Improving Diabetes by Improving Diabetes Education in Primary Care

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Abstract

Diabetes is a leading cause of morbidity in the world. About 42 million people worldwide

have diabetes. Poorly managed diabetes leads to long term complications and mortality.

Diabetes self-management education (DSME) has been effective in preventing or

delaying complications. The purpose of this project is to implement a diabetes self-

management education (DSME) program in primary care and to evaluate its impact on

glycemic control and diabetes knowledge in a selected group of adults 18 years or older

in a community-based practice.
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Keywords: diabetes education, diabetes self-management, hemoglobin A1C, DSME and

structured diabetes education,

Improving Diabetes by Improving Education

Diabetes is one the most common chronic diseases and is estimated to be the fifth leading cause of death in the country (Chaney, 2015). This prevalent disease is associated with the development of increasing mortality, morbidity and rising healthcare costs. Optimal diabetes care requires active involvement of patients. However, in order to engage, one must have an understanding of diabetes and how to manage it. Thus, diabetes education is the cornerstone of diabetes management.

Problem Statement

The complexity of diabetes remains a challenge for many people. About 422 million people, worldwide, have diabetes and the prevalence of this disease continues to rise (World Health Organization (WHO), 2016). In the United States, 29.1 million people have diabetes (Center for Disease Control (CDC), 2014). In the state of Texas, alone, an estimated 11% of adults have diabetes and 8% have pre-diabetes (Texas Department of State Health Services (TDSHS), 2015). Medicaid has spent more than $280 million on Texas beneficiaries with diabetes (TDSHS, 2015). In 2013, there were 5,262 diabetes related deaths in Texas (TDSHS), 2015). In a person with diabetes, there is a higher risk for serious health complications such as blindness, kidney failure, heart disease, stroke, loss of limbs and a 50% higher risk of death than a person without diabetes (CDC, 2014). Many of these complications are directly related to poor management of the disease (healthypeople.org, 2015).

Quality diabetes control is essential to preventing long-term complications. However, interventions aimed at managing this disease are often inefficient in many health care settings and patient populations. Thus, there is a need for change. One key

catalyst for change is diabetes self-management education.

Diabetes self-management education (DSME) provides individuals with knowledge, skill and the ability to navigate the multitude of daily decisions and activities necessary for better health outcomes (Powers, Bardsley, Cypress, Duker, Funnell, Fischl, Maryniuk, et al., 2015). The objectives of DSME are to support informed decision-making, self-care behaviors, problem solving, and active collaboration with the health care team to improve clinical outcomes, health status and quality of life (Powers, Bardsley, Cypress, Duker, Funnell, Fischl, Maryniuk, et al., 2015). This education is designed to address the patient's health beliefs, cultural needs, current knowledge, physical limitations, emotional concerns, family support, financial status, and any other factors that may be an obstacle to successful diabetes self-management (Powers, Bardsley, Cypress, Duker, Funnell, Fischl, Maryniuk, et al., 2015). A well-known health initiative devoted to addressing issues spanning the diabetes continuum is the National Diabetes Education Initiative (NDEI). NDEI is a trusted online destination that delivers scientifically rigorous, evidence-based programs, curricula, and tools that enable practicing clinicians to view clinical practice guidelines, pathophysiology, understand rationale for early intervention with appropriate lifestyle and pharmacologic management to arrest disease progression (NDEI.org, 2017). Another source for diabetes education is American Association of Diabetes Educators. It is a multi-disciplinary professional organization dedicated to improving diabetes care through innovative education, management and support (AADE.org, 2017).

Background and Significance

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia with disorders of carbohydrate, fat and protein metabolism (Sadeghian, Madhu, Kannan, & Agrawal, 2016). This disorder is a result of defects in insulin secretion and/or insulin action (Sadeghian, Madhu, Kannan, & Agrawal, 2016). It is associated with microvascular and macrovascular disease, which can present as myocardial infarction, stroke, end stage renal disease, retinopathy and foot ulcers (McCulloch, Nathan, Mulder, 2017). It is now one of the leading causes of mortality in the world. (WHO, 2016). Hence, there is a need to gain control of this disease.

Diabetes self-management education (DSME) is critical in preventing or delaying complications of diabetes (Haas, Maryniuk, Beck, Cox, Duker, Edwards, 2014; Wong, Wong, Wan, Chan, Lam, 2015, Prezio, Pagan, Shuval, Culica, 2014). Researchers have found that the benefits of DSME are improved knowledge, constructive self-care behaviors, and better clinical outcomes such as lowered hemoglobin A1C levels, decreased risk of major complications, weight loss, and enhanced quality of life (Gumbs, 2012). Many diabetes education programs exist. However, their effectiveness varies.

Regardless of race and culture, group based self-management educational programs using structured guidelines have been significantly effective in improving glycemic control (Sadeghian, Madhu, Agrawal, Kannan, Agrawal, 2016; Essein ,Otu, Umoh, Enang, Hicks, Walley, 2017).

Structured group education is geared towards informed choice, empowerment, shared decision making, patient-centered care and social learning theory while other strategies suggest the importance of frequent interventions and regular follow-ups

undertaken over an extended period of time, to promote enduring change (Long &
Gambling, 2011; Dineen, et al., 2014).

  Recent collection of evidence is available to support the effectiveness of diabetes
self-management education on diabetes. A randomized controlled trial was done to
determine the success of a community-based group intervention in reducing the levels of
hemoglobin A1c and long-term health risks (Lynch, Liebman, Ventrelle, Avery,
Richardson, 2014). The intervention was culturally tailored and was more effective than
usual care at improving glycemic control (Lynch, et al., 2014).

  A different randomized study, conducted in internal medicine practices, general
medical practices and group practices, assessed the efficacy of three different diabetes
management interventions. (Piatt, Anderson, Brooks, Songer, Siminerio, Korytkowski, &
Zgibor, 2010). The interventions included: Chronic Care Model, a Provider Only
intervention and Usual Care practices. The study revealed sustained improvements in
A1C, non-HDLc, and blood pressure at 3-year follow-up (Piatt, et al., 2010).

  In continued efforts to promote better diabetes control, internet-based self-
management programs have been explored. A randomized controlled trial of computer-
based self-management interventions revealed only a small positive effect on blood
glucose control (Pal, Eastwood, Michie, Farmer, Farmer, Barnard, Peacock, 2013).
However, mobile phone interventions appear to have larger effects (Pal, Eastwood,
Michie, Farmer, Farmer, Barnard, & Peacock, 2013).

  Local health departments used a change facilitation model to implement quality
improvement projects that focused on two major themes: increasing community outreach
to patients and providers and improving internal operations related to the delivery of

diabetes self-management education services (Dearinger et al., 2013). Core components

of the change model include quality improvement team development and on-site training.

This training enabled the local health departments to gather data on patient needs and

preferences and implement projects specific to their community. This improved the

delivery of their diabetes self-management education services. Ultimately, it improved

the number of patients receiving educational services (Dearinger et al., 2013).

Culturally tailored diabetes education can lead to significant improvements in self-

care, as well. It is important to understand traditions in cultures and that just talking about

diet and exercise is not enough to produce lifestyle changes (Carter, Berkley, Barba,

Kautz, & Donald, 2013). Culturally appropriate health education is basically tailored to

the cultural or religious beliefs or linguistic skills of the community being approached

(Attridge, Creamer, Ramsden, Cannings,-John, & Hawthorne, 2014). A systematic

literature review of RCTs was done to assess the effectiveness of culturally appropriate

health education in people with diabetes. The results showed that there was glycemic

control and increased knowledge of diabetes following culturally appropriate health

education (Attridge, et al., 2014).

An education program was developed for people with diabetes mellitus already on

insulin to enable effective self-management, improve confidence, reduce hypoglycemia

and enable peer group support (Fairfield, Amin, & James, 2014). The curriculum was

evidence based and tailored to the individual needs of groups. The structured education

included use of a trained and competent diabetes educator; a written curriculum; quality

assurance and regular audits. The content covered: understanding insulin action;

monitoring blood glucose; understanding the influence of food and activity on blood

glucose levels; reducing the risk of hypoglycemia and its management and managing illness and travel. This team-led program resulted in an improvement in glycemic control as evidenced by decreased hemoglobin A1C, increased patient satisfaction and confidence.

Internal Evidence

In a primary care practice in southwestern U.S. with a high number of patients presenting with uncontrolled diabetes, health care providers must make a valid effort to encourage and empower individuals to self-manage their diabetes. Internal evidence from fieldwork reveals more than 70% of patients with diabetes has an HbA1c 0f 7.0% or higher. Some obstacles to adherence include access to medications, the inability to consistently stick to a diet plan, lack of exercise and lack of understanding the link between the food they consume and hemoglobin A1C.

There are methods for risk assessment, screening and patient education. Currently, a local primary care clinic in Texas, does not have a risk assessment or a screening tool for clients with diabetes. Additionally, there is no process in place to provide consistent structured patient education for individuals with diabetes.

New policies and interventions need to be developed and implemented to improve individuals' participation in self-care behaviors, self-management and ultimately clinical outcomes. In light of diabetes self-management education being paramount to the improvement of an individuals' quality of life, it would be interesting to know what is the most effective diabetes self-management education method. This inquiry has led to the clinically relevant PICOT question, "In adults with diabetes, how does a structured

diabetes self-management education compared to current practice of usual diabetes education affect HbA1c over 3 months?"

Search Strategy

Databases searched for the literature review included Cochrane, Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and Academic Search Premier. The focus of the search strategy was to find literature to support the PICOT question. Keywords included; *Education and Diabetes self-management; Diabetes Self-management And Education AND Efficacy; Self-management education efficacy and diabetes; Structured diabetes education and effectiveness; Diabetes education and verbal; Diabetes education and improving clinical outcomes and structured; Diabetes Education AND self efficacy; DSME AND A1C; Structured diabetes education and clinical outcome.* The searches were restricted to peer-reviewed journals written in English and published from 2010 to 2017. Initial yields were produced, abstracts and results were examined to determine relevancy to the clinical question. Studies included evaluated the relationship between diabetes self-management education and improving clinical outcomes. Those excluded were articles that involved individuals without the diagnosis of diabetes, provided unclear documentation, inconclusive evidence, or were impertinent to this review.

The Cochrane Database (Appendix D) was assessed, yielding 5731 reviews. The CINAHL database was assessed (Appendix A), yielding 34 reviews. PubMed (Appendix B) was assessed, yielding 368 reviews. Academic Search Premiere database (Appendix C) was reviewed, yielding 2939 reviews. A total of 71 articles were collected from these searches, and then critically examined according to the level of evidence and clinical

relevancy. thirteen final articles were chosen for inclusion in this review: Systematic

reviews, randomized controlled trials, and meta analyses.

Critical Appraisal and Synthesis

Thirteen studies were included in this literature review, all of which were

evaluated using Melnyk and Fineout-Overholt's (2010) hierarchy of rapid critical

appraisal. Many of the studies answered the PICOT question and are within the last five

years. Most of the studies are of high level of evidence. The articles ranged from level I

to level VII evidence, with eleven of the thirteen studies ranking as levels I and II.

(Appendix F). Although the one level VII article is not considered the strongest evidence,

it offers important guidelines provided by experts on the topic of diabetes education. This

information will be valuable in the development of an evidence-based project (EBP)

focusing on improving clinical outcomes by improving diabetes education.

Most of the participants were between ages 40-60 years old and equally represent

male and female. There is broad ethnic representation across studies. Globally, other

countries are represented. The sample sizes are ranged from 88 to 520,345. Tools to

measure outcomes varied across studies. However, 11 out of 14 measured HbA1C

(Appendix F).

The instruments used are widely accepted and valid. The consistent measurements

were those used measure HbA1c, self-efficacy, diabetes and distress (Appendix F).

Measurements are valid and reliable as demonstrated by high construct validity reported

as a Cronbach's alpha. (Appendix E). Of the final 14 studies, nine were randomized

controlled trials, three systematic reviews, one meta-analysis and one cross-sectional

analysis. Seventeen variables were selected for inclusion in the synthesis table based on

relevance to the PICOT question (Appendix F).

Many studies found significant relationships between structured DSME and improved hemoglobin A1C. Some studies found significant relationships between culturally tailored education and improved HbA1C, diabetes knowledge and self-efficacy. Few studies found relationships between DSME and improved quality of life.

Conclusion

The current standard of care is inconsistent and ineffective in managing diabetes as evidenced by the rising burden of the disease. This literature review revealed that the cornerstone of diabetes management is diabetes education. This literature review revealed that multi-faceted, structured diabetes self-management education and culturally tailored diabetes education were more effective than usual practices. These approaches improve HbA1c, self-management skills, self-efficacy, diabetes knowledge and quality of life.

Theoretical Framework

Self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives (Bandura, 1994). Self-efficacy beliefs determine how people feel, think, motivate themselves and behave. A person who is self-efficacious approaches difficult situations as challenges to be mastered instead of threats to be avoided. An efficacious individual approaches situations with assurances that can be controlled. In order to have adequate control over diabetes, one must have robust sense of efficacy to sustain the perseverant effort needed to succeed in maintaining a health lifestyle. The selected theory that describes the interrelated concepts and behaviors of this body of evidence is Self-efficacy theory (Appendix G).

Conceptual Framework

Ongoing self-care is necessary for effective management of diabetes. This is often achieved through diabetes self-management education. Healthcare providers must use evidence-based healthcare delivery models, such as the chronic care model (CCM), to improve outcomes for people with diabetes. The Chronic Care Model (Appendix H) is an organizing framework for improving chronic illness care by providing a multifaceted framework of six interrelated elements. The idea of CCM is that quality care is not isolated. It creates a culture and mechanisms that promote safe, high quality care; it assures the delivery of effective, efficient clinical care and self-management support; promotes clinical care that is consistent with scientific evidence and patient preferences; organizes patient and population data to facilitate efficient and effective care; empowers and prepares patients to manage their health and health care; and mobilizes community resources to meet the needs of patients (AADE, 2014)

The theoretical/conceptual framework presents a systematic way of understanding events, behaviors and/or situations. The selected framework will describe a set of interrelated concepts, definitions, and propositions that explain or predict events or situations by specifying relationships among variables.

This model can be applied to an evidence-based project. The CCM has proven to be effective in sustaining diabetes self-management programs. It could be incorporated in primary care by facilitating patient-centered care, patient empowerment and self-management support as it relates to diabetes. The CCM could help with assembling diabetes management protocol, tools and education materials that are user-friendly, culturally tailored and at the appropriate literacy level for people with diabetes.

Evidence-Based Model

The chosen evidence base model is that of Translating Evidence into Clinical

Practice (Appendix I). This conceptual model is a systematic process grounded in change

theory, research utilization and standardized nomenclature (Pipe, Wellik, Buchda,

Hansen & Martyn, 2005). It facilitates the translation of research into practice (Pipe, et

al.). There are six phases: assessing the need for change; linking the problem with

interventions and outcomes; synthesizing the best evidence; designing a change in

practice; implementing and evaluating the practice; and integrating and maintaining the

practice change (Pipe, et al.).

Applying Evidence to Practice/Methods

Primary care providers can improve management of diabetes by improving

diabetes self-management education. The evidence suggests that usual care is not

sufficient in helping patients gain glycemic control. The evidence shows that structured

and culturally tailored diabetes self-management education is effective in improving

diabetes knowledge, self-efficacy, clinical outcomes and quality of life. The stakeholders

include the providers, the healthcare workers and patients.

The first three phases of the EBP model were accomplished through fieldwork,

the exhaustive search of evidence, and the critical appraisal and synthesis of that

evidence. The design phase began with me utilizing the evidence to design a practice

change for the primary care clinic.

The practice design was submitted and approved by Arizona State University

Institutional Review Board committee. The setting was a primary care clinic in

Mansfield, TX. The participants were scheduled for an office visit for pre-intervention

HbA1c check and Diabetes Knowledge Test (DKT). The DSME session was followed. It

included diabetes educational videos and compiled sources for a DSME leaflet. This was

followed by a post-test. Three months later, another HbA1c was drawn.

Outcomes/ Results

Data was collected, coded and entered into SPSS. With collaboration with a

statistics consultant, descriptive statistics non-parametric tests were run to analyze data

and produce figures and tables. Frequencies reported on all ordinal and nominal data. The

sample consisted of 60% male and 40% female. Descriptive statistics was reported on all

scale data. The average age of the participants is 72 (SD = 8.34) and the ages ranged from

65 to 82 years of age. There were clinical and statistical significant improvements in

diabetes knowledge post intervention (p=0.043). There were clinical significant

improvements in HbA1c values (P=1.00) post intervention.

Impact/Discussion

By implementing DSME programs in primary care and monitoring HbA1c,

patients should gain improved diabetes knowledge, self-efficacy and glycemic control.

Patients, providers and the health care system will see significant benefits from focusing

on the implementation of evidence-based diabetes education program.

Some strengths of the project include, the patients, provider and the office staff seemed

very receptive to the practice change. However, there were some barriers: time and

available staff. For sustainability, the office may have to set aside a specific day to do the

education sessions or hire more people. Policy and procedural changes could help with

the consistent provision of diabetes education in primary care.

Conclusion

The DNP project demonstrated that implementing DSME in primary care can improve diabetes knowledge and glycemic control. These results seem to be is in line with the current literature. Patients and health care providers should consider DSME interventions in the primary care settings. This can improve patient knowledge about DM self-management and ultimately, improve health outcomes. This DNP project paves the way for future research that should focus on a larger sample across different populations.

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Appendix A

CINAHL

Appendix B

Pubmed

Appendix C

Academic Search Premiere

Appendix D

Cochrane

Appendix E

Evaluation Table

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Attridge, et al. (2014). Culturally appropriate health education for people in ethnic minority groups with type 2 diabetes mellitus. Heterogeneity of studies Risk of bias was judged to be high for many outcomes.	Chronic care model	**Design:** Systematic Review **Purpose:** To assess the effectiveness of culturally appropriate health education for people in ethnic minority groups with type 2 diabetes mellitus.	**Sample: N= 7** n=1,000 Setting: Primary healthy care centers or hospital clinics; (USA, Canada, South Africa, New Zealand, Australia Gender: Male & female (% unclear) AA; British South Asians; Surinam Asians; Mexican American; Peurto Ricans; American Somoans, Native Americans **Selection criteria:** RCTs of	**IV1:** CAE **IV2:** Usual diabetes education **DV1** Glycemic control (Change in HbA1C) **DV2:** Triglycerides **DV3:** Total Cholesterol **DV4:** Knowledge **DV5:** BMI **DV6:** QOL	Glycemic control: Laboratory measurements of HbA1C Self-efficacy: Stanford SE scale Diabetes SC behaviors: Summary of Diabetes Self-Care Activities; BIPQ	Funnel Plots Random – effects Model Meta analyses	DV1 – HbA1c- improved after CAE (MD: -0.4%;(95% CI: -.5 to -.2) DV2:Reduction in Triglycerides ;(95% CI: -40 to -8) DV3- Neutral effects on total cholesterol DV4 – Knowledge	**Level I Strengths:** High Quality evidence **Weakness:** Risk of bias is high **Practice:**

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			culturally appropriate health education for people >16y.o with T2DM; named ethnic minority; upper-middle-income or high income countries.				improved	
Essein, et al., (2017). Intensive Patient Education improved Glycaemic Control in Diabetes Compared to conventional education: a RCT in a Nigerian Tertiary Care Hospital Funding: Novartis & Biofem – Funders had no role in study design or data collection.	Chronic Care Model	**Design** Unblinded, parallel-group RCT **Purpose**: Evaluate whether an intensive & systematic DSME program, using structured guidelines improved glycemic control compared to existing ad hoc pt education.	n=118 **Setting**: Cross river state Nigeria; Teaching hospital, endocrinology clinic. F-71; M-47 Inclusion: >18y.o; HbA1C .8.5% Able to engage n moderate exercise; free of eye disease	IV-Intensive Pt Education IV 2 – Conventional education DV-HbA1c	HbA1C measurements obtained by nurses using Clover A1c Analyzer	SAS with two-sided hypothesis testing & significance at the 0.05 level	Intensive Group HbA1C - 1.8% (95% CI= -2.4 to -1.2) lower than conventional group	**Level II Strengths :** Robust results demonstrating improved clinical outcomes **Weakness:** The trial had only 6 month f/u pd. Unclear on how generalizable the results are bc of pt population **Practice:** Can be used in practice to

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								improve clinical outcomes.
Fairfield, et al., (2014). 'Getting there': the impact of structured insulin management education in a high ethnic ix population with type 1 and type 2 diabetes There are no conflicts of interest declared Funding-unclear	Self Efficacy	**Design** NICE guidelines **Purpose**: develop an education program for people with type 1 or 2 diabetes to enable effective self-management, improve confidence , reduce hypoglycemia & enable peer group support.	n= 40; 68% male; age 35-82y.o Caucasian: 18; Asian: 22 Setting: Cross river state Nigeria; Teaching hospital, endocrinology clinic. **Inclusion**: Type 1 or 2 diabetes; on medications; Able to speak and understand English	**IV:**DAFNE for T1DM **IV2:** DESMOND for T2DM **DV1-**A1C **DV2** Lipids **DV3** BP **DV4** Quality of life	DV 1 – blood work DV 2: Blood work DV 3: BP cuff DV4:Pt feed-back; no scale was used	SAS with two-sided hypothesis testing & significance at the 0.05 level	Improved HgA1C Increased pt satisfaction & confidence	**Level VII Strengths:** The curriculum showed improvements in clinical outcomes, **Weakness: Mix group (type1 & 2); Different medications. Low level of evidence. Practice**: it has practice implications however, this article has low

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis (stats used)	Findings/ Results	level of evidence.
								Level/Quality of Evidence; Decision for practice/
Ferguson, et al., (2015). Does diabetes self-management education in conjunction with primary care improve glycemic control in Hispanic Patients . Funding- unclear Potential for publication bias	Chronic care Model	**Design:** Systematic Review & Meta-analysis of PubMED, Cochrane Library, CINAHL **Purpose:** Test the effect of DSME interventions in Hispanic adults with T2DM	N= 24 n= 2784 Hispanic Mean age: 47.9-70.3 Setting: Diabetic Clinic MA, TX, NY, CA,PR Inclusion: Pre & post intervention; Change in A1C	**IV1**: DSME individual **IV2** DSME group **IV3**-DSME telephone/electronic **IV4**: DSME multimodal **DV**: HbA1C	Glycemic control measured by blood draw: Hb A1C	PRISMA guidelines. Subgroup analyses Funnel plot Failsafe N test CMA	DV: At > 6 month A1C reduction was -.25 (95% CI, -.42 to -0.07) Most successful DSME = Culturally tailored	**Level I Strengths:** RCTs **Weakness:** Interventions represent large variability in DSME design; Heterogeneity; limited published studies. Practice: Usable
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumen-tation	Data Analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Gonzalez, I., et al. (2015). Long-term effects of an intensive=practical diabetes education program and self-care	Chronic Care Self efficacy Cognitive behavior	Cross sectional study, repeated measure design. Purpose Purpose: Long term effects of DEP	N=1 n= 40: 57.5% Female: 23; Male: 17 Setting: Diabetes outpatient clinic San Cecillio University	IV-DEP DV1-HbA1c DV2: knowledge of Diabetes	ECODI scale SDSCA Diabetes Care Profile Confidence in Diabetes Self-Care Blood work	Non-parametric data were analyzed with McNemar's test ANOVA	DV1: HbA1c – lower at 6 mo & 12 mo f/u P<-.000 SD = 1.28 DV2:	**Level III Strengths:** Results support hypothesis; Significant decrease inA1C; measures of

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	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/
No conflicts of interests declared Funded by the Regional Ministry of Health Andalusia, Spain			Hospital in Spain **Inclusion:** T1DM on insulin **Exclusion:** physical impairment; psychological impairment; been recently diagnosed; not being a native Spanish speaking.			SPSS software	Perceived barriers decreased Knowledge increased – Mean value increased(SD =1.24)	clinical significance **Weaknesses:** Small sample size **Practice:** Practice implications because the study shows improved clinical outcomes
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/
Hermanns, N. (2013). The effect of a diabetes education programme (PRIMAS) for people with type 1diabetes: Results of a randomized trial. Funding: Grant of Berlin Chemie AG/Menarini Diagnostics; No role in PRIMAS study design, data collection &	Self Efficacy	**Design** Multi-center Randomized trial - SYSTAT **Purpose**: develop an education program for people with type 1 or 2 diabetes to enable effective self-management, improve confidence , reduce hypoglycemia & enable peer group	n= 160 participants Setting: Outpatient clinics in Germany **Inclusion**: Type 1 Age>18 & <75 y,o BMI >20&<40 HbA1c>7&<13 Informed consent; Ability to understand & speak German. **Exclusion:** Psychological or	**IV:**PRIMAS **IV2:** DTTP **DV1-**A1C **DV2** self management **DV3** Distress **DV4** Self-efficacy	DV 1 – blood work DV 2: Self-care behavior DV 3: Diabetes-related distress scale DV4: Diabetes Self efficacy scale	95% confidence interval – 0.4% -SYSTAT	DV1: 0.4 % greater reduction of DV2: HbA1c in PRIMAS; HbA1C unchanged in DTTP DV3: - PRIMAS = greater decrease in distress DV 4: PRIMAS =	**Level II Strengths:** Modest improvements in clinical outcomes **Weakness:** Not blinded; . **Practice**: it has practice implications however, this article has low level of evidence.

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analysis, decision to publish or preparation of the manuscript.		support.	psychiatric disorder; dementia; cognitive impairment; Somatic disease; Pregnancy.				greater increase in self efficacy	
Piatt, et al. (2010). 3-Year Follow-up of Clinical and Behavioral Improvements following a Multifaceted Diabetes Care intervention Funding: United States Air Force Conflicts unclear	Chronic care Model Self-efficacy	**Design** RCT – 4 phases; cross sectional **Purpose**: To determine if improvements observed in clinical, behavioral, & psychosocial outcomes measured in 12 months following multifaceted diabetes care intervention were sustained at 3-yar follow up	n= 11primary care n= 42 providers n = 119 patients Setting: Supurb of Pittsburgh, Pennsylvania; 11 Primary care practices Demograph: HS education; FT employment or PT employment Income level >$20,000/yr; Home ownership **Inclusion:** diabetes; A1C > 7%; informed consent;	**IV1:** Chronic care model **IV2:** Provider intervention only **IV3:** Usual Care **DV1:** Glycemia **DV2**: BP **DV3**: Self Monitoring blood glucose **DV4**: A1c	Clinical testing Questionnaire – Modified Diabetes Care Profile World Health Organization (Ten) Quality of Well being Index BP cuff Blood work - laboratory. A1C DCS 200 analyzer; Cholestech LDX system	Paired t tests McNemar SAS	DV1;Glycemic improvement – (-0.5%) DV2 BP control (-4.8%) DV3: Self monitor blood glucose (86.7%-100%) DV4: A1c improvement p=.09) Non-HDLc P=0.1)	**Level II Strengths:** Chronic care model; 3 groups; Primary care offices; 4 phases; cross-sectional ;confirm multifaceted interventions **Weakness:** Small sample size University institutional review board did not permit contacts with

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			Exclusion: Gestational diabetes, adolescents, comparative drug effectiveness, type 1 diabetes, studies of Caucasian women, diabetes pathology					pts articles. **Practice**: Very useful; study done in primary care practices
Pimazoni-Netto, et al. (2011). Rapid Improvement of Glycemic Control in Type 2 Diabetes Using weekly intensive multifactorial interventions: structured glucose monitoring, patient education, and adjustment of therapy

Support from Federal University; Diabetes Education & Control Group of | Chronic Care Self efficacy Cognitive behavior | **Design**: Proof of concept RCT **Purpose**: to test the hypothesis that more frequent adjustment of therapy, combined with a multifactorial interdisciplinary approach could result in a more rapid glycemic control | n= 63 pts outpatient **Setting:** Sao Pauo, Brazil **Inclusion:** 35-75y.o A1C>8 **Exclusion:** Noncompliance | IV-intensive treatment DV-WMG DV2: SD DV3:A1C | Accuchek Performa Roche Bloodwork | Computer analysis (SMBG); onside comparison. WMG, SD, A1C. perform X^2 test to assess null hypothesis | DV1: Significant changes in WMG, DV2: SD & DV3A1C occurred more rapidly in intensive treatment group. | **Level II Strengths:** Results support hypothesis; Significant decrease inA1C **Weaknesses:** Small sample size; short duration of study; **Practice:** Practice implications because the study shows improved clinical outcomes |

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the Kidney & Hypertension Hospital								
Authors; APN consultant for Roche, Bayer; Brazil Consultant for Abbott Diabetes; MTZ consultant for Novartis, Pfizer								
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Rygg, et al. (2011). Efficacy of ongoing group based diabetes self-management. Funding: Cenral Norway Health Authorities There are no potential conflicts of interests relevant to this article.	Self-efficacy	**Design** RCT – open pragmatic, parallel group; randomized by computer **Purpose**: To determine if improvements observed in clinical, behavioral, & psychosocial outcomes	n= 146 50%men age: 40-75 Female: 50% Male: 50% **Setting;** Central Norway **Inclusion:** Diabetes duration 1month to 10 years.	**IV1:** DSME **IV2:** Usual Care **DV1:** A1C **DV2**: Self management **DV3:** Quality of Life **DV4:** Diabetes Knowledge **DV5:** BP	**DV1:** Laboratory Measures: **DV2:** Patient Activation Measure (PAM) (Self reporting questionnaires.) **DV3:** Medical outcomes study short Form-36	In A1C 90% power and a 0.05 significance level PAM score of 6.0(S.D 11.1) Analysis of covarianc e	A1C improveme nt – (- 0.5%) BP control (-4.8%) Self monitor blood glucose (86.7%- 100%) A1c	**Level II Strengths:** Intervention group showed better diabetes knowledge, improved self-management skills ; **Weakness:** Participants had lower A1Cs than expected. articles.

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		measured in 12 months following multifaceted diabetes care intervention were sustained at 3-yr follow up			(SF36) **DV4:** 12-item questionnaire **DV5:** BP cuff	Paired t-test Test of proportions SPSS	improvement p=.09) Non-HDLc P=0.1)	**Practice**: Locally developed programs may be less effective than program developed for studies
Sadeghian, et al.,(2016). Effects of self-management educational program on metabolic control in type 2 diabetes Bias: unclear Funding unclear	Self-care theory	Design: RCT; parallel group trial **Purpose:** to evaluate the efficacy of a self-management educational program on metabolic control in type 2	n= 306 Mean age= 45.42 (32-60) 47male; 58.3% female Setting: Diabetic Clinic at Guru Teg Bahadur; India hospital, **Inclusion**: HbA1C>8% T2DM Informed consent Registered for clinic for 1st time **Exclusion:** Pregnancy Gestational diabetes Malignancy	IV-Group education DV- Self management practices	Questionnaires Clinical examination Investigations	Microsoft Excel SPSS Chi-square Independent t-test McNemar's test Generalized estimation equations	Significant improvement in HbA1c (P=.0001)	**Level II Strengths** study proved self-management program improves metabolic control **Weakness** Practice

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Tang, et al. (2014). Comparative Effectiveness of peer Leaders and Community Health Workers in Diabetes Self-Management Support Funding: Peers for Progress grant from American Academy of Family Physicians Foundation, National institute of Diabetes & Digestive, CDC; Funding sources had no role in the study design, data collection, administration of interventions, analysis, interpretation or reporting of data or decision to submit findings for	Self care	**Design:** RCT **Purpose:** compare peer lead vs community health worker outreach intervention in sustaining improvements in A1c	n= 116 Setting: University of Michigan **Age:** 48-50 **Inclusion:** at least 21 y.o Regular health care provider Self-identified as Latino **Exclusions:** physical limitations Terminal health Psychiatric illness excessive alcohol or illicit drug use	**IV1**- Peer lead DSME **IV2:** Community worker **DV**1- HbA1c **DV2** CV disease risk **DV3:** distress	Laboratory: HbA1c, cholesterol	Longitud-inal analysis	Both PL & Community leader led to improved patient outcomes. PL- HB1c: (-0.6 – 6.6mml). (P=0.0004) CHW: -0.3 to -3.3) P=0.234	**Level II** Strength: high level of evidence HbA1C **Weakness:** Small sample size

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publications.								
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Vos, et al.,(2016). Diabetes self-management education after pre-selection of patients. Funding: European Foundation for the study of diabetes The authors declare they have no competing interests.	Self care	Design: RCT :influencing follow up use of DSME	n=88 **age:** <75 y **Setting:** Netherlands **Inclusion:** <75y; Dx with T2DM b/t 3-5 months **Exclusion:** High self-management capabilities; Insignificant cognition;	IV- DSME DV1-Behavior DV2 = Hb A1C DV3 Quality of life	Blood work SemaS: Self management screening EQ-5D tool Short-Form 36 ADDQOL	GEE ANCOVA	Improved clinic outcome: improved Quality of life, BP, & HbA1c	**Level II Strength:** Results yielded improved clinical outcomes. **Weakness:** Small sample size

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Appendix F

Synthesis Table

Author	Attridge	Essien	Fairfield	Ferguson	Gonzalez	Hermanns	Johnson	Pimazoni-Netto	Piatt	Rygg	Sadeghian	Tang	Vos
Year	2014	2017	2014	2015	2015	2013	2017	2011	2010	2011	2016	2014	2016
Design/Level of evidence	SR/II	RCT/II	Guidelines/VII	SR&MA/I	CS/III	RCT/II	SR/I	RCT/II	RCT/II	RCT/II	RCT/II	RCT/II	RCT/II
Demographics													
Sample Size	1000	118	40	2784	40	160	520345	63	119	146	306	116	88
Age (Years)	>16	>17 Mean=52.7	35-82 Mean=58y	Mean 47.9-70.3 y	Mean: 32.8	18-75	45-65	35-75	64-69	40-75	32-60	48-50	<75 y
Female/Male	Unclear % F/M	71/47	32%/68%	Majority Female	23/17	138/22	46.7%/53.3	18/45	91/28	50%/50%	58.3%/47%	68/48	N/A
Race	Multi-ethnic	Multi-ethnic,	Caucasian 18; Asian: 22	Hispanic	unclear	German	Peurto-rican	N/A	'Nonwhite" = 5	White Norwegian	Indian	Latino	Dutch
Country	US, Canada, South Africa, New Zealand, Australia	Nigeria	Nigeria	USA	Spain	Germany	USA	Brazil	USA	Norway	India	USA	Netherlands
Tools													

DSME: Diabetes Self-Management Education; N/A: Not available; RCT: randomized controlled trial; SE: Self efficacy scale; SR: Systematic review; US: United State;USA: United States of America;

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A1c Lab		X	X	X	X	X		X					X	X
SE Scale	X				X	X								
Behaviors	X				X	X								X
Distress scale	X					X								
Telephone Survey							X					X		
Questionnaire			X								X	X		
Interventions														
DSME	X	X	X	X	X	X				X	X		X	X
Group structure			X	X				X		X	X		X	
Culturally tailored	X						X			X				
Online														
Usual Care	X	X	X			X				X	X			
Telephone				X										
Outcomes														
HbA1c		X		X	X	X		X	X	X			X	X
Self-Efficacy						X				X	X			
Knowledge	X				X					X				
Quality of Life	X		X				X			X				

DSME: Diabetes Self-Management Education; N/A: Not available; RCT: randomized controlled trial; SE: Self efficacy scale; SR: Systematic review; US: United State;USA: United States of America;

Appendix G
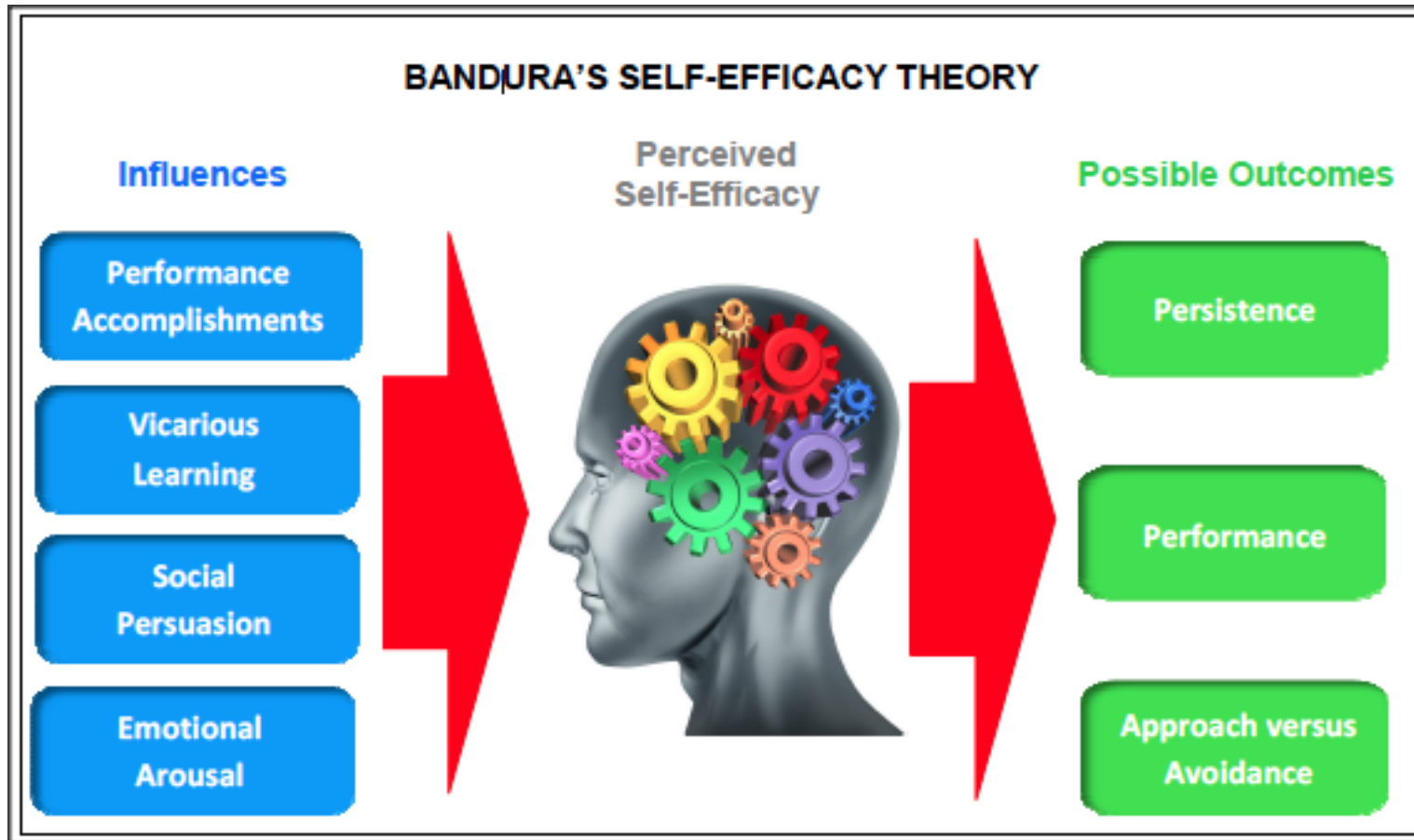
Appendix H

The Chronic Care Model

Community
Resources and Policies

Health Systems
Organization of Health Care

Self-Management Support

Delivery System Design

Decision Support

Clinical Information Systems

Informed, Activated Patient

Productive Interactions

Prepared, Proactive Practice Team

Improved Outcomes

Developed by The MacColl Institute
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Appendix I

EBP Model

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1. Assess need for change in practice

2. Link problem intervention and outcomes

3. Synthesize best evidence

4. Design practice change

5. Implement and evaluate change in practice

6. Integrate and maintain change in practice

- Include stakeholders
- Collect internal data about current practice
- Compare internal data with external data
- Identify problem

- Use standardized classification systems and language
- Identify potential interventions and activities
- Select outcomes indicators

- Search research literature related to major variables
- Critique and weigh evidence
- Synthesize best evidence
- Assess feasibility, benefits, and risk

- Define proposed change
- Identify needed resources
- Plan implementation process
- Define outcomes

- Pilot study demonstration
- Evaluate process and outcome
- Decide to adapt, adopt, or reject practice change

- Communicate recommended change to stakeholders
- Present staff inservice education on change in practice
- Integrate into standards of practice
- Monitor process and outcomes

Source: Urol Nurs © 2005 Society of Urologic Nurses and Associates