator; **CER-** comparative effectiveness research; **CHW-** community health worker; **CI-** confidence interval; **COT-** change over time; **CT-** culturally tailored; **CCT-** cultural care theory; **DM-** diabetes mellitus; **DSMA-** diabetes screener for Mexican-American; **DSES-** diabetes self-efficacy scale; **DSME-** diabetes self-management education; **DSMESEM-** the diabetes self-management support empowerment model; **DV**-dependent variable; **dx**- diagnose(d); **eval**- evaluation; **FBG-** fasting blood glucose; **FGS-** focused-group support;**FQHC**- Federally qualified health center; **FG-** focused group; **FPL-** Federal poverty level; **F/u**- follow-up; **GD-** gestational diabetes; **Glu**- glucose; **His-** Hispanic; **I-** intervention; **IG**- intervention group**; Independ** – independent; I**nterv-** interventions; **ITT-** intention to treat; **IV**- independent variable; **Lat**- Latino; **LHL**- low health literacy; **LOE**- level of evidence; **M-** mean; **MM-** multi-modal; **MA-** meta-analysis; MBTP- model-base time point; **Med**- medication; **Min-** Minority; **MI-** motivational interviewing; **MLRM-** multiple linear regression model; **MM-** multimodal; **mo-** months; **MXA**- Mexican American; **N**-number of studies; **n**- number of participants; **N/A-** not available; **NC-** North Carolina; **NDEP-** National diabetes education program; **p-** after; **PA-** power analysis; **PAM-** patient activation measure; **PC-** primary care**; PCC-** primary care clinics; **PCORI-** patient centered outcomes research institute**; PRISMA-** Preferred Reporting Items for SR and MA; Preg- pregnant; **Prg-** program; **pts**- patients; **PCM-** patient centered model; **PLCM-** performance liquid chromatography method; **QES-** quasi-experimental study; **Qt-** quartile; **QOL-** quality of life; **RCT**- randomized controlled trials; **REM-** random effect model; **SA-** sensitivity analysis; **sat-** satisfaction; **SBP-** systolic blood pressure; **SCDT –** self-care deficit theory; **SD-** Standard deviation; **SDH-** social determinants of health; **SDSCA** – summary of diabetes self-care activities; **sec-** secondary; **SE**- self-efficacy**; SEE-** self-efficacy exercise; **SMA-** shared medical appointments**; SP-** Spanish; **SR-** systematic review; **SaS-** sample size; **SoS-** social support; **StS-** statistically significant; **SS-** Spanish-speaker; **T2DM**- Type II Diabetes Mellitus, **T1D-** type I Diabetes; **trig**- triglycerides; **tx**- treatment; **UC**- usual care; **Unin**- uninsured; **V-** variable; **Wt-** weight; **#-** number; **yr-** year;

Table A3

Synthesis Table

Studies	Chrvala, C. A., et al.	Hildebrand, J. A., et al.	Ferguson, S., et al.	Ramal, E., et al.	Hu, J., et al.	Hughes, M. M., et al.	Kaltman, S., et al.	Noya, C. E., et al.	Perez-Escamilla, R., et al.	Brunk, D. R, et al.
General Information										
Year	2016	2020	2015	2017	2016	2016	2016	2019	2015	2017
Design/LOE	RCT-II	SR/MA-I	SR/MA-I	RCT-II	QES-III	QES-III	QES-III	QES-III	RCT-II	Qual-PA-VI
Baseline A1C	8.4%	8.5%	9.6%	9%	8.9%	8.3%	9.6%	9.5%	9.5%	N/A
Mean Age	58.5	NS	59	53	49.4	57	49	53	56	48
Majority Female	NS	X	NS	X	X	X	X	NS	X	X
Hisp/Lat	X	X	X	X	X	Mixed	X	X	X	X
Sample N	>11,000	>39,00	>29,000	32	186	459	18	90	211	9
AR	Varied	6%-41%	6%-54%	15%	18%	25%	17%	NS	30	0
F/U (months)	Varied	Varied	6-60	1,3,6	1,6	1,12	1,3	1,3,6	3,6,12,18	
Bias	Neg	Neg	Neg	Pos	Pos	Neg	Pos	Pos	Pos	Pos
Setting										
CHC			X	X				X		X
PCP			X				X			
Home						X			X	
Multiple Sites	X	X			X					
Study Variables										
Mode of DSME										
Group Education	X		X	X	X			X		
Solo Education	X	X	X	X			X		X	X
Single Provider	X	X				X				
MDT education	X	X	X	X	X		X	X		
Combo Approach		X						X		
Family Support					X			X		X
Other Variables										
Attendance				X				X		
Duration	X	X	X	X	X					
Nutrition			X	X	X		X		X	X

Key: [this is sample for table A3] **AR** attrition rate **CHC** community health clinic **CT** culturally tailored **DSME** diabetes self-management education **F/U** follow-up **Hisp** Hispanic **Lat** Latin **MA** meta-analysis **MDT** multidisciplinary team **PA** phenomenological analysis **PCP** primary care physician **QES** quasi-experimental study **Qual** qualitative **RCT** randomized control trial **SR** systematic review ↓ decrease ↑increase ⌀ not significant ↖ improvement

Studies	Chrvala, C. A., et al.	Hildebrand, J. A., et al.	Ferguson, S., et al.	Ramal, E., et al.	Hu, J., et al.	Hughes, M. M., et al.	Kaltman, S., et al.	Noya, C. E., et al.	Perez-Escamilla, R., et al.	Brunk, D. R, et al.
Exercise			X		X		X			X
Medications				X		X	X		X	
Self-Management	X				X	X	X	X	X	X
Behavior Change					X	X	X	X		
Country of Origin				X			X			X
Outcome Variables										
↓ A1C	X	X	X	X	X	X	X	X	X	
Weight						⌀				
Anthropometric □				X						
↖ BP						⌀		X		
↖ Self-Care					X	X	X			
↖ Exercise				⌀	⌀	⌀	⌀			
↖ Knowledge/ Empowerment					X	X	X			X
Diet Changes				⌀	X	X		X		
Findings										
↓ A1C Levels	X	X	X	X	X	X	X	X	X	
Correlation b/w variables		X	X	X	X	X		X	X	
Sustainability	X					X				X
Improved Diet					X			X		X
↖ Depression				X		X	X			
↑ participation ↖ outcomes	X		X							
Combo DSME improved outcomes	X			X						
Longer Intervention = ↖ outcomes	X		X	X	X				X	
CT ↖ outcomes		X	X	X	X		X		X	
↖ QOL				X	X		X			

Key: [this is sample for table A3] **AR** attrition rate **CHC** community health clinic **CT** culturally tailored **DSME** diabetes self-management education **F/U** follow-up **Hisp** Hispanic **Lat** Latin **MA** meta-analysis **MDT** multidisciplinary team **PA** phenomenological analysis **PCP** primary care physician **QES** quasi-experimental study **Qual** qualitative **RCT** randomized control trial **SR** systematic review ↓ decrease ↑increase ⌀ not significant ↖ improvement

Appendix B

Models and Frameworks

Figure A1

Illustration of Purnell's Model for Cultural Competence

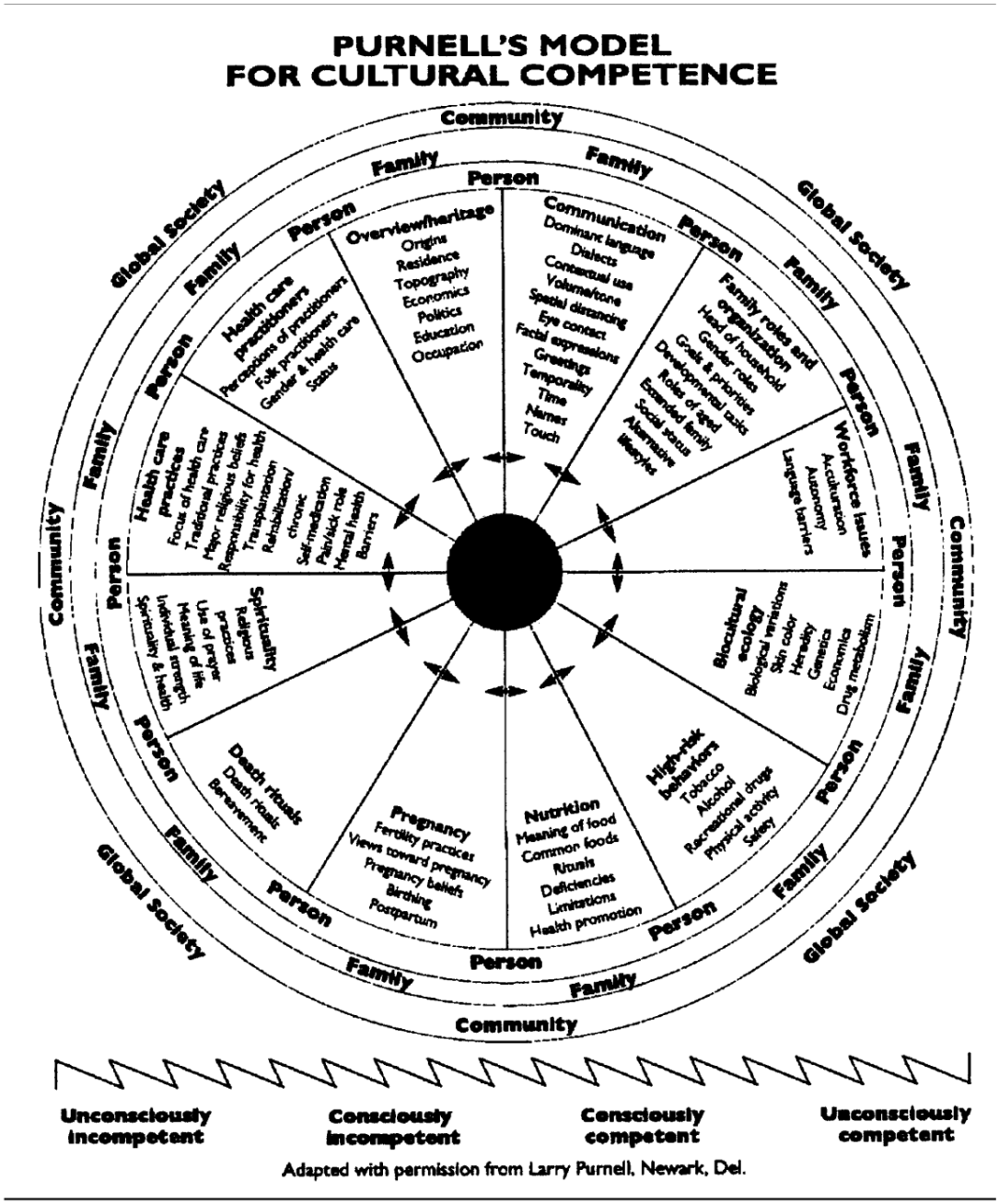
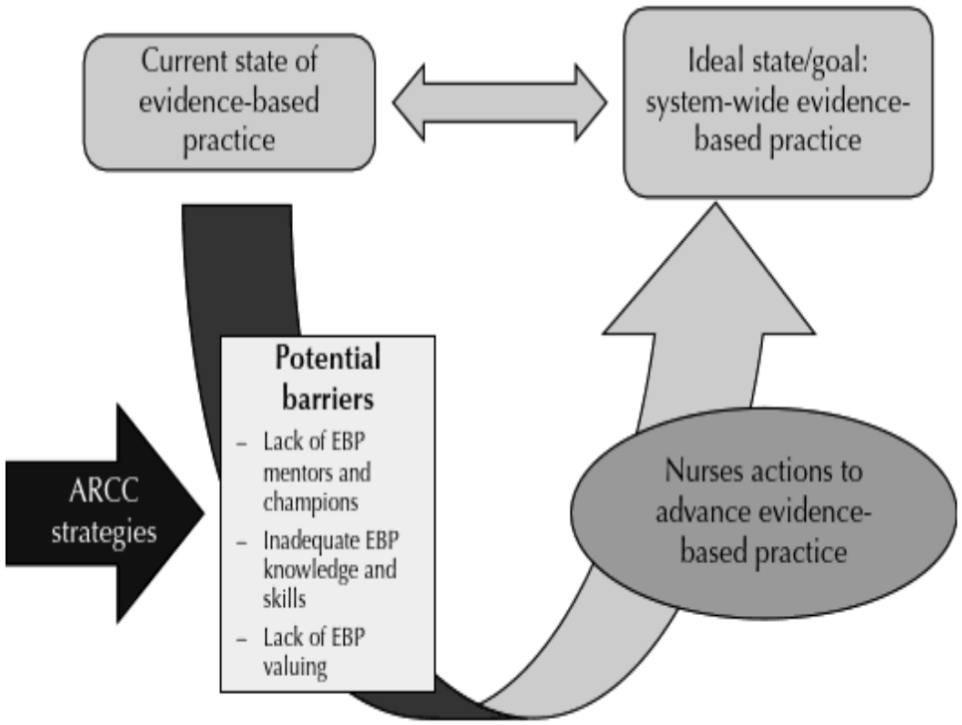


FIGURE 1. Purnell's Model of Cultural Competence.

Purnell (2002)

Figure A2

Illustration of ARCC Conceptual Guide



Rycroft-Malone & Bucknal (2010)

Appendix C

Budget

	Phase	Activities	Cost	subtotal	Total
Direct Costs	**Preparation**	Design and print flyers to give it to patients in clinic (green/yellow/red) food guide	$200		
		Create recipe videos focused on Hispanic diets on Instagram and/or Facebook	$100		
		Hire Spanish Speaking Nutritionist to assist with nutritional plan directed to Hispanics.	$15/hr for 20 hrs	$300	
		Print pre-post test	$100		
Indirect Costs	**Delivery**	Spanish Speaking employee to teach the class (5 sessions – paid by WCC)	$60/class	$300	
		Food bag kit from Food Bank	$50		
		A1C measurements POC testing	$16.45/test*	Depends on the # of subjects	
Funding		Personal Funding & Grant	$750		

Cost Savings/ Evaluation		Review and analysis of results. Evaluation of decrease in A1C benefit in overall healthcare cost	$30/hr for 5 hrs	$150	**$1,200**

Budget Justification

Justification for the numbers provided above:

1. Operations

A. Equipment
a. POC testing – already present at the site and part of standard of care. Patient pays the lab fee that covers the cost of the test.
b. Computer with EMR system – already present at the site with extra computers for students.

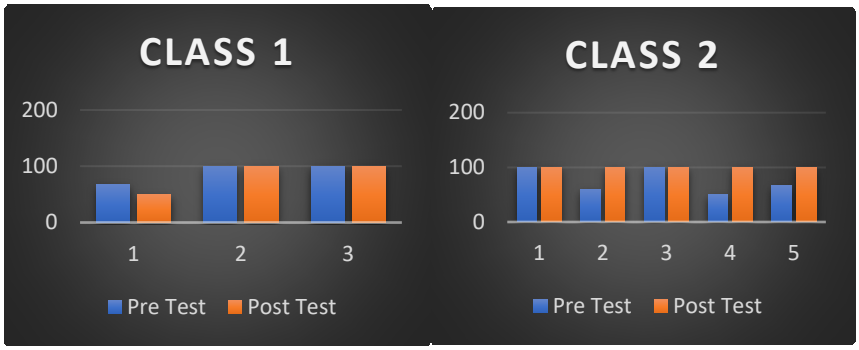
B. Materials and supplies
a. Printed supplies – Packets composed of 3 different color A4 paper and recipes
b. Kitchen supplies pots, pans, silverware) for food nutrition teaching
c. Food baskets donated by food bank with nutritious healthy choices for low-income patients
d. Statistical analysis software owned by primary investigator

C. Outside contracted professionals
a. Bilingual nutritionist for culturally tailored plans for Hispanics
b. Statistician to confirm outcomes measurements and calculations

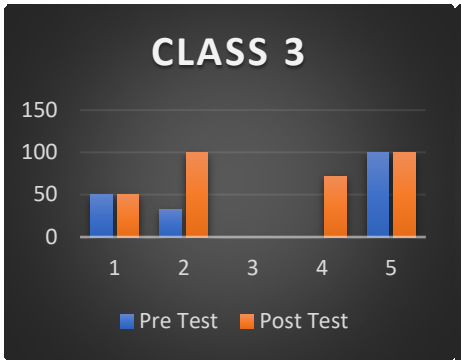
2. Technology

a. Patients to have access to free account for Instagram or Facebook in case classes need to be fully online.
b. Patients will need computer, phone, or tablet with such capabilities.

Appendix D


CLASS 1
200
100
0
1
2
3
Pre Test
Post Test

CLASS 2
200
100
0
1
2
3
4
5
Pre Test
Post Test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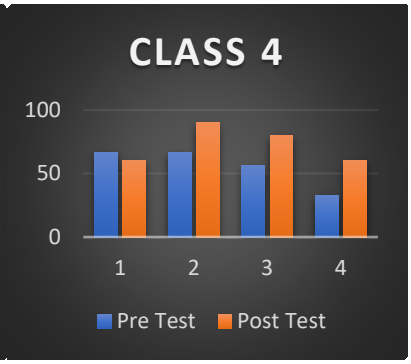
100
50
0
1
2
3
4
5
Pre Test
Post Test


CLASS 4
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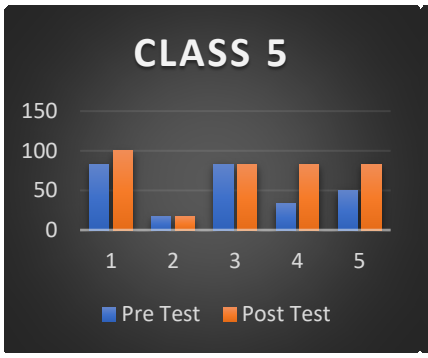
50
0
1
2
3
4
Pre Test
Post Test


CLASS 5
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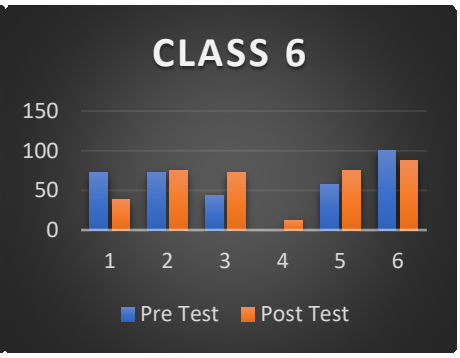
50
0
1
2
3
4
5
Pre Test
Post Test


CLASS 6
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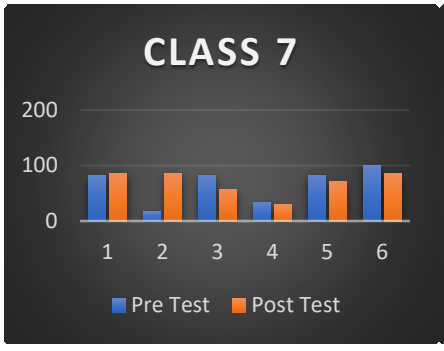
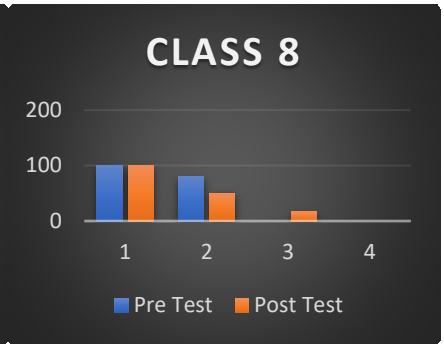
100
50
0
1
2
3
4
5
6
Pre Test
Post Test


CLASS 7
200
100
0
1
2
3
4
5
6
Pre Test
Post Test


CLASS 8
200
100
0
1
2
3
4
Pre Test
Post Test

Appendix E

Patient ID	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Attended	Attended %
1	X								1/8	12.5%
2	X		X		X		X		4/8	50%
3	X	X	X	X		X	X	X	7/8	87.5%
4	X	X	X	X					4/8	50%
5	X	X	X	X			X		5/8	62.5%
6	X	X	X	X	X				5/8	62.5%
7		X	X	X	X				4/8	50%
8		X	X		X	X	X	X	6/8	75%
9		X							1/8	12.5%
10		X			X	X			3/8	37.5%
11		X		X		X	X	X	5/8	62.5%
12		X			X				2/8	25%
13		X			X	X	X		4/8	50%
14			X			X	X	X	4/8	50%
15			X						1/8	12.5%
16			X	X	X		X	X	5/8	62.5%
17			X	X				X	3/8	37.5%
18			X	X		X	X		4/8	50%
19				X	X	X	X	X	5/8	62.5%
20					X				1/8	12.5%
21						X	X	X	3/8	37.5%
22						X	X	X	3/8	37.5%
23						X			1/8	12.5%
24							X		1/8	12.5%
25								X	1/8	12.5%
26								X	1/8	12.5%
27								X	1/8	12.5%
Attended	22%	40%	44%	37%	37%	40%	48%	44%		