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Telehealth and Diabetes Self- Management Education and Support for Improving Health Outcomes in Adults with Type 2 Diabetes: An Integrative Review

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Telehealth and Diabetes Self- Management Education and Support for Improving Health Outcomes in Adults with Type 2 Diabetes: An Integrative Review

A Scholarly Project

Submitted to the

Faculty of Liberty University

In partial fulfillment of the requirements for the degree of

Doctor of Nursing Practice

by

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July, 2018

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ABSTRACT

With the increasing problem of access to health care, telehealth is an evidence-based service that uses a variety of technologies to provide quality healthcare. The use of telehealth services improves self-efficacy, self-management, and glycemic control in adults with type 2 diabetes mellitus after adults receive Diabetes Self-Management Education and Support (DSMES). Type 2 diabetes is the most common form of diabetes. If not self-managed, adults with type 2 diabetes are at increased risk of complications, which can be serious, costly and deadly. This integrative review provides an appraisal of the evidence published regarding the use of telehealth for the management of adults with type 2 diabetes. The results of these studies showed improvement in glycemic control after receiving telehealth services for the self-management of type 2 diabetes. The literature suggests that telehealth interventions are effective in helping to manage type 2 diabetes glycemic control, and to provide adults with type 2 diabetes with the knowledge and skills to better self-manage their type 2 diabetes. The mismanagement of type 2 diabetes contributes to uncontrolled glycemic levels that can lead to other disease-related complications, such as microvascular and macrovascular disease.

Keywords: Type 2 Diabetes, Telehealth, Telephone follow-up, self-efficacy, Diabetes Self-Management Education and Support (DSMES)

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Telehealth and Diabetes Self-Management Education and Support for Adults with Type 2 Diabetes Mellitus

According to the Center for Disease Control (CDC), diabetes is a complex chronic disease with significant health and financial implications (CDC, 2016). About 30.2 million adults ages 19 or older, or 12.2% of all United States adults have diabetes (CDC, 2016). Despite the availability of resources, education, and treatments, glycemic goals are not being reached among adults with type 2 diabetes mellitus according to the American Diabetes Association (ADA, 2018a). A goal of *Healthy People 2020* (2017), is to reduce the disease burden of diabetes mellitus and to improve the quality of life for all people who have the disease or are at any risk for developing diabetes mellitus. Diabetes Self-Management Education and Support (DSMES) is a clinical intervention recommended for all adults with diabetes to improve health outcomes (ADA, 2018a). The ADA *Standards of Medical Care in Diabetes-2018 Abridged for Primary Care Provider* (ADA, 2018a, 2018b), strongly recommends that adults with type 2 diabetes be offered patient-centered DSMES, which the level of evidence is rated grade B for supportive evidence from well-cohort studies. DSMES may be given in group or individual settings or using technology such as telehealth. Telehealth increases access to healthcare and is associated with increased self-efficacy and self-management in adults with type 2 diabetes (Crowley et al., 2013). Telehealth has been validated to be a cost-effective alternative to face-to-face visits between provider and patients that improve health outcomes for adults with type 2 diabetes mellitus (National Conference of State Legislatures, 2016; United States Department of Veteran Affairs, 2016). This integrative review will provide a synthesis of published literature related to evidence-based

telehealth-based DSMES for adults with type 2 diabetes and the recommendation for healthcare providers to implement it into practice. This review will reveal to healthcare providers the state of the science of DSMES, and telehealth in the evidence-based management of type 2 diabetes. This review will allow for the advanced practice nurse to improve the glycemic levels and self-care knowledge to improve self-reported glycemic control among adults with type 2 diabetes.

Background

Type 2 Diabetes Mellitus

Diabetes is a complex chronic disease with significant health and financial implications. Diabetes is a condition in which blood glucose levels are higher than normal. The most common criteria for the diagnosis of diabetes is HbA1c greater than or equal to 6.5% (ADA, 2018a, 2018b, 2018c). Diabetes mellitus is a disease caused by insulin deficiency resulting in hyperglycemia. Type 1 diabetes mellitus, is an auto-immune disease, in which the insulin-producing beta cells are destroyed rendering patients dependent on insulin for life (ADA, 2018c). Type 1 diabetes accounts for 5% of people with diabetes (ADA, 2018c). According to National Institutes of Diabetes and Digestive and Kidney Disease, (NIDDK) (2017), type 2 diabetes has several phenotypes of hyperglycemia with insulin resistance leading to a varying degree of insulin secretion deficits. According to ADA, type 2 diabetes is the most prevalent form of diabetes (ADA, 2018a). The diagnostic tests for type 2 diabetes include: fasting blood glucose test (FGT), 2-hour postprandial glucose during a 75gm oral glucose tolerance test, and HbA1c (ADA, 2018a). According to the ADA (ADA, 2018a, 2018b, 2018c), a reasonable HbA1c goal is for most patients with type 2 diabetes is less than 7.0%. The assessment of glycemic

control can be done with patient self-monitoring of blood glucose (SMBG) and HbA1c, which can be used to assess the effectiveness and safety of glycemic control.

In 2016, it was estimated that 29.1 million people have type 1 or type 2 diabetes in the United States, which is about 1 out of every 11 people (CDC, 2016). The CDC is working to reverse the US diabetes epidemic by tracking disease trends, focusing on prevention, identifying effective treatments and improving medical care. The total estimated cost of managing diabetes in the United States increased to $327 billion 2017 from $245 billion in 2012, which is a 26% increase from the previous estimate (ADA, 2018c). The ADA (2018c), published the Economic Cost of Diabetes in the U.S. in 2017, which addresses the increased financial burden, health resources used, and the loss of productivity related to diabetes. The ADA (2018c) reported that most Americans with type 2 diabetes are not reaching the ADA target goal of HbA1c of less than 7.0%. Results from the National Health and Nutrition Examination Survey (NHANES) reported that 50% of American adults with type 2 diabetes are achieving HbA1c less than 7.0%.

Type 2 diabetes is treated with lifestyle modifications for all and medications for some. There are several glucose-lowering medications, which include oral medications non-insulin injectables and insulin. Self-Monitoring of Blood Glucose (SMBG) and HbA1c are used to assess the management of glycemic control (ADA, 2018a, 2018b, 2018c). Suboptimal self-management behaviors and elevated glycemic levels in adults with type 2 diabetes can cause higher mortality and complication rates and lead to poor clinical outcomes. Type 2 diabetes is associated with major complications and comorbid illnesses, including blindness and vision problems, nervous system disorders, kidney disease, amputations, periodontal disease, heart disease, and stroke (Figure 1). The goal

of telehealth-based DSMES is to improve glycemic control and to reduce clinical complications related to uncontrolled type 2 diabetes (ADA, 2018a, 2018b, 2018c; CDC, 2013).

The ADA (2018a), updates their "Standards of Care in Diabetes" on a yearly basis, which is referred to as the Standards of Care. The ADA Standards of Care provide evidence-based practice guidelines that offer a recommendation for the management of type 2 diabetes in adults. The Standards of Care in Diabetes, (ADA, 2018a), offers a guide for adults with type 2 diabetes management, evidence-based management of type 2 diabetes with self-management of blood glucose in conjunction with telemedicine support. The ADA (2018a; 2018b), continues to recommend that adults with type 2 diabetes be offered high-quality self-management education.

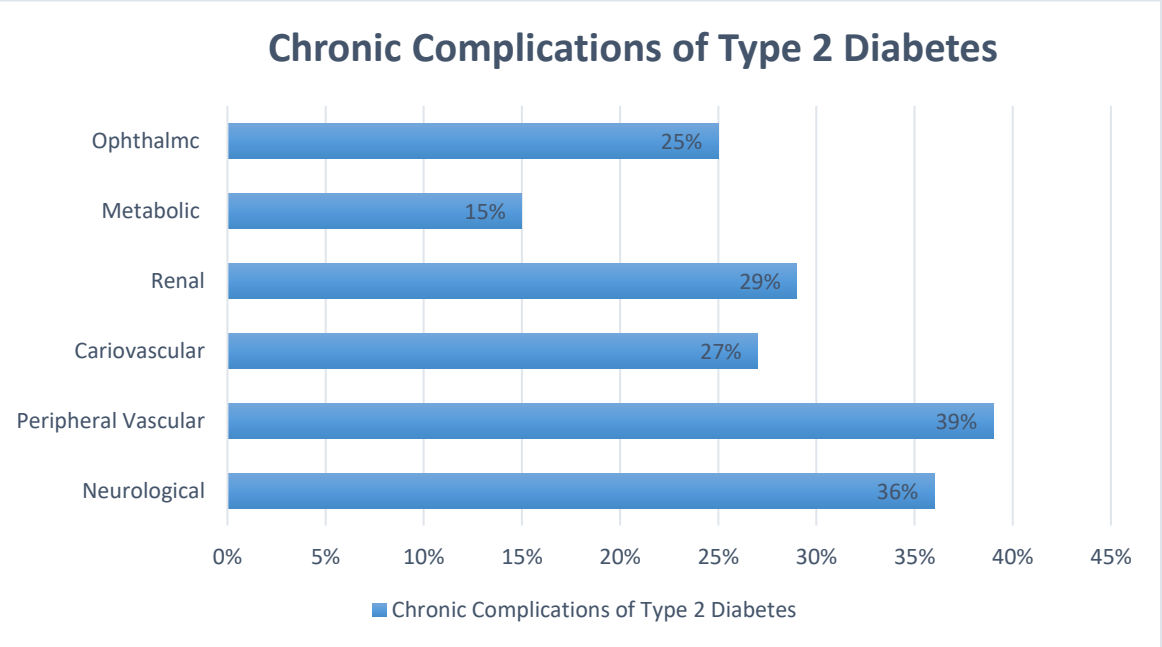

Figure 1. Chronic Complications of type 2 diabetes (ADA, 2018c).

Diabetes Self-Management Education and Support

An important part of diabetes management centers around personal lifestyle and self-care behaviors. DSMES is an evidence-based intervention recommended for all adults with diabetes, to improve patient outcomes (ADA, 2018a). Adults with type 2 diabetes can be referred by their primary care providers to DSMES at four critical times, at diagnosis, annually, when complicating factors occur, and during transitions in care (Beck et al., 2017). DSMES equips adults who have diabetes with the knowledge and skills necessary for diabetes self-care (ADA, 2018a). DSMES has been effective at improving short-term process measures such as knowledge, self-monitoring of blood glucose skills, HbA1c, cholesterol screening, and dietary habits (Strawbridge, Lloyd, Meadows, and Howell, 2017). Edelman and Polonsky (2017), suggest that improvements after a nurse-managed home telemonitoring often wane after the program is completed. There are implications for the Advanced Practice Registered Nurses (APRNs) to provide ongoing support to adults with type 2 diabetes. Diabetes self-management education and support programs can be tailored for adults with type 2 diabetes with the goal of improving glycemic control by increasing self-management skills, knowledge, and self-care in conjunction with ongoing telehealth support (Beck et al., 2017).

Beck et al. (2017), reported that the National Standards for DSMES should be used as a tool for insurance companies to assure reimbursement to providers who oversee self-management education to individuals with diabetes. Medicare reimburses DSMES in 30-minute increments, and the patient must pay 20% of the reimbursement for each session (CMS, 2018). The cost of DSMES to patients is a factor in the use of DSMES Center for Disease Control (CDC, 2018). Reports confirm that less than 7 % of those

with private insurance and 5% of Medicare beneficiaries, with newly diagnosed diabetes, utilized their DSMES benefits between 2 months prior to and 1 year following their diagnosis, which is why there is a proportionately high rate of diabetes among Medicare beneficiaries (Strawbridge, Lloyd, Meadows, and Howell, 2015; CDC, 2014). Strawbridge et al. (2015), recommended that increasing health care providers' awareness of the use of DSMES and decreasing the cost of DSMES could help operationalize the use of DSMES benefits among Medicare beneficiaries. The added cost of copayments is a barrier to participation in DSMES (CDC, 2018). The Center for Health Law and Policy Innovation of Harvard Law School (CHLPI), recommended a reduction or elimination of cost-sharing DSME in Medicare programs (CHLPI, 2015).

DSMES, is covered by Medicare and could cover up to 10 hours of initial DSMES (CMS, 2018). Each year an adult with type 2 diabetes who is covered by Medicare qualifies for up to 2 hours of follow-up training each year. DSMES has been shown to be a cost-effective intervention that decreases hospital admissions and readmissions (Healy, Black, Harris, Lorenz, and Dugan, 2013). Reimbursement for DSMES is available from the Centers for Medicare and Medicaid Services (CMS) and many private payers (CMS, 2018). In order to be eligible for DSMES reimbursement, DSMES programs must be recognized or accredited through programs recognized by the ADA or by the American Association of Diabetes Educators (AADE) (CMS, 2018). Currently, CMS reimburses for 10 program hours of initial diabetes education and 2 hours in each subsequent year (CMS, 2018).

Telehealth Utilization in the Management of Type 2 Diabetes Mellitus

The Health Resources and Services Administration (HRSA) defines telehealth as "the use of electronic information and telecommunications technologies to support and promote long-distance clinical health care, patient, and professional health-related education, public health and health administration" (HRSA, 2015). Telehealth services increase access to healthcare and improve health outcomes. Telehealth-based DSMES is provided through accredited programs recognized by the ADA or AADE (CMS, 2018). The cost of telehealth-based DSMES is the same amount as a face-to-face visit (CMS, 2018). There are coverage issues with Medicare reimbursement, and there are limits to where patients can receive telehealth services (CDC, 2018). Telehealth-based DSMES can be used for ongoing DSMES for adults with type 2 diabetes (Beck et al., 2017). It is further suggested that DSMES be offered to patients diagnosed with type 2 diabetes in conjunction with the use of a telehealth-based DSMES to increase access to DSMES for adults with type 2 diabetes (Beck et al., 2017).

The use of telecommunication is associated with increased self-efficacy and self-management in adults with type 2 diabetes (Crowley et al., 2013). Telehealth services allow for health care services to be offered remotely via telecommunication tools, including telephones, smartphones, and mobile wireless devices, with or without a video connection (Dorsey and Topol, 2016). Home Telehealth programs allow adults with type 2 diabetes to monitor their blood glucose levels and vital signs in the home, which allows them to self-manage their care needs (Crowley et al., 2013). Telehealth services offer remote monitoring of adults with type 2 diabetes for self-management and glycemic control.

The Institute of Medicine (2010), released *The Future in Nursing, Leading Change, Advancing Health,* which recommended that nurses expand their roles and master technological tools and information management systems for inter-professional collaboration and care coordination (IOM, 2010). Telehealth affords the Primary Care Provider (PCP) the use of technology to provide remote clinical care. Telehealth has validated improved adherence to diabetes self-management for adults with type 2 diabetes, Agency for Healthcare Research and Quality (AHRQ, 2018). Telehealth interventions (typically health communication via computer, telephone, or other electronic means) were suggested, to involve independent practitioners for adults who were selected by their primary care provider, in addition to the usual face-to-face follow-up visits (VA/DoD, 2017).

Telehealth is not readily available to all adults with type 2 diabetes due to constraints of services that are provided under certain conditions Centers for Medicare & Medicaid Services (CMS, 2018). Currently, 32 states and the District of Columbia in the United States require private insurance companies to reimburse telehealth providers for care provided remotely via telehealth services, National Conference of State Legislatures, (NCSL, 2016). At this time telehealth services are offered to Medicare beneficiaries who live in rural areas (CMS, 2018). Telehealth services in rural areas do offer DSMES, individual and group training, with a minimum of 1 hour of in-person instruction (CMS, 2018). In Congress, bill S.787 Telehealth Innovation and Improvement Act of 2017, was introduced to expand telehealth services for Medicare coverage regardless of the Medicare beneficiary's location or area of residence (CMS, 2018). If passed by Congress, this bill will allow for the CMS to offer telehealth services to Medicare

beneficiary's and telehealth providers will be able to bill Medicare for a certified enhanced telehealth service (CMS, 2018). The Advanced Practice Nurse can utilize telecommunication and information technology to provide diabetes education and support. Through care coordination of telehealth and DSMES, adults with type 2 diabetes may improve access to quality healthcare and improve diabetes management.

Chrvala, Sherr, and Lipman (2015) suggested DSMES be provided to adults with type 2 diabetes with the mode of delivery being classified into four categories, which include:

1. Individual Education
2. Group Education
3. Combination of individual and group education,
4. By remote methods, such as online or by telephone.

There was a decrease in HbA1c levels for adults with type 2 diabetes who completed DSMES remotely (online or telephone). Telehealth with DSMES has been shown to be a cost-effective intervention that decreases hospital admissions and readmissions (Healy, Black, Harris, Lorenz, and Dugan, 2013). See Figure 2.

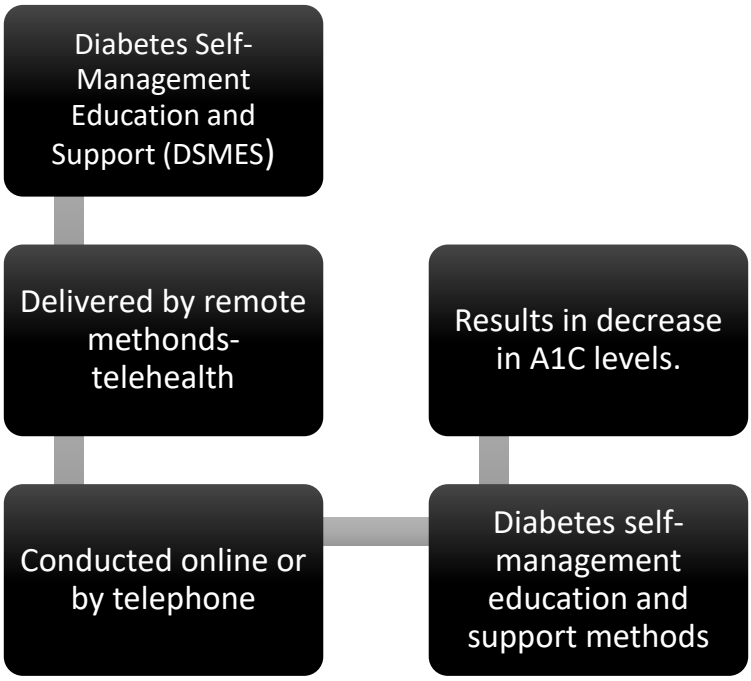

Figure 2. Flowchart of DSMES and the use of telehealth (Chrvala et al., 2016; Beck et al., 2017; AHRQ, 2018; VA/DoD, 2017).

Problem Statement

Despite advances in understanding the pathogenesis of type 2 diabetes, new medications, and technology, many adults with type 2 diabetes still are not at their optimum glycemic goal (ADA, 2018c). The target goal for HbA1c is 7% for most patients for optimal diabetes management (ADA, 2018a, 2018b, 2018c). Glycemic control prevents or delays the development of microvascular and macrovascular disease (ADA, 2018a, 2018b, 2018c). DSMES has demonstrated to be cost-effective and associated with improved clinical outcomes (Chrvala, Sherr, & Lipman, 2015). According to the CDC (2014) and Strawbridge et al. (2017), less than 7% of patients with private insurance and only 5% of Medicare beneficiaries, with newly diagnosed with diabetes, utilize their DSMES benefits within the first year after their diabetes diagnosis.

There are many barriers currently preventing patients with diabetes from accessing DSMES. The Center for Health Law and Policy Innovation of Harvard Law School (CHLPI), reported barrier related issues include, the patient/provider level that the patient does not need DSMES, and many patients, educators, and providers reported that coverage and cost of DSMES services are inhibiting access to DSMES services (CHLPI, 2015). The National Standards for DSMES recommended that persons with diabetes receive ongoing support and multiple services (Beck et al., 2017). The Standards for DSMES anticipate that changes in reimbursement policies stand to increase DSMES access and utilization, which could result in improved clinical outcomes, quality of life, health care utilization and cost (Beck et al., 2017). Telehealth services use technology to increase access to healthcare and improve health outcomes (VA/DoD, 2017). The use of telehealth for DSMES for adults with type 2 diabetes needs to be addressed as an intervention.

Purpose and Significance of this Scholarly Project

The purpose of this integrative review is to present the state of evidence to healthcare providers regarding the effectiveness of DSMES and telehealth to improve health outcomes of adults with type 2 diabetes mellitus. The goal of this integrative review is to provide a synthesis of the evidence and to make recommendations to healthcare providers who manage adults with type 2 diabetes regarding the use of DSMES via telehealth for DSMES.

Clinical Questions

This integrative review will address the following clinical question: In adults with type 2 diabetes mellitus, does telehealth with DSMES intervention improve glycemic control, self-management, and self-efficacy?

Questions to support and maintain the focus of this review:

1. Have DSMES and telehealth strategies demonstrated effectiveness in improving glycemic control in adults with type 2 diabetes mellitus?
2. How are self-management, self-efficacy, and glycemic control affected by DSMES and telehealth interventions in adults with type 2 diabetes mellitus?
3. What type of professional knowledge, and skills does the healthcare provider, who provides cares for adults with type 2 diabetes mellitus, need to obtain to implement telehealth-based DSMES intervention?
4. What settings and situations have been studied, with the adult who has type 2 diabetes mellitus, with telehealth interventions?

The goals of this project are:

1. To provide an integrative review of the literature related to the effectiveness of telehealth and DSMES in the management of adults with type 2 diabetes.
2. To discover the feasibility and advantages of telehealth-based DSMES use among healthcare providers.
3. To provide a recommendation for the use of telehealth and DSMES in the management of adults with type 2 diabetes.

Methods

This integrative review followed Whittemore & Knalf's updated Integrative Review Methodology. Whittemore & Knalf (2005) suggested that the methodology improve the rigor of the integrative review. This integrative review method will be used to display diverse methodologies, such as experimental and non-experimental research (Whittemore & Knalf, 2005). The conceptual framework developed by Whittemore and Knalf (2005), provided guidelines for conducting integrative research review, and is the methodology used for this integrative review. This conceptual framework allows for diverse methodologies, which plays a large role in evidence-based practice for the nursing synthesis of evidence related to telehealth and DSMES. Many researchers perform integrative research to define the state of knowledge concerning the topic of focus (Cooper, 1982). An integrative review will be conducted to investigate the use of telehealth intervention for DSMES for adults with type 2 diabetes mellitus in the primary care settings.

Framework

The framework for this scholarly project is supported by Whittemore's and Knafl's modified framework for research reviews using the integrative reviewed methods (2005). This framework methodology of integrative reviews includes a more systematic and rigorous approach to the review (Whittemore & Knafl, 2005).

Melnyk and Fineout-Overholt Critiquing Evidence. Melnyk and Fineout-Overholt (2015), the hierarchy of evidence tool was used for analyzing the literature for intervention questions (Table 3). The critical appraisal of evidence from the search process is important to check for the validity, reliability, and applicability of the proposed

clinical questions (Melnyk and Fineout-Overholt, 2015). Melnyk's Levels of Evidence has seven levels, (level one is the highest level), including evidence from a systematic review or meta-analysis of all relevant randomized controlled trials, up to level 7, the expert opinion (Melnyk and Fineout-Overholt, 2015).

Whittemore and Knafl. Whittemore and Knafl (2005), noted that conducting a rigorous integrative research review was needed for knowledge, which formed the foundation of nursing practice. Whittemore and Knafl recommended conducting the integrative research review for nursing with a focus on data analysis and synthesis (Whittemore & Knafl, 2005). There are five stages of the integrative review:

1. Problem Identification
2. Literature Search
3. Data Evaluation
4. Data Analysis
5. Presentation of Results

This integrative review provided a synthesis of published literature concerning telehealth and DSMES for adults with type 2 diabetes and looked at research that was left unresolved. Each stage of the integrative review looks at the strategies that enhance the rigor of diverse methodologies.

Problem Identification Stage

This stage looked at the identification of the problem and the variables interest (Whittemore & Knafl, 2005). The problem addressed in this integrative review of literature is the use of telehealth for the DSMES intervention for the management of

glycemic control, self-management, and self-efficacy for adults with type 2 diabetes mellitus. Variables of interest for this project include:

1. Current guides for the use of telehealth for the management of glycemic control.
2. Telehealth based diabetes self-management education and support.
3. The knowledge needed for healthcare providers to utilize telehealth-based DSMES for the management of type 2 diabetes mellitus to obtain glycemic control and self-management skills.
4. Primary care setting for telehealth intervention for adults with type 2 diabetes.

According to Edelman and Polonsky (2017), despite the availability of new medications and technologies adults with type 2 diabetes are not at their acceptable glycemic control. Evidence showed improvement in glycemic control during telehealth monitoring, and glycemic levels increase once the program has ended. According to Garelick (2015), no long-term studies have been evaluated for the effectiveness of telehealth, and the overall effect on morbidity and mortality in the long-term management of diabetes.

DSMES is an evidence-based intervention recommended for all adults with diabetes to improve patient outcomes (ADA, 2018a, 2018b, 2018c). Equipping, adults with type 2 diabetes knowledge regarding diabetes pathophysiology, diet, medication, and physical activity will increase their confidence in diabetes self-management (Beck et al., 2017). Telehealth will also allow health care providers to track Self-Monitoring of Blood Glucose (SMBG) reading remotely while offering opportunities for personalized DSMES (Beck et al., 2017).

Literature Search Stage

Locating the best information sources involved the search for evidence-based research, and included searching in bibliographic databases, an ancestry approach, and a descendancy approach. The key search terms were: type 2 diabetes, diabetes knowledge, primary care, telehealth, telemedicine, diabetes management, and DSMES. Boolean operators used simple words (AND, OR, and NOT) to help focus and narrow the search results from the different databases (Holly, Salmond, & Saimbert, 2017). The search result identified 1,323 studies, guidelines, and reviews with no other studies from other sources identified using the keywords: type 2 diabetes, telehealth, self-management, and diabetes self-management education and support. Of the 1,323 articles, 482 were duplicates. During the screening after excluding titles, 841 were screened, and 700 of the reviews were excluded for not meeting the selection criteria. Full-text articles assessed for eligibility 141. The further review yielded an additional 108 studies were excluded based on the exclusion criteria, leaving 33 studies for critical review. The critical review of 33 studies is available in Table 2.

A comprehensive literature search was conducted electronically using the following databases, Cochran Library, MEDLINE with Elton B. Stephens Co. (EBSCO), Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, ProQuest, Journals@Ovid, National Guidelines Clearinghouse, and Clinical Key from 2013 to 2018. The project leader recognizes that obtaining all the primary data on the problem can be a challenge, due to the increased volume of data available for search. Data collection methods are used for locating the maximum number of eligible studies.

Data Evaluation Stage

Locating the best information sources involved the search for evidence-based research, and included searching in bibliographic databases, an ancestry approach, and a descendancy approach. The key search terms were: type 2 diabetes, primary care, telehealth, telemedicine, diabetes management, DSMES, and DSMS. Boolean operators (AND, OR, and NOT) were used to help focus and narrow the search results from the different databases (Holly, Salmond, & Saimbert, 2017). Sources were coded on a 2-point scale (high or low), and no source was excluded based on the rating (Whittemore & Knafl, 2005). Evaluation of the quality of diverse primary sources in the integrative review is complex (Whittemore & Knafl, 2005).

Data Analysis Stage

The integrative review of this stage analysis and interpret the data collected about the research problem. During this stage, data points synthesized into a unified statement about the research problem (Cooper, 1982). The data analysis stage required that the data from studies be ordered, coded, categorized, and summarized the research problem (Cooper, 1998). Melnyk's Level of Evidence (2015), I-VII rating system was used to support the evaluation and analysis of data collected during this stage. Each data points were analyzed and synthesized to protect validity.

Data Reduction. The data reduction has two phases. The first phase involves the determination of an overall classification system for managing the data from diverse methodologies (Whittemore & Knafl, 2005). The primary sources included in the integrative review are divided into subgroups to facilitate analysis of data. The primary subgroup classification is based on the level of evidence analyzed chronologically. The

second phase involves techniques of extracting and coding data from primary sources to simplify, abstract, focus, and organize data into a manageable framework (Whittemore & Knafl, 2005).

Data Display. The next step in data analysis is data display, in which the extracted data can be in the form of matrices, graphs, charts, or networks (Whittemore & Knafl, 2005). According to Whittemore and Knafl (2005), the data displays enhances the visualization of patterns within and across data sources. Data has been displayed in graphs and charts

Data Comparison. This phase involves the iterative approach of examining data displays of primary data that identifies patterns, themes, or relationships (Whittemore & Knafl, 2005). During this step, key data can be identified and compared for important and accurate patterns and themes (Whittemore & Knafl, 2005).

Conclusion Drawing and Verification. The final step in data analysis is conclusion drawing and verification of data that moves from the interpretive phase to higher levels of abstraction. The final of the integrative review is the synthesis or conclusion of each subgroup into a summary. The review process is completed when a new conceptualization of the sources integrates all subgroups into a comprehensive portrayal of the topic of concern (Whittemore & Knafl, 2005).

Presentation of Results. The results of the integrative review can be the translation of the reviewer's notes, printouts, and remembrances into public documentation for the accumulation of knowledge (Cooper, 1982). The tables are ordered to consist of levels of evidence and sources, a focus of literature background, conclusions, an implication for practice, and recommendations. The conceptual maps

were used to display patterns, themes, and relationships identified during data analysis. The results detect the complexity of the topic and contribute to a new understanding of the phenomenon of concern. The implications for practice are emphasized in addition to implications for research and policy.

Eligibility Criteria. Sampling criteria or eligibility criteria included eligibility of the target population. The target population of this project was adults, 19 years of age and older, with an established diagnosis of type 2 diabetes with a HbA1c level greater than 8.0% requiring self-care and management. The search of literature included publications from January 1, 2013, to May 1, 2018. Criteria for using publications included articles referencing type 2 diabetes and telehealth intervention with full-text availability, English-language reports, and U.S. and International-based research trials. Eligibility criteria for data collection were supported by inclusion and exclusion criteria found in Table 2.

Results

Study Selection

There are 33 research articles included in this integrative review (See Table 1). The types of design include the following: seventeen level-1 systematic review and meta-analysis of randomized controlled trials (Department of Veteran Affairs/Department of Defense, 2017; ADA, 2018a, 2018b, 2018c; Ferguson et al., 2015; Suksomboon et al., 2014; Fitzner, Heckinger, Tulas, Specker, & McKoy, 2014; Lepard, Joseph, Agne, and Cherrington, 2015; Su et al., 2015; Agency for Healthcare Research and Quality, 2016; Gervera & Graves, 2015; Beck et al., 2017, Dickinson et al., 2017; Dickinson et al., 2015; CHLPI, 2015; Garelick, 2015; Beck et al., 2017; Chrvala, C.A., Sherr, D., and Lipman, R.D., 2016); eleven level 2-randomized controlled trials (Brown-Deacon et al.,

2016; Steventon, Bardsley, Doll, Tuckey,& Newman, 2014; Chen, Wang, Lin, Hsu, & Chen, 2014; Egede, Williams,Voronca, Gebregzibher, & Lynch, 2016; Moreira et al., 2017; Blackberry et al., 2013; Odnolekova, Goderis, Nobels, Aetgeerts, & Ramaekers, 2014; Lashkari, Borhani, Sabzevari, & Abbaszadeh, 2013; Nelson, Mulvaney, Gebretsadik, Johnson, & Obsborn, 2016; Crowley et al., 2013; Strawbridge et al., 2017); one level-4 case-control or cohort study (Iannitto, Dickman, Lakhani, & June, 2014); three level-5 systematic review of descriptive & qualitative studies (Hanley et al, 2015; Barker, Mallow, Theeke, & Schwertfeger, 2016; L'Esperance, & Perry, 2015); and one level-6 single descriptive or qualitative study (Cherrington et al., 2015). Results of the integrative review received further discussion using descriptive narratives and concept mapping.

Telehealth and Adults with Type 2 Diabetes

Have DSMES and telehealth strategies demonstrated effectiveness in improving glycemic control in adults with type 2 diabetes mellitus?

Fifteen of 33 studies discussed and/or reviewed telehealth for the management of adults with type 2 diabetes for improving glycemic control (Iannitto et al., 2014; Ferguson et al., 2015; ADA, 2018a, 2018b, 2018c; Department of Defense/Department of Veteran Affairs, 2017; Cherrington et al., 2015; Egede et al., 2016, Agency for Healthcare Research and Quality, 2016; Fitzner et al., 2014; Steventon et al., 2014; Gervera & Graves, 2015; Lepard et al., 2015; Moreira et al., 2017; Suksomboon et al., 2014; Blackberry et al., 2013; Su et al., 2015). These articles focused on the use of telehealth for the management of adults with types 2 diabetes in the primary care setting.

The use of telehealth technologies allows for primary care healthcare providers to manage adults with type 2 diabetes to improve their glycemic control. Telehealth interventions (typically health communication via computer, telephone, and other electronic means) were suggested to involve independent practitioners to adults selected by their primary care provider in adjunct to usual face-to-face follow-up visits (VA/DoD, 2017). Health care providers in primary care treating adults with type 2 diabetes should offer telehealth services with the frequent non-face-to-face follow-up to reassess their self-management of their type 2 diabetes. Frequent evaluation of glycemic readings may promote adults with type 2 diabetes understanding of the disease, treatment, and self-management with diet and exercise. Telehealth technologies allow health care providers who treat adults with type 2 diabetes to track the adults with type 2 diabetes progress towards their diabetes self-management. Health care providers are trained to identify if any additional teaching or medication adjustments are needed to improve adults with type 2 diabetes glycemic control.

When considering the use of telehealth technologies in the management of adults with type 2 diabetes adults in the primary care setting the goal is to improve glycemic control. Several studies indicate that adults with type 2 diabetes need structured education and self-monitoring with continuous support, which can be offered via telehealth according to the literature (Ferguson et al., 2017; Gervera & Graves, 2015; Lepard et al., 2015; Su et al., 2015). This includes basic information regarding their disease, understanding and assisting in self-management skills, knowledge, and self-care with ongoing support. Literature suggests that high glycemic levels are associated with poor outcomes in adults with poorly controlled type 2 diabetes (Egede et al., 2016;

Cherrington et al., 2015; Nelson et al., 2016). Literature suggests that continuous medical care and patient self-management education helps to reduce the risk of long-term complications related to uncontrolled type 2 diabetes (Brown-Deacon et al., 2016; Odnolekova et al., 2014; Ferguson et al., 2015; Nelson et al., 2016; ADA, 2018a, 2018b, 2018c; VA/DoD, 2017). See Figure 3.

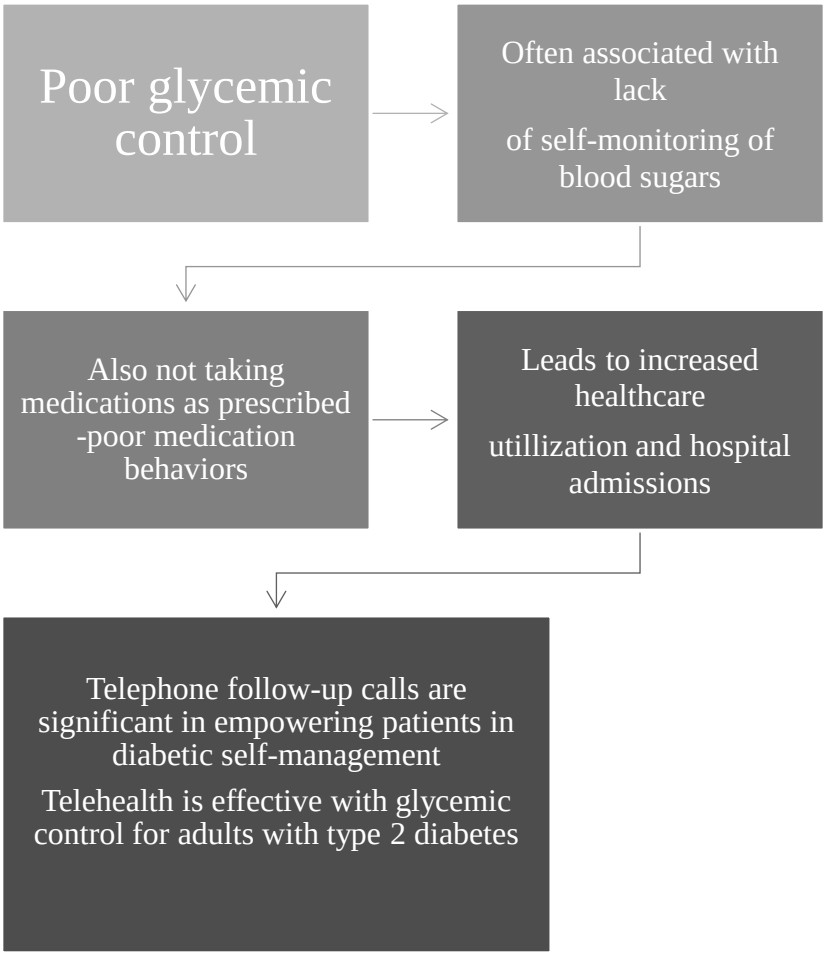

Figure 3. Poor glycemic control and the use of telehealth to improve (Brown-Deacon et al., 2016; ADA, 2018a, 2018b, 2018c; VA/DoD, 2017; AHRQ, 2016)

Telehealth for the Management of Type 2 Diabetes Guidelines

Two of the 33 studies discuss guidelines for the use of telehealth for the management of glycemic control in adults with type 2 diabetes. Many of the recommendations are weak on evidence or recommendations related to expert opinion, consensus, and studies for adults with type 2 diabetes (VA/DoD, 2017; ADA, 2018a). According to the VA/DoD, Clinical Practice Guideline for the management of Type 2 DM in Primary Care, two recommendations in this Clinic Practice Guideline are significant to this project proposal. Clinical Practice Guidelines recommended for DSMES are strongly recommended, and the use of telehealth interventions involving licensed independent practitioners to adults by their primary care provider as an adjunct to usual patient care is weak for the recommendation. This guideline recommendation for telehealth with the communication via computer, telephone, or other electronic means involving licensed independent practitioners was weak for the recommendation but is suggested as an option for the management of type 2 diabetes.

The ADA (2018a), developed the "Standards of Care in Diabetes," which is referred to as the Standards of Care. The ADA Standards of Care provides evidence-based practice guideline that provides a recommendation for the management of type 2 diabetes in adults. This guideline has a focus on patient education, dietary advice, managing cardiovascular risk, managing blood glucose levels, and identifying and managing long-term complications related to type 2 diabetes. The Professional Practice Committee (PPC) of the ADA, conducted a systematic review of literature from MEDLINE for published literature since January 2018 to develop the guideline recommendations (ADA, 2018a). A high-quality level was recommended to assess the

quality of evidence that supports self-management of type 2 diabetes by increasing knowledge and skills for self-managing type 2 diabetes. The ADA (2018a, 2018c), recommend self-monitoring with continuous telephone support, dose titration of medications to target levels, dietary understanding, and exercise. Telehealth is developing with the growth of evidence regarding its effectiveness in glycemic control (ADA, 2018a). All the guidelines and reviews agree that telehealth should be used for continuous DSMES for glycemic control. See Figure 4.

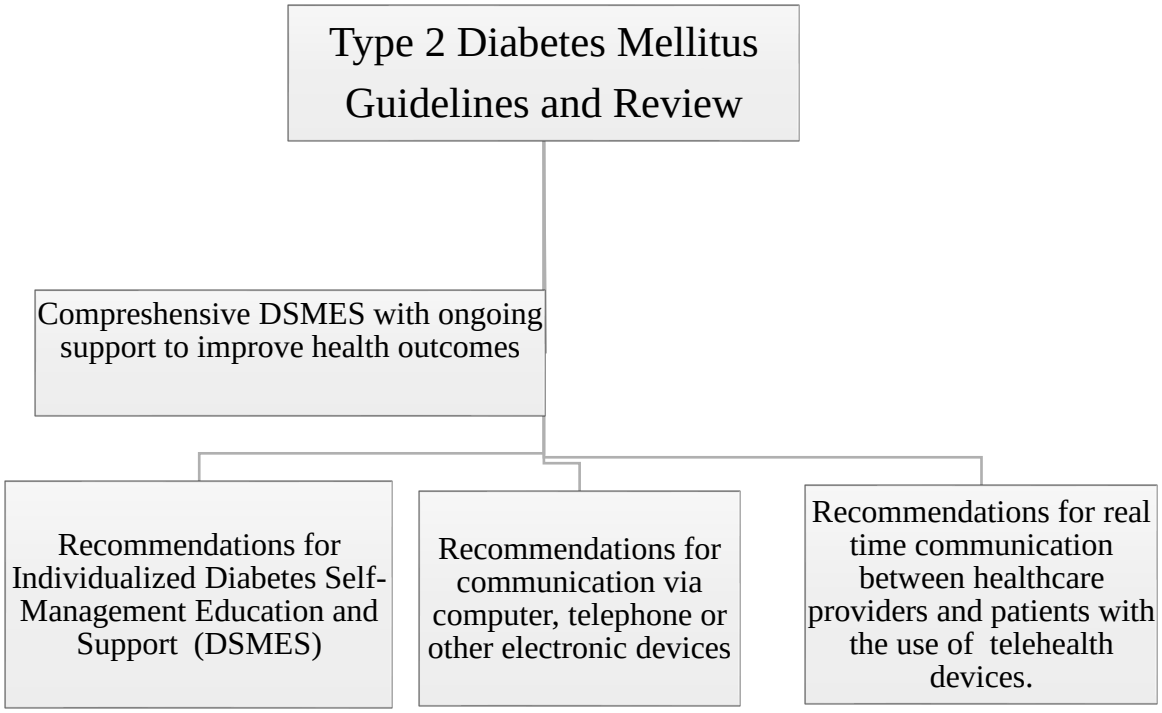

Figure 4. Type 2 Diabetes Mellitus telehealth guideline themes. Adapted from (VA/DoD, 2017 and ADA, 2018a).

Utilization. The Mid-Atlantic Telehealth Resource Center (MATRC) (2018), for this region have developed a website to assist healthcare providers to advance the

adoption and the utilization of telehealth within the mid-Atlantic states: Delaware, District of Columbia, Kentucky, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, and West Virginia (MARTC, 2018). This resource center offers education and training to healthcare professionals and offers guidance on initiating a telehealth program (MARTC, 2018). The University of Virginia (UVA) has developed a program that offers free self-management tele-education to areas in Virginia with higher-than-average risk for diabetes, called the Virginia Center for Diabetes Prevention & Education (VCDPE) (UVA, 2018). The VCPDE offers marketing resources to meet the needs of the healthcare providers organization's needs and details the technical requirements for high-speed internet and teleconferencing equipment with a large monitor for group viewing. The National Organization of Nurse Practitioners Facilities (NONPF) (2017), requires that all nurse practitioners (NPs) be competent in the utilization of telehealth, which addresses patient and healthcare system needs. The American Association of Colleges of Nursing (AACN) (2006), in *The Essentials of Doctoral Education for Advanced Nursing Practice*, emphasized the importance of the use of technology to improve patient outcomes. The evidence is demonstrated that telehealth for the support of self-management is effective in improving glycemic levels and psychosocial outcomes in adults with type 2 diabetes (Blackberry et al., 2013; ADA, 2018a; Fitzner et al., 2014).

Effectiveness. There is sufficient evidence that the use of telehealth is effective for adults with type 2 diabetes (Blackberry et al., 2013; Cherrington et al., 2015; AHRQ, 2016; Iannitto et al., 2014; VA/DoD, 2017; Strawbridge et al., 2017). The literature notes that telehealth for type 2 diabetes is effective for remote monitoring of glycemic levels (AHRQ, 2016). Compared to non-telemedicine, telemedicine interventions are more

effective in improving treatment outcomes for adults with type 2 diabetes (Su et al., 2015). Telehealth has demonstrated to be effective in reducing treatment gap and improving glycemic levels for adults with type 2 diabetes (Blackberry et al., 2013). The effectiveness of telehealth is in terms of patient clinical, psychosocial, and behavioral outcomes (AHRQ, 2016; VA/DoD, 2017; ADA, 2018a, 2018b; Fitzner et al., 2014). The use of telehealth has shown to be effective and efficient in improving health outcomes for those with type 2 diabetes and should be an area of interest for healthcare providers and healthcare organizations (Fitzner et al., 2014). Su et al. (2015) showed that telemedicine was more effective in improving treatment outcomes in type 2 diabetic adults, compared to conventional care.

Feasibility. Telehealth has shown to be effective and cost-effective. Fitzner et al. (2014), reviewed the economic analyses of telehealth interventions and found studies that showed that home telehealth care reduced hospital utilization and improved compliance, satisfaction, and quality of life. Diabetic self-management education and support via telehealth has shown to be cost-effective (Beck et al., 2017; Healy et al., 2013; Iannitto et al., 2014; L'Esperance & Perry, 2015). Cost-effectiveness is essential to support the utilization of telehealth-based DSMES, which has demonstrated the reduction of overall diabetes-related costs (AHRQ, 2016; VA/DoD, 2017; ADA, 2018a).

Telehealth and Type 2 Diabetes Outcomes

How are self-management, self-efficacy, and glycemic control affected by DSMES and telehealth interventions in adults with type 2 diabetes mellitus?

Twenty-six of the studies evaluate the primary outcomes for the use of telehealth for the management of adults with type 2 diabetes (ADA, 2018a, 2018b, 2018c; VA/DoD,

2017; AHRQ, 2016; Fitzner et al., 2014; Beck et al., 2017; Lepard et al., 2015; Ferguson et al., 2015; Su et al., 2015; Cherrington et al., 2015; Hanley et al, 2015; Egede et al., 2016; Suksomboon et al., 2014; Blackberry et al., 2013; Odnolekova et al., 2014; Lashkari, Borhani, Sabzevari, & Abbaszadeh, 2013, Chen et al., 2014; Steventon et al., 2014; Dickinson et al., 2017; Nelson et al., 2016; Iannitto et al., 2014; L'Esperance, & Perry, 2015; Gervera & Graves, 2015; Barker et al., 2016; L'Esperance, & Perry, 2015; CHLPI, 2015). Diabetes self-management education and support via telehealth empowered adults with type 2 diabetes to increase their knowledge and improve their self-care behavior to improve glycemic control (Fitzner et al., 2014).

Self-Management. Adults with type 2 diabetes must stay aggressively involved in self-management of their disease, making choices, problem-solving, and taking actions on a regular basis (ADA, 2018a, 2018b, 2018c; VA/DoD, 2017, AHRQ, 2016; Beck et al., 2017; Lepard et al., 2015; Garelick, 2015). Telehealth interventions for adults with type 2 diabetes are encouraged, as well as diabetes education through DSMES (AHRQ, 2016; Beck et al., 2017; Chrvala et al., 2016; Brown-Deacon et al., 2016). Knowledge and skills that are required for the self-management of type 2 diabetes, are taught in the DSMES training which is provided via telehealth (Fitzner et al., 2014; ADA, 2018a, 2018c; 2015; Dickinson et al., 2017; VA/DoD, 2017). Diabetes self-management education and support equip adults with diabetes with the knowledge and skills necessary for diabetes self-care (ADA, 2018a; Beck et al., 2017). DSMES programs can be tailored for adults with type 2 diabetes with the goal of improving glycemic control by increasing self-management skills, knowledge, and self-care with ongoing telehealth support (Beck et al., 2017; Chrvala et al., 2016; CDC, 2018; VA/DoD, 2017). The Department of

Veteran Affairs and the Department of Defense (VA/DoD) (2017), strongly recommend that patients with diabetes should be offered ongoing self-management education. A concept in self-management is self-efficacy, which is the confidence to carry out a behavior necessary to reach the desired goal (VA/DoD, 2017).

Self-Efficacy. Bandura (2012) reported that self-efficacy beliefs influenced how well people motivate themselves. Increasing self-efficacy for adults with type 2 diabetes increased self-management behaviors and motivated adults with type 2 diabetes to self-confident to manage their diabetes (VA/DoD, 2017; ADA, 2018a; Beck et al., 2017). Adults who have type 2 diabetes with uncontrolled glycemic levels need to be empowered to manage their diabetes (Brown-Deacon et al., 2016; Chen et al., 2014; ADA, 2018a, 2018b, 2018c). Improving self-efficiency also improved diabetes self-management and treatment outcomes for adults with type 2 diabetes (ADA, 2018a). The ADA (2018a., 2018b, 2018c), strongly recommends Self-Monitoring of Blood Glucose (SMBG), which acts as a tool to help to guide treatment decisions or self-management of type 2 diabetes. SMBG allows for adults with type 2 diabetes to evaluate their individual response to their treatment plan and access whether glycemic ranges are being accomplished (ADA, 2018a, 2018b, 2018c). Adults who received technology-based DSMES reported greater self-efficacy (confidence) in their ability to self-manage their type 2 diabetes (VA/DoD, 2017)

Glycemic Control. Adults with type 2 diabetes respond positively to diabetes self-management education and training via telehealth technologies to help improve their glycemic control (Fitzner et al., 2014; Lepard, Joseph, Agne, & Cherrington, 2015; AHRQ, 2016). Evidence suggests that telehealth had been associated with greater

oversight and self-care in adults with type 2 diabetes, and the use of telehealth improved glycemic control in adults with type 2 (Steventon et al., 2014; AHRQ, 2016). Telehealth technology is used to provide support and encouragement for adults with type 2 diabetes in self-managing activities such as glucose monitoring, exercise, and diet management found to improve glycemic control (AHRQ, 2016).

Telehealth Based Diabetes Self-Management and Healthcare Providers

What type of professional knowledge and skills does the healthcare provider, who provides care for an adult with type 2 diabetes mellitus, need to obtain to implement telehealth-based DSME intervention?

During this literature review, two clinical guidelines give healthcare providers knowledge of telehealth-based DSMES for managing adults with type 2 diabetes, which both have recommendations for the use of telehealth intervention for DSMES (ADA, 2018a, 2018c; VA/DoD, 2017). One review discusses the National Standards for DSMES for health care providers (Beck et al., 2017). Eighteen other studies discuss the healthcare providers utilization of telehealth-based DSMES for adults with type 2 diabetes (Dickinson et al., 2017; Nelson et al., 2016; Iannitto et al., 2014; L'Esperance, & Perry, 2015; AHRQ, 2016; VA/DoD, 2017; Fitzner et al., 2014; Ferguson et al., 2015; Suksomboon et al., 2014; Lepard et al., 2015; Su et al., 2015; Hanley et al., 2015; Blackberry et al., 2013; Odenolekova et al., 2013; Brown-Deacon et al., 2016; Barker et al., 2016; Cherrington et al., 2015; The Center for Health Law and Policy Innovation of Harvard Law School, 2015). Iannitto et al. (2014) and L'Esperance, & Perry (2015) reviewed the requirements for nurse practitioners to have competencies in technology for the use of telehealth. DSMES training providers must be certified by AADE for insurance

reimbursement (Beck et al., 2017; ADA, 2018a; VA/DoD, 2017; Strawbridge et al., 2015; Ferguson et al., 2015; Fitzner et al., 2014).

Professional Knowledge. Health care providers who are interested in Medicare reimbursement for DSMES must be accredited by the American Diabetes Association's Education Recognition Program (ERP) or the American Association of Diabetes Educator's Diabetes Education Accreditation Program (DEAP) (Strawbridge et al., 2015; Beck et al., 2017; ADA, 2018b; VA/DoD, 2017; CMS, 2018). A Certified Diabetes Educator (CDE) is a healthcare professional with comprehensive knowledge of and experience in diabetes management, prediabetes, and diabetes prevention (National Certification Board for Diabetes Educators (NCBDE). The CDE credential is administered by NCBDE, which require 1,000 hours of hands-on diabetes education prior to taking the exam (Dickinson, Lipman, & O'Brian, 2015). The Board Certification in Advanced Diabetes Management (BC-ADM) is another certification for diabetes health professionals, which is overseen by the AADE (Dickinson et al., 2015). The BC-ADM requires a master's degree or higher in a related clinical, educational, or management program, and 500 practice hours and a passing score on the exam is required (Dickinson et al., 2015).

According to Beck et al. (2017), in the Standard five paraprofessionals may contribute to DSMES services with the supervision of at least one CDE or BC-ADM. The AADE developed five practice levels for diabetes educators, each having different competencies for practice (Dickinson et al., 2017). In 2013, the AADE workgroup developed a Diabetes Paraprofessional with a practice scope that focuses on informational support (Dickinson et al.,2017). The Level 1 Paraprofessional may include

lay health workers, community health workers, promotora/promotors de salud (Hispanic community health promotor/promoters), peer counselor, and health navigators (Dickinson et al., 2017). Paraprofessional Level 2 includes community health workers, certified nursing assistants, medical assistants, registered dietetic technicians, pharmacy technicians, and others (Dickinson et al., 2017).

The AADE workgroup in 2016, published three Diabetes Educator levels: Level 1 Diabetes Educators are referred to as “beginner” or “advanced beginner”; Level 2 Diabetes Educators are considered “competent” or “proficient”; Level 3 Diabetes Educators are considered “experts” (Dickinson et al., 2017). The AADE established competencies that offer a structure for the knowledge, skills, and abilities required for practice at each level of the diabetes care (Dickinson et al., 2017). The competencies are organized into five domains with roles and responsibilities for each practice level, and each practice level can utilize the five domains. The 5 domains are Domain 1: pathophysiology, epidemiology, and clinical practice of prediabetes and diabetes; Domain 2: cultural competency across the lifespan; Domain 3: teaching and learning skills; Domain 4: self-management education; Domain 5: program and business management (Dickinson et al., 2017). The diabetic educator can review each competency to determine where they can grow in knowledge and skills to continue their current practice level or to expand their professional goals to advance to a higher level (Dickinson et al., 2017).

Primary Care Providers (PCP) who are non-accredited and non-recognized providers of diabetes education should have knowledge and awareness of DSMES services for adults with type 2 diabetes. Healthcare providers must have knowledge of the four times to access, provide, and adjust DSMES, which is at diagnosis, annual check-

ups, when new complicating factors are diagnosed, and when transitions in care occur (ADA, 2018a, 2018b, 2018c). The Standards recommend that DSMES be patient-centered and utilize technological systems for DSMES (Beck et al., 2017). The Standards displays evidence for diabetes self-management educators that are certified and providers that are not certified.

According to Beck et al. (2017), the organizations of a DSMES should have a defined structure, mission, and goals that support effectively support requirements of DSMES. It is important for healthcare providers of DSMES to create a mission statement and goals that are shared with the leaders in healthcare organizations mission and goals. The lack of support is a barrier to the success of DSMES services (Beck et al., 2017). The Standards utilize the Chronic Care Model to support the need for documented organizational mission and goals, which ensures the quality of diabetes care must be a priority (Beck et al., 2017). According to Beck et al. (2017), the providers of DSMES services must be able to identify, understand, engage, and elicit input from the stakeholder. The providers of DSMES must also be able to understand their community and population demographics served with an emphasis on adults with type 2 diabetes. It is important for providers of DSMES to identify barriers that prevent access to DSMES. Barriers include socioeconomic or cultural factors, scheduling, health insurance shortfalls, perceived lack of need, and limited encouragement from healthcare providers (Beck et al.,2017).

Telehealth Technology. Healthcare providers must have the knowledge and skills to be able to use Health Information Technology (HIT) to meet the needs of patients (Fitzner et al., 2014). Technology systems for the management of adults with type 2

diabetes should capture data on variables such as Self-Monitoring of Blood Glucose (SMBG) for glycemic control (Iannitto et al., 2014). Literature suggests that telehealth technology offers tools to help adults with type 2 diabetes learn to self-monitor and change behaviors to improve glycemic control, self-management, and self-efficacy (Fitzner et al., 2014; Beck et al., 2017; Crowley et al., 2013; ADA, 2018a, 2018b, 2018c; Chrvala, Sherr, & Lipman, 2015; AHRQ, 2016). Telecommunication technologies include video-conferencing, asynchronous, remote patient monitoring, mobile health, such as cell phones and tablet computers (MARTC, 2018). The Mid-Atlantic Telehealth Resource Center (MATRC) offers educational training for healthcare providers in the mid-Atlantic states on developing a telehealth program.

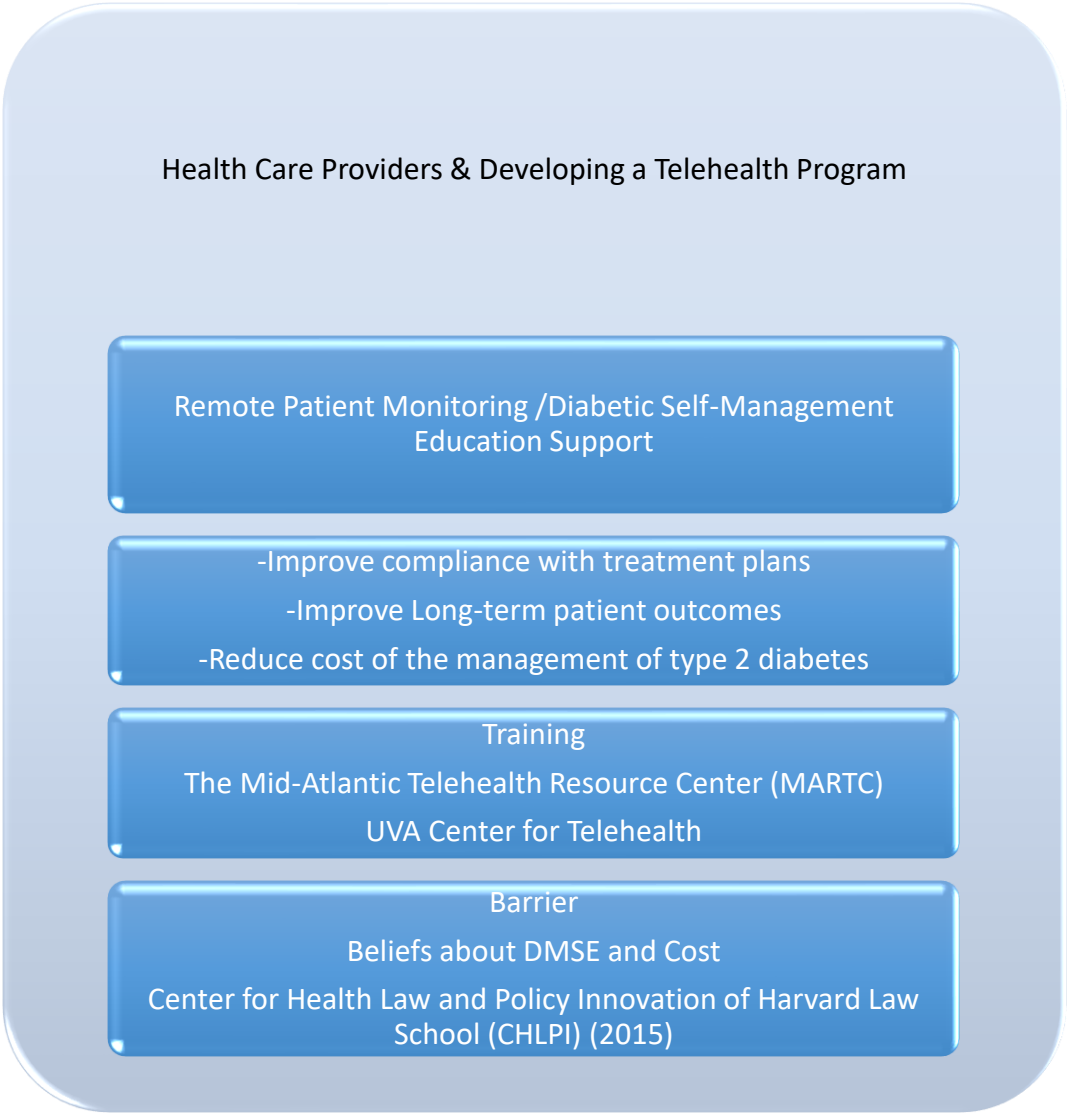

Figure 5. Telehealth Technologies and Health Information Technology (HIT).

In Figure 5, the healthcare provider can use MARTC (2018) to find resources for developing a telehealth program. Remote Patient Monitoring (RPM) is a telehealth intervention that can be used in conjunction with DSMES for the management of adults with type 2 diabetes.

The health care provider must have the knowledge of the standard guidelines for the management of adults with type 2 diabetes and the ability to refer and recommend telehealth-based DSMES when needed. The goal of a telehealth-based DSMES is to improve compliance with treatment plans for adults with type 2 diabetes, improve long-term outcomes, and reduce costs of the management of type 2 diabetes (Fitzner et al., 2014; VA/DoD, 2017; Ferguson et al., 2015; Dorsey & Topol, 2016; ADA, 2018a, 2018b, 2018c, AHRQ, 2018).

Telehealth Delivery

What settings and situations have been studied, involving the adult has type 2 diabetes mellitus, with telehealth interventions?

Settings. The telehealth-based DSMES is used in the primary care setting for adults with type 2 diabetes who are not reaching their glycemic control levels (ADA, 2018a; VA/DoD, 2017; Fitzner et al., 2014; Chrvala et al., 2016; Beck et al., 2017; Ferguson et al., 2015; Lepard et al., 2015; Iannitto et al., 2014; Odnolekova et al., 2014; Cherrington et al., 2015; Dorsey & Topol, 2016; Crowley et al., 2013; Hanley et al, 2015). Telehealth technology can be used for remotely monitoring glycemic levels, self-management, and self-efficacy and providing telehealth-based DSMES to adults with type 2 diabetes (AHRQ, 2016; VA/DoD, 2017; Beck et al., 2017). An adult with type 2 diabetes visits their Primary Care Provider (PCP) at least four times a year, and the average appointment length is 18 to 20 minutes. Telehealth-based DSMES intervention increases the amount of patient and primary care providers contact (Beck et al., 2017; AHRQ, 2016). The ADA Standards of Medical Care in Diabetes, standards of evidence-based recommendations are most relevant to the primary care settings (ADA ,2018a).

Situations. Diabetes self-management education and support should be offered to adults with a diagnosis of prediabetes, uncontrolled diabetes, or a new diagnosis of diabetes (VA/DoD, 2017; Beck et al., 2017; ADA, 2018a). Telehealth DSMES can be used to increase access to DSMES for adults with type 2 diabetes and can be used to replace or supplement face-to-face interactions with health care providers (AHRQ, 2016; ADA, 2018a; Beck et al., 2017; Chrvala, Sherr, & Lipman, 2015; L'Esperance, & Perry, 2015). Telehealth-based DSMES includes several different technologies that follow the same standards as the traditional face-to-face DSMES (AHRQ, 2018; ADA, 2018a; VA/DoD, 2017; Beck et al., 2017).

Synthesis of Results

There are many advancements in the management of type 2 diabetes in adults, but there is still much room needed for improvement of the access to DSMES. The use of telehealth for the management of type 2 diabetes has demonstrated to be effective in many studies. Evidence from seventeen strong systemic reviews and eleven moderate strength systematic review based on the Melnyk's Level of Evidence (LOE) Pyramid (Melnyk and Fineout-Overholt, 2015). The quality of the literature increases the complexity of the use of telehealth for DSMES. The synthesis of the evidence makes recommendations for the use of telehealth for DSMES in the management of adults with type 2 diabetes. Many studies have been conducted on glycemic control, for adults with type 2 diabetes with a telehealth intervention. Researchers have studied strategies and technologies, such a group visits, telehealth, peer counseling, and Internet-based education to improve glycemic control and improve self-efficacy. Several of the studies had small sample sizes and had recommendations for future studies on the long-term use

of the telehealth for diabetes. Many of the studies had results that were clinically significant for the use of telehealth for DSMES. Several of the studies were conducted in the primary care setting for remote monitoring and DSMES. Three of the studies provided guidelines for the management of type2 diabetes with a recommendation for telehealth-based DSMES (ADA, 2018a; VA/DoD, 2017; Beck et al., 2017). The literature acknowledges that many adults with type 2 diabetes are not at optimal glycemic control (Edelman & Polonsky, 2017; ADA, 2018c; VA/DoD, 2017; Iannitto et al., 2014; Moreira et al., 2017).

Discussion

Summary of the Evidence

Research discovered that telehealth-based DSMES for the management of type 2 diabetes was beneficial or had potential benefits, and was feasible and effective (ADA, 2018a, 2018c; VA/DoD, 2017; Beck et al., 2017; AHRQ, 2016; Fitzner et al, 2014; Dorsey & Topol, 2016; Cherrington et al., 2015; Edelman & Polonsky, 2017). The goal of this integrative review was to provide a synthesis of the evidence and make recommendations for implementing a telehealth-based DSMES for adults with type 2 diabetes in the primary care setting. This integrative review identified studies that addressed the use of telehealth for DSMES, the recommendation or the referral of telehealth-based DSMES among health care providers, used to support glycemic control, self-management, and self-efficacy in adults with type 2 diabetes. Several of the studies addressed the clinical questions in this integrative review, but many studies recommend larger more rigorous studies to provide more proof of the effectiveness of telehealth for the management of type 2 diabetes. Three of the studies displayed in their guidelines the

recommendation for the utilization of telehealth-based DSMES for the management of adults with type 2 diabetes (ADA, 2018a; Beck et al., 2017; VA/DoD, 2017). With many adults with type 2 diabetes not reaching optimal levels for their glycemic control, healthcare providers and healthcare organizations awareness of telehealth-based DSMES should be increased to expand access to DSMES for adults with type 2 diabetes.

Limitations

There was limited literature related to telehealth-based DSMES. With the integrative review combining diverse sources, the research reports are complex and challenging, and the updated methodology of integrative reviews includes a more systematic and rigorous approach (Whittemore & Knalf, 2005). There was external bias found in the studies related to low sample sizes and time limitations for the intervention. With only one researcher, the data evaluation stage was another limitation. There are recommendations for additional research for larger sample sizes and the timeline of the studies to be long-term to review more outcomes related to the use of telehealth-based DSMES for adults with type 2 diabetes. Stakeholders, which include healthcare providers, healthcare organizations, federal and state policymakers, and healthcare insurances are challenged with working collaboratively to make decisions related to support, implementation, and funding for telehealth-based DSMES.

Implication for Research

Additional research on the use of telehealth-based DSMES would help to close the gaps and demonstrate the effectiveness of telehealth-based DSMES for adults with type 2 diabetes in the primary care setting. There are recommendations for further research on the outcome measures related to telehealth-based DSMES intervention for

adults with type 2 diabetes. Future research on telehealth-based DSMES will build upon nursing knowledge and practice to influence health policy and enhance health care for adults with type 2 diabetes.

Implications for Practice

The phenomenon of concern is telehealth-based DSMES for adults with type 2 diabetes in the primary care setting. Increasing the knowledge base for health care providers regarding telehealth-based DSMES for adults with type 2 diabetes should help providers and healthcare organizations implement telehealth for the management of type 2 diabetes. Many adults with type 2 diabetes have suboptimal glycemic control, and the implementation of a telehealth-based DSMES intervention could lead to optimal patient outcomes. It is important that healthcare providers to refer adults with type 2 diabetes to telehealth-based DSMES to increase access to ongoing DSMES (Beck et al., 2017). Healthcare providers would need to implement evidence-based practice guidelines regarding when to refer adults with type 2 diabetes to telehealth-based DSMES. Healthcare providers in the primary care setting can utilize Healthcare Information Technology (HIT), software such as Electronic Medical Records (EMR) to implement a diabetic registry, which consists of a searchable list of all adults in the primary care practice who have type 2 diabetes in the EMR. Increasing the healthcare providers knowledge of telehealth-based DSMES for the management of adults with type 2 diabetes is important to increase access to ongoing DSMES.

Researchers support the utilization of telehealth-based DSMES for adults with type 2 diabetes, but more research is needed to demonstrate the effectiveness of telehealth for DSMES. Further research on telehealth-based DSMES is needed to help healthcare

providers compare telehealth services to transitional face-to-face DSMES for adults with type 2 diabetes. Healthcare providers need to continue to provide evidence-based interventions regarding the use of telehealth-based DSMES for adults with type 2 diabetes for the management of glycemic control, self-management, and self-efficacy.

DNP Essentials

Essentials I. This Doctor of Nursing Practice (DNP) scholarly project reflects on providing the synthesis of the evidence and recommendations for the practice of telehealth-based DSMES for the management of adults with type 2 diabetes. According to the American Association of Colleges of Nursing (AACN) (2006), the *Essentials I: Scientific Underpinnings for Practice* reflects on the complexity of practice at the doctoral level, and scientific foundations of nursing practice. There is knowledge needed to integrate nursing science with knowledge from other organizational sciences to develop and evaluate new practice approaches based on nursing theories and theories from other disciplines (AACN, 2006).

The integrative review method according to Whittemore & Knalf (2005) allows for the inclusion of experimental and non-experimental research and has the possibility to make a great role in the evidence-based practice of nursing. The rigorously developed integrative reviews allow for the synthesis of knowledge and allow for the knowledge to be applied in clinical practice (Whittemore & Knalf, 2005). The rigorous integrative reviews allow for the comprehensive understanding of problems related to healthcare and policies. The researchers according to Cooper (1982) rely profoundly on integrative research reviews to define the state of knowledge. The integrative reviews have the potential to build nursing science, inform nursing research, nursing practice, and nursing

policy initiatives (Whittemore & Knalf (2005). The utilization of science-based concepts and theories allows for the Doctor of Nursing Practice (DNP) to provide a synthesis of the evidence regarding the recommendation of telehealth-based DSMES among health care providers for the management of adults with type 2 diabetes in the primary care setting.

New practice approaches are recommended based on the synthesis of evidence for the recommendation of the use of telehealth-based DSMES among healthcare providers to improve outcomes for adults with type 2 diabetes. Scientific underpinning for practice produces theories and concepts to guide practice for the integration of the telehealth-based DSMES in the management of adults with type 2 diabetes. These recommendations can enhance healthcare delivery and improve outcomes for adults with type 2 diabetes.

Essential II. According to the AACN (2006), organizational and systems leadership is imperative for the Doctor of Nursing Practice (DNP) to improve patient and healthcare outcomes. The *Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking*, outlines the competencies for the Advanced Nurse to utilize organizational and system leadership for quality improvement and systems thinking to improve healthcare reform and quality improvement (AACN, 2006). The DNP practice does not focus only on direct care but also focuses on the needs of a panel of patients, a target population, a set of the population, or a broad community (AACN, 2006). This project focused on the telehealth-based DSMES for adults with type 2 diabetes, which is a complex chronic disease. The population of adults with type 2 diabetes that the challenges of improving clinical outcomes were discussed and the limited use of DSMES by health care providers and the recommendations to include

telehealth-based DSMES to increases access to DSMES for adults with type 2 diabetes. The recommendation to include telehealth-based DSMES would meet the healthcare needs of the patient population as well as the needs of an organization and healthcare systems. The implementation of telehealth-based DSMES is demonstrated to support glycemic control, self-management, and self-efficacy in adults with type 2 diabetes, and has improved quality improvement scores for healthcare providers.

The DNP *with Essential II* includes an organization and systems leadership to promote the ongoing improvement of health outcomes while ensuring patient safety (AACN, 2006). The DNP must have expertise in "assessing organizations, identifying systems' issues, and facilitating organization-wide changes in practice delivery" (AACN, 2006, p. 10). This project provides a synthesis of the evidence for the DNP to present to healthcare organizations and systems to improve the implementation of telehealth-based DSMES for adults with type 2 diabetes to facilitate changes in practice delivery. The DNP according to the AACN (2006), must use advanced communication skills and processes to lead quality improvement and patient safety initiatives in healthcare systems. The analyzes of the cost-effectiveness of practice initiatives accounting for risk and improvement of health care outcomes is also important to this project (AACN, 2006). The implementation of telehealth-based DSMES has demonstrated to be effective in improving health outcomes in adults with type 2 diabetes and is cost-effective. This project also reviewed ethical dilemmas with the use of telehealth technologies in delivering DSMES to adult with type 2 diabetes. The DNP according to AACN (2006), must be able to assess risk and collaborate with others to management risks ethically that is found in the professional standards. This project facilitates the collaboration with

experts in the clinical practice, academia, and telecommunication technology software developers. Collaboration is important to analyze complex practice issues through the leadership of interprofessional teams (AACN, 2006). Collaboration is important for this project and is essential for the implementation of telehealth-based DSMES for adults with type 2 diabetes in healthcare organizations. The goal is to develop a recommendation for the implementation of telehealth-based DSMES for adults with type 2 diabetes in the primary care setting.

Essential III. According to the AACN (2006), the third essential involves the translation of research for practice and the dissemination and integration of new knowledge. The *Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice,* outlined the role of the DNP for contribution in clinical scholarship and analytical methods for evidence-based practice. According to AACN (2006), "scholarship and research are the hallmark of doctoral education" (p.11). This project applied clinical scholarship by conducting an integrative review on telehealth-based DSMES for adults with type 2 diabetes, which looked at traditional interventions compared to the new advancement of telehealth technologies for DSMES. This project involved an integrative review of the literature, which plays a great role in evidence-based practice for nursing (Whittemore & Knalf, 2005). Current evidence suggested the many patients with type 2 diabetes do not receive DSMES, and health care providers must ensure that necessary educational alternatives are available (Beck et al.,2017). The integrative review identified gaps in health care and increase access to DSMES. It supported the need to improve access to DSMES with the use of telehealth technologies. It also emphasized the importance of DSMES in the management of type 2 diabetes.

According to Beck et al. (2017), the National Standards for DSMES recommend that healthcare referring providers, and patients with type 2 diabetes, utilize DSMES for the management of type 2 diabetes. This recommendation is demonstrated by the evidence reviewed during this integrative review. The *Essential III* stated that the Doctor of Nursing Practice (DNP) must engage in nurse practice and provide leadership for evidence-based practice (AACN, 2006). The DNP must also have knowledge in the application of the translation of research into practice, the evaluation of practice, the improvement of the reliability of health care practices and outcomes, and the participation in collaborative research (AACN, 2006). This integrative reviewed allows for knowledge to be assessed on the implementation of telehealth-based DSMES for adults with type 2 diabetes. The dissemination of the findings from evidence-based practice and research include the recommendation for telehealth-based DSMES for adults with type 2 diabetes and to improve health outcomes in the primary care setting.

Essential IV. In 2001, the Institute of Medicine argued that Information Technologies (IT) must play a central role in the redesign of the healthcare system if a substantial improvement in health care quality is to be achieved during the coming decade (IOM, 2001). The *Essential IV: Information Systems/Technology and Patient Care Technologies for the Improvement and Transformation of Health Care* recommends the use of technology to improve patient care and outcomes. According to the AACN (2006), the DNP is distinguished by their abilities to use information systems/technology, to support and improve patient care and health systems and to provide leadership within healthcare systems and/or academic settings. Technology during this project was used to complete the comprehensive computerized literature search for the integrative review.

Information technology for the telehealth-based DSMES for adults with type 2 diabetes was used by healthcare providers and patients to improve access to DSMES and improve health outcomes. The Doctor of Nursing Practice (DNP) can use information systems/technology to evaluate and monitor outcomes of care, care systems, and quality improvement to include customer use of health information systems (AACN, 2006). Information Technology was used in this project to offer telehealth-based DSMES for adults with type 2 diabetes in the primary care setting. The DNP must also provide leadership in the evaluation and resolution of any ethical or legal issues related to healthcare systems use of information, and information technology, communication networks, and patient care technologies (AACN, 2006).

Essential V. In 2010, the Institute of Medicine's (IOM) report *The Future of Nursing: Leading Change, Advancing Health* recommended that public, private, and governmental health care decision makers at every level should include representation from nursing on boards, on executive management teams and in other key leadership positions (IOM, 2010). The *Essential V: Healthcare Policy for Advocacy in Healthcare*, involves the DNP being involved in the healthcare policy and advocacy, which potentially affect the delivery of healthcare across all settings. According to the AACN (2006), health policy focuses on multiple healthcare delivery issues, which include: health disparities, cultural sensitivity, ethics, the internationalization of health care concerns, access to care, quality of care, health care financing, and issues of equality and social justice in the delivery of healthcare. In this project, the DSMES could influence healthcare policies with the recommendation of telehealth-based DSMES for the management of adults with type 2 diabetes to improve the health outcomes. Policy

makers with the knowledge gained from the integrative review should advocate for telehealth-based DSMES to improve access to DSMES services. It is important for the DNP to be involved in advocacy and shaping of healthcare policy for the improvement of access of DSMES for adults with type 2 diabetes to improve outcomes.

Essential VI. In the role of the advanced nursing practice, it is important to assume the leadership position and be full collaborative partners with physicians and other healthcare professionals (IOM, 2010). The *Essentials VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes* looks at communication and collaboration skills, analyzes complex practice and organizational issues, and acts as a consultant to interprofessional teams to implement changes in health care systems (AACN, 2006). It is important to have leadership skills to form teams and to come together working to improve patient outcomes. This project facilitates the collaboration with experts in the clinical practice, organizational leaders, academia, community advocates, and telecommunication technology software developers.

It is important to the Doctor of Nursing Practice (DNP) to have effective communication and collaborative skills (AACN, 2006). Effective communication is necessary for the development and implementation of a telehealth-based DSMES for adults with type 2 diabetes in the primary care setting. Collaborative skills are necessary for intraprofessional and interprofessional teams to create change in healthcare and the complex health care delivery systems (AACN, 2006). The development and implementation of a telehealth-based DSMES require a collaborative approach to improve health outcomes for adults with type 2 diabetes.

Essential VII. Clinical prevention, if defined as health promotion and risk reduction-illness prevention for individuals and families, and population health, is defined as including all community, environmental, cultural, and socioeconomic aspects of healthcare (Allan et al., 2004; AACN, 2006). The *Essential VII: Clinical Prevention and Population Healthcare for Improving the Nation's Health* is essential for improving the health status of the population of the United States (AACN, 2006). Type 2 diabetes is a topic of concern for *Healthy People 2020*, which goal is to improve glycemic control in the diabetic population. Adults with suboptimal glycemic control are at risk for major complications and comorbid illnesses, including blindness and vision problems, nervous system disorders, kidney disease, amputations, periodontal disease, heart disease, and stroke. This DNP project analyzed epidemiological data on type 2 diabetes and DSMES in the primary care settings. With diabetes being the 7th leading cause of death in the United States (CDC, 2014). The goal is to reduce the complications related to diabetes and improve the quality of life of a person with diabetes (Healthy People, 2018). Increasing the knowledge of healthcare providers regarding the importance of DSMES for adults with type 2 diabetes have demonstrated the improved practice and individual outcomes (Beck et al., 2017).

Essential VIII. The implementation of the telehealth-based DSMES for adults with type 2 diabetes is an important part of the education of patients with complex health situations. The use of telehealth-based DSMES in adults with type 2 diabetes has been recommended to increase access to DSMES, and the goal is to improve this population outcome. The *Essential VIII: Advanced Nursing Practice*, with the goal of improving patient outcomes the DNP must demonstrate advanced levels of clinical judgment,

systems thinking, and delivery of evidence-based care (AACN, 2006). The Doctor of Nursing Practice (DNP) also must be able to conduct a comprehensive and systematic assessment, design, implement, and evaluate interventions. The DNP must develop and sustain therapeutic relationships and partnerships with patients, mentor other nurses, and educate and guide individuals and groups through complex situational transitions. For the telehealth-based DSMES, it is important to develop a therapeutic relationship with patients to improve patient outcomes and to provide Diabetic Self-Management Education and Support to adult with type 2 diabetes.

Conclusion

Type 2 diabetes is a chronic disease, and its management continues to be a challenge. The use of telehealth for DSMES is technology that has been used as a tool for improving glycemic control, self-management, and self-efficiency of adults with type 2 diabetes. DSMES has improved glycemic control in adults with type 2 diabetes and adding telehealth technology would increase access to DSMES for adults with type 2 diabetes. This integrative review goal is to increase the awareness of healthcare providers of the evidence and recommendations for implementing a telehealth-based DSMES and to increase access to ongoing support for adults with type 2 diabetes. Healthcare providers with the implementation of the telehealth-based DSMES could have the ability to improve self-management and improve outcomes for adults with type 2 diabetes. Future research is needed to determine long-term effects of telehealth-based DSMES for adults with type 2 diabetes. Healthcare providers have the opportunity to increase stakeholder's awareness of the use of telehealth-based DSMES and could affect policy and guideline changes in healthcare systems. With the complexity of type 2 diabetes

increasing awareness among health care providers regarding a telehealth-based DSMES would increase access to support education and improve health outcomes.

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Tables

Table 1

Levels of Evidence for Project Literature Reference

Evidence Category	**Numeric Level**	**Number of articles for Project**
Systematic review and meta-analysis of randomized controlled trials	1	17
One or more randomized controlled trials	2	11
Controlled trial (no randomization)	3	0
Case-control or cohort study	4	1
A systematic review of descriptive & qualitative studies	5	3
Single descriptive or qualitativ study	7	1
Expert Opinion	8	0

Table 2

Inclusion and Exclusion Criteria

Inclusion	Exclusion
Publications from 2013-2018	Publications prior to 2013
Subjects aged 19+ adults	Subjects under the age of 19
Health providers (physicians, nurses, nurs practitioners, and advanced practice nurses)	Healthcare providers not listed in the Inclusion definition
Peer-reviewed, gray literature (i.e., unpublished articles, dissertations, frameworks, policy documents, etc.)	Non-research articles (i.e., commentaries, editorials, briefings, fact sheets)
English language	Publications are written in a foreign language
Full-text articles	Abstract only articles

Table 3

Results Matrix for Telehealth and Type 2 Diabetes Management

The focus of Article, Author, and Year	**Critique: Level of Evidence and Source**	**Type 2 Diabetes and Telehealth/Background**	**Conclusions**	**Practice Implications and Recommendations**
VA/DoD clinical practice guideline for the management of type 2 diabetes in primary care (Department of Defense; Department of Veteran Affairs, 2017)	Level I: Systematic Review	• 5 Telehealth studies reviewed. • Telehealth adjunct to usual care. • This guideline describes the critical decision points for the management of diabetes mellitus. • The guide is intended to improve patient outcomes and management of patients with diabetes mellitus.	• Results include weak recommendations for telehealth involving licensed independent practitioners. • Telehealth outcomes no statistically significant benefit, but clinically benefits.	• Decrease in HbA1c when able to upload glycemic readings. • The use of approaches such as group visits and telehealth should be Considered in providing education. **Recommendations** • Suggesting offering one or more type of bidirectional telehealth interventions (computer, telephone, or other electronic means). • Team approach all licensed independent providers warranted.

ADA (2018a). Standards of medical care in diabetes -2018. ADA (2018b). Standards of medical care in diabetes – 2018 abridged for primary care providers.	Level I: Systematic review	• The guideline focuses on patient education, dietary advice, managing cardiovascular risk, managing blood glucose levels, and identifying and managing long-term complications. • Telemedicine text was added to describe its role in diabetes care • Remote delivery of health-related services for rural populations	• Telehealth intervention in a guide. Evidence-based with high recommendations with evidence. • Telemedicine approach is effective with regards to glycemic control of A1c.	• Increase use of telemedicine in rural populations or those with limited physical access to health care. • Increase data on the cost-effectiveness of telemedicine. **Recommendations** • Use of web-based portal or text-messages with medication adjustment appears more effective.
Does diabetes self-management in conjunction with primary care improve glycemic control in Hispanic patients? A systematic review and meta-analysis. (Ferguson, S., Swan, M., & Smaldone, A., 2015).	Level I: Systematic review and Meta-analysis	• 13 studies reviewed • DSMES intervention sessions with phone follow-up • Subjects adults with type 2 diabetes Hispanic.	• Telephone intervention for greater than 6 months reduced HbA1c. • DSME with primary care effective in glycemic control. • The outcome includes reduction of HbA1c.	• Interventions such as telephone should be implemented in primary care to improve diabetes self-management education. • DSME programs that incorporate telephone contact within a multimodal educational strategy can be effective.

				Recommendations • DSME interventions should be culturally tailored to improve effectiveness in high-risk populations. • Increase use of DSME in the Hispanic community.
State of telehealth (Dorsey, E.R., & Toprol, E.J., 2016). State of telehealth.	Level I: Systemic Reviews	• Telehealth is health care remotely by means of telecommunication tool such as telephone, smartphones, and wireless devices. • Increase access to healthcare to provide convenience and reduce cost. • Address chronic conditions such as type 2 diabetes. • Limited reimbursement is a	• Despite the barriers and financial disincentive telehealth continues to grow. • Many healthcare systems are using telehealth services to increase access and to improve health outcomes. • Telehealth will not seek to replicate traditional office	• Telehealth will have profound implications for healthcare delivery. • More frequent follow-up between clinic visits. • Providers and patient relationship increase with more remote access to healthcare. **Recommendations** • Increase use of telehealth with the advancement of technology for chronic healthcare conditions.

		barrier to the use of telehealth.	visits but rather capitalize on its unique strengths to define new care.	• Telehealth will provide increase access to health care.
Effect of telehealth on glycemic control: analysis of patients with type 2 diabetes in the whole system demonstrator cluster randomized trial. (Steventon, A., Bardsley, M., Doll, H., Tuckey, E., and Newman, S.P., 2014).	Level II: Randomized Controlled Trial	• The use of telehealth with a telehealth base unit that recorded blood glucose readings. • The readings used a store and forward technology, and urgent readings were red flagged and responded to daily the by the nurse.	• The telehealth interventions lowered HbA1c than usual care interventions during this trial. • Telehealth is associated with lower mortality and emergency room rates. • Limits include study not larger enough to produce substantial patient benefit • Telehealth modestly improved glycemic control in patients with	• Telehealth should be used in practice because it showed a modest improvement among patients with type 2 diabetes. **Recommendations** • Long-term studies could examine impacts of telehealth on complications of diabetes, such as retinopathy and acute myocardial infarction. • With the complex relationship between achieved HbA1c levels and patient outcomes, decision-

			type 2 diabetes over 12 months	making should take in account. • Analysis of disease-specific quality of life, and the existing outputs regarding poor overall cost-effectiveness.
Impact of phone call intervention on glycemic control in diabetes patients: A systematic review and meta-analysis of randomized, controlled trials. (Suksomboon, N., Poolsup, N., and Lay Nge, Y., 2014).	Level I: Systematic review and Meta-analysis	• Telephone intervention for patients with diabetes conducted inpatient settings with self-monitoring of blood glucose. • Telephone support is one way of telemonitoring to give education related to disease and to support patients with self-management activities such as medication adherence, physical exercise, and diet.	• Telephone intervention not effective for this study. • The outcome concluded that the phone contact intervention was no more effective than the standard clinical care.	• Telephone intervention may still have potential benefits. **Recommendations** • A well-designed, large randomized controlled studies are a warrant. • The impact of the intervention in diabetes need to be further evaluated.

Telehealth technologies: Changing the way we deliver efficacious and cost-effective diabetes self-management education (Fitzner, K.K., Heckinger, E., Tulas, K.M., Specker, J., and McKoy, J., 2014)	Level I: Systematic review	• Telehealth technologies used for diabetes self-management education. • The technology used for DSME/T, behavioral change, cost-effective, and improved access to chronic disease self-management. • Telehealth used to help patients self-manage the disease. • Improve behavioral, clinical, economic outcomes, and increase access to care.	• Telehealth has been used by healthcare systems to increase access to care. • DSME/T via telehealth is helping to increase access to care for adults with type 2 diabetes in underserved areas. • Literature shows that DSME/T via telehealth improved self-care behaviors and clinical outcomes.	• Many healthcare providers have embraced the use of telehealth for monitoring of DSME/T. • Implementing telehealth DSME/T has improved SMBG to decrease HbA1c • Implementation is cost effective. **Recommendations** • More information is needed over a long time to demonstrate clinical and behavioral effectiveness. • To enhance the quality of studies about DSME/T via telehealth. • All diabetes education programs should adhere to the National Standards of Diabetes Self-Management

				Education and Support (NSDSME).
Diabetes self-management interventions for adults with type 2 diabetes living in rural areas: a systematic literature review. (Lepard, M.C., Joseph, A.L., Agne, A.A., and Cherrington, A.L., 2015).	Level I: Systematic review	• Both telehealth intervention and face-to-face interventions improve outcomes in adults with type 2 diabetes. • Distances for a face-to-face intervention had low retention and the telehealth higher attendance. • Rural communities must contend with high rates of diabetes with limited access to health services and diabetes education, long distances, and scarce community resources.	• Telehealth and in person DSMES have the potential to be effective in a rural population. • Telehealth helped increase access to diabetes self-management training.	• This review identified examples of both in-person DSME and telehealth interventions that have the potential to be effective for patients with type 2 diabetes living in rural areas. **Recommendations** • Future studies are needed to examine the comparative effectiveness of implementing these strategies in real world settings, with attention to not only health outcomes but also, patient-centered outcomes

				and cost-effectiveness.
Does telemedicine improve treatment outcomes for diabetes? A meta-analysis of results from 55 randomized controlled trials. (Su, D., Zhou, J., Kelley, M., Michaud, T., Siahpush, M., Kim, J., Wilson, Stimpson, J.P., and Pagan, J.A., 2015). .	Level I: Systematic review and Meta-analysis	• The increasing prevalence of diabetes and its associated costs has become a health challenge. Patients severed in the telemedicine experience more reduction in HbA1c than those in the conventional, non-telemedicine group.	• Reduction in HbA1c with telemedicine intervention over conventional care. • Telemedicine was effective in improving treatment outcomes for diabetes patients, especially for those with type 2 diabetes.	• Telemedicine interventions are in general more effective in improving treatment outcomes for diabetes patients, especially for those with type 2 diabetes. **Recommendations** • Future research with the growing use of telemedicine in diabetes. • Telemedicine programs were more effective in diabetes management among type 2 diabetic patients than among type 1 diabetic patients need further research.

Diabetes self-management education for adults with type 2 diabetes mellitus: A systematic review of the effect of glycemic control. (Chrvala, C.A., Sherr, D., and Lipman, R.D., 2016).	Level I: Systemic Review	• DSMES should be provided to adults with type 2 diabetes. • Four modes, individual, group, a combination of both, and remote methods. • DSMES is cost effective and improved clinical outcomes. • Improve glycemic control, self-management, and self-efficacy.	• DSMES important to reduce complications of type 2 diabetes. • Improvement in glycemic control is associated with better outcomes. • All modes of DSMES is associated with greater reduction in A1c.	• The implication of DSMES is part of quality diabetes care. • Educational interventions should be implemented in diverse settings. • The implication of DSMES must be cost-effective and low-cost. **Recommendations** • DSMES to be provided to individuals with diabetes when first diagnosed. • Engage patients when they are ready to engage in diabetes self-management. • Methods should be carefully selected.
Effect of telemedicine on the management of diabetes. (Garelick, M.W., 2015)	Level I: Systematic review	• There are various telemedicine interventions on managing diabetes. • Diabetes in the United States is increasing.	• With the increasing demand for primary care providers and telemedicine is an additional	• The implication of telemedicine for the management of diabetes. • Telemedicine implication in practice shown to decrease A1c.

		• Telemedicine has shown to be effective in managing patient's A1c.	resource to increase care. • Telehealth technologies can provide support to patients with diabetes to promote self-management of diabetes. • More research is needed to evaluate the cost-benefit of telemedicine.	**Recommendations** • Long-term studies are recommended to evaluate telemedicine further. • Recommendations for cost analysis studies to be completed to determine if telemedicine is cost effective. • Future research is critical
Tailored case management for diabetes and hypertension (TEACH-DM) in a community population: Study design and baseline sample characteristics. (Crowley et al., 2013).	Level II: Randomized Controlled Trial	• Telehealth intervention for diabetes to improve behaviors to improve glycemic control. • Telephone-based telehealth intervention. • Adults with type 2 diabetes continue to have suboptimal levels. • Behavioral intervention via telehealth for	• The use of telehealth device (telephone) was associated with increased self-efficacy and self-management in adults with type 2 diabetes. • Allows for glucose levels to be monitored at home.	• The implication in the community can present with challenges due to insurance coverage. • Barriers to telephone calls and times for calls. • Barriers should not prevent further research to improve diabetes outcomes. **Recommendations** • Offer intervention as a tool to improve

		patients with poorly controlled diabetes.		behaviors to improve glycemic control. • Community setting for adults with type 2 diabetes who are not at goal. • Increase self-management with telephone-based intervention.
Efficacy of an empowerment program for Taiwanese patients with type 2 diabetes: a randomized control trial. (Chen, M.F., Wang, R.H., Lin, K.C., Hsu, H.Y., and Chen, S.W., 2014).	Level II: Randomized Controlled Trial	• Three weekly telephone interviews were performed after the face-to-face interview. • Five-step empowering program. HbA1c, self-care behaviors, self-efficacy, and quality of life in a Taiwanese patient with type 2 diabetes	• The experimental group had a decrease in HbA1c at 3 months after the intervention. • Also had improved self-care behaviors, self-efficacy, and quality of life at the of the 3-month intervention.	• Empowerment program with a telephone intervention improved HbA1c, self-care behaviors, self-efficacy, and quality of life in a Taiwanese patient with type 2 diabetes. **Recommendations** • Could be a benefit for patients with type 2 diabetes across different cultures. • This study can provide a reference

				when designing empowerment programs for patients with type 2 diabetes.
Telephone-delivered behavioral skills intervention for African American adults with type 2 diabetes: a randomized controlled trial. (Egede, L.E., Williams, J.S., Voronca, D.C., Gebregzibher, M., and Lynch, C.P., 2016).	Level II: Randomized Controlled Trial	• Self-management is important. • All participants received 12 telephone sessions weekly for 30 minutes. • The information-motivation-behavioral model was used to improve diabetes self-management. HbA1c was measured at 3,6 and 12-months.	• This study showed that combined diabetes education and skills training, diabetes knowledge alone, and skills training alone were not sufficient for achieving glycemic control at 12 months. • This study shows that separate and combined education and skills training is not sufficient for achieving glycemic control	• Evidence supports the efficacy of telephone interventions in improving patient outcomes with type 2 diabetes. **Recommendations** • Future research should focus on determining alternative strategies to improve glycemic control in this high-risk population. • This study showed clinical significance, and that can be used for nursing knowledge and practice.

			with poorly controlled type 2 diabetes.	
One-year outcomes of diabetes self-management training amount Medicare beneficiaries newly diagnosed with diabetes. (Strawbridge, Lloyd, Meadows, and Howell, 2017)	Level II: Randomized Controlled Trial	• Diabetes is highly prevalent amount Medicare beneficiaries. • Reports confirm that less than 7 % of those with private insurance and 5% of Medicare beneficiaries, with newly diagnosed diabetes, utilized their DSMES benefits between 2 months prior to and 1 year following. • Diabetes self-management could help reduce the burden of diabetes.	• There are benefits from the use of Diabetes Self-Management Training (DSMT). • The low cost of DSME could lead to a reduction in the burden of diabetes for individuals and healthcare systems. • Lower health service utilization of DSMT. • There are marked disparities in access to DSMT.	• Implication of DSMT for adults with type 2 diabetes would improve diabetes self-management. • The implication of DSMT would decrease hospital utilization. **Recommendations** • Recommended that increasing health care providers' awareness of the use of DSMES and decreasing the cost of DSMES could help operational • Increase use of DSMES benefits among Medicare beneficiaries.

				• For healthcare providers to refer newly diagnosed diabetic patients to DSME.
Effects of nurse telesupport on the transition between specialized and primary care in diabetic patients: study protocol for a randomized control trial. (Moreira et al., 2017).	Level II: Randomized Controlled Trial	• The Global Diabetes Plan preventive and educational strategies are essential. • Telemedicine can be useful to support the discharge of stable patients with type 2 diabetes in the primary care setting. • Randomized Controlled Trial (RCT) with follow-up phone calls every three months for one year.	• Planned to evaluate the effectiveness of a telephone-based intervention on glycemic control. • Improving patient education and knowledge about diabetes. • It is important to prevent overload in specialized care and support patients with diabetes in primary care.	• If this trial is successful, the stakeholders should be presented with this intervention. • Telehealth intervention should be implemented if demonstrated to improve glycemic control. **Recommendations** • Telehealth intervention tool for diabetes self-management. • Use intervention to reduce overcrowding of specialty clinics for diabetes.

A qualitative study of telemonitoring of blood glucose and blood pressure of type 2 diabetes. (Hanley, J., Fairbrother, P., McCaughan, L., Pagliari, C., Paterson, M., Pinnock., H., Sheik, S., Wild, S., and McKinstry, B., 2015).	Level V: Systematic review of descriptive and qualitative studies.	• Telemonitoring with Bluetooth device of blood glucose levels and blood pressure. • If readings are out of the target range, the practitioner will communicate via telephone.	• Telemonitoring of blood glucose, BP, and weight by people with type 2 diabetes was re. • The data generated by telemonitoring supported self-care decisions and medical treatment decisions. • Motivation to self-manage diet was increased by telemonitoring of blood glucose.	• Telemonitoring in type 2 diabetes was well accepted by participants and increased motivation to improve self-management. • Some professionals shared the patients' view that telemonitoring would be beneficial to the practice, others were concerned about workload and cost. **Recommendations** • More evidence of the beneficial effects of these interventions on patient's self-care motivation and behavior may help to encourage health care providers to adopt these technologies in routine practice. • There is a need for further refinement of telehealth care delivery models and

				technical improvements in telemonitoring systems, as well as wider cultural change on the part of patients and healthcare providers.
The effectiveness of general practice based, practice nurse led telephone coaching on glycemic control of type 2 diabetes: The Patient Engagement and Coaching for Health (PEACH) pragmatic cluster randomized controlled trial. (Blackberry, I.D., Furler, J.S., Chondros, P., Valae, M., Walker, C., Dunn, T., Segal, L., Dunbar, J., Audehm, R., Liew, D., and Young, D., 2013).	Level II-Randomized control	• Practice nurses from intervention practices received two days of training in a telephone coaching program. • Aimed to deliver eight telephone interventions and one face to face coaching episodes per patient.	• At 18 months follow-up, the effect on glycemic control did not differ significantly. • A practice nurse led telephone coaching intervention implemented in the primary care setting comparable outcomes to usual primary care.	• This study included interventions inapplicable in clinical practice settings. • A more intensive telephone counseling intervention with more frequent calls, longer interaction, or longer duration of follow-up may lead to better outcomes. **Recommendation** • Telephone-based support of self-management or coaching interventions delivered by a range of health professionals and lay

				people is effective in reducing the treatment gap and improving glycemic.
Nurse-led telecoaching of people with type 2 diabetes in primary care: rationale, design, and baseline data of a randomized controlled trial. (Odnolekova, I., Goderis, Nobels, F., Aetgeerts., L., and Ramaekers, D., 2014).	Level II: Randomized control	• This study consisted of 5 monthly telephone sessions of 30 minutes by a diabetic nurse educator. • The nurse educator helps patients to maintain their target levels of glycemic control with assistance from their GP.	• After 18 months patients with type 2 diabetes with a reduction in glycemic measures. • Telehealth has demonstrated to improve glycemic measures.	• Telephone follow-up can decrease glycemic measures. • Telehealth reduces the medical expenses for the management of type 2 diabetes. • Educational telephone support helped adults with type 2 diabetes with self -management. **Recommendation** • Telehealth should be recommended for the adults with type 2 diabetes. • Continuous medical care and patient self-management education helped to

				reduce the risk of long-term complications related to uncontrolled type 2 diabetes.
Effect of telenursing (telephone follow-up) on glycemic control and body mass index (BMI) of type 2 diabetes patients. (Lashkari, T., Borhani, F., Sabzevari, S., and Abbaszadeh, A., 2013).	Level II: Randomized control	• This study divided patients randomly into two groups in the experimental group received phone calls from the research for 12-weeks. • Followed up included instructions on self-care and advice on their diets, exercise, and medication titration.	• A decrease of HbA1c and postprandial glucose. • Reduction in frequent patient visits to clinics and medical expense. • The evidence showed a reduction in glycemic control with improved self-care.	• Telephone follow-up can decrease the frequency of visits to the clinic. • Telehealth reduces the medical expenses for the management of type 2 diabetes. **Recommendation** • Telehealth should be recommended for the adults with type 2 diabetes. • Has demonstrated that telephone follow-up as an intervention should be implemented in clinical settings to help manage the chronic disease such

				as type 2 diabetes.
The Messaging for Diabetes (MED) intervention improves short-term medication adherence among low-income adults with type 2 diabetes (Nelson, L.A., Mulvaney, S.A., Gebretsadik, T., Johnson, K. B., and Obsborn, C.Y., 2016)	Level II: Randomized control	• Telehealth with mobile communication with text messages and voice communications to medical adherence to medications to improve glycemic control. • Low-income adults with type 2 diabetes have suboptimal glycemic control due to medication nonadherence. • Telehealth technology with text messaging and interactive voice response intervention to	• The telehealth technology had a positive short-term adherence to medications but did not improve glycemic control. • Using SMI and IVR is supported using improving medication adherence and glycemic control in adults with type 2 diabetes.	• Implementation of a telehealth system that delivered daily text messaging and weekly interactive voice response call. • Implemented in a single clinic with low socioeconomic status (SES) with adults with type 2 diabetes. • Data collected HbA1c data at 3 months. **Recommendations** • The long-term impact of the telehealth technology should be explored. • Future studies should consider missing data

		promote adherence to medications		and ways to avoid missing data.
Integrating diabetes guidelines into a telehealth screening tool. (Gervera, K. and Graves, B.A. 2015).	Level I: Systematic review	• The screening tool was emailed to each clinic for a volunteer to utilize the piloted diabetic screening tool for telehealth. • The new screening tool template was compared to the current method of documentation.	• Results showed 88 % increase in assessment and 16.5% increase in offering services like telehealth. • The screening increased the guided assessment of standard diabetes care indicators. • The screening tool increased diabetes management services such as telehealth services.	• This study is applicable to the management of adults with type 2 diabetes and would be useful for clinical decision making **Recommendation** • Future studies included glycemic levels, reduction of complications, expenditure on diabetes care, and management by comparing adults whose care is guided by the templated to those whose care is completed in the usual manner.

Can follow-up phone calls improve patients self-monitoring of blood glucose? (Brown-Deacon, C., Brown, T., Creech, C., McFarland, M., Nair, A., and Whitlow, K., 2016).	Level II: Randomized control	• Two groups with group 1 received standard and group 2 received standard care and follow up phone calls from the nurse practitioner. • Group 2 patients were called and asked if they had been checking their blood glucose.	• The results did be not statistically significant between the two groups. • Results were clinically significant and were implemented in the proposed setting.	• This study was relevant to clinical practice and has demonstrated that follow-up telephone with the patient with type 2 diabetes has led to improved adherence to diabetes management. • Follow-up telephone calls improved adherence to diabetes self-management. **Recommendations** • This study was relevant to clinical practice and has demonstrated that follow-up telephone with the patient with type 2 diabetes has led to improved adherence to diabetes management.

A telehealth rural practice changes for diabetes education and management. (Barker, K., Mallow, J., Theeke, L., and Schwertfeger, R., 2016).	Level V: Systematic review of descriptive & qualitative studies	• Intervention includes the telephone call to manage blood glucose levels. • With a weekly call for seven weeks. • A nurse-led rural telehealth intervention looked at the impact on health behaviors, weight, and blood glucose levels.	• The results included a reduction in glucose level. Decreasing from 213 to 153mg/dl. • Clinically significant for the management to type 2 diabetes. • Telehealth interventions for diabetes education and management have demonstrated the effectiveness in the literature, and could be offered as an alternative to face-to-face interventions.	• The implications of telehealth in the rural clinic. • Nurse practitioner-led pilot study, which included a telephone call to manage blood glucose levels. **Recommendations** • Include future studies that would follow the adults over a longer period to assess the effect on A1c. • Some telephone guideline revisions are suggested based on the feedback of the NP interventionist.

Telehealth insulin program: managing insulin in primary care. (Iannitto, J.M., Dickman, K., Lakhani, R.H., and June, M.C., 2014).	Level IV: Case-control or cohort study.	• The study pilot was evaluated for 1 year. Sample 21 enrolled in telehealth insulin program all with type 2 diabetes. • All not at goal with glycemic control with insulin. • The NP call weekly, and insulin is titrated by the based on the patients SMBG levels.	• Over 75% of the participants improved their glycemic control. • Prior to the intervention, A1c was 10.1, and post-intervention 8.6.	• Telehealth improves access to care by addressing the challenges that patients with diabetes face. • Telehealth aids in access to health care for diabetes management. **Recommendations** • Implementation of telehealth for the management of insulin will improve outcomes in the primary care setting. • Advance practice nurses should be leaders in using telehealth technologies.
Diabetes connects: developing a mobile intervention to link diabetes community health workers with primary care (Cherrington, A., Agne, A.A., Lampkin, Y., Birl, A., Shelton, T.C., Guzman, A., and Willig, J.H., 2015).	Level VI: Single descriptive or qualitative study	• The use of telehealth with mobile health technology has demonstrated to be effective in helping diabetes self-management.	• Developed a mobile health Web application to assist adults with type 2 diabetes to connect with their healthcare team in real time.	• Implementation of the system with real-time feedback with the user, which was easy to use and meet the needs of the community health workers.

		• The goal of this study was to improve diabetes telehealth outcomes through mHealth technology. • Provide ongoing support for monitoring with telephone support.	• Secure messaging with mHealth technology for patients to ask questions about medications, diabetes, and self-management issues. • Telehealth mHealth technology was successfully achieved and readily accepted.	• Allows for the health care providers to track the adults with type 2 diabetes progress towards their diabetes self-management. **Recommendations** • More clinics and healthcare systems should look to include mHealth technology in the management of chronic disease. • Future studies are needed to assess healthcare providers preferences for communication.
Assessing advantages and barriers to telemedicine adoption in the practice setting: a MyCare exemplary. (L'Esperance, S.T., and Perry, D. J., 2015).	Level V: Systematic review of descriptive and qualitative studies. A systematic review of	• This quality improvement project was conducted by a nurse practitioner that assessed the barriers to telemedicine and an online diabetes	• Increasing awareness of the MyCareTeam system and reduction of barriers for the patients and the staff.	• This quality improvement project included an increased awareness of the online diabetes management system and reduction of barriers for the patients and the staff.

	descriptive and qualitative studies.	management system for adults in an adult diabetes clinic. • Two questionnaires on the technology required for MyCareTeam, which is an online diabetes care management application. • Outcomes include classifying patients with regards to their use of technology, and the staff on talking to patients about the online management system.	• Telemedicine was evolving and held great potential to improve patient outcomes by improving access to healthcare.	**Recommendations** • This quality improvement project challenged nurse practitioners and other clinicians to take advantage of telehealth and telemedicine to manage diabetes in adults.
Telehealth: mapping the evidence for patient outcomes for systematic review (AHRQ, 2016)	Level I: Systematic review and Meta-analysis	• Telehealth technologies in healthcare delivery. • Involving a provider across distance or time. • Mapping the evidence of patient outcomes with the use of telehealth.	• Benefit by clinic focus area. • No clear conclusions about the effectiveness of telehealth. • Diabetes care feasible and effective.	• The implication of telehealth interventions to help providers and health systems. • Stakeholders face making decisions to implement telehealth. **Recommendations**

			• Improvement in clinical outcomes (HgA1c, BP, triglycerides, and total cholesterol).	• For the guidelines for care for type 2 diabetes to include telehealth service. • Telehealth guidelines will need to consider the impact of telehealth services on the cost, quality, and the experience of care. • For clinical guidelines to include decisions regarding telehealth services. • Additional studies are needed to evaluate payment models.
National Standards for Diabetes Self-Management Education and Support (Beck et al., 2017).	Level I: Systematic Review	• Diabetes Self-Monitoring Education and Support (DSMES) literature review for the National Standards. • Numerous studies have shown the benefits of DSMES, which include improved clinical outcomes and	• Diabetes self-management education and support (DSMES) is a critical element of care for all people with diabetes. • DSMES must be individualized and guided by the concerns, and the	• The implication of Telehealth, electronic health records (EHR), mobile applications, and cognitive computing will identify and track participants while offering endless opportunities for individualized and contextualized DSMES.

		quality of life while reducing hospitalizations and health care costs. • The evidence indicates that health care providers and patients affected by diabetes are embracing technology, and this is having a positive impact on DSMES access, utilization, and outcomes.	needs of the person affected by diabetes. • DSMES continues to underutilize by health care services. • Technology is changing DSMES delivery and utilization with positive outcomes.	• The providers of DSMES services will define missions and goals, seek input from stakeholders, evaluate the population served, and individualize DSMES. **Recommendations** • Use of digital technology (cloud-based, telehealth, data management platforms, apps, and social media) enhances the ability to employ a technology-enabled self-management feedback loop with 4 key elements: 2-way communication, analysis of patient-generated health data, customized education, and individualized feedback to provide real-time engagement in self-management

				as well as to enable and empower participants
Understanding and applying the AADE competencies. (Dickinson, J.K., Kocurek, B., Reed, A.A., Painter, N.A., 2017).	Level I: Systematic Review	• The American Association of Diabetes Educators (AADE) guide for the specialty of Diabetes Self-Management Education (DSME). • Outline of the competencies for Diabetes Educators and Paraprofessionals.	• The AADE Competencies for Diabetes Education and Diabetes Professionals should guide educators practice regardless of discipline. • This practice resource included the scope practice, standards of practice, and standards of professional performance. • The AADE resources facilitate excellence and	• The implication of the Diabetes Education Competencies to support the National Standards for Diabetes Self-Management Education and Support (DSMES). • The implication of knowledge and skills to practice diabetes education. • Resources for Diabetes Educators and Paraprofessionals to be a guideline not a job description. **Recommendations** • The use of the AADE Competencies for Diabetes Educators

			guide diabetes educators.	and Diabetes Professionals to guide diabetes educators practice regardless of discipline. • Collaboration among current diabetes educators and fostering a career path for future diabetes educators.
Diabetes education as a career choice. (Dickinson, J.K., Lipman, R.D., & O'Brian, C.A., 2015).	Level I: Systematic Review	• Diabetes education as a career choice was reviewed. • This study examined the field of diabetes education. • This review identified barriers for health care professionals entering the specialty field of diabetes education.	• There is a gap between faculty members and student report of awareness of the diabetes education specialty. • Misinformation about diabetes education specialty may limit potential future diabetes educators. • The American Association of Diabetes	• The implication of increasing the awareness of diabetes education as a career path. • Inform health care professionals and the public about diabetes education, what diabetes educators do, and how future educators can get started in this role. • Current diabetes educators can help encourage others on this career path.

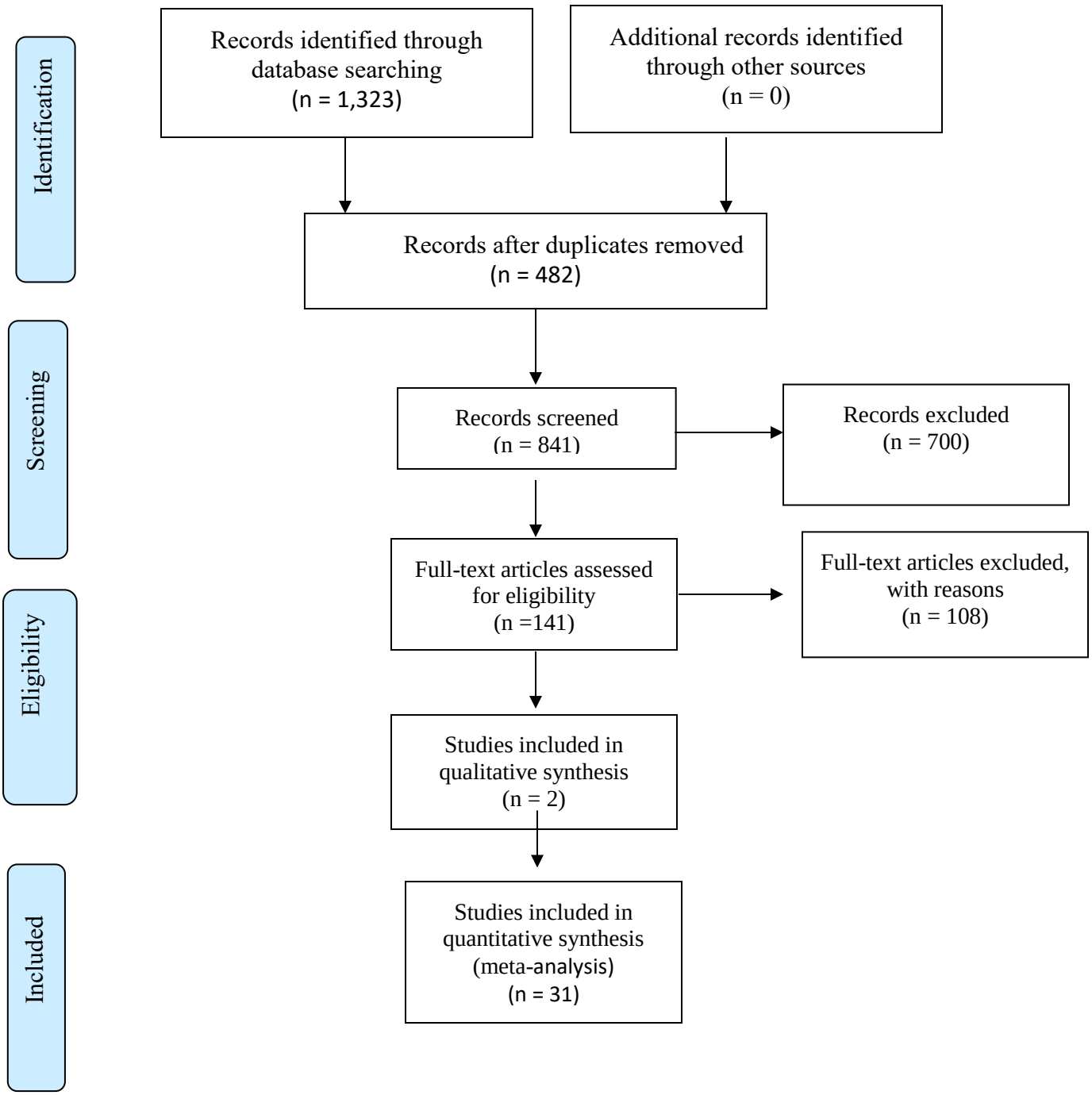
			Educators, health professional faculty members, and practicing diabetes educators can do more to clear up misconceptions and promote diabetes as a career path for students in the health professions.	**Recommendations** • To close the gap between how faculty members, see diabetes education as a career path. • Increase awareness of diabetes education as a career path. • Correct misinformation and lack of understanding regarding diabetes education. • Offer formal education in diabetes education.
The Center for Health Law and Policy Innovation of Harvard Law School (2015). Reconsidering cost-sharing for diabetes self-management education: recommendation for policy reform.	Level I: Systematic Review	• Analysis of type 2 diabetes policies and the case of reducing or eliminating DSME cost-sharing or copayments. • DSME can help patients to significantly lower their blood glucose levels.	• DSME without cost-sharing would increase the number of beneficiary's enrollment in DSME programs. • Patients with diabetes would get the support that is needed to effectively	• DSME implication of cost-sharing reduction or elimination to improve access to DSME services. • The implication of cost-sharing saving can decrease inpatient cost. • Public and private insurers should provide DSME with

		• DSME is shown to be successful and cost-effective intervention.	manage their diabetes. • DSME is a critical and cost-effective intervention for diabetes management.	little or no cost-sharing. Recommendations • Public and private insurance provide policies that cover DSME services with little or no cost-sharing. • Additional cost-sharing focused research needs to be conducted to increase support of the findings. • Policy reform for DSME services to increase participation.

Appendix

Appendix A

Flow Diagram



he PRISMA Statement. PloS Med 6(7): e1000097. Doi:10.1371/journal. pmed1000097**For more information, visit www.prisma-statement.org.**

Appendix B

CITI Training Certificate

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Monica Allen (ID: 5143506)
- **Institution Affiliation:** Liberty University (ID: 2446)
- **Institution Email:** mallen51@liberty.edu
- **Institution Unit:** Nursing
- **Phone:** 757-218-1073

- **Curriculum Group:** Human subject - Basic
- **Course Learner Group:** Nursing
- **Stage:** Stage 1 - Basic Course
- **Description:** This course is appropriate for students doing class projects that qualify as "No More Than Minimal Risk" human subjects research.

- **Record ID:** 17549912
- **Report Date:** 27-Jun-2018
- **Current Score**:** 88

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	07-Oct-2015	7/10 (70%)
Liberty University (ID: 15111)	04-Feb-2017	No Quiz
History and Ethical Principles - SBE (ID: 490)	07-Oct-2015	4/5 (80%)
Defining Research with Human Subjects - SBE (ID: 491)	06-Dec-2015	5/5 (100%)
Belmont Report and Its Principles (ID: 1127)	07-Oct-2015	3/3 (100%)
The Federal Regulations - SBE (ID: 502)	09-Dec-2015	4/5 (80%)
Records-Based Research (ID: 5)	11-Dec-2015	3/3 (100%)
Assessing Risk - SBE (ID: 503)	10-Dec-2015	5/5 (100%)
Informed Consent - SBE (ID: 504)	10-Dec-2015	4/5 (80%)
Research Involving Prisoners (ID: 8)	13-Dec-2015	4/4 (100%)
Research Involving Children (ID: 9)	13-Dec-2015	3/3 (100%)
Privacy and Confidentiality - SBE (ID: 505)	10-Dec-2015	4/5 (80%)
Research Involving Pregnant Women, Fetuses, and Neonates (ID: 10)	13-Dec-2015	3/3 (100%)
Research and HIPAA Privacy Protections (ID: 14)	04-Feb-2017	4/5 (80%)
Vulnerable Subjects - Research Involving Workers/Employees (ID: 483)	13-Dec-2015	4/4 (100%)
Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928)	13-Dec-2015	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	13-Dec-2015	4/5 (80%)
Cultural Competence in Research (ID: 15166)	04-Feb-2017	5/5 (100%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	13-Dec-2015	4/5 (80%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k8127bdff-46bc-4274-bf39-f4f48633dcc0-17549912

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

Appendix C

IRB Letter

June 1, 2018

Monica S. Allen
IRB Application 3359: Telehealth and Diabetes Self- Management Education and Support for Improving Health Outcomes in Adults with Type 2 Diabetes: An Integrative Review

Dear Monica S. Allen,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP Administrative Chair of Institutional Research
The Graduate School