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Educational Materials and Brief Counseling Improve Diabetes Knowledge and Self-Efficacy

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The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Assistant Dean for MSN and DNP Studies, on behalf of the program; we verify that this is the final, approved version of the student's DNP Project including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Tamara K. Wellman, Student

Dr. Karen Stefaniak, Advisor

Final DNP Project Report

Educational Materials and Brief Counseling Improve Diabetes Knowledge and Self-Efficacy

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College of Nursing

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Dedication

I would like to dedicate this work to my family who have loved and supported me throughout this endeavor. Also, a special note to my friends and colleagues who I am fortunate to have in my life who have encouraged me and reminded me that with hard work anything is possible, especially Carol, Ruth and Terri who have lifted me up when I have needed it most. Finally, I would like to thank God who has walked silently and steadily beside me and blessed me with so much.

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Introduction to Final DNP Report

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Providing patients with information to manage their chronic disease, such as diabetes, and encouraging positive changes in healthcare behavior can lead to improved health and a decrease in medical expenses. Primary care providers may have limited time to take care of individuals with diabetes, so programs that provide these patients with information regarding diabetes and the skills necessary to manage their disease are increasingly important.

Implementing and evaluating interventions with a comprehensive approach is imperative, especially for those in rural areas. Interventions should increase patients' diabetes knowledge, self-efficacy and motivation allowing them to improve their diabetes self-management.

Low cost methods are needed for improving diabetes management, most commonly in low-literacy, low-economic and rural areas. Individuals that live in rural areas may have limited access to specialty care and may have decreased means to pay for education. It is important to determine education delivery that is accessible to the patient in the office setting, as well as in areas where healthcare professionals may not be easily accessible. Cost-effective methods involving technology may be beneficial; as if the patient is unable to afford the means to access the material there are often facilities that have such things as internet access or computers for public use.

Programs that are capable of being delivered in multiple ways may be of benefit to the patients with diabetes and those involved in their care. Programs available online may be combined with interaction from a healthcare professional in person or by means such as telephone or email to assist individuals in developing an action plan to improve diabetes knowledge, self-efficacy, and metabolic outcomes for the patient and educate others to

assist in their care. Programs such as this may decrease cost of delivery, as well as improve healthcare behaviors and preventive measures that will decrease overall healthcare costs.

Review of Diabetes Teaching Methods

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Review of Diabetes Education Delivery Methods

Diabetes is a chronic and progressive disease that can impact the life of an individual as well as the lives of their friends and families. High levels of blood glucose resulting from defects in insulin production, insulin action, or both are characteristics of diabetes (Kentucky Cabinet for Health and Family Services, 2009). The number of people with type 2 diabetes is expected to increase worldwide from 175 million in 2000 to 353 million in 2030 (Yach, Stuckler, & Brownell, 2006). Approximately 23.6 million Americans have diabetes, this includes 5.7 million of who do not know that they have the disease (United States Department of Health and Human Services, 2010; National Institutes of Health, 2008). Diabetes can occur at any age but primarily affects people over the age of 40, however the chance for individuals to acquire diabetes increases 0.4% with each year over age 20 (Yach et al., 2006).

Diabetes management can be complex. Lifestyle behaviors and pharmacological treatments can affect the control of diabetes, which are primarily the responsibility of those affected. Successful management of type 2 diabetes requires individuals to commit to lifestyle changes such as healthy diet, physical activity and preventive care in order to adhere to recommended guidelines (American Diabetes Association, 2008; American Association of Diabetes Educators, 2008; Kentucky Cabinet for Health and Family Services, 2010). A person with diabetes needs knowledge about the disease, how it affects the body, and the ways in which lifestyle choices minimize the effect of the disease process (American Diabetes Association, 2008; American Association of Diabetes Educators, 2008). Normalization of blood glucose, levels of blood pressure and

lipids are some basic targets of diabetes education and control of these measurements are associated with a reduction in the risk of complications.

The goal of patient education is to empower patients by improving their diabetes knowledge, self-efficacy and confidence, enabling them to take increasing control of their disease. Structured educational programs for diabetes self-management are often directed by a provider or diabetes educator who has been specifically trained to help people with diabetes gain the knowledge that includes a multitude of interventions that provide information regarding the disease, as well as teach management skills regarding diet, exercise, self-monitoring and medication.

This purpose of this review is to examine different teaching methods that are used to educate individuals with type 2 diabetes and the effectiveness of the method, according to the quality indicators.

Methods

Search methods. The EBSCO host electronic database was used to search for articles published from 2005 to 2012. The search used the electronic databases of CINAHL with full text, Education Full Text, ERIC, Health Source, MEDLINE, and PsychINFO. The EPOC search strategy was used using words such as “diabetes education,” “intervention,” “measurement,” “outpatient,” and “primary care,” and all combinations were considered.

Study selection. A total of 1156 titles and abstracts were screened for eligibility. Studies included in this review discussed the effectiveness of outpatient diabetes education delivered to the patient with type 2 diabetes and the methods that were used to deliver the education. Studies included also identified different quality indicators that have been explored to measure the success of the program. Studies were included if they

met the following criteria: 1) randomized or quasi-randomized trials randomized by patient, healthcare professional, or practice; and 2) nonrandomized studies controlled at a second site with data before and after the intervention. Studies not published in English, available only as abstracts, did not include evaluation of a quality indicator, or that did not address the patient in an outpatient setting were excluded.

Results

Search results. Twenty eight articles were identified that included evaluation of quality indicators, provide education by electronic delivery, provider-specific delivery or delivered by written educational material or lecture. These articles are identified in the table with the accompanying citation and level of evidence grade, utilizing the grading system recommended by the U.S. Preventive Services Task Force (2003).

Characteristics of Included Studies

Participants. Each study consisted of 29 to 2912 participants with diabetes, with a total of 12,085 participants. Additional participants included four physicians, 125 nurses (of various education levels), and one physician's assistant, increasing total participants to 12,215. There were 98 individuals that were training for camp counselors, but they were not included in our review. These studies were conducted in six countries and Canada. Participants in all studies were over age 18.

Twenty seven of the twenty nine articles discussed individuals with type 2 diabetes that received outpatient diabetes education. Two articles (Bell, Patel, & Malasanos, 2006; Siminerio, Piatt, & Zgibor, 2005) discussed mixed groups of participants that included patients, as well as healthcare professionals.

Site selection. All studies were designed specifically to evaluate outpatient diabetes education. This review used twenty nine articles that explored seven hospitals, three diabetes centers, and 156 primary care centers.

Delivery Method

Diabetes education was delivered to the patient using various techniques. The studies that were reviewed included delivery with written material and counseling, interactive web-design, video delivery and provider-led education.

Electronic delivery. Electronics were used in five studies. The study by Dyson, Beatty, and Matthews (2010) used lifestyle videos to accompany educational material delivered by a practice nurse. The study by Lee, Yeh, Liu, and Chen (2006) compared the results of guideline-based education accompanied by access to an electronic patient oriented diabetic management system (POEM), which showed significant positive changes in glycohemoglobin, fasting blood sugar and cholesterol. Song et al. (2009) and Huang, Chen, and Yeh (2009) used web-based interactive educational programs as alternatives to lectures given by healthcare professionals and the results showed improvement of diabetes knowledge, but no significance in blood sugar or self-efficacy. A computer program that included various topics of diabetes education was used to teach patients, as well increase the base knowledge of healthcare providers in the study by Bell et al. (2006). Although the healthcare providers had a higher base knowledge of diabetes than the patients, the post-test scores were indistinguishable.

Provider-led delivery. Specific details related to the provider that delivers the education were reviewed in fourteen studies. Four studies focused on providers that were educated with specific programs that pertain to diabetes education. Deakin and Whitham

(2009) discussed a study where the provider that was prepared with the X-PERT program, which was a structured self-management patient education program delivered the education. This study showed improvements in subjective and objective measurements. The other studies explored education by providers that were educated by a certified diabetes educator (Siminerio, Piatt, & Zgibor, 2005), using the American Diabetes Association guidelines (King & Wolfe, 2009) or specifically regarding diabetes (Sturt et al., 2008). The patients educated by these providers showed improvements in metabolic outcomes such as blood glucose, weight, blood pressure, cholesterol and waist circumference as well as increased diabetes knowledge, increased self-management skills and improved perceived quality of life. The study by Siminerio et al. (2005) found an incidental increase in blood pressure and Sturt et al. (2008) showed improvement in glycohemoglobin, but it was not significant.

Four studies used providers that were protocol driven. McLoughney, Khan, and Ahmed (2007) administered diabetes education that had specific protocols included to treat lipids and hypertension in addition to diabetes. Although the rest of the studies did not include protocols to manage other diseases, Van Sluljsesther et al. (2005) followed the physician based education and counseling program (PACE), Adolfsson, Walker-engstrom, Smide, and Wikblad (2007) used providers that were trained with emphasis on empowerment and Clarke (2011) delivered community oriented diabetes education (CODE) which used emphasis in motivational and facilitating skills, problems solving and goal setting. These studies showed overall improvements in glycohemoglobin, blood pressure, body mass, self-efficacy, diabetes knowledge, and quality of life. Only the

study by Adolfsson et al. (2007) showed no significance in self-efficacy, body mass, or quality of life.

Four studies used Certified Diabetes Educators to deliver education. Gucciardi, Demelo, Booths, Tomlinson, and Stewart (2009) and Davies et al. (2011) had a CDE who led the entire education program. Siminerio, Ruppert, Emerson, Solano, and Piatt (2008) utilized an educator that was a nurse as well as a CDE and Song & Kim (2007) used a CDE that was only a part of an interdisciplinary team that delivered education. Conlon (2010) studied the effectiveness of education that was provided by a nurse practitioner compared to that of the primary care physician. The nurse practitioner group showed better glucose control, but the physician group demonstrated lower patient weights post education with relevance to noted hyperglycemia. Two of the educational programs led by nurse specialists were shown to increase blood pressure control and improve blood glucose. Kulzer, Hermanns, and Reinecker (2007) introduced a program that was led by health psychologists that conducted didactic oriented group interventions which showed improvements in body mass self-efficacy and diabetes knowledge, but the body mass and diabetes knowledge scores were the same in the control group as the intervention group.

Lecture/written delivery. The ten remaining studies delivered the educational material by lecture and written material (Table 2). Three studies focused on implementation of models such as the chronic care model (Yukawa et al., 2010); social cognitive theory (Sevick et al., 2012) using palm pilots, pedometers and glucometers; and Self-Efficacy Enhancing Intervention Program (SEEIP) (Wu et al., 2011). These studies showed improvements in self-efficacy, quality of life and glycohemoglobin, but the improvement in glycohemoglobin was not significant in the study by Sevick et al. (2012).

Two studies followed specific programs, Selea et al. (2011) used the Healthy Lifestyle with Type 2 Diabetes and Krakow and Feulner-krakow (2007) used the LINDA (Living, Interactive, New, Distinguished, Activate) program. Selea et al. (2011) showed increases in glycohemoglobin, diabetes knowledge and self-efficacy, but there were no improvements in glycohemoglobin after 18 months or diabetes knowledge after six months. Krakow and Feulner-krakow (2007) showed improvements in glycohemoglobin, body mass, blood pressure, quality of life and cholesterol, although cholesterol was improved in the control and intervention group.

The five remaining studies used pre and post-tests to evaluate the written educational program. Braun et al. (2009) modified his study to be specific to the geriatric population. Gucciardi, Demelo, Lee, and Grace (2007) directed attention towards solo verse group education and New (2010) used a focus group to create a program and then evaluated the material. These studies showed improvements in self-efficacy, diabetes knowledge and blood glucose in the control and intervention groups. Braun et al. (2009) showed an improvement in glycohemoglobin and New (2010) showed improvements in self-efficacy in only the intervention groups.

In this review there were a variety of measurements used to evaluate the effectiveness of the educational programs. The majority of the programs used metabolic outcomes to measure effectiveness, but measurements of diabetes knowledge, empowerment, confidence, self-management, quality of life and distress were also used to measure effectiveness of the diabetes education provided.

Outcomes Studied

The success of an educational program can be evaluated by a variety of quality indicators. These indicators can be objective (Table 3), which may include bio-demographic values such as glucose, lipids, blood pressure and weight, as well as subjective indicators (Table 4) which rely on results from tests and questionnaires.

Objective measurements. Blood glucose measurements were evaluated in twenty one studies. Glycohemoglobin, which is the average glucose measurement over a three-month time period, were evaluated in seventeen studies. Six of these studies (Song & Kim, 2007; Conlon, 2010; Gucciardia et al., 2007; Lee et al., 2006; Kulzer et al., 2007; Reed, Revel, Carter, Hussein, and Dunn, 2005) also showed improvements in fasting blood glucose, however the study by Song and Kim (2007) showed improvement in glycohemoglobin, but no significant changes in fasting blood glucose. Four studies (Huang et al., 2009; Atak et al., 2009; Song, 2007; Song et al., 2009) evaluated fasting blood glucose only. Two of these studies (Huang et al., 2009; Song & Kim, 2007) showed no changes in fasting blood glucose, but the studies by Gucciardia et al. (2007) and Atak et al. (2009) showed improvements in fasting blood glucose after three months.

Lipids were measured in nine studies. All studies showed positive outcomes except Lee et al. (2006) which showed positive outcomes in total cholesterol and high-density lipoprotein (HDL) but showed an increase in triglycerides. Four studies evaluated at least two measurements of lipids. McLoughney, Khan, and Ahmed (2007) and Krakow and Feulner-krakow (2007) measured total cholesterol and triglycerides; Dyson et al. (2010) measured total cholesterol and low-density lipoproteins (LDL); and Siminerio et al. (2008) measured HDL and LDL. LDL were also evaluated and yielded positive results in studies by King and Wolfe (2009) and Siminerio et al. (2005).

Eight studies (Table 3) measured effectiveness by measuring outcomes such as waist circumference, body mass index (BMI) and weight. Six studies showed effective programs by evidence of lower measurements in waist circumference, body mass index and weight post education. However, the study by Adolfsson et al. (2007) also evaluated impact of empowerment education and did not show significant change in the weight from pre and post education

Blood pressure was used as a measurement to evaluate the effectiveness in seven studies. McLoughney et al. (2007) and Krakow and Feulner-krakow (2007) evaluated blood pressure, as well as glycohemoglobin, total cholesterol and triglycerides. Glycohemoglobin and fasting blood sugar were evaluated in addition to blood pressure in studies by Reed et al. (2005) and Conlon (2010), where Conlon also evaluated weight. Deakin and Whitham (2009) evaluated glycohemoglobin, total cholesterol, BMI and waist circumference in addition to blood pressure. LDL was evaluated in studies by Siminerio et al. (2005) and King and Wolfe (2009), where King additionally evaluated glycohemoglobin. Two of these studies focused on education material (Krakow & Feulner-krakow, 2007; Reed et al., 2005), while the remaining studies were focused on delivery by the provider (McLoughney et al., 2007; Deakin & Whitham, 2009; King & Wolfe, 2009; Conlon, 2010; Siminerio et al., 2005).

Seven studies evaluated body mass to establish success of their programs. Body Mass Index (BMI), waist circumference, and weight were evaluated by Deakin and Whitham (2009). Weight and BMI were evaluated by Clarke (2011) and Adolfsson et al. (2007), where BMI showed no significance despite a decrease in weight. Van Sluljsesther et al. (2005) measured waist circumference and weight. Four studies only measured one value.

Body Mass Index was evaluated in studies by Krakow & Feulner-krakow (2007); Gucciardi et al. (2009); Conlon (2010); and Kulzer et al. (2007), where Kulzer showed no improvement in BMI and Conlon demonstrated a decrease weight.

Subjective measurements. Twenty four studies used subjective measurements that were acquired from the results of tests and questionnaires administered pre and post education (Table 4). Fourteen studies measured diabetes knowledge and all but four studies showed positive results, as evidenced by higher post-test scores. In addition to diabetes knowledge, eleven studies also measured self-efficacy.

Seventeen studies evaluated self-efficacy. Eight studies evaluated self-efficacy only and had positive outcomes. The study by Adolfsson et al., (2007) did not show a significant change in self-efficacy scores, however the measurements pre and post education were evaluated at one year instead of three months. Three other studies (Bell et al., 2006; Dyson et al., 2010; Selea et al., 2011) initially showed positive outcomes, but after three month there were no significant changes.

Quality of life was measured in four studies. Two studies (Adolfsson et al., 2007; Clarke, 2011) were evaluated in diabetes knowledge and self-efficacy, as well as quality of life. Adolfsson et al. (2007) did not show a significant change in quality of life. Krakow and Feulner-krakow (2007) and Yukawa et al. (2010) only measured quality of life and were shown to have positive results.

Discussion

Despite showing positive outcomes, the results of educational interventions aimed at patients with type 2 diabetes are difficult to interpret due to differences in the interventions, the study designs and the types of outcomes reported.

The interventions that involved provider led educational programs or that were guideline based appeared to be the most successful. The success of the provider led educational program could be contributed to a rapport that has been built between the provider and the patient. A good rapport often encourages attention to the details and importance of the educational material that is presented and discussed. Relationships that are built between the patient and educator can help introduce interventions that are designed for their specific population, as they are often more consistent with improvement of diabetes knowledge, than those that are strict didactic. The guidelines can provide the educators with an outline of the educational material that is needed but it can allow the educator to modify specific areas so it can be better understood by their audience.

Most of the studies showed an increase in the diabetes knowledge and improvement in self-efficacy. However, the follow-up periods in most of the studies were short (three to six months), and some studies examined diabetes knowledge and self-efficacy without regard to metabolic outcomes. Positive changes in diabetes knowledge, self-efficacy and confidence were also shown in studies that had both intervention and control groups, suggesting cross contamination of the subjects. In these studies there were multiple methods used for education so it is not clear what caused the outcomes.

Some studies measured metabolic outcomes such as glycohemoglobin, cholesterol and blood pressure. Where some studies showed a statistically significant effect of education on these measurements, others did not measure these outcomes or did not show an effect on change.

There were no specific educational guidelines for diet, but some of the studies mentioned outcomes such as weight, body mass index and waist circumference. The effect of interventions on any diet change was not stated clearly.

Conclusion

After reviewing the literature, studies concluded that providers must be convinced of the importance of changing their practice and motivated enough to carry it out. Combining patient education with a multi-disciplinary team may lead to improvements in the process of care. Awareness and utilization of resources that may be available to the patient need to be considered when tailoring education and instruction. Structured education that is based on evidence-based guidelines have been shown to improve the outcome measures of patients with diabetes, for that purpose alone we should review these guidelines and anticipated goals with our patients. Incidental encouragement regarding lifestyle behaviors may inadvertently influence diet, smoking and physical exercise, which all lead to better disease management. Diabetes education is not limited to the patient with diabetes. Office staff members, family and other individuals that may be an influence to an individual with diabetes may benefit from diabetes education, allowing them to reinforce positive behaviors that enhance metabolic outcomes and knowledge base of the patient.

Recommendations for Further Research

There is a need for long-term more rigorous methodology that compares different types of appropriate health education within defined age groups and specific populations.

Delivery of diabetes education in the form of electronic interventions may be an area that could be expanded. Opportunities include interactive programs or continuous

reinforcement of core guidelines using emails, notifications and telephone calls. Provider based reinforcement at regular primary care visits would deliver needed support to existing diabetes knowledge. Electronic administration of educational material may also be beneficial in the future, especially with the implementation of the electronic medical record. Linking educational reinforcement messages to current metabolic outcomes by electronic delivery may be something that could be beneficial. This would provide the patient with prompt delivery that is unbiased and strictly delivered by outcomes measures and guidelines. Tracking follow up appointments and subsequent metabolic outcomes and interventions implemented to improve a deficiency would prove to be valuable in future diabetes management.

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Table 1

Articles Utilized in Review

Grade	Reference	Design	Intervention	Sample	Setting	Follow Up	Results	Conclusion
Good /A	Sturt, J. A., Whitlock, S., Fox, C., Hearnshaw, H., Farmert, A. J., Wakelin, M.,...Dale, J. (2008). Psychological issues and education effects of the diabetes manual 1:1 structured education in primary care. *Diabetic Medicine, 25*, 722-731. UK	Cluster randomized, controlled trial	The intervention group was given immediate education by an educated practice nurse, consisting of a 15 minute face to face consultation to introduce the 12 week diabetes Manual program. Phone support was provided in weeks 1,5 and 11. The deferred intervention group had routine care and after 26 weeks of collecting data, this group was introduced to the Diabetes Manual program	245 adults with Type 2 diabetes with a mean age of 62 years old.	48 Urban general practices in the West Midlands, UK with high population deprivation levels.	Outcomes were assess at baseline and at 26 weeks	There was no significant difference in HbA1c, between the intervention group and the control group (-.08%, 95% CI -.28, .11). Diabetes related distress scores were lower in the intervention group compared with the control group (difference -4.5, 95% CI -*.1, -1.0). Confidence to self-care scores were 11.2 point higher (95% CI 4.4, 18.0) in the intervention group compared with the control group.	The Diabetes Manual achieved a small improvement in patient diabetes-related distress and confidence to self-care over 26 weeks, without a change in glycemic control. Further study is needed to optimize the intervention and characterize those for whom it is more clinically and psychologically effective to support used in primary care
Good /B	Deakin, T., & Whitham, C. (2009). Structured patient education: The X-PERT programme. *British Journal of Community Nursing, 14*(9), 398-403. UK	RCT	Individuals were placed into individual appointment (control) or into (intervention) where patients attended six 2 hour group sessions of self-management education (X-PERT Program)	314 people with type 2 diabetes Intervention -157 with 149 completing program. Control-157 with 128 completing the program	Individuals living in Burnley, Pendle or Rossendale, Lancashire, UK and receiving treatment for diabetes	Baseline, 4 months and 14 months	By 14 months the X-PERT group compared with the control group showed significant improvements in the mean HbA1c (-.6% vs. +0.1%, repeated measures anova, P<0.001). The number needed to treat for preventing diabetes medication increase was 4 (95%	The program trains health care professionals to deliver the six week structured patient education. Implementation has shown excellent attendance rates, improved diabetes control, reduced weight, blood pressure, cholesterol and waist

							confidence interval) and for reducing diabetes medication was 7 (95% confidence interval). Statistically significant improvements were also shown in the X-PERT patients compared with the control patients for body weight, body mass index, waist circumference, total cholesterol, self-empowerment, diabetes knowledge, physical activity levels, foot care, fruit and vegetable intake, enjoyment of food and treatment satisfaction	circumference and more confidence in self-managing diabetes that has impacted positively on quality of life.
Good /A	Dyson, P. A., Beatty, S., & Matthews, D. R. (2010). An assessment of lifestyle video education for people newly diagnosed with type 2 diabetes. *Journal of Human Nutritional Dietics, 23*, 353-359. UK	RCT	All subjects in the study received usual medical care from their primary care physician, including education about lifestyle management of type 2 diabetes from a practice nurse. In addition, subjects randomized to the video intervention received the three lifestyle videos and	42 subjects with newly diagnosed type 2 diabetes	Direct referral from a primary care physician, practice nurse or from advertisement placed in General Practice surgeries in Oxfordshire.	Baseline and 6 months	At 6 months, the intervention group showed increased knowledge compared to controls (74.3% versus 56.4% correct answers, P≤ 0.0001). although there were no significant differences in changes over 6 months between the two groups, the intervention group showed improvements in A1c (-0.7%, P=0.024), total cholesterol (-0.5mmol L, P=0.017), low-density lipoprotein	A brief video intervention increased diabetes knowledge among those newly diagnosed with type 2 diabetes and may comprise and effective way of directing education to such individuals.

			were requested to watch them in their own time. The subjects in the control group received usual care, including education from a practice nurse and were offered the videos at the end of the six month study.				cholesterol (-0.5, P=0.018) and increased physical activity measured by pedometer (1266 steps per day, P=0.043) from baseline with no significant changes in the control group	
Good /B	McLoughney, C. R., Khan, A., & Ahmed, A. B. (2007). Effectiveness of a specialist nurse-led intervention clinic in the management of cardiovascular risk factors in diabetes. *European Diabetes Nursing, 4*(3), 100-105. UK	Randomized Prospective Study	Subjects were placed into groups where the focus was learning and controlling the secondary issues of hypertension or hyperlipidemia by a nurse-led, protocol driven, doctor supervised clinic	94 patients with diagnosis of type 2 diabetes	Patients in clinic between April 2003 and March 2004	Baseline and 1 year	Significant reduction in systolic blood pressure (167 $\pm$ 12 versus 132 $\pm$8mmHg, $p<0.001$) and diastolic BP (85$\pm$9 versus 70$\pm$7 mmHg, $p<0.001$). 92% achieved target BP. Those treated for hyperlipidemia (6.0$\pm$1.2 versus 3.9$\pm$0.7 mmol/l, $p<0.001$) and triglycerides (4.2$\pm$0.8 versus 2.4$\pm$1.2mmol/l, $p<0.001$) significantly improved. 91% of patient achieved target lipid levels. The mean HbA1c level also improved (8.5$\pm$1.5	Nurse led clinics can effectively improve CV risk factors, hypertension and hyperlipidemia levels.

							versus 7.4±1.5%, p<0.01) and 45% achieved target glycemic control.	
Fair /B	Song, M., Choe, M., Kim, K. S., Yi, M. S., Lee, I., & Kim, J.,...Shim, Y. s (2009). An evaluation of web-based education as an alternative to group lectures for diabetes self-management. *Nursing and Health Sciences, 11*, 277-284. Korea	Quasi experimental investigation with non-equivalent control group, pre test/post test design	Participants in the web group (intervention) took part in a web-based diabetes self-management education program, while those in the lecture group (control) attended the diabetes education lectures provided by healthcare professionals specializing in diabetes care. They attended 1 hour lectures every week for three consecutive weeks. The lectures in the first, second, and third weeks were provided by a diabetes care specialist nurse, a dietician and a physician.	31 participants. 15 in intervention group and 16 in control group. Initially 31 intervention and 29 control but decreased due to drop out	Patient with diabetes treated in the university-affiliated, tertiary care hospital from March to December 2006.	Baseline, 6 weeks and 3 months	The characteristics of both groups were the same; The level of knowledge increased in both groups in 6 weeks but not 3 months. There was significant diabetic care behavior in 6 weeks, but only in the web-based group at 3 months. There was a significant increase in diabetes care behavior; there were no changes in fasting blood glucose levels.	The study indicated that a web-based diabetes self-management education program has potential as an effective alternative to group lecture education in terms of improving diabetes care knowledge, improve diabetes care behavior and improving physiological variables, HbA1c and FBG
Good /A	Song, M., & Kim, H. (2007). Effect of the diabetes outpatient intensive management	Pre/post control group design test	The intervention group was provided with Diabetes outpatient intensive management program	25 patients in the intervention group. 24 patients in the control group.	Participants were recruited from the university affiliated diabetes center of St Vincent's Hospital	Baseline and 3 months	Patients in the intervention group had a mean decrease of 2.3%, which those in the control group having	Diabetes outpatient intensive management can reduce HgA1c in type 2 patients.

	programme on glycaemic control for type 2 diabetic patients. *Journal of Clinical Nursing, 16*, 1367-1373. Korea		(DOIMP), which received multidisciplinary diabetes education, complication monitoring and telephone counseling during 12 weeks. Participants in the control group received a brief conventional description of diabetes mellitus and were instructed to undertake medical nutrition therapy by a diabetic education nurse. Regular physical activity was recommended and followed up on an outpatient basis with causal medical care at regular intervals.		between September 2004 and January 2005.		a mean decrease 0.4% in HgA1c. There was no difference between the two groups in FBG and two hour post-prandial. The proportion of the patients with HgA1c < 7% was higher in the intervention group.	
Good /B	Bell, J. A., Patel, B., & Malasanos, T. (2006). Knowledge improvement with web-based diabetes education program: Brainfood. *Diabetes*	Pre/post test analysis	Completion of computer program with 15 modules. Seven topics should be a review of general nursing knowledge for most nurses, six modules offered more diabetes-	513 users. 124 were nurses (APRN=6, LPN=13, RN=88, unspecified=17). 389 were non-nurse users (patients, family members, teachers, interested	Individuals were recommended by their healthcare provider, advertisement for nursing continuing education on the Florida Department of health website, directions	Baseline and 13 months	Of non-nurses, 145 out of 389 took pre-tests and 135 took post-tests. Post test scores improved significantly (P<0.001 by non-paired t test). Of nurses, 68 of 124 took pre-tests and	The "Brainfood" program is educationally sound and effective at delivering Type 1 diabetes education to both professionals and non-professionals. Web access from non-

	Technology & Therapeutics, 8(4), 444-448. USA		specific information and two modules included complex diabetes management information beyond the scope of most nurses practicing outside of diabetes. Pre and post test scores were collected.	learners and potential camp counselors =98)	from Florida's Diabetes Camp for counselor orientation and those searching the web for diabetes education. Patients and families referred to the site by the University of Florida Pediatric Diabetes Center staff come from all of north central Florida, including participants in a telemedicine program serving rural Volusia County.		up to 56 took post-tests. Post-test scores improved significantly (P=<0.05 by non-paired t test) on 13 modules. Post-test scores improved, but were not statistically significant for "Nutrition 101", a module about very basic nutrition. Nurses had a lower margin of improvement for most modules as they started with a higher base knowledge level. Non-nurses improved significantly on all modules from pre-test to post-test. Post-test scores for the nurses and non-nurses were indistinguishable.	clinic settings can improve access to high-quality education for learners in remote or underserved locations.
Fair /A	New, N. (2010). Teaching so they hear: Using a co-created diabetes self-management education	Quasi experimental Pilot study; pre/post interview	Focus group was used to develop and evaluate the co-created diabetes self-management education intervention. The intervention phase was a	20 participants in each group	Participants were from the delta region of Arkansas, which contains seven of nine counties with a diabetes	Baseline and 3 months	There were no significant differences found between the focus group that developed the intervention with	A co-created teaching approach better meets the learning needs of adults with type 2 diabetes and results in enhances ability to

	approach. *Journal of the American Academy of Nurse Practitioners, 22,* 316-325. USA		quasi experimental design with pre and post intervention data collection for diabetes knowledge, self-management activities, and adaptation. The intervention group was compared to a group of adults with diabetes who received the usual DSME education offered by local hospitals.		prevalence of 11%-12.6%. Forrest City Arkansas was actual site. Diabetes education centers in Jonesboro and west Memphis, Arkansas were the comparison sites.		participants who created the sessions and the control groups with regard to knowledge, adaptation and program satisfaction. Diabetes self-care activities significantly improved (p=.02) for the experimental group.	perform the self-care activities required for successful diabetes control. Better diabetes control reduces visits to monitor and treat complication and the need for repetitive educational sessions that exceed their-party pay limits and extend the time needed for patient encounters.
Good /A	King, A. B., & Wolfe, G. S. (2009). Evaluation of diabetes specialist-guided primary care diabetes treatment program. *Journal of the American Academy of Nurse Practitioners*, (21), 24-30. USA	Pre/post pilot study	Experimental site- NPs received a 6 hour instruction in the use of the treatment algorithms based on the ADA guidelines of care, the accompanying algorithm guidebook for reference and flow sheets for the chart record in the clinic. The control site had no contact with the individual patients after the chart review and during the 12 month study. After completion	101 Control group 34 Experimental group	Board certified family or internal medicine practitioners located within a 100 mile radius of Salinas California	Baseline and 12 months	Mean HbA1c values decreased from baseline by 0.46% in the active treatment group versus 0.06% in the control group; however, reductions in HgA1c did not achieve statistical significance potentially because of the small sample size of the experimental group. Mean SBP values were significantly reduced in both groups; however,	The program provided insights regarding the importance of electronic records and provider notifications, patient adherence, prioritization of provider resources by risk level among patients and access to self-management education

			of the study, the charts of the same patients were again reviewed and data collected.				LDL-C was only significantly reduced in the control group where more aggressive use of statins may have had an effect.	
Good /A	Van Sluljsesther, E. M., Van Poppel, N. M., Twisk, J. W., Paw, M. J., Calfas, K. J., & Van Mechelen, W. (2005). Effect of a tailored physical activity intervention delivered in general practice settings: Results of a randomized controlled trial. *American Journal of Public Health, 95*(10), 1825-1830. Netherlands	RCT	Patients were invited to speak with their provider at baseline for a 10 minute consultations, irrespective of randomization. In addition to discussing diabetes, the provider offered advice to the patient about becoming more physically active. The provider used the PACE (physician based assessment and counseling for exercise) program.	191 Intervention 205 Controlled	29 general practices throughout Netherlands. Each general practitioner identified a target population on the basis of the inclusion criteria and the research team randomized them	Baseline, 8 weeks, 6 months and 1 year	No significant intervention effect over time was observed on physical activity level or stage of change for regular physical activity, and an inverse intervention effect was observed for waist circumference. The study population as a whole exhibited a significant increase in physical activity and borderline significant decrease in body weight at the 1 year follow up.	Positive effects on physical activity level and body weight were observed, but the PACE intervention was not more effective than the standard physical activity advice.
Good /A	Reed, R. L., Revel, A. D., Carter, A. O., Hussein, F. S., & Dunn, E. V. (2005).	Controlled before and after trial	Outcomes and adherence to guidelines were measured over the year before the intervention	738 participants	9 Primary Health Centers in the United Arab Emirates.	One year prior to intervention and one year after intervention	Three outcomes variables were compared. Total cholesterol measurements in the	The intervention described in this study demonstrated an improvement in some process of

	A controlled before-after trial of structured diabetes care in primary health centres in a newly developed country. *International Journal for Quality in Health Care, 17*(4), 281-286. United Arab Emirates		began and for a second one year period at the end of the intervention period. Structured diabetes care, including the development of general practice diabetes clinics, a patient education program, a health care professional education program, and improved recording of clinical information was provided for the 33 month time period.				intervention clinics (-12.0mg/dl) compared with the control clinics (+8.3 mg/dl). The rate of measuring HbA1c was too low to determine whether any changes were made in this parameter. Fasting glucose did improve in the intervention clinics (-0.7mg/dl) when compared with the control clinics (+4.8mg/dl) although this was not statistically significant. Mean blood pressure worsened in the intervention clinics (+2.7mm Hg) when compared with the intervention clinics (-1.4 mm Hg) and this difference was statistically significant).	care measures suggesting an impact of this type of delivery model in the environment
Good /B	Krakow, D., & Feulner-krakow, G. (2007). LINDA: The	RCT	To compare the LINDA (living, interactive, new, distinguished, activating)	1109 diabetes patients. 374 type 2 non-insulin dependent.	Outpatients in centers with ambulant treatment only in Munich,	Baseline and 1 year	Type 2 LIP patients achieved lower HgA1c mean of 6.2% and a reduction	Patient education had a limited effect on knowledge and self-reported self-

	diabetes self-management training programme for people with type 1 or type 2 diabetes. *European Diabetes Nursing, 4*(3), 106-112. Germany		with a standard education program. This program has 4 basic modules covering nutrition, blood glucose monitoring, medication, hypoglycemia, HgA1c, podiatry, micro and macro vascular long term consequence, hypertension, weight reduction, and sports. Modules 5 and 6 pertain to insulin. Module 7 is gestational diabetes.	449 type 2 insulin treated. 286 type 1 diabetes.	Germany		of BMI of 0.8 kg/m2. The control group reached a mean HgA1c 7% and showed an increase in BMI of 0.7 kg/m2. Mean blood pressure improved from 145/85 to 134/80in LIP patients and 138/79 in control group. Triglyceride and cholesterol levels decreased in both groups. For type 2 patients, mean HgA1c fell to 6.8%in the LIP and control group was 7.4%. A quality of life questionnaire showed improvements from 20% to 80% in people who used the LIP	management behavior but a significant effect on self-efficacy in patients with type 2 diabetes
Good /B	Atak, N., Gurkan, T., & Kose, K. (2009). The effect of education on knowledge, self-management behaviors and self-	RCT using a pre and post-test design	The test, including sections on patient characteristic, diabetes knowledge, self-management behaviors and self-efficacy were given to all patients	80 patients with type 2 diabetes	Diabetes Center, Department of Endocrinology and Metabolism, Ankara University, Turkey.	Baseline and 2 weeks post education	There was significant difference between the intervention and control groups. Improvements were observed in taking regular walks (p=0.043), recognizing	Patient education had a limited effect on knowledge and self-reported self-management behavior but a significant effect on self-efficacy in patients with type 2 diabetes

	efficacy of patients with type 2 diabetes. *Australian Journal of Advanced Nursing, 26*(2), 66-74. Turkey		before education as a pre-test. Subjects participated in the education program three months after the initial assessments were completed. The results of routine lab assessments were recorded. Two weeks after the initial education program, the test was re-administered to intervention and control groups. The correct answers were explained to the intervention group during education and to each patient in the control group following the post test.				nutrients with high caloric content (p=0.037), recommended daily fat distribution (p=0.024), regulating blood glucose levels to avoid complications (p=0.002), and in diabetes self-efficacy mean scores (p=0.006)	
Fair /A	Siminerio, L. M., Piatt, G., & Zgibor, J. C. (2005). Implementing the chronic care model for improvements in diabetes care and	Pilot Study Pre/post intervention	Phase I-Extensive chart review as the baseline measurement. Phase II-Included provider and patient education provided by CDE. Phase III-Repeat chart review	29 patients Six primary care providers: 4 physicians, 1 nurse practitioner, 1 physician's assistant	University of Pittsburgh medical Center	Baseline and 12 months	Provider adherence to ADA Standards of Care increased significantly across all process measures. Patient who received DSME at point of service in the	Implementing systems to support decision support, self-management education, and delivery system redesign has a positive influence on practices and patient outcomes in

	education in a rural primary care practice. *The Diabetes Educator*, (31), 225-234. USA		with post-intervention measures.				primary care practice setting gained improvement in knowledge, empowerment, A1C, and high-density lipoprotein cholesterol levels. There was an improvement in A1c >7 (40.7% verse 39.5%) and LDL >100 mg/dL (58.8% verse 50%) but a worsening in blood pressure control (75.6% verse 82.1%). All changes in clinical values were non-significant.	outlying rural communities.
Good /A	Adolfsson, E. T., Walker-engstrom, M. L., Smide, B., & Wikblad, K. (2007). Patient education in type 2 diabetes-a randomized controlled 1-year follow-up study. *Diabetes Research and Clinical Practice, 76*, 341-350. Sweden	RCT	Random assignment to the empowerment group education (intervention) or routine diabetes care (control group). The empowerment group education regarding diabetes knowledge, self-efficacy, satisfaction with daily life, BMI and glycemic control compare with the impact of routine	101 patients 42 intervention group, 46 control group, 13 did not complete	7 primary care centers in Central Sweden	Baseline and 1 year	At 1 year follow up the level of confidence in diabetes knowledge was significantly higher in the intervention group than in the control group. No significant differences were found in self-efficacy, satisfaction with daily life, BMI or intervention	The empowerment group education did improve patients' confidence in diabetes knowledge with maintained glycemic control despite the progressive nature of the disease

			diabetes care.					
Good /A	Gucciardia, E., Demelo, M., Lee, R. N., & Grace, S. L. (2007). Assessment of two culturally competent diabetes education methods: Individual versus individual plus group education in Canadian Portuguese adults with type 2 diabetes. *Ethnicity and Health, 12*(2), 163-187. Canada	Prospective analysis, pre and post test	A questionnaire to collect psychosocial and behavioral measures was completed by patients immediately after their first DMC visit. Participants also were asked to have HbA1c performed if one was not available. This was collected pre education and one year post education	268 patients with type 2 diabetes	2 Diabetes Management Centers in Canada	Baseline and 1 year	Multivariable negative binomial regression model, the number of contacts over 1 year was greater for those who were female, non-smokers, unemployed, self-referred to DSME, lived close to DMC, had lower BMI, or had diabetes for longer duration	Healthcare providers need to encourage ongoing use of DSME, particularly for individual prone to lower follow up services
Good /B	Siminerio, L. M., Ruppert, K., Emerson, S., Solano, F. X., & Piatt, G. A. (2008). Delivering Diabetes Self-Management Education (DSME) in primary care. *Disease Management Health Outcomes, 16*(4), 267-272. USA	RCT Pre and post test	A nurse who was a certified diabetes educator was deployed to provide point of service diabetes education (POSE) to four University of Pittsburgh Medical Center Community Medicine Practices primary care practices. The group of patients who received POSE was compared with patient	Patients with diabetes: Suburban practice (857+2055)= 2912. Urban practice (624+1808)=2432.	Four Community Medical primary care practices, 2 urban academic medical center and 2 suburban practices.	Baseline (January 2003) through December 2006	Of the 5344 diabetes patients in the four practices, 784 received point of service diabetes education (POSE). Mean HgA1c values were higher at baseline in those patients who received POSE than those who received usual care. There was a significant decrease in HgA1c and	Providing DSME in primary care is feasible and offers the opportunity to reach patients who may not be receiving DSME services. However, further research is needed to evaluate other methodologies to increase access to DSME and other factors that my influence improvement in clinical

			from the same practices who were identified as having diabetes and who received usual care. The number of patients was computed and a percentage calculated for comparison against *Healthy People 2010* goals. The HgA1c values of patients were tracked from January 2003 through December 2006, during the timeframe that POSE was provided.				LDL-c levels in both groups. Although there was not a significant between-group difference in HgA1c, those who received POSE had significant improvement in LDL-C levels compared with the usual care group.	outcomes.
Fair /A	Conlon, P. (2010). Diabetes outcomes in primary care: Evaluation of the diabetes nurse practitioner compared to the physician. *Primary Health Care, 20*(5), 26-31. USA	RCT	Patients were scheduled by the receptionist with the physician or NP, based on the availability of each practitioner Patient achievability was measured by each practitioner documenting patient compliance with mutually established goals and acceptance	42 patients with type 2 diabetes. 25 in physician managed group and 14 in nurse practitioner managed group	Large urban federally qualified health center.	Baseline and 12 months	The nurse practitioner interventions lowered HgA1c and glucose to a greater degree than those under physician direction. Weights of the physician's patients were lowered with relevance to noted hyperglycemia. Blood Pressure remained the same in both groups	The diabetes NP is able to demonstrate a high degree of clinical management expertise which translates into better metabolic control, consistent with the standard of care and clinical practice recommendations set by the American Diabetes Association, which in turn decreases

			of their diabetes plan. .					cost
Good /A	Selea, A., Sumarac-dumanovic, M., Pesic, M., Suluburic, D., Stamenkovic-pejkovic, D., Cvijovic, G., & Micic, D. (2011). The effects of education with printed material on glycemic control in patients with diabetes type 2 treated with different therapeutic regimens. *Military Medical & Pharmaceutical Journal of Serbia & Montenegro, 68*(8), 676-683. Serbia	RCT	In all patients fasting plasma glucose and HgA1c were measured and subsequently the patients fulfilled the questionnaire. At the end of the visit the patients were given the printed material "Healthy lifestyle with diabetes type 2". The same procedure was repeated after 3,6 and 18 months (printed material was only given at first office visit). BMI was obtained. Questionnaires were regarding diabetes knowledge, diabetes empowerment, and attitude toward diabetes.	364 patients with diabetes	From 3 regional health centers in Serbia	Baseline, 3, 6, and 18 months	There was a significant improvement in HgA1c levels after 3 months (8.00±1.66% vs 9.06±2.23%, $p<0.01$) and after 6 months (7.67±1.75% vs 9.06±2.23%, $p<0.01$). There was no further improvement in HgA1c levels after 18 months (7.88±1.46% vs 7.67±1.75%), $p>0.05$). There was a significant improvement in the average test score after three months (64.6% vs 55.6%, $p<0.01$). There were no further statistically significant changes in the general level of DM knowledge after 6 months (65.0±32.5% vs 64.5±33.7%, $p>0.005$) and after 18 months (64.8%±32.7 vs 64.5±33.7%, $p>0.005$). There was a	Education with printed material led to improvements in glycemic control and level of DM knowledge in our patients. Education with printed material may be a useful adjunct to DM treatment and should be structured according to the treatment modality.

							significant difference in education intervention response in DM type 2 patients on different therapeutic regimens.	
Good /A	Wu, S. V., Lee, M. C., Liang, S. Y., Lu, Y. Y., Wang, T. J., & Tung, H. H. (2011). Effectiveness of a self-efficacy program for persons with diabetes: A randomized controlled trial. *Nursing and Health Sciences, 13*, 335-343. Taiwan	RCT	Participants were pretested to establish a baseline and then post-tests were undertaken 3 and 6 months after the baseline data were collected. The participants in the intervention group received the standard diabetes education program and an additional self-efficacy program (Self-Efficacy Enhancing Intervention Program-SEEIP)	145 patients. 72-intervention 73-control	Patients were treated at an outpatient clinic of a municipal hospital.	Baseline, 3 and 6 months	The scores for the efficacy expectations, outcome expectations, and self-care activities had significantly increased in the intervention group at the 3 and 6 months follow-ups, when compared to those of the control group. A smaller proportion of the participants in the intervention group had been hospitalized or had visited and emergency room than in the control group at the 6 month follow-up.	This study revealed that a self-efficacy program for diabetes was acceptable and effective in the short term in the self-management of persons with type 2 diabetes.
Fair /A	Braun, A. K., Kubiak, T., Kuntsche, J., Meier-hofig, M., Muller, U. A., Feucht, I., & Zeyfang,	RCT	To evaluate the effectiveness of new structured diabetes teaching and treatment program with specific didactical approaches	155 Geriatric patients 83-intervention 72-control	Treated at outpatient facility in Germany	Baseline, immediately after education, and 6 months.	Patients showed improved levels of HgA1c 6 months after the new education, and less acute complication than the	The new structured geriatric diabetes education program, focusing on the learning capabilities and the particular needs of

	A. (2009). SGS: A structured treatment and teaching programme for older patients with diabetes mellitus a prospective randomised controlled multi-centre trial. *Age and Ageing, 38*, 390-396. Germany		and topics for geriatric patients with DM. Patient were randomly placed into educational groups receiving routine DSME vs the new program				standard group ($p<0.009$). Bothe groups demonstrated a good capacity for diabetes self-management and improvement in diabetes knowledge after the education ($p<0.01$).	older persons, is effective in improving metabolic control and in maintaining auto-sufficiency in geriatric patients with diabetes mellitus.
Good /A	Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., & Cradock, S.,...Khunti, K. (2011). Effectiveness of the diabetes education and self-management for ongoing and newly diagnosed (DESMOND) programme for people with newly diagnosed type 2 diabetes: cluster randomise	RCT	A structured group education program for six hours delivered in the community by two trained healthcare professional educators compared with usual care.	824 adults	207 general practices in 13 primary care sites in the United Kingdom	Baseline and 12 months	HgA1c levels at 12 months had decreased by 1.49% in the intervention group compared with 1.21% in the control group. After adjusting for baseline and cluster, the difference was not significant: 0.05% (95%CI). The intervention group showed a greater weight loss: -2.98kg (95%CI) compared with 1.86kg, $p=0.027$ at 12 months. The odds of not smoking were 3.56 (95%CI),	A structured group education program for patients with newly diagnosed type 2 diabetes resulted in greater improvement in weight loss and smoking cessation and positive improvement in beliefs about illness but no difference in HgA1c levels up to 12 months after diagnosis.

	d controlled trial. *British Medical Journal*, , 1-11. UK						p=0.033higher in the intervention group at 12 months. The intervention group showed significantly greater changes in illness belief scores (p=0.001); directions of change were positive indicating greater understanding of diabetes. The intervention group had a lower depression score at 12 months: mean difference was -.50 (95%CI); p=0.032. A positive association was found between change in perceived personal responsibility and weight loss at 12 months (p=0.008)	
Good /A	Yukawa, K., Yamazaki, Y., Yonekura, Y., Togari, T., Abbott, F., & Homma, M.,...Kagawa, Y. (2010). Effectiveness of	RCT	Evaluation of the Chronic Disease Self-management Program by comparing changes in health outcomes. The program is a patient centered educational program for	128 participants with diabetes	Participants were recruited from 18 Chronic Disease Self-management Program workshops	Baseline, 3 and 6 months	The findings indicated statistically significant positive changes in health distress, coping with symptoms, stretching exercises, communication with the physician,	These finding suggest that the CDSP can be effective for Japanese people with chronic conditions.

	chronic disease self-management program in Japan: Preliminary report of a longitudinal study. *Nursing and Health Sciences, 12*, 456-463. Japan		the self-management of chronic conditions delivered by one of 18 workshops. The health outcomes that were measured included health status, self-management behaviors, utilization of health services, self-efficacy, satisfaction with daily living, and clinical indicators.				and satisfaction with daily living. The positive changes were especially remarkable among the groups with diabetes and rheumatic disease.	
Good /B	Huang, J. P., Chen, H. H., & Yeh, M. L. (2009). A Comparison of diabetes learning with and without interactive multimedia to improve knowledge, control, and self-care among people with diabetes in Taiwan. *Public Health Nursing, 26*(4), 317-328. Taiwan	RCT	The experimental group received patient education through interactive multimedia about diabetes for 3 months, while the control group received a routine 3 month patient education. Data were collected from both groups at baseline and at the completion of the patient education. Findings were then compared to evaluate the effects of the intervention	60 participants 30-control 30-intervention	Recruited from the endocrinology Outpatient department at a regional hospital in the south of Taiwan.	Baseline and 3 months	The experimental group showed greater improvement in understanding diabetes than the control ($t=3.29$, $p<0.001$). There was no significant difference in control of blood sugar levels ($t=-1.72$, $p=.10$) and self-care ($F=1.03$, $p=.32$)	The use of an interactive multimedia device to intervene in diabetes self-care was effective only in raising the subjects' knowledge about the disease. Additionally, the subjects may need more time to implement more effective blood sugar control and self-care activities after receiving instruction.

			on the subjects' knowledge of diabetes, blood sugar control and self-care.					
Good /B	Sevick, M. A., Korytkowski, M., Stone, R. A., Piraino, B., Ren, D., & Sereika, S.,...Burke, L. e (2012). Biophysiologic outcomes of the enhancing adherence in type 2 diabetes (ENHANCE) trial. *Journal of the Academy of Nutrition and Dietetics*, *112*(8), 1147-1157. USA	RCT	Participants in both groups received training in use of a study provided glucose meter and sufficient supplies to perform ≥ measurement per day. All participants also were given pedometer with instructions for use and a target level of physical activity of 10,000 steps per day. Intervention group was exposed to group counseling sessions guided by the Social Cognitive Theory and given a palm pilot with a dietary self-monitoring program. Intervention group sessions were held weekly during months 1 and 2 and biweekly during months 3	296-completed 3 months. 246 completed 6 months.	Patients treated on campus of university of Pittsburgh medical Center. Self-referred	Baseline, 3 and 6 months	HgA1c was reduced in the intervention group by 0.5% at 3 months and 0.6% at 6 months ($p<0.001$ for each), and the control group by 0.3% ($p<0.001$) at 3 months and 0.2% ($p<0.05$) at 6 months; but between group differences were not significant. In those with baseline HgA1c ≥8% and estimated glomerular filtration rate ≥60 mL/min, HgA1c was reduced in the intervention group by 1.5% at 3 months and 1.8% at 6 months; but between group differences were not significant. In random intercept models, the estimated reduction in HgA1c of 0.29% was	Two behavioral approaches to improving general lifestyle management in individuals with type 2 diabetes mellitus were effective in improving glycemic control, but no significant between group differences were observed.

			and 4 and monthly during months 5 and 6.				not significant.	
Good /B	Kulzer, B., Hermanns, N., & Reinecker, H. (2007). A self-management approach to patient education for type 2 diabetes was more effective than a didactic approach. *Diabetes Medicine, 24*, 415-423. Germany	RCT	Didactic oriented group intervention (4-90minute sessions) focusing on acquisition of knowledge, skills, and information about treatment of diabetes; self-management oriented group intervention (12-90minute sessions) focusing on emotional, cognitive, and motivational processes of behavior change; and self-management oriented individual intervention (6-individual and 6-group sessions) with the same content as the second group. The interventions were conducted by 4-trained health psychologist.	193 patient with type 2 diabetes	Patients living in Wurzburg, Germany	3 and 15 months	Mean HgA1c and FBG were reduced more in the self-management group than in the didactic group, but the self-management and self-management individual groups did not differ. Groups did not differ for improvement in BMI, diabetes knowledge, and frequency of glucose monitoring. The self-management group showed more improvement than the didactic group in psychological determinants of eating, anxiety, and frequency of exercise; the 2 self-management groups did not differ for these outcomes.	In middle aged adults with type 2 diabetes, a group self-management approach to patient education was more effective than a group didactic approach. Providing some of the self-management intervention as individual sessions did not provide any advantage over all group sessions.
Good /A	Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L. (2006).	Quasi-experimental	Both received treatment based on same guidelines,	274 participants 134 in interventio	Outpatient visiting the Metabolism Center	3,6,9, and 12 months	Standard Deviations are listed for testing. I:C 1=1st follow	The POEM system can help patients control their glucose, HbA1c and

	Development and evaluation of a patient-oriented education system for diabetes management. *International Journal of Medical Informatics*, *76*(9), 655-663. Taiwan		the intervention group received access to POEM (patient oriented diabetic education management system). Lab test results including fasting blood glucose, HbA1c, total cholesterol, triglyceride and HDL were tested from the first visit through each follow up at 3,6,9 and 12 months	n group (57% male 43% female) 140 in control group (46%male and 54% female). Both received treatment based on same guidelines, the intervention group received access to POEM			up, 2=2nd follow up, 3=3rd follow up. Fasting Blood Sugar- 1-47.47:43.46; 2-47.67:42.37; 3-45.52;41.44. HgA1c-1-2.16:1.49;2-2.14:1.49;3-2.12:1.65. Total Cholesterol-130.25:37.36; 229.57:39.41; 3-29.047:40.597. Triglyceride-1-58.58:64.63; 2-58.59:64.65; 3-58.50:64.67. HDL-1-14.02:11.82; 2-14.07:11.57; 14.03:11.66. Follow Up-1-A significant difference in fasting blood glucose levels. 2-fbg and HgA1c were significantly different. 3-Signifcant difference in fasting blood glucose, HgA1c and total	total cholesterol levels to manage their diabetes, providing an easy and inexpensive way to extend hospital-based patient education services for community-based continuous education

							cholesterol	
Good/ A	Clarke, A. (2011). Effectiveness of a community orientated diabetes education (CODE) programme for people with type 2 diabetes. *European Diabetes Nursing, 8*(3), 94-99. Ireland	RCT	The healthcare provider delivering Community Oriented Diabetes Education (CODE) had training in motivational interviewing, facilitation skills, problem solving and goal setting along with an accredited diabetes qualification. The CODE curriculum was delivered over 3 successive weeks with a 10 week support telephone call and 26 weeks follow up session. Outcome measures were collected at baseline and 26 weeks.	237 participants	31 local settings	Baseline and 26 weeks	The empowerment scores raised from 3/5 to 4/5 (p=0.047). QOL range decreased from 25 to 21 and the average score had increased (p=0.00). Knowledge had also increased significantly (p=0.01). People lost on average 0.5kg with similar reduction in BMI.	Increasing patients' self-management skills to manage their diabetes is extensively the target of diabetes education. Most education interventions report positive outcomes based on patterns of group level change. There is a need to focus on individual change. This study identified younger age and reported poorer QOL as possible causes of attrition. This group needs to be targeted for more intensive retention strategies and their reasons for attrition identified and addressed.
Good/ A	Gucciardia, E., Demelo, M., Lee, R. N., & Grace, S. L. (2007). Assessment of two culturally competent	RCT	Patients were randomly assigned to receive either diabetes education counseling only (control) or counseling in	61 Patients 36-control 25-intervention	Patients of Toronto Western hospital Diabetes Education Center	Baseline and 3 months	Attitudes, subjective norms, perceived behavior control, and intentions towards nutrition adherence, self-reported	The study provides preliminary evidence that culturally competent group education in conjunction with individual

	diabetes education methods: Individual versus individual plus group education in Canadian Portuguese adults with type 2 diabetes. *Ethnicity and Health*, *12*(2), 163-187. Canada		conjunction with group education (intervention).				nutrition adherence and glycemic control significantly improved in both groups, over the 3 month study period, yet those receiving individual counseling with group education showed greater improvement in all measures with the exception of glycemic control, where no significant difference was found between the two groups at 3 months.	counseling may be more efficacious in shaping eating behaviors than individual counseling alone. Larger longitudinal studies are needed to determine the most efficacious education method to sustain long-term nutrition adherence and glycemic control.

Table 2

Delivery Methods

Electronic Delivery
Dyson, Beatty & Matthews; 2010 Bell, Patel, & Malasanos; 2006 Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L., 2006 Song, Choe, Kim, Yi, Lee, Kim, Lee, et al., 2009
Provider Delivery
McLoughney, Khan, Ahmed; 2007 Song, Choe, Kim, Yi, Lee, Kim, Lee, et al., 2009 Deakin, Whitham ; 2009; King, A.B., & Wolfe, G.S.; 2009 Conlon,P.; 2010 Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Stuart, Whitlock, Fox, Hearnshaw, Farmer, Wakelin, et al., 2008 Van Sluljsesther, E. M., Van Poppel, N. M., Twisk, J. W., Paw, M. J., Calfas, K. J., & Van Mechelen, W.,2005 Siminerio, L. M., Piatt, G., & Zgibor, J. C., 2005 Song, Kim; 2007 Siminerio, L. M., Ruppert, K., Emerson, S., Solano, F. X., & Piatt, G. A., 2008 Kulzer, B., Hermanns, N., & Reinecker, H., 2007 Gucciardi, DeMelo, Booth, Tomlinson, and Stewart; 2009 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007 Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., & Cradock, S.,...Khunti, K., 2011
Lecture/Written Delivery
New; 2010 Krakow, D., & Feulner-krakow, G.; 2007 Clarke, A., 2011 Gucciardia, E., Demelo, M., Lee, R. N., & Grace, S. L., 2007 Atak, Gurkan, Kose; 2009 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007 Selea, A., Sumarac-dumanovic, M., Pesic, M., Suluburic, D., Stamenkovic-pejkovic, D., Cvijovic, G., & Micic, D. (2011). Reed, R.L., Revel, A.D., Carter, A.O., Hussein, F.S., & Dunn, E.V.; 2005 Braun, A. K., Kubiak, T., Kuntsche, J., Meier-hofig, M., Muller, U. A., Feucht, I., & Zeyfang, A. (2009). Yukawa, K., Yamazaki, Y., Yonekura, Y., Togari, T., Abbott, F., & Homma, M.,...Kagawa, Y. (2010) Sevick, M. A., Korytkowski, M., Stone, R. A., Piraino, B., Ren, D., & Sereika, S.,...Burke, L. e (2012). Wu, S. V., Lee, M. C., Liang, S. Y., Lu, Y. Y., Wang, T. J., & Tung, H. H., 2011

Table 3
Measuring Objective Quality Indicators

BLOOD SUGAR
Glycohemoglobin
Song, Kim; 2007 Siminerio, Ruppert, Emerson, Solano & Piatt; 2008 McLoughney, Khan, Ahmed; 2007 Gucciardi, DeMelo, Booth, Tomlinson, and Stewart; 2009 Dyson, Beatty & Matthews; 2010 Deakin, Whitham ; 2009; Stuart, Whitlock, Fox, Hearnshaw, Farmer, Wakelin, et al., 2008 King, A.B., & Wolfe, G.S.; 2009 Conlon,P.; 2010 Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., & Cradock, S.,...Khunti, K., 2011 Reed, R.L., Revel, A.D., Carter, A.O., Hussein, F.S., & Dunn, E.V.; 2005 Krakow, D., & Feulner-krakow, G.; 2007 Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L., 2006 Kulzer, B., Hermanns, N., & Reinecker, H., 2007 Selea, A., Sumarac-dumanovic, M., Pesic, M., Suluburic, D., Stamenkovic-pejkovic, D., Cvijovic, G., & Micic, D. (2011). Sevick, M. A., Korytkowski, M., Stone, R. A., Piraino, B., Ren, D., & Sereika, S.,...Burke, L. e (2012) Braun, A. K., Kubiak, T., Kuntsche, J., Meier-hofig, M., Muller, U. A., Feucht, I., & Zeyfang, A. (2009)
Fasting Blood Sugar
Song, Kim; 2007 Conlon,P.; 2010 Gucciardia, E., Demelo, M., Lee, R. N., & Grace, S. L., 2007 Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L., 2006 Kulzer, B., Hermanns, N., & Reinecker, H., 2007 Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Atak, Gurkan, Kose; 2009 Reed, R.L., Revel, A.D., Carter, A.O., Hussein, F.S., & Dunn, E.V.; 2005 Song, Choe, Kim, Yi, Lee, Kim, Lee, et al., 2009
LIPID
Total Cholesterol
McLoughney, Khan, Ahmed; 2007 Dyson, Beatty & Matthews; 2010 Deakin, Whitham ; 2009 Reed, R.L., Revel, A.D., Carter, A.O., Hussein, F.S., & Dunn, E.V.; 2005 Krakow, D., & Feulner-krakow, G.; 2007 Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L., 2006
HDL
Siminerio, Ruppert, Emerson, Solano & Piatt; 2008

Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L., 2006
LDL
Siminerio, Ruppert, Emerson, Solano & Piatt; 2008 Dyson, Beatty & Matthews; 2010 King, A.B., & Wolfe, G.S.; 2009 Siminerio, L. M., Piatt, G., & Zgibor, J. C., 2005
TRIGLYCERIDES
Krakow, D., & Feulner-krakow, G.; 2007 Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L., 2006 McLoughney, Khan, Ahmed; 2007
BODY MASS
BMI
Krakow, D., & Feulner-krakow, G.; 2007 Gucciardi, DeMelo, Booth, Tomlinson, and Stewart; 2009 Deakin, Whitham ; 2009 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007 Kulzer, B., Hermanns, N., & Reinecker, H., 2007 Clarke, A., 2011
Waist
Deakin, Whitham ; 2009 Van Sluljsesther, E. M., Van Poppel, N. M., Twisk, J. W., Paw, M. J., Calfas, K. J., & Van Mechelen, W.,2005
Weight
Clarke, A., 2011 Deakin, Whitham ; 2009 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007 Conlon,P.; 2010 Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., & Cradock, S.,...Khunti, K., 2011 Van Sluljsesther, E. M., Van Poppel, N. M., Twisk, J. W., Paw, M. J., Calfas, K. J., & Van Mechelen, W.,2005
BLOOD PRESSURE
McLoughney, Khan, Ahmed; 2007 Deakin, Whitham ; 2009 King, A.B., & Wolfe, G.S.; 2009 Conlon,P.; 2010 Krakow, D., & Feulner-krakow, G.; 2007 Siminerio, L. M., Piatt, G., & Zgibor, J. C., 2005 Reed, R.L., Revel, A.D., Carter, A.O., Hussein, F.S., & Dunn, E.V.; 2005

Table 4

Measuring Subjective Quality Indicators

Diabetes Knowledge
Siminerio, Piatt & Zgibor; 2005 New; 2010 Bell, Patel, & Malasanos; 2006 Dyson, Beatty & Matthews; 2010 Clarke, A., 2011 Atak, Gurkan, Kose; 2009 Kulzer, B., Hermanns, N., & Reinecker, H., 2007 Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., & Cradock, S.,...Khunti, K., 2011 Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Braun, A. K., Kubiak, T., Kuntsche, J., Meier-hofig, M., Muller, U. A., Feucht, I., & Zeyfang, A. (2009) Selea, A., Sumarac-dumanovic, M., Pesic, M., Suluburic, D., Stamenkovic-pejkovic, D., Cvijovic, G., & Micic, D. (2011) Song, Choe, Kim, Yi, Lee, Kim, Lee, et al., 2009 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007
Self-Efficacy
Siminerio, Piatt & Zgibor; 2005 Deakin, Whitham ; 2009 Clarke, A., 2011 Gucciardia, E., Demelo, M., Lee, R. N., & Grace, S. L., 2007 Wu, S. V., Lee, M. C., Liang, S. Y., Lu, Y. Y., Wang, T. J., & Tung, H. H.,2011 Song, Choe, Kim, Yi, Lee, Kim, Lee, et al., 2009 Braun, A. K., Kubiak, T., Kuntsche, J., Meier-hofig, M., Muller, U. A., Feucht, I., & Zeyfang, A.,2009 Kulzer, B., Hermanns, N., & Reinecker, H., 2007 Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Yukawa, K., Yamazaki, Y., Yonekura, Y., Togari, T., Abbott, F., & Homma, M.,...Kagawa, Y.,2010 Sturt, Whitlock, Fox, Hearnshaw, Farmer, Wakelin, et al., 2008 New; 2010 Atak, Gurkan, Kose; 2009 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007 Dyson, Beatty & Matthews; 2010 Van Sluljsesther, E. M., Van Poppel, N. M., Twisk, J. W., Paw, M. J., Calfas, K. J., & Van Mechelen, W., 2005
Quality of Life
Krakow, D., & Feulner-krakow, G.; 2007 Adolfsson, E.T., Walker-engstrom, M.L., Smide, B., & Wikblad, K; 2007 Clarke, A., 2011 Yukawa, K., Yamazaki, Y., Yonekura, Y., Togari, T., Abbott, F., & Homma, M.,...Kagawa, Y.,2010

Review of Diabetes Education Delivered with Technology

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Review of Diabetes Education Delivered with Technology

Diabetes is a chronic, life threatening disease that presents serious personal and economic costs to the community. The National Institutes of Health (2008) report that the total direct and indirect costs of diabetes were around $174 billion in 2008.

Changes in healthcare, which include reimbursement based on patient safety and quality outcome measures have brought attention to patient education. Patient education has become an important component of many disease management programs. Due to increased pressure to provide more informative and interactive educational resources to patients at a lower cost, healthcare providers are beginning to realize the benefits of using computer technology to help educate patients.

Activities to educate, monitor and manage patients with diabetes must be encouraged (Adolfsson, Walker-engstrom, Smide, & Wikblad, 2007; Baradaran, Shams-hosseini, Noori-hekmat, Tehrani-banaihashemi, & Khmseh, 2010; Barnes, Ziemer, Miller, & Doyle, 2004). However, the time and cost of implementing educational interventions can be substantial and may place an unreasonable burden on healthcare professionals (Cranney, Warren, Barton, Gardner, & Walley, 2001). In today's healthcare environment of increasing costs and decreasing reimbursements, many healthcare professionals lack the resources necessary to adequately address patient education as part of the standard office visit (Cranney et al., 2001; Haggerty, Pineault, & Beaulieu, 2007; & Legare, Ratte, Gravel, & Graham, 2008).

Technology has presented various populations with opportunities for education. Electronic means have been used to educate both patients and medical personnel. These interventions are cost effective and do not require substantial time commitments from the healthcare professionals (Cranney, Warren, Barton, Gardner, & Walley, 2001); as a result, researchers are investigating the possibility of using computers to deliver patient education(Keulers, Welters, Spauwen, & Houpt, 2007).

Purpose of Review

The purpose of this review is to explore the ways that diabetes education has been delivered using electronic technology, identify different quality indicators that have been used to measure the success of a program, and the length of time that these indicators were followed.

Methods

Search methods. The EBSCO host electronic database was used to search for articles published from 2000 to 2012, with most articles being published in the last five years. The search used the electronic databases of CINAHL with full text, Education Full Text, ERIC, MEDLINE, and PsychINFO. The EPOC search strategy was used "diabetes education," "computer based intervention," "technology," "informatics," and "consumer health information," as well as combinations of these terms. .

Study selection. A total of 844 titles and abstracts were screened for eligibility. Studies included in this review discussed various ways that diabetes education has been electronically delivered to individuals with diabetes and studies focused on the healthcare providers who work with them. Studies

included also identified different quality indicators that have been explored to measure the success of a program, such as measurements of diabetes self-care, diabetes knowledge or bio-demographics (glycohemoglobin, lipids and blood pressure) and the length of time that these indicators were followed. Studies were included if they met the following criteria: 1) randomized or quasi-randomized trials randomized by patient, healthcare professional, or practice; and 2) nonrandomized studies controlled at a second site with data before and after the intervention. Studies not published in English, available only as abstracts or that did not include evaluation of quality indicators were excluded.

Results

Search Results. Sixteen articles were identified that included diabetes quality indicators, computer based diabetes teaching, web-based teaching, online education, and multi-media diabetes education. These articles are identified in the table with the accompanying citation and level of evidence grade, utilizing the grading system recommended by the U.S. Preventive Services Task Force (2003).

Characteristics of Included Studies

Participants. Each study consisted of 12 to 513 participants with diabetes, with a total of 1818 participants in all. These studies were conducted in four different countries, with over half occurring in the USA (67%). Participants in all studies except one were over 18; in the study by Franklin, Waller, Pagliari, and Greene (2006), 126 participants were aged 8-18.

Fourteen of sixteen articles discussed individuals with diabetes and the electronic delivery of diabetes education. Two articles (Bell, Patel, & Malasanos,

2006; Halkoaho, Kavilo, & Pietila, 2007) discussed mixed groups of participants that included patients as well as nursing professionals that were educated using programs delivered electronically. Bell et al.(2006) used the "Brainfood" educational website and Franklin et al. (2006) used self-care system software to see if it would increase knowledge in the patient and healthcare provider, as well as enhance the existing knowledge of the healthcare provider and evaluate the programs' usefulness.

Site selection. All studies were designed specifically to evaluate outpatient diabetes education delivered by electronic means. This review used sixteen articles that explored twenty-seven locations related to primary care. While most articles included only one location, two articles (Gerber et al., 2005; Noh et al., 2010) used information from five different locations; one study used three locations (Jennings, Powell, Armstrong, Stuart, & Dale, 2009), and the article by McIlhenny, Guzic, Knee, Demuth, and Roberts (2011) used two locations.

Interventions. All studies were designed specifically to evaluate electronic delivery of diabetes education (Table 2). The study by Franklin, Waller, Pagliari, & Greene (2006) used texting to send supportive messages with goal specific prompts and messages to the participants. Two studies (Zyskind, Jones, Pomerantz, & Barker, 2009; Song et al., 2009) used websites that utilized educational videos or programs that were designed strictly to deliver information. Thirteen studies used interactive programs and conferencing. Dyson, Beatty, and Matthews (2010) used video conferencing with the ability to interact with the healthcare professional. Yielding highly effective results, the twelve other studies

used programs or websites to educate patients and gave them the opportunity to interact with healthcare professionals so that they might receive care that was tailored specifically to them.

Outcomes Studied

Quality indicators are often used to evaluate the success of an educational program. These indicators can be objective (Table 3), which may include bio-demographic values such as glucose, lipids, blood pressure and weight, as well as subjective indicators (Table 4) which rely on results from tests and questionnaires.

Objective measurements. Twelve studies tracked blood glucose as a quality indicator. Glycohemoglobin, which is an average measurement of blood glucose over a three-month time period, was used in twelve studies that used objective measurements, but fasting blood sugar results were also included in the study by Lee, Yeh, Liu, and Chen (2007).

Lipid levels were monitored in four studies. Four different types of lipid measurements were evaluated in at least two different studies: total cholesterol (Lee, et al., 2007; Dyson et al., 2010), HDL (Lee et al., 2007; McMahon et al., 2005), LDL (Zyskind, Jones, Pomerantz, & Barker, 2009; Dyson et al., 2010), and triglycerides (Lee et al., 2007; McMahon et al., 2005).

Three studies used blood pressure as a quality indicator. Gerber et al. (2005) and Khan et al. (2011) used blood pressure measurements and glycohemoglobin measurements for their studies that evaluated interactive multimedia. McMahon et al. (2005) combined glycohemoglobin, HDL and triglycerides with blood pressure measurements to evaluate the web-based care study.

Subjective measurements. Eight studies measured a change in participants' knowledge of diabetes by comparing results from pre and post study tests and questionnaires. Franklin, Waller, Pagliari, and Greene (2006) and Song et al. (2009) measured diabetes knowledge and self-efficacy, as well as the objective measurement of glycohemoglobin when evaluating a web-based program and the Sweet Talk texting program that utilized informative and encouraging text messages. Glycohemoglobin, total cholesterol, and LDL accompanied measurements of diabetes knowledge to evaluate the effects of the three lifestyle videos in the study by Dyson, Beatty, and Matthews (2010). McIlhenny, Guzic, Knee, Demuth, and Roberts (2011) and Balamurugan et al. (2009) evaluated the measurement of diabetes knowledge in addition to other subjective measures such as self-efficacy and quality of life, after receiving diabetes education by electronic delivery. Multiple measurements of subjective and objective values were evaluated by Gerber et al. (2005) in a study that evaluated supplemental computer multimedia use. Bell, Patel, and Malasanos (2006) only evaluated diabetes knowledge.

Self-efficacy and self-care behaviors were measured in ten studies. Increases in self-efficacy and diabetes knowledge were noted in studies by McIlhenny, Guzic, Knee, Demuth, and Roberts (2011) and Balamurugan et al. (2009). The study by Huang, Chen, and Yeh (2009) showed increased diabetes knowledge, but no change in self-efficacy. There were no changes found regarding self-efficacy in three studies (Khan et al., 2011; Jennings, Powell, Armstrong, Stuart, & Dale, 2009; Gerber et al., 2005). There were increases in self-efficacy in the studies by

Song et al. (2009), Halkoaho et al. (2007), and Izquierdo et al. (2003), as well as the only study that included participants less than 18 years of age (Franklin et al., 2006). Self-reported increases in exercises were reported in studies by Khan et al. (2011) and Lee, Yeh, Liu, and Chen (2007). No changes were noted in quality of life (McIlhenny, Guzic, Knee, Demuth, & Roberts, 2011; Jennings, Powell, Armstrong, Stuart, & Dale, 2009).

Discussion

Overall, the results of education delivery using technology were very diverse regarding study design, interventions and outcomes reported.

The content of the educational material should be evidence-based, and the material may be more accurate if specific guidelines are used. If the content of the material is not in the original format then the source should be clearly indicated within the material to verify accuracy.

Most sites used in these articles were technically advanced in respect to design of navigation, but were shown to have poor interactivity. Most educational sites could benefit from items such as easier mechanisms of feedback, more accessible chat and discussion groups, and ability to tailor the content and alerts to a specific patient or group of patients.

Geographic specificity was not mentioned in many of the studies. Educational material can often be especially effective when cultural content is tailored to a particular population. Since the studies were not conducted regarding a specific population, studies that are focused on populations such as Appalachia may be useful.

Individuals in a particular geographic area may choose not to participate in an educational opportunity due to the stigma that may be related to the disease, such as being labeled “broken”, “lazy”, or “unhealthy”. Areas populated by individuals with low literacy may choose not to participate if the material is not supplied with audio or delivered at a lower literacy level.

Educational material that is accompanied by audio may aid in recruiting subjects with lower literacy. Individuals who have time constraints such as commuting may find audio components beneficial to initiate or continue a particular educational program.

There were no alternative means mentioned in these studies regarding access to the electronic material if immediate access was not available. Access to electronic education material may be difficult in some geographical locations due to availability of a device to view the material on, availability of service to transmit the program, or the cost to power the device. Establishment of a centralized location to allow a participant to access electronic media may support the recruitment of subjects to participate in a program or encourage a participant to complete an existing electronic diabetes education program.

Standard recruitment protocols were not consistent. There were no incentives for the healthcare providers to refer individuals to participate in or complete the studies. Individuals who participated in the studies did not have specific incentives to encourage them to participate in or complete the studies. Sample sizes used in the studies were not consistent and ranged from 12 participants to 513 participants.

There were six different time spans that were followed (Table 5). The study by Song et al. (2009) had the earliest recorded results at baseline to 6 weeks showing significant increase in glycohemoglobin and diabetes knowledge, but the final results of this study regarding web-based education were recorded at three months. Four studies (Huang, Chen, & Yeh, 2009; Khan et al., 2011; Izquierdo et al., 2003; Balamurugan et al., 2009) only used results from baseline to 3 months. Lee, Yeh, Liu, and Chen (2007) and McMahon et al. (2005) followed results at baseline, 3 months, 6 months, 9 months and one year. Zyskind, Jones, Pomerantz, and Barker (2009) only used measurements from baseline to 9 months. Measurements from baseline to 6 months were evaluated in studies by Dyson, Beatty, and Matthews (2010), Jennings, Powell, Armstrong, Stuart, and Dale (2009) and Noh et al. (2010). Gerber et al. (2005), Franklin, Waller, Pagliari, and Greene (2006) and Bell, Patel, and Malasanos (2006) extended their studies from baseline to one year, while Halkoaho, Kavilo, and Pietila (2007) only listed pre and post-test measurements with no designated timeframe.

Although it appears that electronic delivery and computer-based education is an effective and efficient way to teach skills and provide information to patients, this may be questionable as evidence based practice evolves and guidelines change. If knowledge diminishes over time, the overall value of technology-based education would be greatly reduced, thus adding support for the need for customized information that is flexible enough to adapt to the nature of the patients' ongoing informational needs and changes to their health and social circumstances.

Conclusion

The results of this review support use and delivery of technology based educational material. Diabetes education, based on the patients' own goals, values and motivation will help resolve daily problems, as well as encourage individuals with diabetes to accept responsibility for making choices that affect their healthcare.

Technology based material can support the formation of patient and provider relationships, improve the balance of self-efficacy versus provider responsibility, and create new educational opportunities with the transfer of applicable data.

To capitalize on the advantages of this technology, we need to broaden our understanding of how people learn best using technology and examine the impact of this knowledge on healthcare over time. This can only be accomplished through further research. Cost-benefit analysis and cost-effectiveness would be useful in establishing the effectiveness of these interventions. This may identify areas where we may need to encourage more time or emphasis on a particular area of study.

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Table 1

Articles Utilized in Review

Grade	Reference	Design	Intervention	Sample	Setting	Follow Up	Results	Conclusion
Good/ A	Bell, J. A., Patel, B., & Malasanos , T. (2006). Knowledg e improvem ent with web-based diabetes education program: Brainfood . *Diabetes Technolog y & Therapeut ics*, *8*(4), 444-448. USA	CBA Pre and post tests	Delivery of educational material "Brainfood" via educational website	513 participant s 124 Nurses 389 Non-nurse	University Outpatient Setting	13 months	Non-nurse post scores improved significantly ($p<0.001$). Nurse post scores improved significantly ($p<0.05$). Post scores improved, but not statistically significant for basic nutrition. Web-based education about Type 1 diabetes improved the knowledge of all users. Nurses had lower margin of improvement for most modules since they had higher base knowledge.	Brainfood is educationally sound and effective at delivering Type 1 diabetes education to both professional and non-professionals . Web access from non-clinic settings can improve access to high-quality education for learners in remote or underserved locations
Good/ A	Lee, T. I., Yeh, Y. T., Liu, C. T., & Chen, P. L. (2007). Developm ent and evaluation of a patient-oriented education system for diabetes managem ent. *Internatio nal Journal of Medical Informatic*	Quasi-experimen tal	Both received treatment based on same guidelines, the intervention group received access to POEM (patient oriented diabetic education management system) Lab test results including fasting blood	274 participant s 134 in interventio n group (57% male 43% female) 140 in control group (46%male and 54% female) Both received treatment based on same guidelines, the	Outpatient visiting the Metabolism Center	3,6,9, and 12 months	Standard Deviations are listed for testing. I:C 1=1st follow up, 2=2nd follow up, 3=3rd follow up. Fasting Blood Sugar- 1-47.47:43.46; 2-47.67:42.37; 3-45.52;41.44. HgA1c- 1-2.16:1.49; 2-2.14:1.49; 3-2.12:1.65.	The POEM system can help patients control their glucose, HbA1c and total cholesterol levels to manage their diabetes, providing an easy and inexpensive way to extend hospital-based patient education services for community-based

	s, *76*, 655-663. Taiwan		glucose, HbA1c, total cholesterol, triglyceride and HDL were tested from the first visit through each follow up at 3,6,9 and 12 months	intervention group received access to POEM			Total Cholesterol-1-30.25:37.36; 2-29.57:39.41; 3-29.047:40.597. Triglyceride-1-58.58:64.63; 2-58.59:64.65; 3-58.50:64.67. HDL-1-14.02:11.82; 2-14.07:11.57; 14.03:11.66. Follow Up-1-A significant difference in fasting blood glucose levels. 2nd-fbg and HgA1c were significantly different. 3-Significant difference in fasting blood glucose, HgA1c and total cholesterol	continuous education
Fair/A	Zyskind, A., Jones, K. C., Pomerantz, K. L., & Barker, A. L. (2009). Exploring the use of computer based patient education resources to enable diabetic patients from underserv	RCT	Both received standard of care diabetes treatment. The intervention group received additional computer based diabetes education in either English or Spanish from the Medline-Plus.gov	108 participants 58 in intervention group 50 in the control group	Large urban community health center with Spanish speaking patients.	3,6 and 9 months	The intervention group had a small decline in HgA1c (-0.3%) and LDL (-9.9mg/dl). The control group had a small increase in HgA1c (+0.1%) and LDL (+0.5mg/dl)	The study allowed patients with low-literacy levels to receive health information targeted for their comprehension. The study found a downward trend in both HgA1c and LDL. Due to small size the differences

	ed populations to self-manage their disease. *Information Services & Use, 29*, 29-43.USA		website					were not statistically significant. This study supports the theory that computer based patient education can positively impact clinical outcomes.
Good/ A	Huang, J. P., Chen, H. H., & Yeh, M. L. (2009). A comparison of diabetes learning with and without interactive multimedia to improve knowledge, control, and self-care among people with diabetes in Taiwan. *Public Health Nursing, 26*(4), 317-328. Taiwan	RCT	The control group used routine 3-month patient education and intervention group received education through interactive multimedia about diabetes for 3 months.	60 subjects with diabetes 30 in intervention group 30 in control group	Endocrinology outpatient department at a regional hospital in the south of Taiwan	Base and 3 month	The experimental group showed greater improvement in understanding diabetes than the control ($p<.001$). There was no significant difference in control of blood sugar levels ($p=.10$) and self-care ($p=.32$)	The use of an interactive multimedia device to intervene in diabetes self-care was effective only in raising the subjects' knowledge about the disease. Additionally, the subjects may need more time to implement more effective blood sugar control and self-care activities after receiving instruction
Good/ B	Song, M., Choe, M. A., Kim, K. S., Yi, M. S., Lee, I., Kim, J.,...Shim, Y. s (2009). An evaluation of web-based education	RCT	The intervention group participated in the web-based diabetes self-management program as an alternative to attending 3 hours of group lectures	31 participants 15 in intervention group 16 in the control group	Outpatient group affiliated with the College of Nursing and the endocrine department of a university-affiliated, tertiary care hospital in Seoul,	Base, 6 weeks and 3 months	From base line to 6 weeks the HbA1c and knowledge improved significantly in the web-based group, as well as diabetes care behavior continuously improved from base to	The results of this study indicate that a web-based diabetes self-management education program has potential as an effective alternative to group lecture education for diabetes self-management,

	as an alternative to group lectures for diabetes self-management. *Nursing and Health Sciences, 11*, 277-284. Korea		provided by health care professional specializing in diabetes care.		Korea		6 weeks to 3 months. Diabetes care knowledge and behavior improved significantly in the lecture group from base to 6 weeks, but the HgA1c did not change at all	in terms of improving diabetes care knowledge, improving diabetes care behavior, and improving the physiological variables, HgA1c and FBS
Good/ A	Dyson, P. A., Beatty, S., & Matthews, D. R. (2010). An assessment of lifestyle video education for people newly diagnosed with type 2 diabetes. *Journal of Human Nutrition and Dietetics, 23*, 353-359. UK	RCT	All subjects in the study received usual medical care from their primary care physician, including education about lifestyle management of type 2 diabetes from a practice nurse. In addition, subjects randomized to the video intervention received the three lifestyle videos and were requested to watch them in their own time. The control group was offered the videos at the end of the 6 month study period	42 newly diagnosed diabetic Patients 21 controlled group 21 intervention group	Direct referral from primary care physician, practice nurse or from ads	Base and 6 months	The intervention group showed increased knowledge compared to controls ($p<= 0.0001$). There were no significant differences in changes over 6 months in either group, however the intervention group showed improvements in HgA1c ($p=0.024$), total cholesterol ($p=0.017$), LDL cholesterol ($p= 0.018$) and increased physical activity measured by pedometer ($p=0.043$) from baseline, with no significant changes in control	A brief video intervention increased diabetes knowledge amongst those newly diagnosed with type 2 diabetes and may comprise an effective way of directing education to such individuals.

							group.	
Good/ B	Khan, M. A., Shah, S., Grudzien, A., Onyejekwe, N., Banskota, P., Karim, S.,...Gerber, B. s (2011). A diabetes education multimedia program in the waiting room setting. *Diabetes Therapy, 2*(3), 178-188. USA	RCT	Participants either viewed a computer multimedia education program (intervention) or read an educational brochure (control) while in the waiting room	129 uninsured, primarily ethnic minority adults with type 2 diabetes 67 interventio n group 62 control group	Patients at a county clinic in Chicago, Illinois	Base and 3 months	There was an increase in the number of oral diabetes medications prescribed over 3 months to multimedia users compared with those in the control group (p=0.017). HgA1c declined by 1.5 in the multimedia group versus 0.8 in the control group (p=0.06). There were no difference between groups in changes in blood pressure levels, self-efficacy, and most diabetes related behaviors. Self-reported exercise increased in the control group compared with the multimedia group (p=0.016)	Multimedia users received a greater intensificatio n of diabetes therapy, but demonstrated no difference in self-management in comparison with those receiving educational brochures. The availability of a computer multimedia program in the waiting room appears to be a novel and acceptable approach in providing diabetes education for underserved populations
Fair/B	Jennings, A., Powell, J., Armstrong, N., Stuart, J., & Dale, J. (2009). A virtual clinic for diabetes	CBA	These patients used a virtual clinic system that allowed communicati on with health professionals ; interact with peers	17 patients, convenien ce sample	Outpatients from three UK hospitals in the West and East Midland	Base and 6 months	Participants found the virtual clinic easy to use and positively rated its design. Peer support was the most valued	An internet-based system to aid the management of diabetes appears feasible and well accepted by patients. The pilot study did not

	self-management: Pilot study. *Journal of Medical Internet Research, 11*(1), 1-8. UK		and access information.				aspect and the discussion boards the most used component. All participants highly rated the virtual clinic in terms of improving communication with peers, but few agreed it had improved communication with health care professionals. No significant improvements in physiological and psychological measurements were found. Regarding HgA1c measurements, there was no significant difference found between the pre and post test results (p=0.53). Mean ADDQoL scores at base were -2.1 compared to -2.0 post test (p=.62). Patient's confidence in their ability to perform self-care tasks	identify evidence of an impact on improving quality of life or self-efficacy in patient who used insulin pump therapy

							was found to be significantly reduced from base to follow up (p=0.45)	
Fair/A	McIlhenny, C. V., Guzic, B. L., Knee, D. R., Demuth, B. R., & Roberts, J. B. (2011). Using technology to deliver healthcare education to rural patients. *Rural and Remote Health, 11*(1798), 1-11. USA	RCT	In the intervention group that received regularly scheduled; one-on-one individualized diabetes related health education and hands on instruction how to use an internet portal by a nurse educator. Control patients in the second clinic were given pamphlet describing how to access the portal. All participants completed baseline and post studies. Disease knowledge and problem areas in diabetes were measured. All participants completed a behavior modifications survey post study. A satisfaction survey was completed. Serum	98 patients 48 intervention group 50 control group	Patients at two rural medical clinics	Base, 3 and 6 months	Disease knowledge and self-blood glucose monitoring improved with one-on-one education. Demographic and baseline scores were similar between groups. At 6 months, the intervention group showed significant increase in disease knowledge and self-blood glucose monitoring behavior. There were no differences in QOL between the groups at 6 months. Participants in the intervention group were highly satisfied with the educator, but not the internet as a resource	Diabetes knowledge and self-blood glucose monitoring improved with one-on-one education. High attrition and a short study period were limitations of this study. The researchers speculate that the age of the participants and low internet penetration affected satisfaction scores.

			glucose, HgA1c, and lipids were reviewed					
Good/ B	Gerber, B. S., Bordsky, I. G., Lawless, K. A., Smolin, L. I., Arozullah, A. M., Smith, E. V.,...Eiser, A. r (2005). Implementation and evaluation of a low-literacy diabetes education computer multimedia application. *Diabetes Care, 28*(7), 1574-1580. USA	RCT	Randomly placed into intervention group that included supplemental computer multimedia use or control which received the standard of care. Intervention included audio/video sequences to communicate information, provide psychological support, and promote diabetes self-management skills	244 patients started study with 183 completing the study	Patients from 5 public clinics in Chicago, Illinois	Base and 1 year	Only 183 subjects completed the study. There were no significant differences in change in A1c, weight, blood pressure, knowledge, self-efficacy or self-reported medical care between the intervention and control groups. There was an increase in perceived susceptibility to diabetes complications in the intervention group. Lower literacy patients reported this higher. Time on the computer was increased in the intervention group.	Access to multimedia lessons resulted in an increase in perceived susceptibility to diabetes complications, particularly in subjects with lower health literacy. Despite measures to improve informational access for individuals with lower health literacy, there was relatively less use of the computer among these participants.
Fair/A	Noh, J. H., Cho, Y. J., Nam, H. W., Kim, J. H., Kim, D. J., Yoo, H. S.,...Woo, M. h (2010). Web-based	RCT	Evaluate the effect of a web-based comprehensive information system, consisting of Internet and cellular phone use, on blood glucose monitoring	40 patients Age 18-80; type 2 diabetes and A1c between 7-10 with stable control. Randomly assigned to interventio	Outpatient department from 5 hospitals	Base and 6 months	Significant decrease in A1c in intervention group but not in the control group. There was a relationship between the change in A1C and frequency of	Significant HgA1c was improved by a web-based intervention not only via computer but also via cellular phone at 6 months post initiation in patients with type 2

	comprehe nsive informatio n system for self-managem ent of diabetes mellitus. *Diabetes Technolog y & Therapeut ics, 12*(5), 333-337. Korea		Intervention patients received training in eMOD usage and logged into the system whenever it was convenient for them. The control group received diabetes educational books with similar contents	n group (20) or Control group (20).			access to the eMOD system by computer and cellular phone	diabetes. These results indicate that the use of a convenient web-based education system could be more effective for glycemic control than traditional education for diabetes patients.
Fair/A	Halkoaho, A., Kavilo, M., & Pietila, A. M. (2007). Informatio n technolog y supporting diabetes self-care: A pilot study. *European Diabetes Nursing, 4*(1), 14-17. UK	CBA	Data collected by questionnair e and interview. People with diabetes were sent a questionnair e and the nurses were interviewed	9 individuals with diabetes 3 diabetes nurses	9 patients from outpatient program, the nurses worked with those patients	Post interview questionnair es	The results suggest that the Self-Care system software supports and motivates diabetes self-care. The nurses felt that the application was useful when changes were introduced. Both groups disliked the mechanical nature of the software	The results suggest that the Self-Care system software supports and motivates diabetes self-care. The nurse felt that the application was useful when changes, such as starting insulin treatment, were introduced. The application was further described as effective and motivating in short-term intensive diabetes education and monitoring; however, both nurses and patients disliked the mechanical nature of the software

Good/ B	McMahon , G. T., Gomes, H. E., Hickson-Hohne, S., Hu, T. M., Levine, B. A., & Conlin, P. A. (2005). Web-based care managem ent in patients with poorly controlled diabetes. *Diabetes Care, 28*(7), 1624-1629. USA	RCT	All participants completed a diabetes education class and were randomized to continue with their usual care or receive web-based care management. The web-based group received a notebook computer, glucose and blood pressure monitoring devices, and access to a care management website. The website provided educational modules, accepted uploads from monitoring devices, and had an internal messaging system for patients to communicat e with the care manager	104 patients 52 in Control group 52 in interventio n group	Patients with diabetes and HgA1c >=9.0% who received their care at a Department of Veterans Affairs medical center were recruited.	Baseline, 3, 6, 9 and 12 months	Patients receiving web-based care management had lower A1c over 12 months when compared with education and usual care. Persistent website users had greater improvement in A1c when compared with intermittent users or education and usual care. A larger number of website data uploads was associated with a larger decline in A1c. Hypertensive participants in the web-based group had a greater reduction in systolic blood pressure. HDL cholesterol rose and triglycerides fell in the web-based group	Web-based care management may be a useful adjunct in the care of patients with poorly controlled diabetes
Good/ A	Izquierdo, R. E., Knudson, P. E., Meyer, S., Kearns, J., Ploutz-snyder, R., & Weinstock , R. S.	RCT	Determine whether diabetes education can be provided as effectively through telemedicine technology as through	56 adults with diabetes 28 control group 28 interventio n group	Patients at the Joslin Diabetes Center at SUNY Upstate medical University in Syracuse, New York	Baseline and 3 months	Patient satisfaction was high in the telemedicine group. Problem Areas in Diabetes scale scores improved	Diabetes education via telemedicine and in person was equally effective in improving glycemic control, and both methods were well

	(2003). A comparison of diabetes education administered through telemedicine versus in person. *Diabetes Care, 26*(4), 1002-1007. USA		in-person encounters with diabetes nurse and nutrition educators. Randomized to receive diabetes education in person (control group) or via telemedicine (telemedicine group). The education consisted of three consultative visits with diabetes nurse and nutrition educators. The in-person and telemedicine groups were compared using measures of glycemic control and questionnaires to assess patient satisfaction and psychosocial functioning as related to diabetes.				significantly with diabetes education, and the attainment of behavior change goals did not differ between groups. With diabetes education, HgA1c improved from 8.6 +/- 1.8% at baseline to 7.8 +/-1.8% 3 months after the third educational visit, with similar changes observed in the telemedicine and in-person groups.	accepted by patients. Reduced diabetes-related stress was observed in both groups. These data suggest that telemedicine can be successfully used to provide diabetes education to patients
Good/ A	Franklin, V. L., Waller, A., Pagliari, C., & Greene, S. A (2006). A randomized controlled trial of Sweet Talk, a text-	RCT	To assess Sweet Talk, a test messaging support system designed to enhance self-efficacy, facilitate uptake of intensive insulin therapy and improve glycaemic	126 patients, 28 conventional therapy 33 conventional therapy and Sweet Talk 31 Intensive insulin therapy and Sweet Talk	Patients with type 1 diabetes for > 1 year, on conventional insulin therapy, aged 8-18years attending outpatient clinics in Tayside, Scotland.	Base and 12 months	HbA1c did not change in patients on conventional therapy without or with Sweet Talk, but improved in patients randomized to intensive therapy and Sweet Talk. Sweet Talk	Sweet Talk was associated with improved self-efficacy and adherence; engaging a classically difficulty to reach group of young people. While Sweet Talk alone

	messaging system to support young people with diabetes. *Diabetic Medicine, 23*, 1332-1338. UK		control in pediatric patients with type 1 diabetes. Goal-setting at clinic visits was reinforced by daily text-messages from the Sweet Talk software system, containing personalized goal-specific prompts and messages tailored to patients' age, sex and insulin regimen.				was associated with improvement in diabetes self-efficacy and self-reported adherence. When surveyed, 82% of patients felt that Sweet Talk had improved their diabetes self-management and 90% wanted to continue receiving message	did not improve glycaemic control, it may have had a role in supporting the introduction of intensive insulin therapy. Scheduled, tailored text messaging offers an innovative means of supporting adolescents with diabetes and could be adapted for other health-care settings and chronic disease.
Fair/A	Balamurugan, A., Hall-barrow, J., Blevins, M. A., Brech, D., Phillips, M., & Holley, E.,...Brittle, K. (2009). A pilot study of diabetes education via telemedicine in a rural underserved community-opportunities and challenges. *The Diabetes Educator, 35*, 147-154. USA	CBA	Participant knowledge, self-efficacy, and self-care practices were assessed before participants began the education program and after they had completed it. Also, select clinical measures were collected	38 participants started 25 completed program	People with diabetes in underserved rural communities supported by the University of Arkansas	Base and 3 months	66% of participants completed the DSME-T program. A significantly greater proportion of participants demonstrated improved knowledge, endorsed greater self-efficacy, and reported more frequent self-care practices to manage their diabetes at the conclusion of the study period.	The results of this pilot study suggest that DSME-T may offer opportunities for DSME among rural residents with diabetes. Plans are in place to explore the possibility of sustaining and expanding the program to other underserved rural communities.

Table 2

Type of Delivery of Education

Web-based information
Lee, Ting-I, Yeh, Yu-ting, Liu, Chien-tsai, Chen, Ping-ling, 2007 Zyskind, A., Jones, K. C., Pomerantz, K. L., & Barker, A. L., 2009 Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Song, M., Choe, M. A., Kim, K. S., Yi, M. S., Lee, I., Kim, J.,...Shim, Y. , 2009 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005 Izquierdo, Knudson, Meyer, Kearns, Ploutz-snyder & Weinstock, 2003 Bell, J. A., Patel, B., & Malasanos, T., 2006
Interactive
Huang, J. P., Chen, H. H., & Yeh, M. L., 2009 Khan et al., 2011 Jennings, A., Powell, J., Armstrong, N., Stuart, J., & Dale, J., 2009 Mcilhenny, C. V., Guzic, B. L., Knee, D. R., Demuth, B. R., & Roberts, J. B., 2011 Gerber et al., 2005 Noh, J. H., Cho, Y. J., Nam, H. W., Kim, J. H., Kim, D. J., Yoo, H. S.,...Woo, M. h, 2010 Halkoaho, A., Kavilo, M., & Pietila, A. M., 2007 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005 Izquierdo, Knudson, Meyer, Kearns, Ploutz-snyder & Weinstock, 2003 Balamurugan, Hall-barrow, Blevins, Brech, Phillips, Holley & Bittle, 2009 Bell, J. A., Patel, B., & Malasanos, T.,2006 Lee, Ting-i, Yeh, Yu-ting, Liu, Chien-tsai, Chen, Ping-ling, 2007 Dyson, P. A., Beatty, S., & Matthews, D. R., 2010
Telephone
Franklin, Waller, Pagliari & Greene, 2006

Table 3
Articles Using Objective Quality Indicators

BLOOD SUGAR
Glycohemoglobin
Lee, Yeh, Liu, & Chen, 2007 Zysknd, Jones, Pomerantz, & Barker, 2009 Song et al., 2009 Khan et al., 2011 Jennings, Powell, Armstrong, Stuart, & Dale, 2009 Gerber et al., 2005 Noh et al., 2010 Dyson, Beatty, & Matthews, 2010 Franklin, Waller, Pagliari & Greene, 2006 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005 Izquierdo, Knudson, Meyer, Kearns, Ploutz-Snyder & Weinstock, 2003 Huang, Chen, & Yeh, 2009
Fasting Blood Sugar
Lee, Yeh, Liu, & Chen, 2007
LIPID
Total Cholesterol
Lee, Yeh, Liu, & Chen, 2007 Dyson, Beatty, & Matthews, 2010
HDL
Lee, Yeh, Liu, & Chen, 2007 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005
LDL
Zysknd, Jones, Pomerantz, & Barker, 2009 Dyson, Beatty, & Matthews, 2010
Triglycerides
Lee, Yeh, Liu, & Chen, 2007 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005
BLOOD PRESSURE
Gerber et al., 2005. McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005 Khan et al., 2011

Table 4

Articles Using Subjective Quality Indicators

Diabetes Knowledge
Huang, Chen, & Yeh, 2009
Song et al., 2009
Dyson, Beatty, & Matthews, 2010
McIlhenny, Guzic, Knee, Demuth, & Roberts, 2011
Gerber et al., 2005
Franklin, Waller, Pagliari & Greene, 2006
Balamurugan, Hall-barrow, Blevins, Brech, Phillips, Holley & Bittle, 2009
Bell, J. A., Patel, B., & Malasanos, T., 2006
Self-Efficacy
Song et al., 2009
Khan et al., 2011
Jennings, Powell, Armstrong, Stuart, & Dale, 2009
Gerber et al., 2005
Franklin, Waller, Pagliari & Greene, 2006
Izquierdo, Knudson, Meyer, Kearns, Ploutz-snyder & Weinstock, 2003
Balamurugan, Hall-barrow, Blevins, Brech, Phillips, Holley & Bittle, 2009
Huang, Chen, & Yeh, 2009
McIlhenny, Guzic, Knee, Demuth, & Roberts, 2011
Halkoaho & Pietila, 2007
Khan et al., 2011
Lee, Yeh, Liu, & Chen, 2007
Quality of Life
McIlhenny, Guzic, Knee, Demuth, & Roberts, 2011
Jennings, Powell, Armstrong, Stuart, & Dale, 2009

Table 5
Length of Study

Baseline to 6 weeks
Song et al., 2009
Baseline to 3 month
Lee, Yeh, Liu, & Chen, 2007 Zyskind, Jones, Pomerantz, & Barker, 2009 Huang, Chen, & Yeh, 2009 Song et al., 2009 Khan et al., 2011 Mcilhenny, Guzic, Knee, Demuth, & Roberts, 2011 Izquierdo, Knudson, Meyer, Kearns, Ploutz-snyder & Weinstock, 2003 Balamurugan, Hall-barrow, Blevins, Brech, Phillips, Holley & Bittle, 2009 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005
Baseline to 6 months
Lee, Yeh, Liu, & Chen, 2007 Dyson, Beatty, & Matthews, 2010 Jennings, Powell, Armstrong, Stuart, & Dale, 2009 McIlhenny, Guzic, Knee, Demuth, & Roberts, 2011 Noh et al., 2010 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005 Zyskind, Jones, Pomerantz, & Barker, 2009
Baseline to 9 months
Lee, Yeh, Liu, & Chen, 2007 Zyskind, A., Jones, K. C., Pomerantz, K. L., & Barker, A. L., 2009 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005
Baseline to 1 year
Lee, Yeh, Liu, & Chen, 2007 Gerber et al., 2005 Franklin, Waller, Pagliari & Greene, 2006 McMahon, Gomes, Hickson Hohne, Hu, Levine & Conlin, 2005 Bell, J. A., Patel, B., & Malasanos, T.,2006
Generalized pre and post study
Halkoaho, A., Kavilo, M., & Pietila, A. M., 2007

Do Educational Materials and Brief Counseling Improve Diabetes Knowledge and Self-Efficacy?

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Abstract

Purpose: The purpose of this study was to see if education and counseling of the Appalachian individual with diabetes and a family member/friend would improve knowledge of the disease and self-efficacy of the patient in regard to their diabetes care.

Setting: The setting was one of eight primary care offices of Our Lady of Bellefonte Hospital, Bon Secours, located in the Ashland, Kentucky.

Design: A pilot study of descriptive, comparative design was used.

Subjects: Data were collected from a convenience sample of patients with type 2 diabetes (n=15) that were established at the primary care office and their family members/friends (n=15).

Measurements: The Diabetes Knowledge Tests (DKT), the Diabetes Empowerment Tests (DES-SF) and the Thai Family Function Tests were used to assess the subjective variables of interest. A chart review of the standard office visit was reviewed and objective metabolic outcomes, such as weight, blood pressure (systolic and diastolic), lipids (total cholesterol and triglycerides), pulse, and glycohemoglobin were extracted and recorded. All measurements were evaluated pre-education and post-education. Demographic and clinical characteristics were obtained from all participants.

Results: Thirty participants, consisting of patients with type 2 diabetes (n=15) and family members/friends (n=15), completed the study with pre-education and three month post-education results. Increases in diabetes knowledge, improvement in self-efficacy and increased family function were noted; however, there was no indication that a higher family function score would relate to a higher level of diabetes knowledge, a greater

improvement of self-efficacy or improvement in metabolic outcomes. Although the test regarding self-efficacy (p=0.188) was not statistically significant p-value >0.05, it was clinically significant as evidenced by the results of the metabolic testing. The family function score (p=0.016) and diabetes knowledge (p=0.035) were statistically significant p-value <0.05 as well as clinically significant as evidenced by the test scores and results of the metabolic testing. The mean glycohemoglobin dropped by 0.32 percentage points. Decreases were also seen in systolic blood pressure, pulse, weight, and triglycerides. There were, however, increases in diastolic blood pressure and total cholesterol.

Conclusions: Results of the pilot study indicated positive changes in diabetes knowledge, self-efficacy and family function, as well as the majority of metabolic outcomes. Families with higher family functioning scores did not appear to have higher scores measuring diabetes knowledge or self-efficacy at the initiation of the study. Those families with higher family functioning scores showed no greater improvement in diabetes knowledge or self-efficacy scores than those families with lower family functioning scores at the conclusion of the study. This pilot study did not support inclusion of family in the educational process or disease management, but will support the use of a structured diabetes educational plan in the family practice setting to promote patient collaboration and outcomes. This study offers patients and their family members/friends education on maintenance and preventive measures, encouraging them to lead a healthy lifestyle, maintain their current health and prevent expensive complications, therefore reducing healthcare costs.

Educational Materials and Brief Counseling Improve Diabetes Knowledge and Self-Efficacy

Diabetes is one of the most common and serious chronic diseases in the United States. According to the Centers for Disease Control and Prevention (2008), over 25 million Americans (8.3% of the population) have diabetes, and more than 1.9 million are newly diagnosed each year. Seven million individuals do not know they have diabetes and do not receive appropriate early intervention, which increases the long-term complications associated with diabetes (Centers for Disease Control and Prevention, 2011).

In order to attain successful management of diabetes, adequate patient education and social support are needed, both of which require substantial time and money. According to the National Institutes of Health (2008), the total direct and indirect costs of diabetes were a staggering $174 billion. This total included the direct medical cost of $116 billion and indirect costs (e.g., disability, work loss and premature mortality) of $58 billion. Increasing access to adequate education and counseling could be considered in an effort to reduce these costs. Activities to educate, monitor and manage patients with diabetes must be encouraged (Adolfsson, Walker-engstrom, Smide, & Wikblad, 2007; Baradaran, Shams-hosseini, Noori-ekmat, Tehrani-banaihashemi, & Khmseh, 2010; Barnes, Ziemer, Miller, & Doyle, 2004).

Educational Materials and Counseling

Patient education is a critical component of caring for patients with chronic diseases such as diabetes. A person with diabetes needs knowledge about the disease, how it affects the body, and the ways in which lifestyle choices minimize the effects of the disease process (Barnes et al., 2004; American Association of

Diabetes Educators, 2008; American Diabetes Association, 2008). Patient education strategies can take various forms. The most traditional methods are classroom-based group sessions, one-on-one education and patient education handouts (Bell, Patel, & Malasanos, 2006).

Traditional methods are often all that are available to individuals in rural areas. Resources such as Certified Diabetes Educators, Endocrinologist, educational material and diabetes support groups are not always easily accessible. In the Appalachian region, it is estimated that 42% of the area is rural and an estimated 23 million individuals inhabit the area (Center for Disease Control, 2011). Increasing access and availability of educational resources would make a significant difference in regard to the number of individuals that this could involve.

Appalachian Population and Family Involvement

Successful management of type 2 diabetes requires individuals to make a commitment to lifestyle changes such as healthy diet, physical activity and preventive care in order to adhere to recommended guidelines (American Diabetes Association, 2008; American Association of Diabetes Educators, 2008). In regard to Appalachia, these necessary changes can affect family members, which can circle back to the individual, as most family members are interdependent. Family plays a critical role in the health of each member (Allender, Rector, & Warner, 2010), because health habits are often developed directly and indirectly within the context of the family (Campbell, 2006).

Within the last decade, family dynamics have been examined to see if

interaction between family members could play a role in health care behaviors (Dedaic, 2001; Sarangi, 2006; Tannen, Kendall, & Gordon, 2007). The daily habits of individuals that are in a position of influence often set the pace for the rest of the family, depending on the dynamics of the family, this may influence health care behavior in a positive or negative way (Sarangi, 2006). With this in mind, individuals from Appalachia may benefit from a family centered approach to education because their culture values family relationships.

Diabetes Knowledge

In support of the family centered approach, it was found that healthcare providers from the same cultural backgrounds have shown the most impact on disease management (Early, Shultz, & Corbett, 2009; Keogh et al., 2007). Tessaro, Smith, and Rye (2005) reported that more than 70% of patients in their study of rural Appalachians engaged in self-treatment, and two thirds had initially sought advice from family or friends before seeking professional help. Family influence is supported by culture and ethnicity and is the basis for how patients and family members understand, respond to and manage chronic disease over time, even though self-care behavior often takes place elsewhere, such as work (Gordon, 2009).

Self-Efficacy

Teaching techniques are often more successful if modified to the individuals that need educated. Information regarding how the Appalachian population may influence their family simulates that the most common influences are areas of task related behavior. In regard to the concept of self-efficacy, Bandura (1997)

believed that perceived self-efficacy was task specific and not only determined the amount of effort and perseverance one expended on a given endeavor, but also shaped the outcomes one expected from one's actions.

Self-empowerment helps the individual to select achievable goals and derive satisfaction from meeting those goals. Outcome expectancies represent beliefs that behavior will lead to desired and expected consequences and behavior is best predicted by knowledge of both efficacy and outcome expectations (Bandura, 1986; Iannotti et al., 2006). Persons with higher diabetes self-efficacy were more satisfied with their quality of life, coped more successfully with their diabetes and had lower levels of depression than those with lower ratings of self-efficacy (Holmes et al., 2005). Self-efficacy has also been associated with diabetes self-care in the areas of diet, exercise and glucose monitoring (Johnston-brooks, Lewis, & Garg, 2002; Williams & Bond, 2002).

The purpose of this project was to evaluate whether structured diabetes education, using material from the *Diabetes: A Family Matter* program and counseling in the family practice setting would improve patients' diabetes knowledge and self-efficacy, and guide family members to promote healthy behavior and family function by assigning the family member a task.

Methods

Design. This descriptive pilot study was used to: 1) Evaluate if there were improvements in the scores measuring diabetes knowledge and self-efficacy after administration of structured education and counseling; 2) Evaluate if there were improvements in metabolic outcomes in patients with type 2 diabetes after

administration of structured education and counseling; 3) Evaluate if families with higher family functioning scores have greater knowledge about diabetes and/or self-efficacy after administration of structured education and counseling.

Setting. The setting was one of eight primary care offices of Our Lady of Bellefonte Hospital, Bon Secours, located in the Ashland, Kentucky. The sample size was statistically determined by evaluating the number of persons with diabetes treated per month in this clinic. Protocols for participant recruitment, consent to participate, confidentiality and anonymity were conducted according to procedures approved by the Institutional Review Board (IRB) of Bon Secours and the University of Kentucky.

Sample. Data were collected from a convenience sample of patients with type 2 diabetes who had been diagnosed within the last two years and have a treatment relationship with the investigator (n=15) and their family members/friends (n=15). All 30 participants completed the program, complete with baseline and three month assessments. The mean age group of patients was 51-60 (46.7%). Participants were predominantly female, 12 patients (80%) and nine family members/friends (60%). The largest group of patients participating was college educated (47%) and the largest group of family members/friends was primarily those with a high school education (60%). The majority of the patients were on oral medications (53%). Nine (60%) of the family members/friends knew the specific type of diabetes that the patient had. None of the participants had ever received previous diabetes education or seen an endocrinologist.

Instruments

Family function. The Thai Family Functioning Scale (TFFS) (Appendix A) was a modified version of the Thai Family Health Routine Scale (TFHR) based on the structural domains of Denham's Family Health Model (Kanjanawetang, Yunibhand, Chaiyawat, Wu, & Denham, 2009). The 30-item test used a four-point scale (0 = Never, 1= Sometimes, 2 = Usually, 3 = Always) to assess the experiences family members have had over the last three months. A higher score indicates a greater likelihood of a healthy family function. It was reported to have an alpha $\geq$ 0.70, which provided reliability of the test.

Diabetes knowledge. The Diabetes Knowledge Test (DKT) (Appendix B) developed by the Michigan Diabetes Research Training Center (MDRTC) (1998) measured general diabetes knowledge. This test consists of 23 items to test general knowledge of diabetes. The first 14 items are appropriate for people who do not use insulin. This 14-item multiple-choice test was reported to have an alpha of .71, which provided reliability of the test.

Self-efficacy. The Diabetes Empowerment Scale-Short Form (DES-SF) (Appendix C) developed by the Michigan Diabetes Research Training Center (MDRTC) (1998) was used to measure the psychosocial self-efficacy of people with diabetes, and a modified version was used for the family members/friends (Appendix D). The Diabetes Empowerment Scale (DES) was originally created with 37 items representing eight conceptual dimensions (e.g., assessing the need for change; developing a plan; overcoming barriers; asking for support; supporting oneself; coping with emotion; motivating oneself; and making diabetes care choices appropriate for one's priorities and circumstances) and three subscales: (a) managing the psychosocial aspects of diabetes

with nine items, alpha= 0.93; (b) assessing dissatisfaction and readiness to change with nine items alpha = 0.81; and (c) setting and achieving goals with ten items, alpha = 0.91. The items with the highest item to subscale correlation from each of the original eight conceptual domains were used to develop the eight item short form (DES-SF) that was used in this project. The DES-SF was reported to have an alpha of 0.84.

Educational material. The educational material used in this project consisted of the diabetes self-management pamphlets from the program *Diabetes: A Family Matter* developed by Dr. Sharon Denham (Diabetes: A Family Matter, 2011). This program was created using the guidelines set by the American Association of Diabetes Educators, the CDC, and the American Diabetes Association and included the seven key areas of diabetes education. The educational pamphlets (Appendix D) used in this project were: (1) *Healthy Living: Family Routines Count;* (2) *Your Family's Genes Count*; (3) *Sharing Healthy Family Routines*; and (4) *Depression and Diabetes*.

Interventions

Initial contact and baseline data collection. Initial face-to-face contact between investigator and participants consisted of administration of the Diabetes Knowledge Test (DKT), Self-Empowerment Scale (DES-SF), and Family Functional Assessment (TFFS), as well as informed consent and demographic information were obtained (Table 1). The material from Dr. Denham's *Diabetes: A Family Matter* was introduced and content was briefly reviewed. For the purpose of this study, four pamphlets were reviewed in detail: (a.) *Healthy Living: Family Routines Count;* (b.) *Your Family Genes Count;* (c.) *Sharing*

Healthy Family Routines; and (d.) *Depression and Diabetes.* The modifiable factors related to each area were reviewed and the investigator asked participants to identify a goal related to each topic, as well as identify a role that their family member/friend would play in reaching the goal. If the participant was unable to immediately identify a goal, the investigator assisted the participants in the identification of an achievable goal and development of an action plan. Participants were asked to rate their confidence in their ability to complete the goal or action plan, on a scale from zero (not confident) to ten (very confident). The behavior change model was used for those participants with a score less than seven and they were assisted in identifying smaller steps to help them reach their goal. The participants' confidence scores, as well as the success of the action plans, were critical elements of the intervention and its evaluation**.**

Four and eight weeks after initial visit. The participant was contacted by phone, using semi-structured interview. How participants and their families used *Diabetes: A Family Matter* material was assessed and progress with their most recent action plan and role of the family member/friend was evaluated. Information was reviewed in order to sustain or create new or additional action plans. The participants were assisted in identifying and finding solutions to overcome self-management barriers that hindered completion of their action plans.

Twelve weeks after initial visit. During a routine three-month follow up office visit, the educational material was reviewed, and time was offered to answer questions or discuss comments. The current results of the standard metabolic outcomes, recommended by the ADA (2008) and AADE (2008); i.e., weight, blood pressure, and glycohemoglobin, were reviewed and recorded. Information to sustain or create new or

additional action plans was reviewed. An exit interview was performed, which included post-tests and evaluated materials and interventions.

Analysis

All analyses were conducted using SPSS software, version 15.0. Descriptive statistics were generated for the demographic and health-related characteristics of the sample. The differences among various measurements before and after the education were analyzed with paired t-tests. Any measurements with a p value less than 0.05 were considered statistically significant.

Comparisons of self-reported diabetes knowledge, self-efficacy, and family function are summarized in Table 2. Increases in diabetes knowledge, improvement in self-efficacy and increased family function were noted; however, there was no indication that a higher family function score would relate to a higher level of diabetes knowledge, a greater improvement of self-efficacy or improvement in metabolic outcomes. Although the test regarding self-efficacy ($p=0.188$) was not statistically significant (p-value >0.05), it was clinically significant as evidenced by the results of the metabolic testing. The Thai family function ($p=0.016$) and diabetes knowledge ($p=0.035$) were statistically significant (p-value <0.05) as well as clinically significant as evidenced by the test scores and results of the metabolic testing.

Changes in metabolic outcomes are summarized in Table 2. The mean glycohemoglobin dropped by 0.32 percentage points. Decreases were also seen in systolic blood pressure, pulse, weight, and triglycerides. There were, however, increases in diastolic blood pressure and total cholesterol.

Discussion

Material from Dr. Denham's *Diabetes: A Family Matter* and brief counseling appear to show improvement in the majority of the areas observed in this study. To the best of the author's knowledge, this is the first study evaluating the use of material from *Diabetes: A Family Matter* and brief counseling in the primary care setting. There were some challenges encountered during the course of the program. The interaction at four and eight weeks was tedious to manage since these were not completed at a routine office visit, as were the baseline and post education. The initial sample size was small, only including 30 participants, and it would have been interesting to include all individuals that met the inclusion criteria at the primary care clinic. Inclusion of staff and other health care professionals in the education and follow up sessions may present greater opportunities for interaction regarding the disease process and the patients' current regimen. Expanding the focus of the education to include the full *Diabetes: A Family Matter* toolkit may encourage the patient and their family member/friend to incorporate other aspects of their daily activities or allow them to relate to similar situations addressed in the material. Ongoing support may assist individuals to develop personal strategies to address psychosocial issues, and to promote and sustain ongoing behaviors to maintain their condition. This may be achieved by implementing the patient centered medical home concept that would include a nurse navigator that could maintain close communication with these patients and review any barriers regarding their health care goals and help determine a means to complete them.

There were some great opportunities, despite the challenges. Denham's *Diabetes: A Family Matter* (Denham, 2011) is available via the Internet, and is appropriate for those with low literacy skills, allowing the opportunity to expand their knowledge and include

other family members/friends in the educational process, encouraging change not only for the patient, but also for other family members/friends. Having the patient and family member/friend on site during the primary and three month follow up made the sessions more personal than they otherwise might have been. The personal contact by the provider was enhanced by the monthly interaction with the patient. The inclusion of an opportunity to interact via email may also help to further initiate behavior change and adaption to healthy lifestyle. The interaction with the patient as well as the family member/friend may help the provider better understand the patient and the individual needs of the patient, allowing the provider to further tailor the education to suit their needs. Feedback upon completion of the program from the patient and the family member/friend indicated that they felt comfortable with the interaction with the provider and found that the pamphlets allowed them to further relate to some of the common situations that were presented in the program.

Implications

Results of the pilot study indicated positive changes in diabetes knowledge, self-efficacy and family function, as well as the majority of metabolic outcomes in this group of patients. Families with higher family functioning scores did not appear to have higher scores measuring diabetes knowledge or self-efficacy at the initiation of the study. Those families with higher family functioning scores showed no greater improvement in diabetes knowledge or self-efficacy scores than those families with lower family functioning scores at the conclusion of the study. This pilot study did not support inclusion of family in the educational process or disease management, but does support the use of a structured diabetes

educational plan in the family practice setting to promote patient collaboration and outcomes.

The integration of clinical expertise, evidence based practice, and collaborative planning with the patient and their family member/friend is an example how nurses have committed to promote quality healthcare and preventative maintenance. Documentation and accessibility of educational material suggests that nurses use information technology for the improvement and transformation of health (American Association of Colleges of Nursing, 2006). This study offers patients and their family members/friends education on maintenance and preventative measures, encouraging them to lead a healthy lifestyle, maintain their current health and prevent expensive complications, therefore reducing healthcare costs.

Denham's *Diabetes: A Family Matter* and counseling may be an effective strategy for teaching diabetes self-management skills in the primary care setting. Since the materials were designed for the Appalachian population, clinics caring for this population may find them particularly useful. This process of using patient-centered materials and planning may also translate to other chronic conditions requiring patient self-care.

Table 1

Frequency Table

Descriptive Characteristic		**Patient (n=15)**	**Friend/Family (n=15)**	**Combined (n=30)**
Gender	Male	3 (20%)	4 (26.7%)	7 (23.3%)
	Female	12 (80%)	11 (73.3%)	23 (76.3)
Age	30-40	0 (0 %)	4 (26.7%)	4 (13.3%)
	41-50	6 (40 %)	2 (13.3%)	8 (26.7%)
	51-60	7 (46.7%)	5 (33.3%)	12 (40%)
	61-70	2 (13.3%)	4 (26.7%)	6 (20%)
Marital Stats	Single	1 (6.7%)	1 (6.7%)	2 (7%)
	Married	7 (46.7%)	11 (73.3%)	18 (60%)
	Divorced	7 (46.7%)	3 (20%)	10 (33%)
Education	GED	3 (20%)	1 (6.7%)	4 (13.3%)
	High School	5 (33.3%)	9 (60%)	14 (46.7%)
	College	7 (46.7%)	5 (33.3%)	12 (40%)
Knows Type of Diabetes	Does	13 (86.7%)	9 (60%)	22 (73%)
	Does Not	2 (13.3%)	6 (40%)	8 (27%)
Time Since Diagnosed	New	3 (20%)		
	0-1 year	6 (40%)		
	1-2 years	6 (40%)		
Type of Complication	Neurologic	3 (20%)		
	Cardiac	1 (6.7%)		
	None	11 (73.3%)		
Type of Treatment	Diet	1 (6.7%)		
	Diet/Ex	2 (13.3%)		
	Oral Med	8 (53.3%)		
	Insulin	4 (26.7%)		
Type of Insurance	Medicare	3 (20%)		
	Medicaid	2 (13.3%)		
	Commercial	8 (53.3%)		
	Self-Pay	2 (13.3%)		

Table 2

Paired Sample Test

Descriptive Characteristic		**Patient (n=15)**	**Friend/Family (n=15)**	**Combined (n=30)**
DES Measurement	Before	35 ±4.87	34.87 ±4.93	34.93 ±4.81
	After	38.47 ±1.41	38.2 ±2.34	38.34 ±1.90
	Difference	+3.47 ±3.89	+3.33 ±3.11	+3.41 ±3.46
	P-value	.004	.014	.188
DKT Measurement	Before	15.8 ±3.49	15.4 ±3.42	15.6 ±3.40
	After	16.73 ±3.35	16.4 ±2.87	16.56 ±3.07
	Difference	+.93 ±1.28	+1 ±1.69	+0.96 ±1.47
	P-value	.001	.038	.035
Thai Measurement	Before	60.27 ±10.95	63.2 ±10.10	61.7 ±10.46
	After	62.53 ±11.43	66.13 ± 9.57	64.33±10.52
	Difference	+2.27 ±6.34	+2.93 ±4.86	+2.60±5.56
	P-value	.000	.001	.016
Systolic Blood Pressure Management	Before	120.8 ±12.28		
	After	119.86 ±13.76		
	Difference	-0.93 ±10.28		
	P-value	.730		
Diastolic Blood Pressure Measurement	Before	76 ±7.45		
	After	77 ±9.02		
	Difference	+0.2 ±6.93		
	P-value	.581		
Pulse Measurement	Before	80 ± 9.80		
	After	79 ±14.11		
	Difference	-1 ±7.45		
	P-value	.611		
Weight Measurement	Before	239.2 ±60.49		
	After	237.8 ±59.33		
	Difference	-1.4 ±9.63		
	P-value	.582		
HgA1c Measurement	Before	7.21 ±1.18		
	After	6.89 ±0.78		

	Difference	-0.32 ±1.03		
	P-value	.248		
Total Cholesterol Measurement	Before	179.47 ±34.72		
	After	182.4 ±35.80		
	Difference	+2.2 ±28.28		
	P-value	.673		
Triglyceride Measurement	Before	229.27 ±233.42		
	After	181.47 ±66.97		
	Difference	-47.8 ±199.16		
	P-value	.368		

****Mean and standard deviation are reported in specific before (education) and after (education) fields.**

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Appendix A: **Thai Family Functioning Scale (TFFS)**

[INTERVIEWER READ: "This group of questions is to assess the experiences families have. Please indicate **how often** you have experienced in your family **in the past 3 months** for the following statement. There is no right or wrong answer for each question. Please feel free to give the truth without consulting other family members. Your responses will be kept confidential"]

0 = Never
1 = Sometimes
2 = Usually
3 = Always

1. My family was able to solve most daily problem(s) that occur in household 0 1 23
2. Family members confided in each other 0 1 2 3
3. Family members were obedient to seniors 0 1 2 3
4. Family members hardly expressed their love and care 0 1 2 3
5. In times of crisis family members turned to each other for support 0 1 2 3
6. My family solved problem(s) by having agreement 0 1 2 3
7. Senior members were kind and merciful to younger persons in my family 0 1 2 3
8. Family members could not talk to each other about the sadness one feels 0 1 2 3
9. Family members had kindness to help each other 0 1 2 3
10. My family had plans to handle emergency situation 0 1 2 3
11. My family followed religious sayings 0 1 2 3
12. I could not tell what my family members felt by the words they spoke 0 1 2 3
13. My family tried to find ways to solve problem(s) 0 1 2 3
14. Family members were good role models for each other 0 1 2 3
15. Family members avoided discussing feelings of fears and concerns that they may have had 0 1 2 3
16. My family was able to make decisions about how to solve problem(s) 0 1 2 3
17. My family had time for each other 0 1 2 3
18. When family members got mad or angry with others, they did not talk to each other 0 1 2 3
19. After my family was able to solve a problem, we always discussed the effectiveness of strategy 0 1 2 3
20. Family members shared love and unity 0 1 2 3
21. My family discussed responsibilities of each member 0 1 2 3
22. My family was reluctant to express love to each other 0 1 2 3
23. My family used reasoning to solve problem(s) 0 1 2 3
24. My family valued gratitude to parents or other persons who gave support 0 1 2 3
25. My family encountered mood problem(s) 0 1 2 3
26. There were lots of bad feelings in my family 0 1 2 3
27. My family was able to solve most of problem(s) that were irritable to other members 0 1 2 3
28. Family members talked politely to each other 0 1 2 3
29. Family members cared for each other 0 1 2 3
30. Often times, family members could not talk to other members as they wanted to 0 1 2 3

Appendix B: **Michigan Diabetes Research and Training Center DKT**

1. The diabetes diet is:
   a. the way most American people eat
   b. a healthy diet for most people
   c. too high in carbohydrate for most people
   d. too high in protein for most people

2. Which of the following is highest in carbohydrate?
   a, Baked chicken
   b. Swiss cheese
   c. Baked potato
   d. Peanut butter

3. Which of the following is highest in fat?
   a. Low fat milk
   b. Orange juice
   c. Corn
   d. Honey

4. Which of the following is a "free food"?
   a Any unsweetened food
   b. Any dietetic food
   c. Any food that says "sugar free" on the label
   d. Any food that has less than 20 calories per serving

5. Glycosylated hemoglobin (hemoglobin A1) is a test that is a measure of your average blood glucose level for the past:
   a. day
   b. week
   c. 6-10 weeks
   d. 6 months

6. Which is the best method for testing blood glucose?
   a. Urine testing
   b. Blood testing
   c. Both are equally good

7. What effect does unsweetened fruit juice have on blood glucose?
   a. Lowers it
   b. Raises it
   c. Has no effect

8. Which should <u>not</u> be used to treat low blood glucose?
   a. 3 hard candies
   b. 1/2 cup orange juice
   c. 1 cup diet soft drink
   d. 1 cup skim milk

9. For a person in good control, what effect does exercise have on blood glucose?
   a. Lowers it
   b. Raises it
   c. Has no effect

10. Infection is likely to cause:
   a. an increase in blood glucose
   b. a decrease in blood glucose
   c. no change in blood glucose

11. The best way to take care of your feet is to:
   a. look at and wash them each day
   b. massage them with alcohol each day
   c. soak them for one hour each day
   d. buy shoes a size larger than usual

12. Eating foods lower in fat decreases your risk for:
   a. nerve disease
   b. kidney disease
   c. heart disease
   d. eye disease

13. Numbness and tingling may be symptoms of:
   a. kidney disease
   b. nerve disease
   c. eye disease
   d. liver disease

14. Which of the following is usually <u>not</u> associated with diabetes:
   a. vision problems
   b. kidney problems
   c. nerve problems
   d. lung problems

15. Signs of ketoacidosis include:
   a. shakiness
   b. sweating
   c. vomiting
   d. low blood glucose

16. If you are sick with the flu, which of the following changes should you make?
   a. Take less insulin
   b. Drink less liquids
   c. Eat more proteins
   d. Test for glucose and ketones more often

17. If you have taken intermediate acting insulin (NPH or Lente), you are most likely to have an insulin reaction in:
   a. 1-3 hours
   b. 6-12 hours
   c. 12-15 hours
   d. more than 15 hours

18. You realize just before lunch time that you forgot to take your insulin before breakfast. What should you do now?
   a. Skip lunch to lower your blood glucose
   b. Take the insulin that you Usually take at breakfast
   c. Take twice as much insulin as you usually take at breakfast
   d. Check your blood glucose level to decide how much insulin to take

19. If you are beginning to have an Insulin reaction, you should:
   a. exercise
   b. lie down and rest
   c. drink some juice
   d. take regular insulin

20. Low blood glucose may be caused by:
   a. too much insulin
   b. too little insulin
   c. too much food
   d. too little exercise

21. If you take your morning insulin but skip breakfast your blood glucose level will usually:
   a. increase
   b. decrease
   c. remain the same

22. High blood glucose may be caused by:
   a. not enough insulin
   b. skipping meals
   c. delaying your snack
   d. large ketones in your urine

23. Which one of the following will most likely cause an insulin reaction:
   a. heavy exercise
   b. infection
   c. overeating
   d. not taking your insulin

Appendix C: **Michigan Diabetes Research and Training Center Diabetes Empowerment Scale-Short Form (DES-SF)**

The 8 items below constitute the DES-SF. The scale is scored by averaging the scores of all completed items (Strongly Disagree =1, Strongly Agree = 5)

Check the box that gives the best answer for you.

In general, I believe that I:

1. ...know what part(s) of taking care of my diabetes that I am dissatisfied with.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
2. …am able to turn my diabetes goals into a workable plan.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
3. ...can try out different ways of overcoming barriers to my diabetes goals.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
4. ...can find ways to feel better about having diabetes.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
5. ...know the positive ways I cope with diabetes-related stress.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
6. ...can ask for support for having and caring for my diabetes when I need it.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
7. ...know what helps me stay motivated to care for my diabetes.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
8. ...know enough about myself as a person to make diabetes care choices that are right for me.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree

Appendix D: **Diabetes Empowerment Scale-Short Form (DES-SF) For the Family Member**

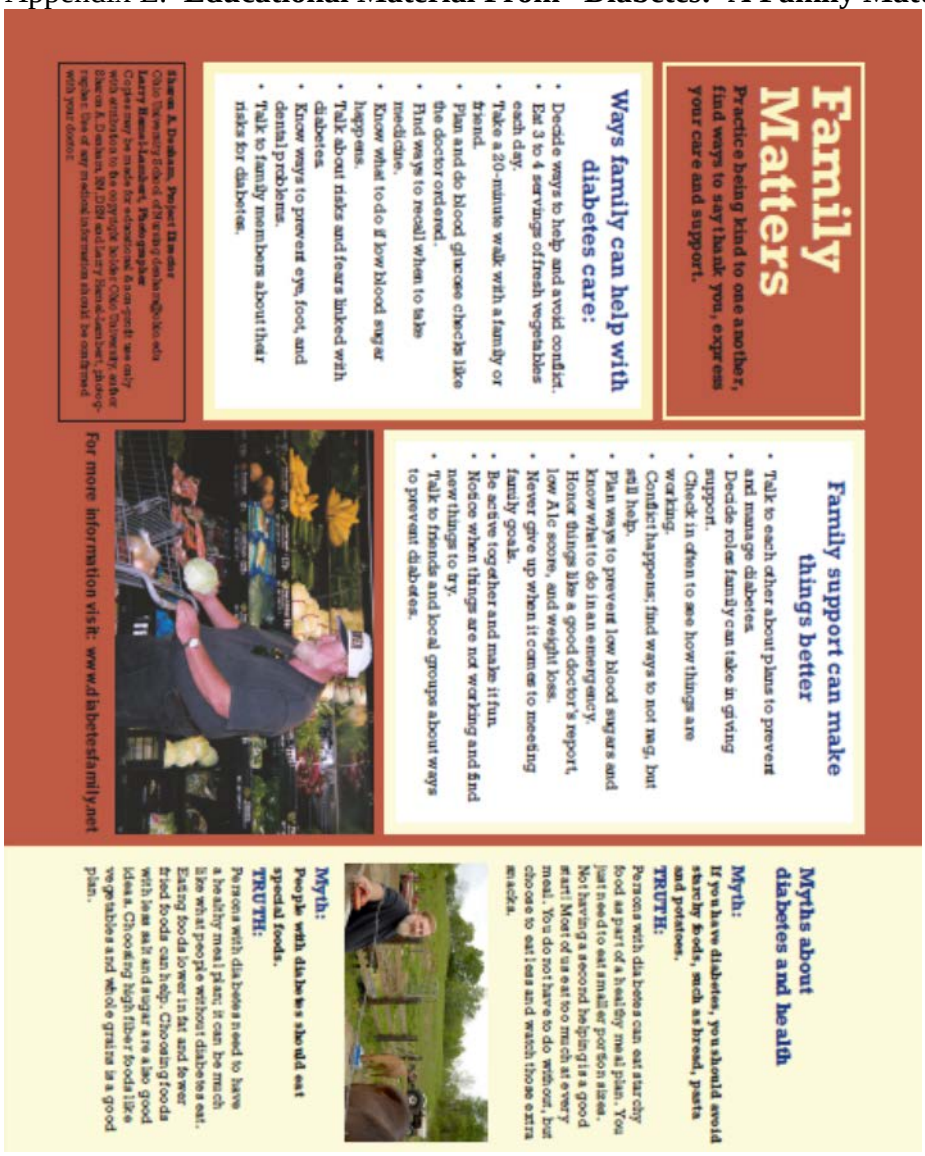
The 8 items below constitute the DES-SF. The scale is scored by averaging the scores of all completed items (Strongly Disagree =1, Strongly Agree = 5)

Check the box that gives the best answer for you.

In general, I believe that I can support my friend or family member to:

1. identify what part(s) of taking care of their diabetes that they are dissatisfied with.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
2. become able to turn their diabetes goals into a workable plan.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
3. ...try out different ways of overcoming barriers to their diabetes goals.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
4. ...find ways to feel better about having diabetes.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
5. ...know the positive ways they cope with diabetes-related stress.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
6. ... ask for support for having and caring for their diabetes when they need it.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
7. ...know what helps them stay motivated to care for their diabetes.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
8. ...know enough about themselves as a person to make diabetes care choices that are right for them.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree

Appendix E: **Educational Material From "Diabetes: A Family Matter"**



Family Matters

Practice being kind to one another, find ways to say thank you, express your care and support.

Ways family can help with diabetes care:

- Decide ways to help and avoid conflict.
- Eat 3 to 4 servings of fresh vegetables each day.
- Take a 20-minute walk with a family or friend.
- Plan and do blood glucose checks like the doctor ordered.
- Find ways to recall when to take medicine.
- Know what to do if low blood sugar happens.
- Talk about risks and fears linked with diabetes.
- Know ways to prevent eye, foot, and dental problems.
- Talk to family members about their risks for diabetes.

Sharon A. Denham, Project Director
Ohio University School of Nursing, Athens, Ohio
Larry Hamel-Lambert, Photographer

Family support can make things better

- Talk to each other about plans to prevent and manage diabetes.
- Decide roles family can take in giving support.
- Check in often to see how things are working.
- Conflict happens; find ways to not nag, but still help.
- Plan ways to prevent low blood sugars and know what to do in an emergency.
- Honor things like a good doctor's report, low A1c score, and weight loss.
- Never give up when it comes to meeting family goals.
- Be active together and make it fun.
- Notice when things are not working and find new things to try.
- Talk to friends and local groups about ways to prevent diabetes.

For more information visit: www.diabetesfamily.net

Myths about diabetes and health

Myth:
If you have diabetes, you should avoid starchy foods, such as bread, pasta and potatoes.
TRUTH:
Persons with diabetes can eat starchy food as part of a healthy meal plan. You just need to eat smaller portion sizes. Not having a second helping is a good start! Most of us eat too much at every meal. You do not have to do without, but choose to eat less and watch those extra snacks.

Myth:
People with diabetes should eat special foods.
TRUTH:
Persons with diabetes need to have a healthy meal plan; it can be much like what people without diabetes eat. Eating foods lower in fat and fewer fried foods can help. Choosing foods with less salt and sugar are also good ideas. Choosing high fiber foods like vegetables and whole grains is a good plan.

Forming Family Routines

Create a healthy legacy for your family. Find ways to include family in healthy habits.

Evelyn walked into the kitchen and placed the two heavy grocery bags on the counter beside the sink. Josh, 15 years-old, and Jerrod, 12 years-old were peering inside the refrigerator. Dark-haired Josh was pulling out the makings for their famous super-duper triple-decker sandwiches. As Josh turned around to face her, she could see that he was skillfully balancing honey mustard, cheese slices, pickles, lettuce, packages of ham slices, and bologna in both arms. She knew that he would be reaching for the cookies as soon as he placed everything on the counter. Jerrod held four 20-ounce bottles of soda pop that they bought on the way home.

"Hey, Mom," Jerrod said as he looked as he heard the back door close. He leaned over and kissed her on the cheek. "Where's Dad?" He asked, as he began to peer into the grocery bags. "What's up?" joined in Josh hardly looking up from his task.

"He's outside getting the other sacks from our shopping trip," Evelyn replied. "He'll be in here soon."

"Cool!" said Josh as he peered into one sack placed on the table and reached for the bag of chips. "Something else to eat with our famous sandwiches," he said. "Thanks Mom!"

"Josh," Evelyn said sternly as she placed her hand over the chips. "Leave those chips be... Put the rest of those things back. I'll have a real dinner ready in no time."

"That's all right, Mom. We're just having sandwiches for dinner," Jerrod piped in as he placed the soda pop on the counter. "And put that pop in the refrigerator," she scolded.

"You're not having those sandwiches this evening," said Jerry, the boys' father, as he came through the back door. "I could use a little help here," he shouted as he tried to steady several grocery bags in each hand. Jerrod reached over and grabbed a sack.

"We're going to sit down at the table and have a family dinner. We're going to have to make some changes," said Evelyn with a strained voice. "We need you boys to help!" "Can we make those changes after we've eaten the sandwiches?" pleaded Josh innocently.

Evelyn shook her head and pointed to the food they had dumped on the counter and said, "Put it all back now! Like I said, dinner will be ready soon. We're going to begin some new ways around here. You boys need some better eating habits."

"But this is our thing, Mom," said Josh. "We do this all the time, what's the problem?" Both boys groaned as they slowly picked up the sandwich makings and put them back in the fridge. He knew arguing would not help as she was using that 'don't tangle with me' voice.

> **"Boys, we've got to help your Dad!" she exclaimed. "He can't do this by himself. We have to change some of our bad habits so that we can help him be healthier."**

"It used to be your thing," Evelyn said. "Your father and I went to the doctor today and we got some news that's going to change some things around here real quick. First thing we are going to do is start some new eating habits and eat at the table like a family for dinner."

"Boys, my sugar diabetes is way out of control," said Jerry in a soft voice as he emptied the bags and placed canned goods in the cupboards. Jerry had been diagnosed with sugar diabetes a year ago, but he had not changed many of his ways. He thought everything was fine and had not altered his habits. He refused to change his eating style. In fact, he was the one who taught the boys about the triple-decker. "That means that the sugar in my blood is way too high. I have not been doing right! My blood pressure was really high today too, and Dr. Clark said that if I kept on like I am, I'd be headed for great big trouble."

"Boys, we've got to help your Dad!" Evelyn exclaimed. "He can't do this by himself. We have to change some of our bad habits so that we can help him get healthy."

"Looks like that sweet tooth has finally got you, Dad!" said Josh jokingly.

"It's not a laughing matter, son," said Jerry. He walked over to Josh and placed his hands on the boy's shoulders. "Sugar diabetes isn't caused by eating too many sweets. It runs in the family. Your Aunt Helen has it bad. Aunt Dee and Uncle Buzz, they have it too." Folding his arms, Jerry said, "And the doctor warned us that you boys could be next."

"Look at us," snapped Evelyn, "We are all over-weight and out of shape! We've got to change some of our ways," said Evelyn as she turned on a stove burner. "We have to help your dad do right. We're all going to change our bad habits into better ones." The boys saw that she was not joking and stood quietly as they heard her words.

With a little fear in his eyes, Jerrod said, "It's not too serious, right Dad? You don't look sick! You seem to be okay most of the time." Squeezing Jerrod's shoulder, Jerry said, "You know, Jerrod, it is serious and it could get even more serious, if I don't watch my blood sugar levels. That's why I'm setting you boys in charge to remind me 'bout checking my blood sugars, taking my medicine, and watching what I eat."

Grabbing a small paper bag out of one of the larger sacks, Jerry said with as much excitement as he could muster, "Check this out! The doctor gave it to me. A blood glucose monitor! I have to use these lancets to stick my finger and put a drop of blood on this strip. Then it goes in the machine here and in seconds I will know my blood sugar."

"Wow," said Jerrod smiling, "a personal calculator." Jerry nodded and said, "So you guys need to remind me to check my sugar before I eat meals and then figure out my insulin dose."

"Ouch!" replied Jerrod, "Looks like it's gonna hurt!" "Nah," answered Jerry. "We Thompsons are brave, I can do this," he laughed. "Great! Lucky for you I am good at math. I can help you figure your dose," said Jerrod gleefully.

"Quit it, Jerrod!" Josh shouted, "Can't you see this is serious! Remember Aunt Dee had to go to the hospital last month because of sugar complications? She was starting to have trouble with her eyes and the doctor was worried about her kidneys. That's not going to happen to you, is it Dad," Josh asked with a worried look on his face.

"I sure hope not," Jerry said, as he placed the monitor back into the bag. "Diabetes can be serious and it can cause other problems. But the doctor said eating healthy and being more active can help prevent many bad things from happening. So..."

He kept the group in suspense as he turned and ran out the door to the car. In a few minutes he returned a bit winded with a basketball in his hand. "So boys, I think it's about time I started to help you with your jump shots and you can help me lower my blood sugar."

Josh's face lit up as his father tossed him the new basketball. "So, Dad is this going to be our new thing?" he asked. "If you want it to be," Jerry replied. "We can shoot out by the garage. I got an old rim that I can hang there. We can do this together. I need to get more active. Looking at your waistlines, you boys could use some hoop action too"

"Maybe, we can go hiking this spring?" Josh asked. He had been talking about walking the Appalachian Trail and camping for a long time. "You know what, son? That's a great idea!" exclaimed Jerry. "That can be one of our goals. We will need to get in shape first. Maybe we can talk your mom into joining us."

"As much as I hate sweating," Evelyn said as she washed some fresh greens for the salad she was fixing. "I'll do what it takes to be sure you're with this family for a long time. Count me in! Let's finish putting these groceries away. Then, go wash up! We're starting a new chapter. My job is to find ways to cook foods we like, but make them healthier. Let's talk about ideas at dinner. We must stick together, that's what families do. It will not be easy, but we can do this!"

Each day, people make many choices.

The things we pick to do can impact health in good or bad ways. Choosing healthy routines is not always easy, but it is worth it.

Family share many routines. Make healthy snacks, carb counting, and being active a family matter.

Here are some ways family can help:

- Learn as much as you can about diabetes.
- Get the facts you need to make smart choices.
- Talk about meal plans ahead of time.
- Make a list, shop together, make healthy choices.
- Try foods you like fixed in more healthy ways.
- Set times to eat meals together often.
- Choose smaller size portions.
- Take medicines at the same time every day.
- Be active as a family and make it fun.
- Take family or a friend with you to the doctor.


Diabetes: A Family Matter
Depression and Diabetes
Sometimes a medical problem like diabetes can cause depression. This illness impacts thought, mood, and the way a person eats and sleeps. It affects ways one feels about self and thinks about things. If you have diabetes, you could be at risk to develop depression. You and your family need to know the signs. Depression can be treated. Talk to your doctor, find things to help.
Myths about diabetes and depression
Signs of depression
Treating depression
Websites for more information
American Diabetes Association
National Institute of Mental Health
Visit us online at:
www.diabetesfamily.net

You're Not Alone, Even in the Dark

Persons with diabetes may suffer from depression, but doctors, medicine and family can help.

Ruth took two steps into the diabetes medication bedroom and stopped. She walked slowly over to the night table and picked up the diabetes magazine. She stopped on the closed eyes of the woman. He was in that pose again, a place where she couldn't reach him. She thought, "I wonder how long it will take this time? Hopefully, not long." Their children and grandchildren were coming this weekend to their 40th anniversary party. She didn't want them to see him like this.

Mike sat on the other side of the bed and shook the bedroom window. The blinds were still down, only a little bit of light showed through. He was still in his blue cotton pajama pants and white T-shirt. He sat there, bent forward, head in his hands, staring at the blinds.

Ruth walked around the bed and sat quietly next to him. It had been about 3 years since the diagnosis of depression. The doctor had said, "Depression often happens when people have diabetes." The medication helped some, but Mike hated it and sometimes stopped taking it without her knowing. At these times, he would withdraw, and lose interest in people and things he used to enjoy. Sometimes, even with the medicine, bad news would pull him into a dark lonely place.

Ruth ran a little scared deeply about

> **Mike was a big strong man and did not like to think that he had a mental problem. People did not take kindly to problems like depression.**

one another. They talked about these times and she was happy they did. She wanted to support him, to let him know she cared. Ruth kissed his cheek, stroked his white hair and said, "I know that I already told you this, but I'm sorry. I'm sorry you have to deal with this. I love you, Mike. I'm here." She squeezed his arm, she cried, and went toward the door. She lingered a minute further and said, "Coffee and breakfast will soon be on the table."

Ruth had learned the signs of pending problems. They saw the doctor a few weeks ago for Mike's regular check-up. Dr. Plymesh had said, "Mike, your A1c score is a bit high." He explained, "The A1c gives an average of your blood sugar levels over the past few months." Dr. Plymesh had been their doctor since 1976. Dr. Jones retired. Mike liked him, but said, "He is hard to understand." They had

less exotic questions and got the facts they needed. Mike's insulin was changed and he was told to be more active and watch his portion size. Mike told Dr. Plymesh about the numbness and tingling in his feet and legs. Dr. Plymesh said, "You have to keep your blood sugar in control or you could have even worse problems."

The results were like a backward card. Mike was upset and said, "What am I going to say at our anniversary party when everyone asks questions?"

Mike turn I going to tell them?" Mike was much stressed. He thought always his fault the diabetes was out of control. He told Ruth, "I feel like a failure when I get these test reports. I know that I should be careful. I do try. It's just too much some days! I'm sick of all these medicines." Ruth thought to herself, "I bet that's when he quit taking his pills for depression." He had done that before. He said that they upset his stomach and took away his sex drive. Ruth wished she had talked to Dr. Plymesh about that.

It's Ruth lightly touched her head and shook her head as she called Beth, the daughter who's older. She had said, "People with diabetes are at risk for depression. If a person feels hopeless or sad for a long time, these could be signs. If you have problems, you should tell your doctor." She had told them that their doctor could make a referral to a specialist. They used her advice when Mike started having symptoms. He was much better when he took his medicine, but sometimes had nervous let him back for awhile.

Ruth snapped and became alert when she heard Mike's footsteps on the hallway floor. "Smells good, but I'm not hungry." he said in a low tone as he entered the room. He sat down in his usual chair and looked away as she poured the coffee. Ruth said, "Mike, it is important that you eat." She swiftly placed his blood glucose monitoring machine in front of him and handed him the strips and lancets. This was a routine they had formed. He reached for the machine slowly and pierced his stick his finger for the blood sample.

"What's the use?" he said in a low voice mostly to himself.

The phone rang. "Hello," said Ruth. "Well, good morning Larry. What are you doing up so early this morning?" Larry was Mike's cousin, he just lived down the road. He had a couple diabetes too. "Oh, just getting a get morning. How's he make by while the sun shines," answered Larry, "Mike up yet?"

Larry knew about Mike's battle with depression, but they seldom talked about it. Larry often said, "I've been one my share of trouble, but I fall in all, life is good." Larry was a jokester, always full of fun. He or children acts always been close. They ancient cool each other well.

Ruth called him last evening when Mike fell asleep on the couch. "Larry! Hello. How are you?" She barely passed for his answer before going on, "I need you or help, it's Mike..." She paused, "Yeah, he's down in the dumps again. He's barely talking, wants to sleep, and stares into space." Larry had helped before, in fact, he was the one who first talked Mike into seeing Dr. Plymesh about the depression. "You always work wonders with him. He knows to get fishing with you and it is going to be nice tomorrow. Any chance you could get him out of the house? Going with you and fishing might help him open up a bit," she said with a weak voice betraying back her tears. "Thanks, Larry. I just want him to be feeling better. Our family is coming this weekend...how good

humor might help."

"Mike, it's Larry," Ruth said as she handed him the phone. He took it without looking up. "Morning, Mike!" Larry said, "The sun is shining, the birds are singing, and I hear the catfish in the river calling our names. What do you say you get Ruth to pack a lunch and we go fishing?" Mike replied in a low voice, "I am not sure I am up to it."

"Have you and I ever let a little thing like that stop us before?" returned Larry. "We can't pass up a great day like today." They had a strong friendship even though they were cousins. Larry had always been able to talk Mike into things he didn't want to do. Of course, this involved some big trouble when they were younger, but that was a long time ago.

With a sigh, Mike said, "Okay, see you at 10:30am." He walked slowly over to the couch and replaced the phone. "Guess I'm going fishing," he said crossly. "Just can't win with Larry." "You didn't put him up to this, did you?" "Well, we did talk yesterday and said you were a little down in the mouth." Under the weather was the term they used for depression. Mike was still a big strong man and did not like to think about mental problems. People in their town did not like to talk about those kinds of problems. They were also kind of things that had to do with the mind.

Mike folded his arms and said, "Guess I better go shut my shirt, before the pounding on the door any minute." Ruth thought to herself, "Today is going to be a win in the diabetes battle." Mike said, "We are lucky I love you. We will get through this just like before. It's time Larry will make me laugh, he has that way!"

Ruth bit on her lip to keep from the slightest smile. She answered, "You get find your fishing gear and I will pack a healthy lunch for you to share." "I am going. By the way, guess I better shut back on my depression medicine. I wish I didn't have to take it, but it does help," he said as he went to the sink to fill a glass of.

Depression can be treated

When a person is depressed, they may not be able to enjoy life as they should. They may have trouble falling back to sleep, or they may sleep more than usual. They may not want to be active.

Causes of depression are not always clear. It can be caused by things like brain chemicals, family genes, or personal style.

Long-time stress and serious changes can also get you at risk. Depression can affect the way you think, feel, or the way you cope and act.

Finally, you have support, but sometimes you need more help. Talking need also for the depression, and talk therapy can make things better. Your doctor can suggest other things to help.


Diabetes: A Family Matter
Sharing Healthy Family Routines
Sometimes diabetes is viewed as a person's problem, but it is truly a family matter. Persons with diabetes are a part of a family. Where one lives, works, and plays impacts diabetes care.
Tips for healthy family routines
For more information, please visit www.diabetesfamily.net
Making changes for better health
Setting goals for better health

For more information, please visit www.diabetesfamily.net

We're in this Together

Martha looked strong, was always thirsty, and had to go to the bathroom often. This went on for a long time before she went to see Dr. Harris. She ate a lot even for a man of her size. He was there for the birth of her three babies. She would see him at times in town and he would ask, "how are you Martha?" He always called her by name. "I'm doing just fine," she always answered even when she was not feeling well.

In her family, members often put off going to the doctor until they were really sick. Also, when times were hard, Martha seldom had the extra money to pay for doctor visits. Her health insurance now covered all the costs. So, she waited until she was really sick before making a visit.

Dr. Harris said, "Martha, you have diabetes."

"I thought that might be the case! My mother has had sugar for a long time. Her mother had it too. In fact, many of my people on both mother's and father's side of the family have the sugar" she said.

Martha had been gaining pounds for many years. It started with the first baby and the weight she did not lose. Two more births and more pounds were added. She knew that she should eat healthy foods, be active, and take care of her health. She knew her family history of diabetes put her at great risk. Even though she was so worried, she lived her life thinking it would not happen to her. Her job, family, and church work kept her busy. She often said, "I run to a doctor's office or sickness to catch me."

"Martha, you are going to have change your ways if you want to see these grandbabies grow up," said Dr. Harris. He knew everyone in the family as they all lived in or near Tyler's Creek and he was the town's only doctor. "Now, you know Sam is not going to take kindly to me losing our cook in stores (" Martha replied. Sam was her husband and with seven kids he surely had an appetite. "You and Sam both need to change some things, we eat a lot more vegetables, less fried foods" answered Dr. Harris, "you need to help each other to learn new routines."

"Teaching old dogs new tricks is not easy" chuckled Martha, "you know that neither Sam nor I are quick to change." Dr. Harris replied, "It is not going to be easy, but you can make changes in your diabetes and prevent problems. I'll talk to him if you like" Before Martha left, she had received tips about healthy eating, being active, and the medicines to take. Tucked in her purse was a booklet about diabetes care. As she was going out the door, Dr. Harris had said, "Take this to Sam and tell him I said to read it. You have to change your family ways. He needs to help you." Dr. Harris and Sam had been deer hunting buddies for years.

On the way home, she stopped at her parent's home to drop off the items they needed from the store. "Mom, the doctor says I have the sugar. I have to change my ways and take pills to control things." Martha's father shook his head and looked down at the floor. Her mother spoke up, "I have been telling you for years that you better mind your ways or you would wind up like me." Martha nearly did not want to hear what her mother had to say but she listened anyway as once again she heard the story about the problems diabetes causes in their family.

When Martha got home, she went about fixing Sam's dinner. While she prepared the chicken, she started to think about what she should do. She knew it was going to be hard to change her eating habits. When Sam came in from work she said, "Sweetie, you know Dr. Harris, uh, well I have sugar diabetes." Her husband looked up, "Martha, you know that you might get the sugar, it's in your family genes." He was silent for a minute and then added, "I'll prove you'll never do a change what we eat!" "Did I hear you say we?" Martha answered. "Guess so," replied Sam. "I saw Dr. Harris at the gas station on my way home and he has already given me directions she also hangs on me exactly to make."

Sam went on, "Martha, I want you around for a few more years. I am not exactly sure what I can do to help, but Dr. Harris said diabetes is a family matter. He said you would be extra help. Guess we have to find some ways to do this together."

"I don't think either of us is going to like these changes," answered Martha. She then explained everything she was told to Sam at dinner. "Small steps, "said Sam, "we've got to plan some small steps that 'll come through many hard things already and we can do this together."

The dinner conversation moved on to how they could make some changes. They decided they needed to set some goals. One goal was to get their children involved. "They don't have to have this disease," said Martha, "family has to stick together. We have to do more than just talk about this, but talking about it is a good start."

As she sat on the porch after dinner, Martha thought about the future. She knew that this was her decision, but though it about how her family could help. She knew they loved her. She wanted her children to know that they could also get diabetes. She thought, "I am so glad we can talk about our problems. Family has to stick together"

FOR THE FAMILY

- Talk about diabetes
- Ask questions about things you do not know
- Eat healthy meals to prevent diabetes
- Make time for walking every day, one time for the family together
- Be active every day, make it fun time to get out
- Create meal times that make you fit

FOR YOU

- Find your family ways they can help you manage diabetes
- Get answers to your questions about your concerns
- Plan for healthy foods and learn to cook them
- Actively participate, plan for it every day.
- Plan activities daily to lose weight and health by life.

DAILY ROUTINES ARE IMPORTANT

Diabetes affects every part of family life. Diabetes each person 24 hours a day and 7 days a week. Family members can help a person with diabetes with daily routines.

People with diabetes have family members that help. For some family members were pressing out without even asking. Pick out the ways you can help, but many of the everyday tasks. Some making a plan of how you worked and talking go over plans to encourage you to keep on track. Ask for help when you need it to keep on track.

Get The Facts:

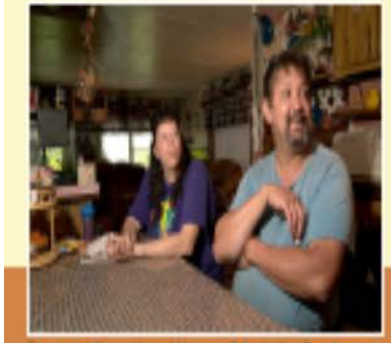
Type 1 and Type 2 diabetes have different causes

Type 1

- Genes are important, but how you care for your body makes a difference.
- Persons with type 1 diabetes could get more than half of their risk from lifestyle factors.
- This form of diabetes most often occurs in children, youth, and teens

Type 2

- Being overweight is a risk factor for type 2 diabetes. Children and teens who are overweight or have other risk factors are at greater risk.
- Type 2 diabetes is likely to be caused by family genes and lifestyle habits that put you at risk. Eating and getting to a healthy weight can help you avoid risk. Diabetes can be prevented and managed.



For more information visit: www.diabetesfamily.net

How you can prevent type 2 diabetes:

- Make healthy food choices. Limit the amount of calories and fat in your diet.
- Exercise about 30 minutes a day, 5 days a week. Brisk walking is a good choice.
- Think about losing 5 to 7% of your body weight, or maintain your ideal weight.
- Talk with your family members who have diabetes, and learn their story.
- Encourage your diabetic family members to join the fight against diabetes.

Sharon A. Denham, Project Director, Ohio University School of Nursing denham@ohio.edu
Larry Hamel, Landmark Printing Asylum

This project was supported by Grant Number R18 DP000 from the Centers for Disease Control and Prevention. The findings and conclusions in this publication are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Myths about Diabetes

Myth:
"I have diabetes and have many healthy relatives. If family members have diabetes, there is nothing I can do about it."

Truth:
Type 2 diabetes is not a death sentence. Even though some family members have diabetes, you can decrease your risk by healthy living. If you already have diabetes, how to manage it and other problems preventing.

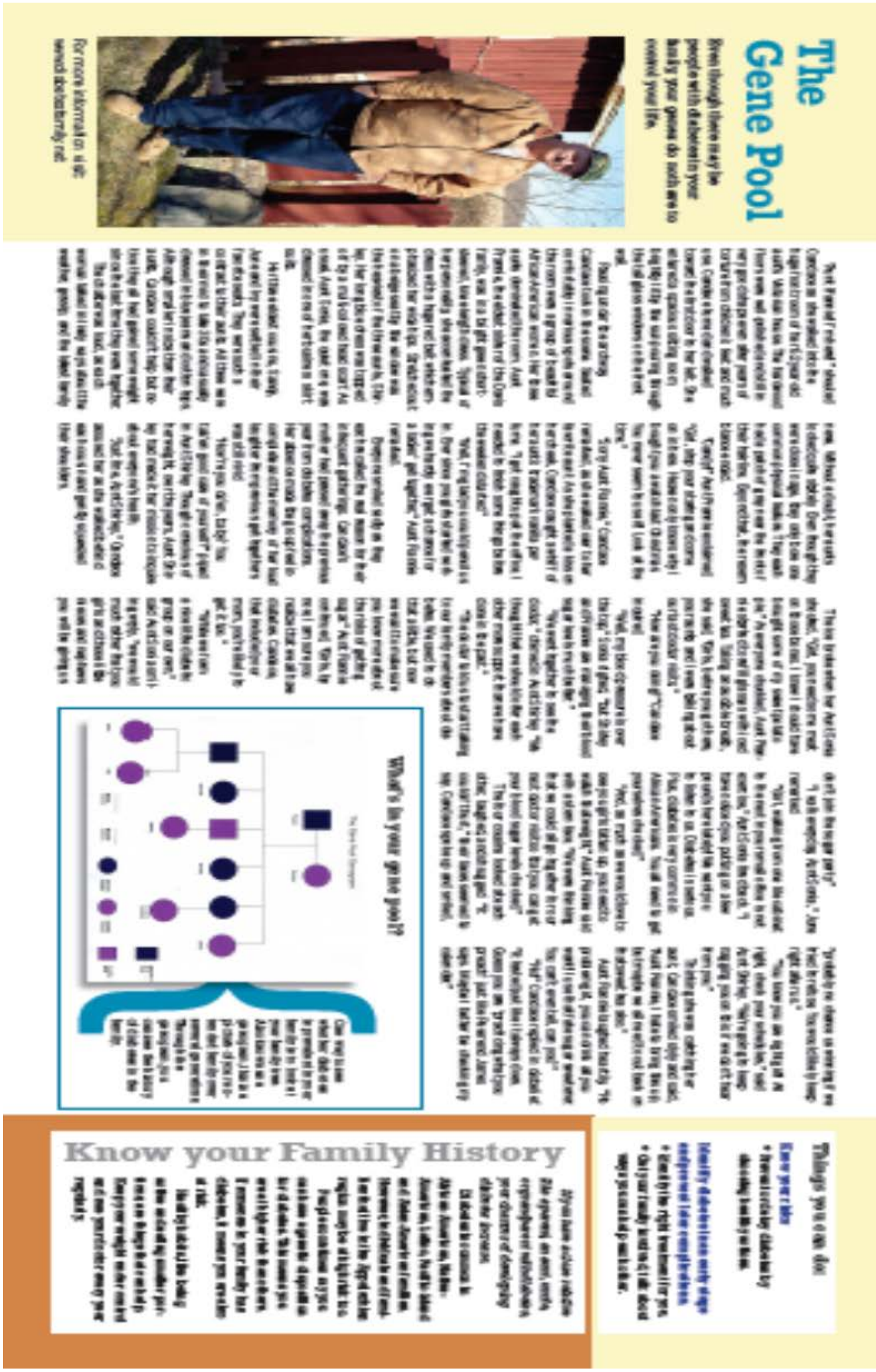
Myth:
I only have a touch of diabetes.

Truth:
If your blood sugar level is higher than normal, it has a likely that you are at greater risk or may already have diabetes. You need to change your habits now. Ask your doctor what you need to do.

Diabetes: A Family Matter

Your Family's Genes Count

Some families seem to be at a greater risk for diabetes than others. If you have a family member with or at risk for diabetes, take time to learn about it. Prevent type 2 diabetes. Know your family's risks and choose a healthy lifestyle.


The Gene Pool
What's in your gene pool?
Know your Family History
Things you can do

Conclusion to Final DNP Capstone Report

Tamara Wellman

University of Kentucky

College of Nursing

The intent of the author was to review diabetes education delivery methods, explore accessibility of educational material via electronic means and combine strengths found with delivery and implementation and incorporate them into an educational program that could be used for the Appalachian population in a family care setting.

In summary, this study suggests that a population specific program based on guidelines suggested by the ADA and AADE and led by a healthcare provider would increase patients' diabetes knowledge, improve self-efficacy and improve results of metabolic outcomes. The availability of educational resources is a very important detail. Information regarding diabetes, how it effects the individuals, and measures to maintain good control or improve complications are imperative to healthy lifestyle behaviors. Health care providers should consider materials that may be available by handouts or electronic means when collaborating with the patient

The relationship between the healthcare provider and the patient may assist in modifying the education to be patient specific. This would allow the patient to identify goals that include task specific behaviors that may motivate them to achieve their goals and incidentally give them greater satisfaction. In Appalachia, inclusion of the family in collaborative care suggests greater improvements in maintenance and preventive care regarding diabetes. Further studies implementing these processes may prove beneficial not only to diabetes, but also other chronic diseases.

Appendix A: Patient Demographic

1. **Patient Name:**
2. **Date of Birth:**
3. **Gender:** (circle one) Male Female
4. **Marital Status:** (circle one)

   Married Single Divorced Widowed Separated
5. **Highest Level of Education**: (circle one)

   Elementary High School GED College Graduate

   Doctoral
6. **What City/State do you live in? _____**
7. **What type of Diabetes do you have?** (circle one)

   Type II Don't Know
8. **How many years have you had diabetes?** (circle one)

   Newly Diagnosed 0-1year over 1 year-2years
9. **Do you have any complications from your diabetes?** (circle one) Yes

   No

   If yes, what? (circle all that apply)

   Retinopathy Neuropathy Nephropathy Heart Disease Stroke

   Other: _____
10. **What type of treatment do you follow for your diabetes?**

    (circle all that apply) Diet Diet/Exercise Oral Medications Insulin
11. **Do you have any biological family members with diabetes?**

(circle one) Yes No

If yes, what relationship are they? _____

(example: daughter, mother, uncle, cousin)

12. **Does anyone help you with your diabetes care regimen, such as diet, medications or blood glucose checks?** (circle one) Yes No

    If yes, what relationship are they? _____

    (example: spouse, daughter, mother, friend, cousin, significant other)

13. **Have you ever had any previous formal diabetes education?**

    (circle one) Yes No

    If yes, briefly describe when and what you learned:

    _____

    _____

14. **Do you see an endocrinologist?** (circle one) Yes No

    If so, who? _____

15. **Do you have insurance? (circle one)**

    Medicare Medicaid Commercial Insurance Self-Pay

Appendix B: Friend/Family Member Demographic

1. **Friend/Family Member Name:**
2. **Date of Birth:**
3. **Gender:** (circle one) Male Female
4. **Marital Status:** (circle one)

   Married Single Divorced Widowed Separated
5. **Relationship to the Patient: (circle one)**

   Spouse Child Parent Friend Significant Other Other Relative
6. **Highest Level of Education**: (circle one)

   Elementary High School College Graduate Doctoral
7. **What City/State do you live in? _____**
8. **Do you know what type of diabetes your friend/family member has?**

   No or Yes

   If yes (circle one) Type I Type II Don't Know
9. **Do they have any complications from their diabetes?** (circle one)

   Yes or No

   If yes, what? (circle all that apply)

   Retinopathy Neuropathy Nephropathy Heart Disease Stroke

   Other: _____
10. **What type of treatment do they follow for their diabetes?**

    (circle all that apply) Diet Diet/Exercise Oral Medications Insulin
11. **Do you have any biological family members with diabetes?**

(circle one) Yes No

If yes, what relationship are they? _____

(example: daughter, mother, uncle, cousin)

12. **Do you assist with the diabetes care regimen of your friend/family member? Such as diet, medications or blood glucose checks?**

(circle one) Yes No

If yes:

What do you assist them with? _____

What relationship are they? _____

(example: spouse, daughter, mother, friend, cousin, significant other)

13. **Have you ever been involved in any previous formal diabetes education?** (circle one) Yes No

If yes:

When did this occur? _____

What did you learn?_____

Appendix C: Patient Consent

Patient Consent to Participate in a Research Study

DOES EDUCATIONAL MATERIALS AND BRIEF COUNSELING IMPROVE DIABETES KNOWLEDGE AND SELF-EFFICACY

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are being invited to take part in a research study about the evaluation of educational materials and brief counseling regarding diabetes knowledge and self-efficacy using education material from "Diabetes: A Family Matter", in the primary care setting. A family member/friend may be invited to join the study, if they are available. You are being invited to take part in this research study because you have the diagnosis of type 2 diabetes, you are between the ages of 35-70, you have the ability to provide written consent and you speak English. If you volunteer to take part in this study, you will be one of about 20 people to do so (10 patients in the study group).

WHO IS DOING THE STUDY?

The person in charge of this study is Tamara Wellman APRN, FNP-BC, CDE of University of Kentucky, College of Nursing. She is being guided in this research by Karen Stefaniak, PhD *[Advisor].*

WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of the study is to learn how to help people increase their knowledge of diabetes and how to manage diabetes.

By doing this study, we hope to learn if the educational material and counseling help individuals with diabetes and their family/friends learn about their disease and what they can do help themselves.

ARE THERE REASONS WHY YOU SHOULD NOT TAKE PART IN THIS STUDY?

You should not take part in the study if you are not a person with type 2 diabetes, are less than 35 years of age or over 70, are not able to provide written consent or not able to speak English, or do not have the ability to read at a 6th grade level.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The study will be conducted at Bon Secour Health System in Ashland, Kentucky (Cannonsburg Primary Care). The study will be initiated at your routine office visit and concluded in a routine three-month follow up visit. You will have monthly contact, in person or by phone, to track your progress on your action plan. This project will last over the next three months. The total amount of time you are being asked to volunteer is approximately three hours over the next three months.

WHAT WILL YOU BE ASKED TO DO?

At your first visit, you will be asked for your personal information and written permission to participate in this study. Your initial metabolic outcomes (i.e., weight, blood pressure, and glycohemoglobin) will be recorded. You will be asked to complete three questionnaires: Diabetes Knowledge Test, Self-Empowerment Scale, and a Family Functional Assessment. The material from Dr. Denham's "Diabetes: A Family Matter" will be given to you and briefly reviewed. Four pamphlets from the material will be reviewed in detail: (a.) Healthy Living: Family Routines Count; (b.) Your Family Genes Count; (c.) Sharing Healthy Family Routines; and (d.) Depression and Diabetes.

Your daily routine and activities will be discussed. You will be asked to identify a behavior that you can improve on in order to reach a goal that you will set, as well as identify what your family member/friend could do to help you reach that goal. If you have difficulty identifying a goal, the investigator will assist you to identify some things that you could consider. Your confidence scores, as well as the success of the action plans, will be very important in the evaluation of the study.

Four and Eight weeks after start of study: You will be contacted, by phone or in person, to check on your progress in reaching your goal.

Twelve weeks after start of study: During a routine 3-month follow up office visit, you will be asked if you have met your goal. If you have not met your goal, you may be assisted in making a plan to help you reach your goal. An exit interview will be performed, where you may ask any questions or make any comments that you may have. You will be asked to complete post-tests, which are similar to the questionnaires that were given to you at the start of the program, and be asked to evaluate the educational materials and the interventions that were used during this study. Your metabolic outcomes (i.e., weight, blood pressure, and glycohemoglobin) will be obtained and compared to the initial results.

STUDY TIMELINE

Initial Visit (Routine OV)	***4 and 8 Week Follow Up***	***3 Month Follow Up (Routine OV)***
Patient AND Friend/Family -Obtain Demographic Info -Obtain Consent - Obtain Metabolic Outcomes (Weight, Blood Pressure, Glycohemoglobin)*Patient Only* - Complete Pre-test	Patient Follow Up (Phone or In Person)	Obtain/Compare Metabolic Outcomes (Weight, Blood Pressure, Glycohemoglobin)*Patient Only* Exit Interview (Patient and Friend/ Family Member) -Comments/Questions

Questionnaires (DES-SF, DKT, Family Function) - Obtain/Review "Diabetes: A Family Matter" Material		-Complete/Compare Post-test Questionnaires (DES-SF, DKT, Family Function) -Evaluate: Program, Intervention,Materials
Review the 4 Specific Pamphlets (Listed Above)	How/If Educational Material Was Used	
Set Goal Regarding Each Pamphlet	Problems/Concerns Role of Patient and Friend/Family Member?	Goal Met?
Make Action Plan for Each (See Action Plan Example, Step I and II)	Follow up on Action Plan (Step III)	Follow up on Action Plan (Step III)-Offer to Continue Plan at Completion of Study
Have Confidence Level >7 for Each Action Plan (Step II)	Follow Up Confidence Level (Step II)	Follow Up Confidence Level (Step II)
Schedule Routine Follow Up	Offer Follow Up Appt	Schedule Routine Follow Up -Offer Further Educational/Endocrinology Referral

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

There are no risks or discomforts involved in participating in this study.

WILL YOU BENEFIT FROM TAKING PART IN THIS STUDY?

There is no guarantee that you will get any benefit from taking part in this study. You may increase your knowledge about diabetes and learn what you can do to improve your health or what your friend/family member can do to help improve your health. You may also experience improved metabolic outcomes, such as weight loss, lower blood pressure and lower glycohemoglobin. Your participation in this study may, in the future, help providers better understand and/or treat others who have your condition.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights that you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering. If you decide not to take part in this study, your decision will have no effect on the quality of medical care you receive.

IF YOU DON'T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to take part in the study, there are other choices such as formal diabetes education offered by Bon Secours Diabetes Center or surrounding health care facilities.

WHAT WILL IT COST YOU TO PARTICIPATE?

There are no costs to you or your family member/friend for receiving this information individually, or participating in this project. Any fees associated with a routine office visit and laboratory tests will be billed, as usual, to you and/or your insurance company. These are costs that are considered medically reasonable and necessary and will be part of the care you receive if you do not take part in this study.

Therefore, these costs will be your responsibility or may be paid by your insurer if you are insured by a health insurance company (you should ask your insurer if you have any questions regarding your insurer's willingness to pay these costs); **or** may be paid by Medicare or Medicaid if you are covered by Medicare, or Medicaid, (if you have any questions regarding Medicare/Medicaid coverage you should contact Medicare by calling 1-800-Medicare (1-800-633-4227) or Medicaid at 1-800-635-2570.

A co-payment/deductible from you may be required by your insurer or Medicare/Medicaid even if your insurer or Medicare/Medicaid has agreed to pay the costs. The amount of this co-payment/deductible may be substantial.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

We will make every effort to keep private all of your information private.

Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered. You will not be personally identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. The information will be kept in a locked cabinet in the principal investigator's office, as well as on a password protected computer. Officials from the University of Kentucky may look at, or copy pertinent portions of the records that identify you.

CAN YOUR TAKING PART IN THE STUDY END EARLY?

If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study.

ARE YOU PARTICIPATING OR CAN YOU PARTICIPATE IN ANOTHER RESEARCH STUDY AT THE SAME TIME AS PARTICIPATING IN THIS ONE?

You may take part in this study if you are currently involved in another research study.

WHAT HAPPENS IF YOU GET HURT OR SICK DURING THE STUDY?

This study uses informational material only, so if you get sick or hurt during this study, it would not be related to the study. If you believe you are hurt or if you get sick during this study please inform the investigator (for documentation purposes only).

WILL YOU RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

You will not receive any rewards or payment for taking part in the study.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS, CONCERNS, OR COMPLAINTS?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigator, Tamara Wellman APRN, FNP-BC, CDE at 606-928-1881. If you have any questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky at 859-257-9428 or toll free at 1-866-400-9428. We will give you a signed copy of this consent form to take with you.

WHAT IF NEW INFORMATION IS LEARNED DURING THE STUDY THAT MIGHT AFFECT YOUR DECISION TO PARTICIPATE?

If the researcher learns of new information in regards to this study, and it might change your willingness to stay in this study, the information will be provided to you. You may be asked to sign a new informed consent form if the information is provided to you after you have joined the study.

WHAT ELSE DO YOU NEED TO KNOW?

Your patient records will be accessed to obtain the metabolic outcomes, such as weight, blood pressure and glycohemoglobin.

_____ _____
Signature of person agreeing to take part in the study Date

_____
Printed name of person agreeing to take part in the study

_____ _____
Name of [authorized] person obtaining informed consent Date

_____
Signature of Investigator

Appendix D: Friend/Family Member Consent

Family Member/Friend Consent to Participate in a Research Study

DOES EDUCATIONAL MATERIALS AND BRIEF COUNSELING IMPROVE DIABETES KNOWLEDGE AND SELF-EFFICACY

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are being invited to take part in a research study about the evaluation of educational materials and brief counseling regarding diabetes knowledge and self-efficacy using education material from "Diabetes: A Family Matter". You are a friend/family member of an individual that has the following: diagnosis of type 2 diabetes, between the ages of 35-70, has the ability to provide written consent and speaks English, and can read at a 6th grade level. If you volunteer to take part in this study, you will be one of about 20 people to do so (10 family members/friends in the study group).

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WHO IS DOING THE STUDY?

The person in charge of this study is Tamara Wellman APRN, FNP-BC, CDE of University of Kentucky, College of Nursing. She is being guided in this research by Karen Stefaniak, PhD *[Advisor].*

WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of the study is to learn how to help people increase their knowledge of diabetes and how to manage diabetes.

By doing this study, we hope to learn if the educational material and counseling help individuals with diabetes and their family/friends learn about their disease and what they can do help themselves.

ARE THERE REASONS WHY YOU SHOULD NOT TAKE PART IN THIS STUDY?

You should not take part in the study if you are not a family member/friend of someone in this study, who has type 2 diabetes.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The research procedures will be conducted at Bon Secour Health System in Ashland, Kentucky. You will need to come to the office once at the beginning of the study (today) and again at the conclusion (in three months). These visits will be routine office visits for the patient, who is your friend/family member. The total amount of time that you will be asked to volunteer is approximately three hours over the next three months.

WHAT WILL YOU BE ASKED TO DO?

At your first visit, you will be asked for your personal information and written permission to participate in this study. You will be asked to complete three questionnaires: Diabetes Knowledge Test (DKT), Self-Empowerment Scale for the Family Member (DES-SF), and a Family Functional Assessment. The material from Dr. Denham's "Diabetes: A Family Matter" will be given to you and briefly reviewed. Four pamphlets from the material will be reviewed in detail: (a.) Healthy Living: Family Routines Count; (b.) Your Family Genes Count; (c.) Sharing Healthy Family Routines; and (d.) Depression and Diabetes.

Daily routines and activities will be discussed and the patient will be asked to identify something that they could do to improve their health care behavior. The patient will set a goal and state how they think you may help them reach that goal.

Twelve weeks after start of study: You will accompany the patient to their routine 3-month follow up office visit. The action plan will be evaluated. An exit interview will be performed, where you may ask any questions or make any comments that you may have. You will be asked to complete post-tests, which are similar to the questionnaires that were given to you at the start of the program, and be asked to evaluate the educational materials and the interventions that were used during this study.

STUDY TIMELINE

Initial Visit (Routine OV)	***4 and 8 Week Follow Up***	***3 Month Follow Up (Routine OV)***
Patient AND Friend/Family -Obtain Demographic Info -Obtain Consent - Obtain Metabolic Outcomes (Weight, Blood Pressure, Glycohemoglobin)*Patient Only* - Complete Pre-test Questionnaires (DES-SF, DKT, Family Function) - Obtain/Review "Diabetes: A Family Matter" Material		Obtain/Compare Metabolic Outcomes (Weight, Blood Pressure, Glycohemoglobin)*Patient Only* Exit Interview (Patient and Friend/ Family Member) -Comments/Questions -Complete/Compare Post-test Questionnaires (DES-SF, DKT, Family Function) -Evaluate: Program, Intervention,Materials
Review the 4 Specific Pamphlets (Listed Above)		
Set Goal Regarding Each		Goal Met?

Pamphlet		
Make Action Plan for Each (See Action Plan Example, Step I and II)		Follow up on Action Plan (Step III)-Offer to Continue Plan at Completion of Study
Have Confidence Level >7 for Each Action Plan (Step II)		Follow Up Confidence Level (Step II)
Schedule Routine Follow Up		Schedule Routine Follow Up -Offer Further Educational/Endocrinology Referral

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

There are no risks or discomforts involved in participating in this study.

WILL YOU BENEFIT FROM TAKING PART IN THIS STUDY?

There is no guarantee that you will get any benefit from taking part in this study. You may increase your knowledge about diabetes and learn what you can do to help improve the health of a family member/friend. Your participation in this study may, in the future, help providers better understand and/or treat individuals with diabetes.

DO YOU HAVE TO TAKE PART IN THE STUDY?

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IF YOU DON'T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to take part in the study, there are other choices such as formal diabetes education offered by Bon Secours Diabetes Center or surrounding health care facilities.

WHAT WILL IT COST YOU TO PARTICIPATE?

There are no costs to you or your family member/friend for receiving this information, or participating in this project. Any fees associated with a routine office visit and laboratory tests will be billed, as usual, to the patient and/or their insurance company. Travel costs for you to return to the clinic with patient is not reimbursed. These costs are considered medically reasonable and necessary and will be part of the care you receive if you do not take part in this study.

Therefore, these costs will be their responsibility or may be paid by their insurer if they are insured by a health insurance company (they should ask their insurer if they have any questions regarding their insurer's willingness to pay these costs); **or** may be paid by Medicare or Medicaid if they are covered by Medicare, or Medicaid, (if they have any questions regarding Medicare/Medicaid coverage they should contact Medicare by calling 1-800-Medicare (1-800-633-4227) or Medicaid at 1-800-635-2570.

A co-payment/deductible from them may be required by their insurer or Medicare/Medicaid even if their insurer or Medicare/Medicaid has agreed to pay the costs. The amount of this co-payment/deductible may be substantial.

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We will make every effort to keep private all of your information private.

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We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. The information will be kept in a locked cabinet in the principal investigator's office, as well as on a password-protected computer. Officials from the University of Kentucky may look at or copy pertinent portions of records that identify you.

CAN YOUR TAKING PART IN THE STUDY END EARLY?

If you decide to take part in the study, you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study.

ARE YOU PARTICIPATING OR CAN YOU PARTICIPATE IN ANOTHER RESEARCH STUDY AT THE SAME TIME AS PARTICIPATING IN THIS ONE?

You may take part in this study if you are currently involved in another research study.

WHAT HAPPENS IF YOU GET HURT OR SICK DURING THE STUDY?

This study uses informational material only, so if you get sick or hurt during this study, it would not be related to the study. If you believe you are hurt or if you get sick during this study please inform the investigator (for documentation purposes only).

WILL YOU RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

You will not receive any rewards for taking part in this study**?**

WHAT IF NEW INFORMATION IS LEARNED DURING THE STUDY THAT MIGHT AFFECT YOUR DECISION TO PARTICIPATE?

If the researcher learns of new information in regards to this study, and it might change your willingness to stay in this study, the information will be provided to you. You may be asked to sign a new informed consent form if the information is provided to you after you have joined the study.

WHAT ELSE DO YOU NEED TO KNOW?

No further personal information will be gathered, other than what you supply in the demographic form.

_____ _____

Signature of person agreeing to take part in the study Date

_____

Printed name of person agreeing to take part in the study

_____ _____

Name of [authorized] person obtaining informed consent Date

_____

Signature of Investigator

Appendix E: Data Collection Legend

Legend for Diabetes Educational Material and Counseling Data Sheet

PARTICIPANT:

A: Patient

B: Family Member/Friend

DATA COLLECTED:

PATIENT/FAMILY MEMBER/FRIEND

1. Score of Diabetes Knowledge Test Before Education
2. Score of Diabetes Knowledge Test After Education
3. Difference in Scores

4. Score of Diabetes Empowerment Test Before Education
5. Score of Diabetes Empowerment Test After Education
6. Difference in Scores

7. Score of Thai Family Function Scale Before Education
8. Score of Thai Family Function Scale After Education
9. Difference in Scores

PATIENT ONLY

10. Glycohemoglobin Before Education
11. Glycohemoglobin Weight After Education
12. Difference in Glycohemoglobin

13. Weight Before Education
14. Weight After Education
15. Difference in Weight

16. Systolic Blood Pressure Before Education
17. Systolic Blood Pressure After Education
18. Difference in Systolic Blood Pressure

19. Diastolic Blood Pressure Before Education
20. Diastolic Blood Pressure After Education
21. Difference in Diastolic Blood Pressure

Appendix F: Data Collection Tool

	DES-SF PRIOR	AFTER	DIFF	DKT PRIOR	AFTER	DKT DIFF
1A	31	37	-6	18	18	0
1B	35	38	-3	18	18	0
2A	36	37	-1	18	18	0
2B	38	40	-2	17	16	1
3A	37	39	-2	14	14	0
3B	35	40	-5	15	16	-1
4A	34	40	-6	16	16	0
4B	40	40	0	15	16	-1
5A	35	38	-3	20	20	0
5C	32	38	-6	21	20	1
6A	21	36	-15	14	14	0
6B	26	33	-7	14	13	1
7A	33	39	-6	16	17	-1
7B	38	39	-1	17	18	-1
8A	40	40	0	19	20	-1
8B	34	39	-5	12	13	-1
9A	40	40	0	20	20	0
9B	32	38	-6	17	17	0
10A	35	38	-3	20	22	-2
10B	35	39	-4	22	22	0
11A	34	37	-3	11	13	-2
11B	34	35	-1	15	17	-2
12A	38	39	-1	14	17	-3
12B	40	40	0	12	13	-1
13A	40	40	0	8	9	-1
13B	40	40	0	10	13	-3
14A	32	37	-5	15	15	0
14B	24	34	-10	11	14	-3
15A	39	40	-1	14	18	-4
15B	40	40	0	15	20	-5

	THAI PRIOR	AFTER	DIFF			COMMENT
1A	39	39	0	22	NO	NO
1B	60	60	0	25	NO	NO
2A	59	57	2	24	NO	NO
2B	50	53	-3	25	NO	NO
3A	45	45	0	25	NO	NO
3B	40	42	-2	25	NO	NO
4A	65	64	1	25	NO	NO
4B	73	73	0	25	NO	NO
5A	57	58	-1	25	NO	NO
5C	78	79	-1	25	NO	NO
6A	66	69	-3	23	NO	NO
6B	68	71	-3	23	NO	NO
7A	52	52	0	23	NO	NO
7B	72	72	0	24	NO	NO
8A	78	78	0	23	NO	NO
8B	57	58	-1	22	NO	NO
9A	70	73	-3	25	NO	NO
9B	61	61	0	22	NO	NO
10A	56	53	3	22	NO	NO
10B	57	68	-11	22	NO	NO
11A	71	73	-2	24	NO	NO
11B	75	70	5	24	NO	NO
12A	68	65	3	24	NO	NO
12B	70	70	0	22	NO	NO
13A	69	73	-4	25	NO	NO
13B	66	71	-5	25	NO	NO
14A	47	70	-23	22	NO	NO
14B	61	72	-11	20	NO	NO
15A	62	69	-7	25	NO	NO
15B	60	72	-12	25	NO	NO

PATIENT	SBP Baseline DBP Baseline	SBP 3 month DBP 3 month	SBP Diff DBP Diff	Pulse Baseline	Pulse 3 months	Pulse Diff
1						
	128	146	-18	68	68	0
	82	96	-14			
2						
	132	130	2	78	74	4
	80	80	0			
3						
	100	110	-10	94	96	-2
	62	68	-6			
4						
	114	118	-4	78	93	-15
	80	80	0			
5						
	114	120	-6	98	94	4
	86	80	6			
6						
	122	124	-2	74	60	14
	82	90	-8			
7						
	134	132	2	85	82	3
	80	80	0			
8						
	118	98	20	89	96	-7
	74	70	4			
9						
	110	98	12	84	84	0
	72	62	10			
10						
	112	112	0	76	80	-4
	64	68	-4			
11						
	138	140	-2	72	64	8
	68	80	-12			
13						
	104	108	-4	77	73	4
	68	67	1			
14						
	122	124	-2	60	50	10
	80	80	0			
15						
	142	122	20	83	91	-8
	82	74	8			

PATIENT	Wt Baseline	Wt 3month	Wt Diff	HgA1c Baseline	HgA1c 3months	HgA1c Diff
1	257	266	-9	6.5	6.8	-0.3
2	434	428	6	5.4	7.1	-1.7
3	215	216	-1	7.5	7.4	0.1
4	221	242	-21	7.1	7.5	-0.4
5	231	218	13	8.3	6.8	1.5
6	225	216	9	6.6	6	0.6
7	266	256	10	6.6	6.4	0.2
8	174	174	0	9.3	8.5	0.8
9	209	209	0	7.7	5.7	2
10	276	277	-1	9.5	7.3	2.2
11	186	186	0	5.6	6	-0.4
13	209	210	-1	7	7.6	-0.6
14	244	224	20	6.8	6.1	0.7
15	217	217	0	7.8	7.6	0.2

PATIENT	Chol Baseline	Chol 3months	Chol Diff	Trig Baseline	Trig 3month	Trig Dif
1	162	174	-12	200	171	29
2	152	159	-7	149	228	-79
3	196	186	10	98	169	-71
4	193	185	8	1034	291	743
5	152	156	-4	126	121	5
6	216	222	-6	114	121	-7
7	116	116	0	136	136	0
8	182	187	-5	221	138	83
9	175	236	-61	255	215	40
10	122	118	4	128	145	-17
11	220	169	51	82	145	-63
13	205	187	18	346	364	-18
14	201	204	-3	189	106	83
15	234	213	21	232	186	46

Appendix G: **ACTION PLANS**

Healthy Living: Family Routines Count

I. Construct Action Plan (What, How Much, When, How many times)

_____
_____
_____

Family Member/Friend's Role in Action Plan

_____
_____
_____

II. Check Confidence: 0 1 2 3 4 5 6 7 8 9 10

If 7 or below: What is the barrier?_____
_____

Identify steps to overcome barrier:
_____
_____
_____

Review/Re-evaluate revised plan (New Confidence #):
0 1 2 3 4 5 6 7 8 9 10

III. Goal: MET NOT MET

What is the barrier?_____
_____

Identify steps to overcome barrier: _____
_____

Review/Re-evaluate revised plan (New Confidence #):
0 1 2 3 4 5 6 7 8 9 10

Your Family's Genes Count

I. Construct Action Plan (What, How Much, When, How many times)

_____
_____
_____

Family Member/Friend's Role in Action Plan

_____
_____
_____

II. Check Confidence: 0 1 2 3 4 5 6 7 8 9 10

If 7 or below: What is the barrier?_____

_____

Identify steps to overcome barrier: _____

_____

Review/Re-evaluate revised plan (New Confidence #):

0 1 2 3 4 5 6 7 8 9 10

III. Goal: MET NOT MET

What is the barrier?_____

_____

Identify steps to overcome barrier: _____

_____

Review/Re-evaluate revised plan (New Confidence #):

0 1 2 3 4 5 6 7 8 9 10

Sharing Healthy Family Routines

I. Construct Action Plan (What, How Much, When, How many times)

_____

_____

_____

Family Member/Friend's Role in Action Plan

_____

_____

II. Check Confidence: 0 1 2 3 4 5 6 7 8 9 10

If 7 or below: What is the barrier?_____

_____

Identify steps to overcome barrier: _____

_____

Review/Re-evaluate revised plan (New Confidence #):

0 1 2 3 4 5 6 7 8 9 10

III. Goal: MET NOT MET

What is the barrier?_____

_____

Identify steps to overcome barrier: _____

_____

Review/Re-evaluate revised plan (New Confidence #):

0 1 2 3 4 5 6 7 8 9 10

Depression and Diabetes

I. Construct Action Plan (What, How Much, When, How many times)

_____
_____
_____
_____

Family Member/Friend's Role in Action Plan

_____
_____
_____

II. Check Confidence: 0 1 2 3 4 5 6 7 8 9 10

If 7 or below: What is the barrier?_____
_____

Identify steps to overcome barrier: _____
_____

Review/Re-evaluate revised plan (New Confidence #):
0 1 2 3 4 5 6 7 8 9 10

III. Goal: MET NOT MET

What is the barrier?_____
_____

Identify steps to overcome barrier: _____
_____

Review/Re-evaluate revised plan (New Confidence #):
0 1 2 3 4 5 6 7 8 9 10

Appendix H: **CAPSTONE COMPLETION SURVEY**

Name: (voluntary) _____

Survey Upon Completion of Project:

1. I think that the information that I verbally received is beneficial in managing my diabetes.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
2. I think that the information from "Diabetes: A Family Matter" is beneficial in managing my diabetes.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
3. I think that the information, if shared with other family members, would benefit them in better understanding diabetes	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
4. The pamphlets administered were easy to read.	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree
5. The follow up phone calls were beneficial to me	☐1 Strongly Disagree	☐2 Somewhat Disagree	☐3 Neutral	☐4 Somewhat Agree	☐5 Strongly Agree

6. Do you have any suggestions or questions, regarding any material that you were given? Yes No

If so, what?_____

_____

_____

7. Would this information be better shared during a group class or informal group setting? Yes No

8. Additional comments or suggestions?

_____

_____

_____

Grade	Reference	Design	Intervention	Sample	Setting	Follow Up	Results	Conclusion
Good/ B	Atak, N., Gurkan, T., & Kose, K. (2009). The effect of education on knowledg e, self-managem ent behaviors and self-efficacy of patients with type 2 diabetes. *Australian Journal of Advanced Nursing, 26*(2), 66-74. Turkey	RCT using a pre and post-test design	The test, including sections on patient characteristic, diabetes knowledge, self-management behaviors and self-efficacy were given to all patients before education as a pre-test. Subjects participated in the education program three months after the initial assessments were completed. The results of routine lab assessments were recorded. Two weeks after the initial education program, the test was re-administered to intervention and control groups. The correct answers were explained to the intervention group during education and to each patient in the control group following the post test.	80 patients with type 2 diabetes	Diabetes Center, Departmen t of Endocrinol ogy and Metabolis m, Ankara University, Turkey.	Baseline and 2 weeks post education	There was significant difference between the intervention and control groups. Improvement s were observed in taking regular walks (p=0.043), recognizing nutrients with high caloric content (p=0.037), recommende d daily fat distribution (p=0.024), regulating blood glucose levels to avoid complication s (p=0.002), and in diabetes self-efficacy mean scores (p=0.006)	Patient education had a limited effect on knowledge and self-reported self-management behavior but a significant effect on self-efficacy in patients with type 2 diabetes
Fair/A	Balamuru gan, A., Hall-	CBA	Participant knowledge, self-efficacy,	38 participants started	People with diabetes in	Base and 3 months	66% of participants completed	The results of this pilot study suggest

	barrow, J., Blevins, M. A., Brech, D., Phillips, M., & Holley, E.,...Brittle, K. (2009). A pilot study of diabetes education via telemedicine in a rural underserved community-opportunities and challenges. *The Diabetes Educator, 35*, 147-154. USA		and self-care practices were assessed before participants began the education program and after they had completed it. Also, select clinical measures were collected	25 completed program	underserved rural communities supported by the University of Arkansas		the DSME-T program. A significantly greater proportion of participants demonstrated improved knowledge, endorsed greater self-efficacy, and reported more frequent self-care practices to manage their diabetes at the conclusion of the study period.	that DSME-T may offer opportunities for DSME among rural residents with diabetes. Plans are in place to explore the possibility of sustaining and expanding the program to other underserved rural communities.
Good/ A	Bell, J. A., Patel, B., & Malasanos, T. (2006). Knowledge improvement with web-based diabetes education program: Brainfood. *Diabetes Technology & Therapeutics, 8*(4), 444-448. USA	Pre/post test analysis	Completion of computer program with 15 modules. Seven topics should be a review of general nursing knowledge for most nurses, six modules offered more diabetes-specific information and two modules included complex diabetes management information beyond the scope of most nurses practicing outside of	513 users. 124 were nurses (APRN=6, LPN=13, RN=88, unspecified=17). 389 were non-nurse users (patients, family members, teachers, interested learners and potential camp counselors=98)	Individuals were recommended by their healthcare provider, advertisement for nursing continuing education on the Florida Department of health website, directions from Florida's Diabetes Camp for counselor orientation and those searching the web for diabetes education.	Baseline and 13 months	Of non-nurses, 145 out of 389 took pre-tests and 135 took post-tests. Post test scores improved significantly (P<0.001 by non-paired t test). Of nurses, 68 of 124 took pre-tests and up to 56 took post-tests. Post-test scores improved significantly (P=<0.05 by non-paired t test) on 13 modules. Post-test scores improved,	The "Brainfood" program is educationally sound and effective at delivering Type 1 diabetes education to both professionals and non-professionals. Web access from non-clinic settings can improve access to high-quality education for learners in remote or underserved locations.

			diabetes. Pre and post test scores were collected.		Patients and families referred to the site by the University of Florida Pediatric Diabetes Center staff come from all of north central Florida, including participants in a telemedicine program serving rural Volusia County.		but were not statistically significant for "Nutrition 101", a module about very basic nutrition. Nurses had a lower margin of improvement for most modules as they started with a higher base knowledge level. Non-nurses improved significantly on all modules from pre-test to post-test. Post-test scores for the nurses and non-nurses were indistinguishable.	
Fair/A	Braun, A. K., Kubiak, T., Kuntsche, J., Meier-hofig, M., Muller, U. A., Feucht, I., & Zeyfang, A. (2009). SGS: A structured treatment and teaching programme for older patients with diabetes mellitus a prospective	RCT	To evaluate the effectiveness of new structured diabetes teaching and treatment program with specific didactical approaches and topics for geriatric patients with DM. Patient were randomly placed into educational groups receiving routine DSME vs the new program	155 Geriatric patients 83-intervention 72-control	Treated at outpatient facility in Germany	Baseline, immediately after education, and 6 months.	Patients showed improved levels of HgA1c 6 months after the new education, and less acute complication than the standard group ($p<0.009$). Bothe groups demonstrated a good capacity for diabetes self-management and improvement in diabetes knowledge after the	The new structured geriatric diabetes education program, focusing on the learning capabilities and the particular needs of older persons, is effective in improving metabolic control and in maintaining auto-sufficiency in geriatric patients with diabetes mellitus.

	randomised controlled multi-centre trial. *Age and Ageing, 38*, 390-396. Germany						education (p<0.01).	
Good/A	Clarke, A. (2011). Effectiveness of a community orientated diabetes education (CODE) programme for people with type 2 diabetes. *European Diabetes Nursing, 8*(3), 94-99. Ireland	RCT	The healthcare provider delivering Community Oriented Diabetes Education (CODE) had training in motivational interviewing, facilitation skills, problem solving and goal setting along with an accredited diabetes qualification. The CODE curriculum was delivered over 3 successive weeks with a 10 week support telephone call and 26 weeks follow up session. Outcome measures were collected at baseline and 26 weeks.	237 participants	31 local settings	Baseline and 26 weeks	The empowerment scores raised from 3/5 to 4/5 (p=0.047). QOL range decreased from 25 to 21 and the average score had increased (p=0.00). Knowledge had also increased significantly (p=0.01). People lost on average 0.5kg with similar reduction in BMI.	Increasing patients' self-management skills to manage their diabetes is extensively the target of diabetes education. Most education interventions report positive outcomes based on patterns of group level change. There is a need to focus on individual change. This study identified younger age and reported poorer QOL as possible causes of attrition. This group needs to be targeted for more intensive retention strategies and their reasons for attrition identified and addressed.
Fair/A	Conlon, P. (2010). Diabetes outcomes in primary care:	RCT	Patients were scheduled by the receptionist with the physician or	42 patients with type 2 diabetes. 25 in physician managed	Large urban federally qualified health center.	Baseline and 12 months	The nurse practitioner interventions lowered HgA1c and glucose to a	The diabetes NP is able to demonstrate a high degree of clinical management

	Evaluation of the diabetes nurse practitioner compared to the physician. *Primary Health Care, 20*(5), 26-31. USA		NP, based on the availability of each practitioner Patient achievability was measured by each practitioner documenting patient compliance with mutually established goals and acceptance of their diabetes plan. .	group and 14 in nurse practitioner managed group			greater degree than those under physician direction. Weights of the physician's patients were lowered with relevance to noted hyperglycemia. Blood Pressure remained the same in both groups	expertise which translates into better metabolic control, consistent with the standard of care and clinical practice recommendations set by the American Diabetes Association, which in turn decreases cost
Good/ A	Davies, M. J., Heller, S., Skinner, T. C., Campbell, M. J., Carey, M. E., & Cradock, S.,...Khunti, K. (2011). Effectiveness of the diabetes education and self-management for ongoing and newly diagnosed (DESMOND) programme for people with newly diagnosed type 2 diabetes: cluster randomised controlled trial. *British Medical Journal, ,*	RCT	A structured group education program for six hours delivered in the community by two trained healthcare professional educators compared with usual care.	824 adults	207 general practices in 13 primary care sites in the United Kingdom	Baseline and 12 months	HgA1c levels at 12 months had decreased by 1.49% in the intervention group compared with 1.21% in the control group. After adjusting for baseline and cluster, the difference was not significant: 0.05% (95%CI). The intervention group showed a greater weight loss: -2.98kg (95%CI) compared with 1.86kg, p=0.027 at 12 months. The odds of not smoking were 3.56 (95%CI), p=0.033higher in the intervention group at 12 months. The intervention	

	1-11. UK						group showed significantly greater changes in illness belief scores (p=0.001); directions of change were positive indicating greater understanding of diabetes. The intervention group had a lower depression score at 12 months: mean difference was -.50 (95%CI); p=0.032. A positive association was found between change in perceived personal responsibility and weight loss at 12 months (p=0.008)	
Good/ B	Deakin, T., & Whitham, C. (2009). Structured patient education: The X-PERT programme. *British Journal of Community Nursing, 14*(9), 398-403. UK	RCT	Individuals were placed into individual appointment (control) or into (intervention) where patients attended six 2 hour group sessions of self-management education (X-PERT Program)	314 people with type 2 diabetes Intervention -157 with 149 completing program. Control-157 with 128 completing the program	Individuals living in Burnley, Pendle or Rossendale, Lancashire, UK and receiving treatment for diabetes	Baseline, 4 months and 14 months	By 14 months the X-PERT group compared with the control group showed significant improvements in the mean HbA1c (-.6% vs. +0.1%, repeated measures anova, P<0.001). The number needed to treat for preventing	The program trains health care professionals to deliver the six week structured patient education. Implementation has shown excellent attendance rates, improved diabetes control, reduced weight, blood pressure, cholesterol

							diabetes medication increase was 4 (95% confidence interval) and for reducing diabetes medication was 7 (95% confidence interval). Statistically significant improvements were also shown in the X-PERT patients compared with the control patients for body weight, body mass index, waist circumference, total cholesterol, self-empowerment, diabetes knowledge, physical activity levels, foot care, fruit and vegetable intake, enjoyment of food and treatment satisfaction	and waist circumference and more confidence in self-managing diabetes that has impacted positively on quality of life.
Good/ A	Dyson, P. A., Beatty, S., & Matthews, D. R. (2010). An assessment of lifestyle video education for people newly diagnosed	RCT	All subjects in the study received usual medical care from their primary care physician, including education about lifestyle management of type 2 diabetes from a practice	42 newly diagnosed diabetic Patients 21 controlled group 21 intervention group	Direct referral from primary care physician, practice nurse or from ads	Base and 6 months	The intervention group showed increased knowledge compared to controls (p<= 0.0001). There were no significant differences in changes over 6 months in either group, however the	A brief video intervention increased diabetes knowledge amongst those newly diagnosed with type 2 diabetes and may comprise an effective way of directing education to such

	with type 2 diabetes. *Journal of Human Nutrition and Dietetics*, *23*, 353-359. UK		nurse. In addition, subjects randomized to the video intervention received the three lifestyle videos and were requested to watch them in their own time. The control group was offered the videos at the end of the 6 month study period				intervention group showed improvements in HgA1c (p=0.024), total cholesterol (p=0.017), LDL cholesterol (p= 0.018) and increased physical activity measured by pedometer (p=0.043) from baseline, with no significant changes in control group.	individuals.
Good/ A	Franklin, V. L., Waller, A., Pagliari, C., & Greene, S. A (2006). A randomized controlled trial of Sweet Talk, a text-messaging system to support young people with diabetes. *Diabetic Medicine*, *23*, 1332-1338. UK	RCT	To assess Sweet Talk, a test messaging support system designed to enhance self-efficacy, facilitate uptake of intensive insulin therapy and improve glycaemic control in pediatric patients with type 1 diabetes. Goal-setting at clinic visits was reinforced by daily text-messages from the Sweet Talk software system, containing personalized goal-specific prompts and	126 patients, 28 conventional therapy 33 conventional therapy and Sweet Talk 31 Intensive insulin therapy and Sweet Talk	Patients with type 1 diabetes for > 1 year, on conventional insulin therapy, aged 8-18years attending outpatient clinics in Tayside, Scotland.	Base and 12 months	HbA1c did not change in patients on conventional therapy without or with Sweet Talk, but improved in patients randomized to intensive therapy and Sweet Talk. Sweet Talk was associated with improvement in diabetes self-efficacy and self-reported adherence. When surveyed, 82% of patients felt that Sweet Talk had improved their diabetes self-management and 90%	Sweet Talk was associated with improved self-efficacy and adherence; engaging a classically difficulty to reach group of young people. While Sweet Talk alone did not improve glycaemic control, it may have had a role in supporting the introduction of intensive insulin therapy. Scheduled, tailored text messaging offers an innovative means of supporting

			messages tailored to patients' age, sex and insulin regimen.				wanted to continue receiving message	adolescents with diabetes and could be adapted for other health-care settings and chronic disease.
Good/ B	Gerber, B. S., Bordsky, I. G., Lawless, K. A., Smolin, L. I., Arozullah, A. M., Smith, E. V.,...Eiser, A. r (2005). Implementation and evaluation of a low-literacy diabetes education computer multimedia application. *Diabetes Care, 28*(7), 1574-1580. USA	RCT	Randomly placed into intervention group that included supplemental computer multimedia use or control which received the standard of care. Intervention included audio/video sequences to communicate information, provide psychological support, and promote diabetes self-management skills	244 patients started study with 183 completing the study	Patients from 5 public clinics in Chicago, Illinois	Base and 1 year	Only 183 subjects completed the study. There were no significant differences in change in A1c, weight, blood pressure, knowledge, self-efficacy or self-reported medical care between the intervention and control groups. There was an increase in perceived susceptibility to diabetes complications in the intervention group. Lower literacy patients reported this higher. Time on the computer was increased in the intervention group.	Access to multimedia lessons resulted in an increase in perceived susceptibility to diabetes complications, particularly in subjects with lower health literacy. Despite measures to improve informational access for individuals with lower health literacy, there was relatively less use of the computer among these participants.
Good/ A	Gucciardia, E., Demelo, M., Lee, R. N., & Grace, S. L. (2007). Assessment of two culturally competent	RCT	Patients were randomly assigned to receive either diabetes education counseling only (control) or counseling in conjunction	61 Patients 36-control 25-intervention	Patients of Toronto Western hospital Diabetes Education Center	Baseline and 3 months	Attitudes, subjective norms, perceived behavior control, and intentions towards nutrition adherence, self-reported	The study provides preliminary evidence that culturally competent group education in conjunction with individual

	diabetes education methods: Individual versus individual plus group education in Canadian Portuguese adults with type 2 diabetes. *Ethnicity and Health, 12*(2), 163-187. Canada		with group education (intervention).				nutrition adherence and glycemic control significantly improved in both groups, over the 3 month study period, yet those receiving individual counseling with group education showed greater improvement in all measures with the exception of glycemic control, where no significant difference was found between the two groups at 3 months.	counseling may be more efficacious in shaping eating behaviors than individual counseling alone. Larger longitudinal studies are needed to determine the most efficacious education method to sustain long-term nutrition adherence and glycemic control.
Fair/A	Halkoaho, A., Kavilo, M., & Pietila, A. M. (2007). Information technology supporting diabetes self-care: A pilot study. *European Diabetes Nursing, 4*(1), 14-17. UK	CBA	Data collected by questionnaire and interview. People with diabetes were sent a questionnaire and the nurses were interviewed	9 individuals with diabetes 3 diabetes nurses	9 patients from outpatient program, the nurses worked with those patients	Post interview questionnaires	The results suggest that the Self-Care system software supports and motivates diabetes self-care. The nurses felt that the application was useful when changes were introduced. Both groups disliked the mechanical nature of the software	The results suggest that the Self-Care system software supports and motivates diabetes self-care. The nurse felt that the application was useful when changes, such as starting insulin treatment, were introduced. The application was further described as effective and motivating in short-term

								intensive diabetes education and monitoring; however, both nurses and patients disliked the mechanical nature of the software
Good/ B	Huang, J. P., Chen, H. H., & Yeh, M. L. (2009). A Comparison of diabetes learning with and without interactive multimedia to improve knowledge, control, and self-care among people with diabetes in Taiwan. *Public Health Nursing, 26*(4), 317-328. Taiwan	RCT	The experimental group received patient education through interactive multimedia about diabetes for 3 months, while the control group received a routine 3 month patient education. Data were collected from both groups at baseline and at the completion of the patient education. Findings were then compared to evaluate the effects of the intervention on the subjects' knowledge of diabetes, blood sugar control and self-care.	60 participants 30-control 30-intervention	Recruited from the endocrinology Outpatient department at a regional hospital in the south of Taiwan.	Baseline and 3 months	The experimental group showed greater improvement in understanding diabetes than the control ($t=3.29$, $p<0.001$). There was no significant difference in control of blood sugar levels ($t=-1.72$, $p=.10$) and self-care ($F=1.03$, $p=.32$)	The use of an interactive multimedia device to intervene in diabetes self-care was effective only in raising the subjects' knowledge about the disease. Additionally, the subjects may need more time to implement more effective blood sugar control and self-care activities after receiving instruction.
Good/ A	Izquierdo, R. E., Knudson, P. E., Meyer, S., Kearns, J., Ploutz-snyder, R., &	RCT	Determine whether diabetes education can be provided as effectively through telemedicine technology as	56 adults with diabetes 28 control group 28 intervention group	Patients at the Joslin Diabetes Center at SUNY Upstate medical University in	Baseline and 3 months	Patient satisfaction was high in the telemedicine group. Problem Areas in Diabetes	Diabetes education via telemedicine and in person was equally effective in improving glycemic control, and

	Weinstock, R. S. (2003). A comparison of diabetes education administered through telemedicine versus in person. *Diabetes Care, 26*(4), 1002-1007. USA		through in-person encounters with diabetes nurse and nutrition educators. Randomized to receive diabetes education in person (control group) or via telemedicine (telemedicine group). The education consisted of three consultative visits with diabetes nurse and nutrition educators. The in-person and telemedicine groups were compared using measures of glycemic control and questionnaires to assess patient satisfaction and psychosocial functioning as related to diabetes.		Syracuse, New York		scale scores improved significantly with diabetes education, and the attainment of behavior change goals did not differ between groups. With diabetes education, HgA1c improved from 8.6 +/- 1.8% at baseline to 7.8 +/-1.8% 3 months after the third educational visit, with similar changes observed in the telemedicine and in-person groups.	both methods were well accepted by patients. Reduced diabetes-related stress was observed in both groups. These data suggest that telemedicine can be successfully used to provide diabetes education to patients
Fair/B	Jennings, A., Powell, J., Armstrong, N., Stuart, J., & Dale, J. (2009). A virtual clinic for diabetes self-management: Pilot study. *Journal of*	CBA	These patients used a virtual clinic system that allowed communication with health professionals; interact with peers and access information.	17 patients, convenience sample	Outpatients from three UK hospitals in the West and East Midland	Base and 6 months	Participants found the virtual clinic easy to use and positively rated its design. Peer support was the most valued aspect and the discussion boards the most used component.	An internet-based system to aid the management of diabetes appears feasible and well accepted by patients. The pilot study did not identify evidence of an impact on improving quality of life

	Medical Internet Research, 11(1), 1-8. UK						All participants highly rated the virtual clinic in terms of improving communication with peers, but few agreed it had improved communication with health care professionals. No significant improvements in physiological and psychological measurements were found. Regarding HgA1c measurements, there was no significant difference found between the pre and post test results (p=0.53). Mean ADDQoL scores at base were -2.1 compared to -2.0 post test (p=.62). Patient's confidence in their ability to perform self-care tasks was found to be significantly reduced from base to follow up (p=0.45)	or self-efficacy in patient who used insulin pump therapy
Good/ B	Khan, M. A., Shah, S.,	RCT	Participants either viewed a computer	129 uninsured, primarily	Patients at a county clinic in	Base and 3 months	There was an increase in the number	Multimedia users received a greater

	Grudzien, A., Onyejekwe, N., Banskota, P., Karim, S.,...Gerber, B. s (2011). A diabetes education multimedia program in the waiting room setting. *Diabetes Therapy, 2*(3), 178-188. USA		multimedia education program (intervention) or read an educational brochure (control) while in the waiting room	ethnic minority adults with type 2 diabetes 67 intervention group 62 control group	Chicago, Illinois		of oral diabetes medications prescribed over 3 months to multimedia users compared with those in the control group (p=0.017). HgA1c declined by 1.5 in the multimedia group versus 0.8 in the control group (p=0.06). There were no difference between groups in changes in blood pressure levels, self-efficacy, and most diabetes related behaviors. Self-reported exercise increased in the control group compared with the multimedia group (p=0.016)	intensification of diabetes therapy, but demonstrated no difference in self-management in comparison with those receiving educational brochures. The availability of a computer multimedia program in the waiting room appears to be a novel and acceptable approach in providing diabetes education for underserved populations
Good/ A	King, A. B., & Wolfe, G. S. (2009). Evaluation of diabetes specialist-guided primary care diabetes treatment program. *Journal of the American*	Pre/post pilot study	Experimental site- NPs received a 6 hour instruction in the use of the treatment algorithms based on the ADA guidelines of care, the accompanying algorithm guidebook for reference and flow sheets	101 Control group 34 Experimental group	Board certified family or internal medicine practitioners located within a 100 mile radius of Salinas California	Baseline and 12 months	Mean HbA1c values decreased from baseline by 0.46% in the active treatment group versus 0.06% in the control group; however, reductions in HgA1c did not achieve statistical significance	The program provided insights regarding the importance of electronic records and provider notifications, patient adherence, prioritization of provider resources by risk level among patients and

	Academy of Nurse Practitioners, (21), 24-30. USA		for the chart record in the clinic. The control site had no contact with the individual patients after the chart review and during the 12 month study. After completion of the study, the charts of the same patients were again reviewed and data collected.				potentially because of the small sample size of the experimental group. Mean SBP values were significantly reduced in both groups; however, LDL-C was only significantly reduced in the control group where more aggressive use of statins may have had an effect.	access to self-management education
Good/ B	Krakow, D., & Feulner-krakow, G. (2007). LINDA: The diabetes self-management training programme for people with type 1 or type 2 diabetes. *European Diabetes Nursing, 4*(3), 106-112. Germany	RCT	To compare the LINDA (living, interactive, new, distinguished, activating) with a standard education program. This program has 4 basic modules covering nutrition, blood glucose monitoring, medication, hypoglycemia, HgA1c, podiatry, micro and macro vascular long term consequence, hypertension, weight reduction, and sports. Modules 5 and 6 pertain to insulin. Module 7 is gestational	1109 diabetes patients. 374 type 2 non-insulin dependent. 449 type 2 insulin treated. 286 type 1 diabetes.	Outpatients in centers with ambulant treatment only in Munich, Germany	Baseline and 1 year	Type 2 LIP patients achieved lower HgA1c mean of 6.2% and a reduction of BMI of 0.8 kg/m2. The control group reached a mean HgA1c 7% and showed an increase in BMI of 0.7 kg/m2. Mean blood pressure improved from 145/85 to 134/80in LIP patients and 138/79 in control group. Triglyceride and cholesterol levels decreased in both groups. For type 2 patients, mean HgA1c fell to 6.8%in	Patient education had a limited effect on knowledge and self-reported self-management behavior but a significant effect on self-efficacy in patients with type 2 diabetes

			diabetes.				the LIP and control group was 7.4%. A quality of life questionnaire showed improvements from 20% to 80% in people who used the LIP	
Good/ B	Kulzer, B., Hermanns, N., & Reinecker, H. (2007). A self-management approach to patient education for type 2 diabetes was more effective than a didactic approach. *Diabetes Medicine, 24*, 415-423. Germany	RCT	Didactic oriented group intervention (4-90minute sessions) focusing on acquisition of knowledge, skills, and information about treatment of diabetes; self-management oriented group intervention (12-90minute sessions) focusing on emotional, cognitive, and motivational processes of behavior change; and self-management oriented individual intervention (6-individual and 6-group sessions) with the same content as the second group. The interventions were conducted by 4-trained health psychologist.	193 patient with type 2 diabetes	Patients living in Wurzburg, Germany	3 and 15 months	Mean HgA1c and FBG were reduced more in the self-management group than in the didactic group, but the self-management and self-management individual groups did not differ. Groups did not differ for improvement in BMI, diabetes knowledge, and frequency of glucose monitoring. The self-management group showed more improvement than the didactic group in psychological determinants of eating, anxiety, and frequency of exercise; the 2 self-management groups did not differ for these outcomes.	In middle aged adults with type 2 diabetes, a group self-management approach to patient education was more effective than a group didactic approach. Providing some of the self-management intervention as individual sessions did not provide any advantage over all group sessions.
Good/	Lee, T. I.,	Quasi-	Both received	274	Outpatient	3,6,9, and	Standard	The POEM

A	Yeh, Y. T., Liu, C. T., & Chen, P. L. (2006). Development and evaluation of a patient-oriented education system for diabetes management. *International Journal of Medical Informatics, 76*(9), 655-663. Taiwan	experimental	treatment based on same guidelines, the intervention group received access to POEM (patient oriented diabetic education management system). Lab test results including fasting blood glucose, HbA1c, total cholesterol, triglyceride and HDL were tested from the first visit through each follow up at 3,6,9 and 12 months	participants134 in intervention group (57% male 43% female). 140 in control group (46%male and 54% female). Both received treatment based on same guidelines, the intervention group received access to POEM	visiting the Metabolism Center	12 months	Deviations are listed for testing. I:C. 1=1st follow up, 2=2nd follow up, 3=3rd follow up. Fasting Blood Sugar-1-47.47:43.46; 2-47.67:42.37; 3-45.52;41.44. HgA1c-1-2.16:1.49;2-2.14:1.49;3-2.12:1.65.Total Cholesterol-130.25:37.36; 229.57:39.41; 3-29.047:40.597. Triglyceride-1-58.58:64.63; 2-58.59:64.65; 3-58.50:64.67. HDL-1-14.02:11.82; 2-14.07:11.57; 14.03:11.66. Follow Up-1-A significant difference in fasting blood glucose levels. 2nd-fbg and HgA1c were significantly different. 3-Signifcant difference in fasting blood glucose, HgA1c and total cholesterol	system can help patients control their glucose, HbA1c and total cholesterol levels to manage their diabetes, providing an easy and inexpensive way to extend hospital-based patient education services for community-based continuous education

Fair/A	McIlhenny, C. V., Guzic, B. L., Knee, D. R., Demuth, B. R., & Roberts, J. B. (2011). Using technology to deliver healthcare education to rural patients. *Rural and Remote Health, 11*(1798), 1-11. USA	RCT	In the intervention group that received regularly scheduled; one-on-one individualized diabetes related health education and hands on instruction how to use an internet portal by a nurse educator. Control patients in the second clinic were given pamphlet describing how to access the portal. All participants completed baseline and post studies. Disease knowledge and problem areas in diabetes were measured. All participants completed a behavior modifications survey post study. A satisfaction survey was completed. Serum glucose, HgA1c, and lipids were reviewed	98 patients 48 intervention group 50 control group	Patients at two rural medical clinics	Base, 3 and 6 months	Disease knowledge and self-blood glucose monitoring improved with one-on-one education. Demographic and baseline scores were similar between groups. At 6 months, the intervention group showed significant increase in disease knowledge and self-blood glucose monitoring behavior. There were no differences in QOL between the groups at 6 months. Participants in the intervention group were highly satisfied with the educator, but not the internet as a resource	Diabetes knowledge and self-blood glucose monitoring improved with one-on-one education. High attrition and a short study period were limitations of this study. The researchers speculate that the age of the participants and low internet penetration affected satisfaction scores.
Good/ B	McLoughney, C. R., Khan, A., & Ahmed, A. B. (2007). Effectiveness of a	Randomized Prospective Study	Subjects were placed into groups where the focus was learning and controlling the secondary issues of	94 patients with diagnosis of type 2 diabetes	Patients in clinic between April 2003 and March 2004	Baseline and 1 year	Significant reduction in systolic blood pressure (167 $\pm$ 12 versus 132 $\pm$8mmHg,	Nurse led clinics can effectively improve CV risk factors, hypertension and hyperlipidemi

	specialist nurse-led intervention clinic in the management of cardiovascular risk factors in diabetes. *European Diabetes Nursing*, *4*(3), 100-105. UK		hypertension or hyperlipidemia by a nurse-led, protocol driven, doctor supervised clinic				p<0.001) and diastolic BP (85±9 versus 70±7 mmHg, p<0.001). 92% achieved target BP. Those treated for hyperlipidemia (6.0±1.2 versus 3.9±0.7 mmol/l, p<0.001) and triglycerides (4.2±0.8 versus 2.4±1.2mmol/l, p<0.001) significantly improved. 91% of patient achieved target lipid levels. The mean HbA1c level also improved (8.5±1.5 versus 7.4±1.5%, p<0.01) and 45% achieved target glycemic control.	a levels.
Good/ B	McMahon, G. T., Gomes, H. E., Hickson-Hohne, S., Hu, T. M., Levine, B. A., & Conlin, P. A. (2005). Web-based care management in patients with poorly controlled diabetes.	RCT	All participants completed a diabetes education class and were randomized to continue with their usual care or receive web-based care management. The web-based group received a notebook computer, glucose and	104 patients 52 in Control group 52 in intervention group	Patients with diabetes and HgA1c >=9.0% who received their care at a Department of Veterans Affairs medical center were recruited.	Baseline, 3, 6, 9 and 12 months	Patients receiving web-based care management had lower A1c over 12 months when compared with education and usual care. Persistent website users had greater improvement in A1c when compared with	Web-based care management may be a useful adjunct in the care of patients with poorly controlled diabetes

	Diabetes Care, 28(7), 1624-1629. USA		blood pressure monitoring devices, and access to a care management website. The website provided educational modules, accepted uploads from monitoring devices, and had an internal messaging system for patients to communicate with the care manager				intermittent users or education and usual care. A larger number of website data uploads was associated with a larger decline in A1c. Hypertensive participants in the web-based group had a greater reduction in systolic blood pressure. HDL cholesterol rose and triglycerides fell in the web-based group	
Fair/A	New, N. (2010). Teaching so they hear: Using a co-created diabetes self-management education approach. *Journal of the American Academy of Nurse Practitioners, 22*, 316-325. USA	Quasi experimental Pilot study; pre/post interview	Focus group was used to develop and evaluate the co-created diabetes self-management education intervention. The intervention phase was a quasi experimental design with pre and post intervention data collection for diabetes knowledge, self-management activities, and adaptation. The intervention group was compared to a group of adults with	20 participants in each group	Participants were from the delta region of Arkansas, which contains seven of nine counties with a diabetes prevalence of 11%-12.6%. Forrest City Arkansas was actual site. Diabetes education centers in Jonesboro and west Memphis, Arkansas were the comparison sites.	Baseline and 3 months	There were no significant differences found between the focus group that developed the intervention with participants who created the sessions and the control groups with regard to knowledge, adaptation and program satisfaction. Diabetes self-care activities significantly improved (p=.02) for the experimental group.	A co-created teaching approach better meets the learning needs of adults with type 2 diabetes and results in enhances ability to perform the self-care activities required for successful diabetes control. Better diabetes control reduces visits to monitor and treat complication and the need for repetitive educational sessions that exceed their-

			diabetes who received the usual DSME education offered by local hospitals.					party pay limits and extend the time needed for patient encounters.
Fair/A	Noh, J. H., Cho, Y. J., Nam, H. W., Kim, J. H., Kim, D. J., Yoo, H. S.,...Woo, M. h (2010). Web-based comprehensive information system for self-management of diabetes mellitus. *Diabetes Technology & Therapeutics, 12*(5), 333-337. Korea	RCT	Evaluate the effect of a web-based comprehensive information system, consisting of Internet and cellular phone use, on blood glucose monitoring Intervention patients received training in eMOD usage and logged into the system whenever it was convenient for them. The control group received diabetes educational books with similar contents	40 patients Age 18-80; type 2 diabetes and A1c between 7-10 with stable control. Randomly assigned to intervention group (20) or Control group (20).	Outpatient department from 5 hospitals	Base and 6 months	Significant decrease in A1c in intervention group but not in the control group. There was a relationship between the change in A1C and frequency of access to the eMOD system by computer and cellular phone	Significant HgA1c was improved by a web-based intervention not only via computer but also via cellular phone at 6 months post initiation in patients with type 2 diabetes. These results indicate that the use of a convenient web-based education system could be more effective for glycemic control than traditional education for diabetes patients.
Good/A	Reed, R. L., Revel, A. D., Carter, A. O., Hussein, F. S., & Dunn, E. V. (2005). A controlled before-after trial of structured diabetes care in primary health centres in	Controlled before and after trial	Outcomes and adherence to guidelines were measured over the year before the intervention began and for a second one year period at the end of the intervention period. Structured diabetes care, including the development of general	738 participants	9 Primary Health Centers in the United Arab Emirates.	One year prior to intervention and one year after intervention	Three outcomes variables were compared. Total cholesterol measurements in the intervention clinics (-12.0mg/dl) compared with the control clinics (+8.3 mg/dl). The rate of measuring HbA1c was	The intervention described in this study demonstrated an improvement in some process of care measures suggesting an impact of this type of delivery model in the environment

	a newly developed country. *International Journal for Quality in Health Care, 17*(4), 281-286. United Arab Emirates		practice diabetes clinics, a patient education program, a health care professional education program, and improved recording of clinical information was provided for the 33 month time period.				too low to determine whether any changes were made in this parameter. Fasting glucose did improve in the intervention clinics (-0.7mg/dl) when compared with the control clinics (+4.8mg/dl) although this was not statistically significant. Mean blood pressure worsened in the intervention clinics (+2.7mm Hg) when compared with the intervention clinics (-1.4 mm Hg) and this difference was statistically significant).	
Good/ A	Selea, A., Sumarac-dumanovic, M., Pesic, M., Suluburic, D., Stamenkovic-pejkovic, D., Cvijovic, G., & Micic, D. (2011). The effects of education with	RCT	In all patients fasting plasma glucose and HgA1c were measured and subsequently the patients fulfilled the questionnaire. At the end of the visit the patients were given the printed material "Healthy lifestyle with diabetes type	364 patients with diabetes	From 3 regional health centers in Serbia	Baseline, 3, 6, and 18 months	There was a significant improvement in HgA1c levels after 3 months ($8.00 \pm 1.66\%$ vs $9.06 \pm 2.23\%$, $p<0.01$) and after 6 months ($7.67 \pm 1.75\%$ vs $9.06 \pm 2.23\%$, $p<0.01$). There was no further improvement	Education with printed material led to improvements in glycemic control and level of DM knowledge in our patients. Education with printed material may be a useful adjunct to DM treatment and should be structured according to

	printed material on glycemic control in patients with diabetes type 2 treated with different therapeutic regimens. *Military Medical & Pharmaceutical Journal of Serbia & Montenegro, 68*(8), 676-683. Serbia		2". The same procedure was repeated after 3,6 and 18 months (printed material was only given at first office visit). BMI was obtained. Questionnaires were regarding diabetes knowledge, diabetes empowerment, and attitude toward diabetes.				in HgA1c levels after 18 months (7.88±1.46% vs 7.67±1.75%), p>0.05). There was a significant improvement in the average test score after three months (64.6% vs 55.6%, p<0.01). There were no further statistically significant changes in the general level of DM knowledge after 6 months (65.0±32.5% vs 64.5±33.7%, p>0.005) and after 18 months (64.8%±32.7 vs 64.5±33.7%, p>0.005). There was a significant difference in education intervention response in DM type 2 patients on different therapeutic regimens.	the treatment modality.
Good/ B	Sevick, M. A., Korytkowski, M., Stone, R. A., Piraino, B., Ren, D., & Sereika, S.,...Burke, L. e	RCT	Participants in both groups received training in use of a study provided glucose meter and sufficient supplies to perform ≥ measurement	296-completed 3 months. 246 completed 6 months.	Patients treated on campus of university of Pittsburgh medical Center. Self-referred	Baseline, 3 and 6 months	HgA1c was reduced in the intervention group by 0.5% at 3 months and 0.6% at 6 months (p<0.001 for each), and the control	Two behavioral approaches to improving general lifestyle management in individuals with type 2 diabetes mellitus were effective in

	(2012). Biophysiologic outcomes of the enhancing adherence in type 2 diabetes (ENHANCE) trial. *Journal of the Academy of Nutrition and Dietetics*, *112*(8), 1147-1157. USA		per day. All participants also were given pedometer with instructions for use and a target level of physical activity of 10,000 steps per day. Intervention group was exposed to group counseling sessions guided by the Social Cognitive Theory and given a palm pilot with a dietary self-monitoring program. Intervention group sessions were held weekly during months 1 and 2 and biweekly during months 3 and 4 and monthly during months 5 and 6.				group by 0.3% ($p<0.001$) at 3 months and 0.2% ($p<0.05$) at 6 months; but between group differences were not significant. In those with baseline HgA1c $\geq$8% and estimated glomerular filtration rate $\geq$60 mL/min, HgA1c was reduced in the intervention group by 1.5% at 3 months and 1.8% at 6 months; but between group differences were not significant. In random intercept models, the estimated reduction in HgA1c of 0.29% was not significant.	improving glycemic control, but no significant between group differences were observed.
Fair/A	Siminerio, L. M., Piatt, G., & Zgibor, J. C. (2005). Implementing the chronic care model for improvements in diabetes care and education in a rural	Pilot Study Pre/post intervention	Phase I-Extensive chart review as the baseline measurement. Phase II-Included provider and patient education provided by CDE. Phase III-Repeat chart review with post-intervention	29 patients Six primary care providers: 4 physicians, 1 nurse practitioner, 1 physician's assistant	University of Pittsburgh medical Center	Baseline and 12 months	Provider adherence to ADA Standards of Care increased significantly across all process measures. Patient who received DSME at point of service in the primary care practice	Implementing systems to support decision support, self-management education, and delivery system redesign has a positive influence on practices and patient outcomes in outlying rural communities.

	primary care practice. *The Diabetes Educator*, (31), 225-234. USA		measures.				setting gained improvement in knowledge, empowerment, A1C, and high-density lipoprotein cholesterol levels. There was an improvement in A1c >7 (40.7% verse 39.5%) and LDL >100 mg/dL (58.8% verse 50%) but a worsening in blood pressure control (75.6% verse 82.1%). All changes in clinical values were non-significant.	
Good/ B	Siminerio, L. M., Ruppert, K., Emerson, S., Solano, F. X., & Piatt, G. A. (2008). Delivering Diabetes Self-Management Education (DSME) in primary care. *Disease Management Health Outcomes*, *16*(4), 267-272. USA	RCT Pre and post test	A nurse who was a certified diabetes educator was deployed to provide point of service diabetes education (POSE) to four University of Pittsburgh Medical Center Community Medicine Practices primary care practices. The group of patients who received POSE was compared with patient from the same	Patients with diabetes: Suburban practice (857+2055) = 2912. Urban practice (624+1808) =2432.	Four Community Medical primary care practices, 2 urban academic medical center and 2 suburban practices.	Baseline (January 2003) through December 2006	Of the 5344 diabetes patients in the four practices, 784 received point of service diabetes education (POSE). Mean HgA1c values were higher at baseline in those patients who received POSE than those who received usual care. There was a significant decrease in HgA1c and LDL-c levels in both groups. Although	Providing DSME in primary care is feasible and offers the opportunity to reach patients who may not be receiving DSME services. However, further research is needed to evaluate other methodologies to increase access to DSME and other factors that my influence improvement in clinical outcomes.

			practices who were identified as having diabetes and who received usual care. The number of patients was computed and a percentage calculated for comparison against *Healthy People 2010* goals. The HgA1c values of patients were tracked from January 2003 through December 2006, during the timeframe that POSE was provided.				there was not a significant between-group difference in HgA1c, those who received POSE had significant improvement in LDL-C levels compared with the usual care group.	
Good/ A	Song, M., & Kim, H. (2007). Effect of the diabetes outpatient intensive managem ent programm e on glycaemic control for type 2 diabetic patients. *Journal of Clinical Nursing, 16*, 1367-1373. Korea	Pre/post control group design test	The intervention group was provided with Diabetes outpatient intensive management program (DOIMP), which received multidisciplin ary diabetes education, complication monitoring and telephone counseling during 12 weeks. Participants in the control group received a brief conventional description of diabetes mellitus and were	25 patients in the intervention group. 24 patients in the control group.	Participant s were recruited from the university affiliated diabetes center of St Vincent's Hospital between September 2004 and January 2005.	Baseline and 3 months	Patients in the intervention group had a mean decrease of 2.3%, which those in the control group having a mean decrease 0.4% in HgA1c. There was no difference between the two groups in FBG and two hour post-prandial. The proportion of the patients with HgA1c < 7% was higher in the intervention group.	Diabetes outpatient intensive management can reduce HgA1c in type 2 patients.

			instructed to undertake medical nutrition therapy by a diabetic education nurse. Regular physical activity was recommended and followed up on an outpatient basis with causal medical care at regular intervals.					
Fair/B	Song, M., Choe, M., Kim, K. S., Yi, M. S., Lee, I., & Kim, J.,...Shim, Y. s (2009). An evaluation of web-based education as an alternative to group lectures for diabetes self-management. *Nursing and Health Sciences, 11*, 277-284. Korea	Quasi experimental investigation with non-equivalent control group, pre test/post test design	Participants in the web group (intervention) took part in a web-based diabetes self-management education program, while those in the lecture group (control) attended the diabetes education lectures provided by healthcare professionals specializing in diabetes care. They attended 1 hour lectures every week for three consecutive weeks. The lectures in the first, second, and third weeks were provided by a diabetes care specialist nurse, a dietician and a physician.	31 participants. 15 in intervention group and 16 in control group. Initially 31 intervention and 29 control but decreased due to drop out	Patient with diabetes treated in the university-affiliated, tertiary care hospital from March to December 2006.	Baseline, 6 weeks and 3 months	The characteristics of both groups were the same; The level of knowledge increased in both groups in 6 weeks but not 3 months. There was significant diabetic care behavior in 6 weeks, but only in the web-based group at 3 months. There was a significant increase in diabetes care behavior; there were no changes in fasting blood glucose levels.	The study indicated that a web-based diabetes self-management education program has potential as an effective alternative to group lecture education in terms of improving diabetes care knowledge, improve diabetes care behavior and improving physiological variables, HbA1c and FBG

Good/ A	Sturt, J. A., Whitlock, S., Fox, C., Hearnsha w, H., Farmert, A. J., Wakelin, M.,...Dale, J. (2008). Psycholog ical issues and education effects of the diabetes manual 1:1 structured education in primary care. *Diabetic Medicine, 25*, 722-731. UK	Cluster randomiz ed, controlle d trial	The intervention group was given immediate education by an educated practice nurse, consisting of a 15 minute face to face consultation to introduce the 12 week diabetes Manual program. Phone support was provided in weeks 1,5 and 11. The deferred intervention group had routine care and after 26 weeks of collecting data, this group was introduced to the Diabetes Manual program	245 adults with Type 2 diabetes with a mean age of 62 years old.	48 Urban general practices in the West Midlands, UK with high population deprivation levels.	Outcomes were assess at baseline and at 26 weeks	There was no significant difference in HbA1c, between the intervention group and the control group (-.08%, 95% CI -.28, .11). Diabetes related distress scores were lower in the intervention group compared with the control group (difference -4.5, 95% CI -*.1, -1.0). Confidence to self-care scores were 11.2 point higher (95% CI 4.4, 18.0) in the intervention group compared with the control group.	The Diabetes Manual achieved a small improvement in patient diabetes-related distress and confidence to self-care over 26 weeks, without a change in glycemic control. Further study is needed to optimize the intervention and characterize those for whom it is more clinically and psychologically effective to support used in primary care
Good/ A	Van Sluljsesth er, E. M., Van Poppel, N. M., Twisk, J. W., Paw, M. J., Calfas, K. J., & Van Mechelen, W. (2005). Effect of a tailored physical activity interventi on delivered in general practice	RCT	Patients were invited to speak with their provider at baseline for a 10 minute consultations, irrespective of randomizatio n. In addition to discussing diabetes, the provider offered advice to the patient about becoming more physically active. The provider used the PACE	191 Intervention 205 Controlled	29 general practices throughout Netherland s. Each general practitione r identified a target population on the basis of the inclusion criteria and the research team randomize d them	Baseline, 8 weeks, 6 months and 1 year	No significant intervention effect over time was observed on physical activity level or stage of change for regular physical activity, and an inverse intervention effect was observed for waist circumferenc e. The study population as a whole exhibited a	Positive effects on physical activity level and body weight were observed, but the PACE intervention was not more effective than the standard physical activity advice.

	settings: Results of a randomized controlled trial. *American Journal of Public Health, 95*(10), 1825-1830. Netherlands		(physician based assessment and counseling for exercise) program.				significant increase in physical activity and borderline significant decrease in body weight at the 1 year follow up.	
Good/ A	Wu, S. V., Lee, M. C., Liang, S. Y., Lu, Y. Y., Wang, T. J., & Tung, H. H. (2011). Effectiveness of a self-efficacy program for persons with diabetes: A randomized controlled trial. *Nursing and Health Sciences, 13*, 335-343. Taiwan	RCT	Participants were pretested to establish a baseline and then post-tests were undertaken 3 and 6 months after the baseline data were collected. The participants in the intervention group received the standard diabetes education program and an additional self-efficacy program (Self-Efficacy Enhancing Intervention Program-SEEIP)	145 patients. 72-intervention 73-control	Patients were treated at an outpatient clinic of a municipal hospital.	Baseline, 3 and 6 months	The scores for the efficacy expectations, outcome expectations, and self-care activities had significantly increased in the intervention group at the 3 and 6 months follow-ups, when compared to those of the control group. A smaller proportion of the participants in the intervention group had been hospitalized or had visited and emergency room than in the control group at the 6 month follow-up.	This study revealed that a self-efficacy program for diabetes was acceptable and effective in the short term in the self-management of persons with type 2 diabetes.
Good/ A	Yukawa, K., Yamazaki, Y., Yonekura, Y.,	RCT	Evaluation of the Chronic Disease Self-management Program by comparing	128 participants with diabetes	Participants were recruited from 18 Chronic Disease	Baseline, 3 and 6 months	The findings indicated statistically significant positive changes in	These finding suggest that the CDSP can be effective for Japanese people with

	Togari, T., Abbott, F., & Homma, M.,...Kagawa, Y. (2010). Effectiveness of chronic disease self-management program in Japan: Preliminary report of a longitudinal study. *Nursing and Health Sciences, 12*, 456-463. Japan		changes in health outcomes. The program is a patient centered educational program for the self-management of chronic conditions delivered by one of 18 workshops. The health outcomes that were measured included health status, self-management behaviors, utilization of health services, self-efficacy, satisfaction with daily living, and clinical indicators.		Self-management Program workshops		health distress, coping with symptoms, stretching exercises, communication with the physician, and satisfaction with daily living. The positive changes were especially remarkable among the groups with diabetes and rheumatic disease.	chronic conditions.
Fair/A	Zyskind, A., Jones, K. C., Pomerantz, K. L., & Barker, A. L. (2009). Exploring the use of computer based patient education resources to enable diabetic patients from underserved populations to self-manage their disease. *Information Services*	RCT	Both received standard of care diabetes treatment. The intervention group received additional computer based diabetes education in either English or Spanish from the Medline-Plus.gov website	108 participants 58 in intervention group 50 in the control group	Large urban community health center with Spanish speaking patients.	3,6 and 9 months	The intervention group had a small decline in HgA1c (-0.3%) and LDL (-9.9mg/dl). The control group had a small increase in HgA1c (+0.1%) and LDL (+0.5mg/dl)	The study allowed patients with low-literacy levels to receive health information targeted for their comprehension. The study found a downward trend in both HgA1c and LDL. Due to small size the differences were not statistically significant. This study supports the theory that computer based patient education can

	& Use, 29, 29-43.USA							positively impact clinical outcomes.

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