

DIABETES HEALTH LITERACY IN THE RURAL COMMUNITY

An Integrative Review

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Shannon M. Elrod

Liberty University

Lynchburg, VA

August, 2020

DIABETES HEALTH LITERACY IN THE RURAL COMMUNITY

An Integrative Review

Submitted to the

Faculty of Liberty University

In partial fulfillment of

The requirements for the degree

Of Doctor of Nursing Practice

By

Shannon M. Elrod

Liberty University

Lynchburg, VA

August, 2020

Scholarly Project Chair:

Dr. Dana Woody, DNP, RN, Associate Professor of Nursing

ABSTRACT

Health literacy is paramount for successful management of health and prevention of disease. Yet a majority of adults have low health literacy. The impact of low health literacy on chronic disease management affects health outcomes and health care costs. With six out of 10 adults in the US diagnosed with a chronic disease such as diabetes, health literacy is a serious concern. Diabetes impacts over 30.3 million Americans. Since diabetes is one of the most common chronic diseases in the country, it is imperative that health literacy be addressed as part of this population's health management. Diabetes health literacy plays a substantial role in disease management by increasing successful self-management behaviors. Rural populations in particular have lower levels of health literacy and higher incidence of diabetes, making this population at increased risk for morbidity and complications such as vision loss, cardiac disease and kidney failure. The geographical and demographic inequities of the rural population provide unique challenges that impact diabetes health literacy. Given the statistics related to diabetes and diabetes health literacy in the rural community, it is paramount that providers working in these communities acknowledge the factors that influence diabetes health literacy and are knowledgeable of interventions and strategies that impact diabetes health literacy. This integrative review examines the state of evidence regarding diabetes health literacy in the rural community in an effort to support health care providers in improving diabetes health literacy in this at-risk population.

Keywords: diabetes, health literacy, rural, provider, disease management.

Copyright© (2020) by Shannon Elrod, RN, BSN, FNP-DNP candidate

Acknowledgments

To my Lord and Savior who pushed me outside my comfort zone to pursue this degree. The verse He gave me from the beginning rings true: “Not that we are competent in ourselves to claim anything for our self, but our competence comes from God” (2 Corinthians 3:5, New International Version). To my husband for holding down the fort and being my biggest cheerleader while I spent countless hours driving back and forth to school and holed up studying and writing. Thanks for believing in me even when I did not. I am excited to move into the next adventure with you! To my parents who cheered me on, prayed for me, understood my long absences, and kept my husband company while I pursued this calling—I am blessed to have you! Thank you, Dr. Woody, for accepting the challenge of being my project chair. Your patience, standard of excellence, and faith in our Savior’s work put me over the finish line with a project I can be proud to own! Thank you to all of Liberty’s professional, smart, talented professors that prayed for us, raised the bar high, and helped us meet the high expectations; you are great examples of how to impact nursing and our patients’ health for the glory of Christ.

Table of Contents

ABSTRACT	3
Acknowledgments.....	5
List of Tables	9
List of Figures	10
List of Abbreviations.....	11
SECTION ONE: INTRODUCTION	12
Background	14
Problem Statement.....	21
Purpose of the Scholarly Project	22
Significance of the Scholarly Project	22
Clinical Review Questions.....	23
Project Goals	23
SECTION TWO: METHODOLOGY.....	24
Ethical Considerations	24
Framework	25
Integrative Review Stages.....	28
Presentation Stage	33
SECTION THREE: COMPREHENSIVE AND SYSTEMATIC SEARCH	33
Search Strategies	33
Literature Search Results	35
Methods for Quality Assessment	36
SECTION FOUR: CRITICAL APPRAISAL	37

Guidelines	37
Systematic Review and Meta-Analysis of Randomized Controlled Trials	38
Randomized Controlled Trials	39
Systematic Reviews and Meta-Analyses of Descriptive and Qualitative Studies	43
Cross-Sectional Studies	46
Qualitative Studies.....	47
Mixed-Method Studies	50
Integrative Review.....	54
Professional Opinion	54
SECTION FIVE: DATA ANALYSIS AND SYNTHESIS	56
For Rural Patients Living With Diabetes, What Are Outcomes Related to DHL?.....	56
For Rural Patients Living With Diabetes, Are There Rural-Specific Variables That Impact DHL?.....	58
For Rural Patients Living With Diabetes, What Provider Interventions and Strategies Increase DHL?.....	60
SECTION SIX: DISCUSSION	67
Limitations	70
Implications for Research	71
Implications for Practice	71
DNP Essentials	73
SECTION SEVEN: CONCLUSIONS	76
References	78
Appendix A: Collaborative Institutional Training Initiative Program Completion Certificate	87

Appendix B: Institutional Review Board Letter88

Appendix C: PRISMA Flow Diagram89

Appendix D: Review Question Matrices.....90

List of Tables

Table H-1. Outcomes Related to Diabetes Health Literacy	97
Table H-2. Variables Influencing DHL in Rural Populations	103
Table H-3. Rural Provider Interventions and Strategies that Increase DHL	107

List of Figures

Figure 1. Flowchart of outcomes related to diabetes health literacy	58
Figure 2. Flowchart of variables influencing diabetes health literacy in rural patients	60
Figure 3. Flowchart of rural provider interventions and strategies.....	67

List of Abbreviations

Agency for Healthcare Research and Quality (AHRQ)

American Association of Diabetes Educators (AADE)

American Diabetes Association (ADA)

Appraisal for Guidelines and Research Evaluation II (AGREE II)

Body mass index (BMI)

Centers for Disease Control and Prevention (CDC)

Centers for Medicare and Medicaid Services (CMS)

Diabetes health literacy (DHL)

Diabetes Self-Management Education and Support (DSMES)

Doctor of Nursing Practice (DNP)

Health Information Technology (HIT)

Health literacy (HL)

International Union for Health Promotion and Education (IUHPE)

Joanna Briggs Institute (JBI)

Levels of evidence (LOE)

National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)

National Rural Health Association (NRHA)

Office of Disease Prevention and Health Promotion (ODPHP)

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

Self-monitoring blood glucose use (SMBG)

U.S. Department of Health and Human Services (USDHHS)

World Health Organization (WHO)

SECTION ONE: INTRODUCTION

Health literacy (HL) is defined by the Department of Health and Human Services as the “degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (U.S. Department of Health and Human Services [USDHHS], 2019, para. 1). HL affects how patients navigate the health care system, their understanding of disease, and their disease self-management. HL has been shown to affect health outcomes, rates of hospitalization, and use of preventative services (USDHHS, 2019). It is estimated that only 12% of adults are proficient in HL, which means nine out of 10 adults lack the necessary skills to manage their health and prevent disease (USDHHS, 2019). With six out of 10 U.S. adults living with a chronic disease, HL is a serious concern (National Center for Chronic Disease Prevention and Health Promotion [NCCDPHP], 2019).

In order to address HL, the Office of Disease Prevention and Health Promotion (ODPHP) released the *National Action Plan to Improve Health Literacy* in 2010. This document is based on the premises that all people have a right to health information that helps them make informed decisions and that health services should be delivered in an easy-to-understand manner that benefits health and quality of life (ODPHP, 2010). The document presents seven goals to improve HL nationally by addressing provider roles, health care systems, policy makers, communities, and the education system. These seven goals are: to develop and disseminate accurate and accessible health and safety information; to promote changes in the health care system that improve health information, communication, informed decision-making, and access to services; to incorporate accurate and developmentally appropriate health information from throughout the educational system; to support and expand culturally relevant health information;

to change policies; to increase research and implementation of practices to increase HL; and to increase the dissemination and use of evidence-based HL practices and interventions (ODPHP, 2010).

Rural communities have shown a higher prevalence of low HL due to unique challenges that include: travel distances, limited access to providers and health care resources, gaps in health care coverage, poverty, lack of support resources, and limited Internet capabilities, which all provide unique barriers to patients receiving necessary health care and health education (Centers for Medicare and Medicaid Services [CMS], 2018; National Rural Health Association [NRHA], n.d.). These communities also have higher rates of diabetes and coronary heart disease than their nonrural counterparts and higher mortality rates from diabetes (Callaghan, Towne, Bolin, & Ferdinand, 2017; NRHA, n.d.).

The plight of rural diabetes health is a national concern and needs to be addressed by providers, the community, and policy makers. Rural Healthy People 2020 was published by the Southwest Rural Health Center at Texas A&M School of Public Health for the purpose of providing federal and state policy leaders with valuable information regarding rural health and rural health leaders and providers with the necessary tools to respond to the needs of the rural community (Southwest Rural Health Center, n.d.). This policy publication identified diabetes as the third most important rural priority (Bolin, Schulze, Helduser & Ory, 2015). From a national perspective, Healthy People 2020 identified objectives to decrease the rate of diabetes and diabetes complications (ODPHP, 2020). These objectives include improving glycemic control with a target of A1c below nine percent, improving lipid control among patients with diabetes, increasing the proportion of adults with diabetes who self-monitor blood glucose at least once

daily, and increasing the proportion of patients with diabetes who receive formal diabetes education (ODPHP, 2020).

Only one third of the rural population in the southeastern part of the US has received diabetes self-care education, which has been shown to improve patient self-management behaviors (Bolin et al., 2015). Rural minorities in the southeastern United States have the highest prevalence of diabetes, and rural minorities in general are twice as likely as rural whites to experience diabetes complications such as blindness, kidney failure, and lower limb amputation (Bolin et al., 2015). Rural barriers to improving management and outcomes related to diabetes have been identified as limited health care resources and limited access to diabetes self-management education and support (DSMES; Bolin et al., 2015). The American Diabetes Association (ADA, 2020) guidelines provide strong evidence-based recommendations to refer patients for diabetes teaching and support self-management. However, the rural community's unique challenges related to HL referenced earlier place them at higher risk for diabetes complications and poor health outcomes. To advocate for a plan of action that aligns with national health goals, this scholarly project sought to evaluate the state of evidence regarding diabetes HL (DHL) in the rural community and raise awareness of evidence-based interventions and strategies for rural providers in support of improved DHL and outcomes in the rural diabetic population.

Background

Diabetes. The World Health Organization (WHO, 2019) defines diabetes as a chronic metabolic disease that is the result of elevated blood glucose levels, which over time can lead to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. The ADA has four general classifications for diabetes: (1) Type 1 diabetes, (2) Type 2 diabetes, (3) gestational diabetes

mellitus, and (4) specific types of diabetes due to other causes (ADA, 2020). Type 1 diabetes is the result of autoimmune destruction of the beta cells in the pancreas that leads to insulin deficiency, while Type 2 diabetes is the result of insulin resistance and the progressive loss of beta-cell insulin-secretion function (ADA, 2020). Gestational diabetes mellitus is diabetes that is diagnosed in the second or third trimester of pregnancy and was not overtly present prior to the pregnancy (ADA, 2020). Diabetes due to other causes includes neonatal diabetes, drug or chemically induced diabetes (i.e., glucocorticoid steroid use, HIV/AIDS treatments), and diseases such as cystic fibrosis and pancreatitis (ADA, 2020).

Diabetes diagnosis. The ADA has set guidelines for the diagnosis of diabetes. These guidelines define diabetes as: an A1c level of $\geq 6.5\%$, oral fasting plasma glucose of $\geq 126\text{mg/dL}$, an oral glucose tolerance test of $\geq 200\text{mg/dL}$, or random plasma glucose level of $\geq 200\text{mg/dL}$ (ADA, 2020). Without overt signs of hyperglycemia, diagnosis requires either two abnormal test results from the same sample or two separate samples (ADA, 2020).

Diabetes comorbidities. Diabetes is a chronic disease that over time leads to serious damage to the heart, blood vessels, eyes, kidneys, and nerves and is the seventh leading cause of death in the US (ADA, 2020; WHO, 2019). Large vessel effects of diabetes include heart disease, stroke and gangrene (Centers for Disease Control and Prevention [CDC], 2017, 2019). Smaller blood vessels affected by diabetes cause diabetic retinopathy, glaucoma, cataracts and chronic kidney disease, while nerves affected by diabetes lead to neuropathies most often affecting the legs and feet, but also affecting digestion, blood vessels and the heart (CDC, 2019). Infections such as gangrene from poor circulation are difficult to treat in the diabetic client and often lead to amputations to stop the spread of the infection. In addition, diabetes can increase

the risk of depression. Often this is the result of feeling overwhelmed with managing the disease, as well as dealing with diabetes complications and declining health (CDC, 2019).

Diabetes prevalence. It is estimated that over 34 million Americans are living with diabetes and another 88 million are living with prediabetes (ADA, n.d.). However, the prevalence of diabetes in the rural population is 17% higher than in the rest of the population (CMS, 2018). Healthy People 2020 reports concern regarding the rising number of diabetes cases in the US and worldwide, which increases the prevalence of diabetes-related complications and threatens to overwhelm current health care systems (ODPHP, 2020).

Diabetes cost. The estimated national cost of diabetes based on medical costs and loss in productivity was estimated to be \$245 billion in 2012, but the cost rose by 26% by 2017 to \$327 billion due to increased prevalence of diabetes and cost per person (ADA, n.d.; CDC, 2017). People with diabetes incur on average 2.3 times higher medical expenditures than those without diabetes, with an average medical expenditure of approximately \$16,750 annually (ADA, 2018; CDC, 2017). Most of the costs for diabetes care are provided by government insurance, including Medicare, Medicaid, and the military (ADA, 2018).

Diabetes self-management. Healthy People 2020 set goals to decrease comorbidities and death associated with diabetes. These goals include: improving glycemic control by decreasing the proportion of diabetic clients with A1c levels greater than 9%, improving lipid control among diabetic clients, increasing the proportion of diabetic adults who self-monitor their glucose at least one time per day, and increasing the proportion of diabetic clients who received formal diabetes education (ODPHP, 2020). DSMES is an accepted standard component of diabetes care that has been shown to improve A1c levels by as much as 1%, reduce all-cause mortality risk,

reduce health costs, and improve quality of life for the chronic diabetic population (ADA, 2020; Heitkemper, Mamykina, Travers, & Smaldone, 2017; Kim & Lee, 2016).

DSMES focuses on seven self-care behaviors to improve diabetes self-management: healthy eating, being active, monitoring, taking medications, problem solving, healthy coping skills, and decreasing risks (ADA, 2020). The DSMES process involves assessing, setting a goal, developing a specific plan, implementing the plan, and lastly, evaluating the outcome (Burke, Sherr, & Lipman, 2014). Assessment is conducted of personal lifestyle factors, daily routines, eating patterns, tobacco and alcohol use, living arrangements, occupation, financial barriers, and HL. Goals are not set by the provider, but rather by the patient with the provider's guidance (Burke et al., 2014). A specific plan for the patient is developed by the patient, based on their goals, as this plan is more likely to mirror the patient's reality and allow the patient to be successful with implementation. Burke et al. (2014) noted that individuals are most vulnerable to failure during the implementation process because they are returning to their home environment and daily life. Ongoing support is an important component of the implementation process—from the provider as well as the patient's support system. The final step of the DSMES process is to evaluate progress and monitor the patient. This may include reviewing a blood glucose log, food diaries, and A1c levels, as well as what is or is not working in regard to the plan.

There are four critical times to refer clients to DSMES: at the time of diagnosis, for an annual assessment, when new complications arise, and when there are transitions in care (ADA, 2020). Typically, DSMES takes place in person between the patient and diabetes educator. However, research has shown that even technology such as phone calls, phone apps, and in particular video calls demonstrates similar effectiveness to in-person DSMES (Heitkemper et al.,

2017). In addition, research supports that clinicians can foster self-management success by demonstrating belief in the patient's competence and autonomy while providing the necessary education and tools for the patient to be successful (Mohn et al., 2015).

Health literacy. HL is dependent upon a host of variables such as communication skills and knowledge of both the patient and health professional, culture, and the demands of health care and public health care systems (USDHHS, 2019). HL affects how patients navigate the health system, their knowledge of health topics (such as diabetes), their numeracy skills (needed to measure medications and understand blood sugar levels), and how they self-manage their disease. Limited HL is often the cause of a lack in knowledge or misinformation regarding the body and the nature and cause of disease. This makes it difficult to understand the relationship between modifiable lifestyle factors related to diabetes (e.g., food choices, exercise) and health outcomes. With only 12% of U.S. adults proficient in HL, nearly nine out of 10 adults lack the skills needed to manage their health and prevent disease (USDHHS, 2019). Low HL is shown to correlate with poor health outcomes, higher rates of hospitalization, and decreased use of preventative services, making it a priority to address for the benefit of overall population health, keeping down national medical costs, and improving individual quality of life (USDHHS, 2019).

Often, it can be assumed that HL is directly proportional to overall literacy (i.e., the ability to read and write). However, this is not always the case. It should be pointed out that this relationship is complex because overall literacy can be high and yet HL low (ODPHP, 2020; Rajah, Hassali, Jou, & Murugiah, 2018; Storms, Aertgeerts, Vandenabeele, & Claes, 2017). For instance, a client may have a college education but still struggle to understand which foods are considered carbohydrates and why these foods should be limited. Health information can

overwhelm even those with the most advanced literacy skills—especially in stressful situations where clients may be unlikely to retain information.

Types of HL. HL is more than the ability to read and write, although this is an important part of HL. There are three subdomains of HL: functional HL, communicative/interactive HL, and critical HL (The International Union for Health Promotion and Education [IUHPE], 2018; Xu, Leung, & Chau, 2018). Functional HL requires basic reading and writing skills needed to function in everyday life and is associated with following recommended disease management strategies (IUHPE, 2018; Xu et al., 2018). A diabetes class would be an example of a way to increase functional HL. A higher educational level, higher income, employment, marriage, and use of Internet were found to all contribute to higher functional HL (Xu et al., 2018).

Communicative/interactive HL requires advanced skills to extract important information during the process of communication and the ability to apply new information to changing circumstances (IUHPE, 2018; Xu et al., 2018). Increasing this domain of communicative/interactive HL requires higher levels of interaction such as a diabetes class or interactive website. Critical HL is the most advanced type of HL, as it requires a more advanced set of skills to critically think about information and apply it to manage one's life/disease (Xu et al., 2018). Health education that impacts critical HL may include information regarding personal health risk, but also the larger impacts of social, economic, and environmental effects on health.

Universal precautions. The Agency for Healthcare Research Quality (AHRQ, 2020) has advocated for universal HL precautions, which assume that everyone may have difficulty understanding health information and difficulty accessing care. With this assumption, providers and the health care system can create environments where all patients have the potential to be successful in managing their health (AHRQ, 2020). The goals for the precautions are to simplify

communication, confirm patient understanding, make the health care system easier to navigate for patients, and support patient efforts in improving their health (AHRQ, 2020). AHRQ provides a free online HL Universal Precautions Toolkit for providers to use to implement evidence-based interventions and systems into their health care practices. The use of simple language, free of medical jargon, is encouraged to improve patient understanding of health information. Use of the teach-back method, where the provider asks the patient to teach back to the provider what the patient understands regarding health information, is utilized to confirm patient understanding (AHRQ, 2020).

Motivational interviewing. Motivational interviewing has been used to empower patients to manage their health and improve their HL (Kim & Lee, 2016). This form of communication involves four major principles: expressing empathy, supporting self-efficacy, helping the patient to see discrepancies with where they are versus where they want to be, and rolling with patient resistance where the provider explores the patient's resistance with them by asking questions and facilitating the patient's feelings of acceptance (Dart, 2011).

Health literacy and diabetes. These methods to address HL can be applied to disease-specific HL as well, including DHL (Kim & Lee, 2016). Low DHL is common, with a prevalence of 22%–38% depending on the population, and is not routinely assessed by providers (Ferguson et al., 2015; Mohn et al., 2015). Diabetes is a complex, chronic disease that requires clients to know how and when to check their blood sugar, be able to understand when and how to administer insulin to themselves, read an insulin syringe, be able to evaluate their diet to recognize carbohydrates that are more than just “desserts,” and make significant changes to their everyday life to limit the effects of the disease. Clients who develop HL have skills and

capabilities that enable them to employ actions to enhance their health outcomes (IUHPE, 2018). Limited DHL can therefore be considered a threat to the health of the diabetic population.

Problem Statement

DHL has been identified as a determinant for improved patient outcomes and has been shown to not only increase a patient's knowledge of diabetes, but also empower them to self-manage their disease. There are strong recommendations by the ADA (2020) to provide measures that increase DHL to improve self-management and outcomes. However, patients in the rural community lack access to the resources that impact DHL compared to their urban counterparts (Bolin et al., 2015; NRHA, n.d.). They are often navigating a fragmented health care system with a lack of providers and specialty providers, which puts them at risk for complications and poor outcomes, in addition to the risk factors of generally being older, underinsured, and living in poverty (CMS, 2018). The assessment and provision of DHL to patients in the rural community fall on the primary care provider, who research shows is often operating with a lack of resources (CMS, 2018). Providers are often hesitant to guide discussions about diabetes because of time constraints and feeling they lack the necessary skills to motivate clients to change behaviors (Faruqi, Lloyd, Ahmad, Yeong, & Harris, 2015; IUHPE, 2018; Rajah et al., 2018). However, as the rural primary care provider may be the only medical resource the rural patient has contact with, it is important these providers have an awareness of overall HL and are comfortable with assessing the patient's level of DHL to determine the risk factors for clients to fail in self-managing their disease. By completing an assessment of the patient's DHL level in a quick and efficient manner, the provider can intervene with necessary strategies to empower the client to be successful at self-managing their disease and mitigate complications that increase the client's morbidity. This integrative review serves to inform

providers regarding evidence-based interventions and strategies to best address DHL in the rural community.

Purpose of the Scholarly Project

The purpose of this scholarly project is to raise awareness among rural health care providers of the challenges of limited DHL among diabetic clients living in rural communities and to provide them with strategies and interventions they can utilize in their practice. This will be accomplished by summarizing past and present literature regarding what is currently known about DHL, particularly in the rural community; gaps that persist in research and current practices related to DHL; and recommendations as well as implications for research, practice, education and policy (Toronto & Remington, 2020). Results of the integrative review will empower rural providers to intervene in order to improve outcomes for patients living with diabetes in the rural community.

Significance of the Scholarly Project

There is a paucity of literature regarding DHL and the rural population, even though there is a higher prevalence of diabetes and lower rates of HL in these communities. In addition, DHL is a proven determinant of improved patient health outcomes and is characteristic of quality health care (USDHHS, 2019). It is therefore imperative that rural health care providers lead the charge to give a voice to the significance of DHL in these communities and provide evidence-based solutions to improve DHL. This integrative review examines variables that influence DHL for the rural patient and actions rural providers can take to improve outcomes for patients living with diabetes.

Clinical Review Questions

The integrative review will specifically address the following query: For rural adults living with diabetes, does receiving DHL impact patient self-management behaviors and outcomes compared with patients who do not receive DHL? The following questions will serve to focus the review:

1. For rural patients living with diabetes, what outcomes are related to DHL?
2. For rural patients living with diabetes, are there rural-specific variables that impact DHL?
3. For rural patients living with diabetes, what provider interventions and strategies can increase DHL?

The following questions will help to support and maintain the focus of the review:

1. What are barriers and facilitators of HL?
2. What are barriers to DHL that are unique to rural communities?
3. Is there provider awareness of DHL?
4. Are there provider barriers to addressing DHL in the rural community?
5. What are evidence-based strategies and interventions to address DHL that can be applied to the rural community?

Project Goals

The goals for this integrative review are to:

1. Provide an integrative review of literature that will enable increased understanding for rural providers regarding variables that influence DHL for patients living in rural areas.

2. Provide evidence-based interventions and strategies that rural providers can implement to increase patient DHL, thereby improving diabetes outcomes and lowering health costs.

SECTION TWO: METHODOLOGY

The methodology of the integrative review used the robust framework developed by Whitemore and Knafl (2005) based on Hooper's original integrative review methodology. The framework processes were closely followed to maintain rigor and decrease bias and inaccuracy. The vast amount and complexity of evidence that health care professionals require to inform their practice has resulted in a host of review types to provide comprehensive, manageable updates on topics pertaining to the many aspects of health care (Toronto & Remington, 2020). The integrative review is the broadest of these reviews and is well suited to the science of nursing because the broad review of literature lends itself well to tackling the complexities of nursing concerns such as DHL (Toronto & Remington, 2020; Whitemore & Knafl, 2005).

This integrative review of literature was undertaken to understand DHL in the rural community. Research shows that low DHL is common with diabetes, and few providers routinely assess for it (Ferguson et al., 2015; Rajah et al., 2018). The rural community presents unique challenges that can impact clients' DHL (Burke et al., 2014; CMS, 2018; McLendon, Wood, & Stanley, 2019; Yeh et al., 2018).

Ethical Considerations

Both the project researcher and the project chair completed the Collaborative Institutional Training Initiative to support the protection of human research subjects (Appendix A). Institutional Review Board approval was not required for this review because it does not involve the use of human subjects or medical record data (Appendix B).

Framework

Integrative review requires a rigorous methodology that is supported by a comprehensive framework. The framework for integrative review developed by Harris Cooper in the 1980s–1990s has often been used as a framework for integrative reviews and aligns with the systematic and meta-analysis reviews (Whittemore & Knafl, 2005). This framework was later modified by Whittemore and Knafl (2005) to address issues specific to the integrative review method, and most recently, Toronto and Remington (2020) developed a step-by-step guide to conducting an integrative review utilizing Cooper’s framework as a foundation.

The integrative review is the broadest type of research review intended to better understand an identified topic (Toronto & Remington, 2020; Whittemore & Knafl, 2005). The inclusion of diverse methodologies within an integrative review makes it an attractive option to investigate the complexity of nursing science (Toronto & Remington, 2020). However, without rigor and the application of systematic methods when conducting an integrative review, the end result can be fraught with bias and error (Toronto & Remington, 2020; Whittemore & Knafl, 2005). Therefore, it is paramount to apply a rigorous framework to the integrative review process.

The overarching framework for the undertaking of this integrative review scholarly project is the modified methodology of Whittemore and Knafl (2005) and the step-by-step guide to conducting an integrative review put forth by Toronto and Remington (2020). The overarching framework includes: formulation of a purpose or review questions, a systematic search of literature, quality appraisal of literature, analysis and synthesis, discussion and conclusion, and finally, dissemination of integrative review findings (Toronto & Remington, 2020; Whittemore & Knafl, 2005). Furthermore, the framework of the Preferred Reporting

Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was utilized to guide the process of the integrative review of literature. The Melnyk level of evidence (LOE) pyramid was utilized to organize literature into categories, while the PRISMA 27-item checklist and the Joanna Briggs Institute (JBI) critical appraisal tools were utilized to appraise literature. The Appraisal for Guidelines and Research Evaluation II (AGREE II) was used to appraise guidelines (Brouwers et al., 2010).

Whittemore and Knafl. Whittemore and Knafl (2005) noted that methods of analysis, synthesis, and conclusion-drawing for integrative reviews were more suited for systematic reviews and were thus poorly formulated for the diverse literature sources included in an integrative review process. Their modified integrative review framework addresses these methodological shortcomings with strategies to enhance the rigor of the integrative review by developing data analysis strategies that include data reduction, data display, data comparison, data conclusion, and verification (Whittemore & Knafl, 2005).

Toronto and Remington. Recognizing the importance of the integrative review to nursing in order to answer questions nursing has regarding practice and the limited quality resources available to guide the conducting of an integrative review, Toronto and Remington (2020) provide a detailed step-by-step guide to conducting an integrative review. Their guide is based on Cooper's original integrative review framework and was utilized to guide the process of this integrative review (Toronto & Remington, 2020).

PRISMA statement. The PRISMA statement provides guidelines for performing systematic reviews and meta-analyses with the aim of helping authors improve reporting (Moher, Liberati, Tetzlaff, & Altman, 2009). The PRISMA statement was developed to ensure clear

presentation of what was planned, done, and found in a systematic review (Liberati et al., 2009). The statement includes a four-phase flow diagram (Appendix C) and a 27-item checklist.

The PRISMA flow diagram provides transparency and replication of the data extraction process used for a review. The flow diagram was utilized for this integrative review to ensure transparency of the data extraction process undertaken for this review. The 27-item checklist is utilized to improve reporting of a systematic review or meta-analysis, both for randomized trials and other types of research (Moher et al., 2009). In addition, an explanation and elaboration document is provided as part of the PRISMA statement to provide the meaning and rationale of each item on the 27-item checklist (Liberati et al., 2009). The checklist can also be useful as a critical appraisal tool for published systematic reviews (Moher et al., 2009). The PRISMA 27-item checklist was utilized to guide the reporting of this integrative review but was also used to critically appraise systematic reviews and meta-analysis.

Melnyk level of evidence. The reviewer utilized the Melnyk LOE pyramid to initially evaluate the strength of studies reviewed and categorize them (Melnyk & Fineout-Overholt, 2015; University of Michigan Library, 2020). The pyramid ranks methodology of studies from Level I to Level VII, with Level I having the highest LOE. The higher a methodology ranks on the pyramid, the more likely the results are to be accurate and able to produce similar or the same health care outcomes (Melnyk & Fineout-Overholt, 2015). The LOE utilized for this project included Levels I–VII.

Joanna Briggs Institute critical appraisal tools. The JBI is associated with the University of Adelaide, South Australia, and is based in the Faculty of Health and Medical Sciences (JBI, n.d.). JBI is focused on improving health outcomes globally through the use of the best evidence-based and reliable information. They provide multiple evidence-based practice

tools and resources to support, appraise, and utilize research evidence with rationales for each step of critical appraisal, as appropriate to the methodology of the literature. The critical appraisal tools provided by the JBI were used to critically appraise nonsystematic reviews or non-meta-analysis literature.

AGREE II. The AGREE II tool was developed to address variability in quality guidelines (Brouwers et al., 2010). The tool provides a framework by which to assess the quality of a guideline as well as methodological strategy for developing one and informs what information should be included in a guideline. The tool consists of six domains: scope and practice, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence (Brouwers et al., 2010). The tool was utilized by this reviewer for guidelines that informed this integrative review.

Integrative Review Stages

The integrative review framework conceptualized by Whittmore and Knafl (2005) has five stages: problem identification, literature search, data evaluation, data analysis, and presentation.

Problem identification. The problem identification stage of an integrative review provides focus and boundaries for the review (Whittmore & Knafl, 2005). Well-written review questions identify the purpose of the review and contribute to a better understanding of the factors that impact rural providers' awareness of DHL (Toronto & Remington, 2020). The review questions that guided this integrative review were formulated from variables of interest. These variables of interest were: impact of DHL, factors that influence DHL, identification of DHL challenges in the rural population, and strategies rural primary care providers can employ to improve client DHL.

The identified problem that provides the purpose of this integrative review is the increased prevalence of diabetes in the rural community that has limited resources to address DHL. Rural communities have unique challenges compared to their urban counterparts that put them at higher risk for limited DHL, such as a higher prevalence of diabetes, provider and specialist shortages, transportation challenges, older populations, and minimal education attainment (CMS, 2018; Jones, Crabb, Turnbull, & Oxlad, 2014; McLendon et al., 2019). DHL is known to be low within this group of clients and is associated with nonadherence to therapies, impaired glycemic control, poor decision making, and ultimately poor outcomes and higher medical costs (Alvarez et al., 2018; Ferguson et al., 2015; Mantwill & Schultz, 2015; ODPHP, 2020). A well-defined purpose and variables provided focus for the review (Whittemore & Knafl, 2005).

Literature search stage. A well-defined literature search strategy contributes to the necessary rigor of an integrative review and should be systematic, comprehensive, and reported in detail (Toronto & Remington, 2020; Whittemore & Knafl, 2005). Documentation of the methods utilized to perform the search, search terms, and inclusion/exclusion criteria was completed by the researcher to provide evidence of rigor, as well as guidance for future researchers seeking similar results. This integrative review involved a systematic and comprehensive search that resulted in a total of 43 articles. These included: one guideline, one systematic review of randomized controlled trials; two systematic review and meta-analyses of randomized controlled trials, three randomized controlled trials, seven systematic reviews and meta-analyses of qualitative studies, six cross-sectional studies, four qualitative studies, two mixed-method studies, one integrative review, and three professional opinion manuscripts. The remaining literature consisted of government and agency reports.

Data evaluation stage. Evaluating the quality of literature in an integrative review is complex due to the multiple source types incorporated (Whittemore & Knafl, 2005). Therefore, it is imperative to assess the quality and internal validity of selected studies, which will assist with mitigating bias in the integrative review (Toronto & Remington, 2020; Whittemore & Knafl, 2005). The quality of the data sources was evaluated for methodological rigor and informational usefulness. Each of these criteria was rated on a two-point scale. One point was given if the study was considered low because it was missing significant items from the critical appraisal tools utilized. A study was given a two if considered high, meaning the study met the majority of the critical appraisal tool items. No source was eliminated based on the evaluation score. Critical appraisal tools utilized for this integrative review were: (a) Melnyk's LOE to categorize studies; (b) the PRISMA checklist to appraise systematic reviews and meta-analysis; (c) JBI critical appraisal tools to appraise all other studies that were non-systematic reviews or non-meta-analysis; and (d) AGREE II to evaluate guidelines. Integrative reviews should be conducted with the same degree of rigor as the studies the review is summarizing (Toronto & Remington, 2020). Utilizing multiple appraisal tools appropriate to the type of study ensures the rigor required of an integrative review.

Data analysis stage. The data analysis stage is the most challenging stage of the integrative review process and can be vulnerable to errors (Whittemore & Knafl, 2005). This stage involves ordering, coding, and categorizing the data. These categories are then examined for similarities and differences in relation to the integrative review purpose or review questions. The goal of the integrative review is to create a better understanding of a topic by synthesis of multiple sources. The data analysis stage moves the reviewer from simple facts regarding the identified topic to a new body of information (Toronto & Remington, 2020). This stage of the

integrative review consists of data reduction, data display, and data comparison to arrive at a new knowledge.

Data reduction. Data reduction is the process of selecting, focusing, and organizing the data from sources in such a manner that the results of the review can be displayed and verified (Toronto & Remington, 2020). There are two phases of data reduction: creating a classification system and coding/organizing data into a manageable framework (Whittemore & Knafl, 2005). Primary sources are divided into subgroups that serve to enable analysis of the data. Creation of a review matrix provides a structured document to facilitate synthesis of the data extracted from primary sources which aligns with the purpose of the review (Toronto & Remington, 2020). The initial review matrix created for this review was organized by Melnyk's LOE hierarchy. Each study was assigned a level of evidence from Level I to Level VII and organized accordingly, with the highest level of evidence (Level I) at the top of the matrix. Data were then coded and organized based on the themes of interest for this review.

Data display. Data display allows for a simplified, summarized presentation of the information that facilitates drawing conclusions (Toronto & Remington, 2020). This can be in the form of graphs, charts, or matrices that allow the reviewer to see relationships and patterns in the data. The data extracted for this integrative review were displayed within three matrices, each representing the review questions that guided this review. Each of the three matrices presents the title and author, study purpose, Melnyk's LOE, results, and limitations, strengths, and implications for practice. Data reduction and display are crucial to allow the reviewer to process a large amount of information and begin to synthesize the literature (Toronto & Remington, 2020).

Data comparison. The data comparison phase involves the examination of the data displays for patterns, themes, similarities, and differences among the data (Toronto & Remington, 2020). The process of visualization and comparison provides clarity of the empirical support emerging from the data gathered during the literature review (Whittemore & Knafl, 2005). Rigorous analysis of the data supports drawing conclusions during the final phase of data analysis. This integrative review utilized matrixes to organize the data based on the review questions. The researcher found common themes and displayed them in flow charts (Figures 1, 2, and 3).

Conclusions and verification. Conclusion-drawing is the final phase of data analysis (Toronto & Remington, 2020; Whittemore & Knafl, 2005). Patterns are isolated, similarities and differences are identified, and small generalizations are made regarding the subgroups created during analysis. These conclusions are verified with the primary source to confirm truthfulness. Any conflicting evidence demonstrates the need for further research with a subsequent review question aimed to resolve the conflict (Whittemore & Knafl, 2005). It is recommended that the entire process be documented, to include data analysis, analytical hunches, thoughts, alternate hypotheses, and ideas that directly relate to interpretation of the data (Whittemore & Knafl, 2005).

Subcategories for this integrative review were based on the original review questions for the project and included outcomes related to DHL, rural variables impacting DHL, and interventions and strategies to improve DHL. After each subcategory of this integrative review was analyzed, important conclusions from each were synthesized. These conclusions were verified against the original sources of data. The integration of these conclusions into a summation of the topic of DHL in the rural population supported the development of a new body

of information from the smaller subcategories, thus completing the review process as recommended by Whitemore and Knafl (2005).

Presentation Stage

Finally, explicit details of the findings of the review must be provided to demonstrate a logical chain of evidence. The use of tables and diagrams is encouraged to provide details. Findings should encapsulate the full depth of the topic and provide new understanding. Implications for practice, further research, and policy initiatives should be emphasized (Whitemore & Knafl, 2005). In addition, methodology limitations of the review should be included.

There are three presentations of results utilized in this integrative review: a flow diagram, tables, and concept maps. The flow diagram clearly depicts the report selection process throughout the integrative review (Liberati et al., 2009). Details of the evidence from selected sources are reported in a narrative format within the critical appraisal section of this integrative review. Tables allow the reader to see the evidence, conclusions, and recommendations that resulted from the literature, and the concept maps provide a visual depiction of the major themes, patterns and relationships identified for each of the review questions.

SECTION THREE: COMPREHENSIVE AND SYSTEMATIC SEARCH

The scholarly project was evaluated by the author and project chair throughout the process to ensure the evolving document upheld scholarly work, maintained rigor, and met the standards of the Doctor of Nursing Practice program at Liberty University.

Search Strategies

For a comprehensive literature search, it is recommended to utilize two or more search methods to avoid an inadequate database or inaccurate results (Toronto & Remington, 2020;

Whittemore & Knafl, 2005). The methods used by this researcher were multiple databases and ancestry searching. A research librarian was consulted to identify effective search terminology and strategies. The time period from 2010 to 2020 was chosen due to the ODPHP release in 2010 of the *National Action Plan to Improve Health Literacy*. This document discussed the nation's seven goals to improve HL by mobilizing not just providers, but health care administration, policymakers, communities, and the education system. Ancestry searching located articles prior to this time period, which were included due to the important foundation they provided for studies during the 2010–2020 timeframe. Databases searched included CINAHL, Cochrane Library, ProQuest and PubMed. Including gray literature as part of the search method for the integrative review serves to mitigate publication bias related to results (Toronto & Remington, 2020). A search of gray literature utilizing Google and Google Scholar was therefore undertaken for guidelines, government resources, and additional resource information.

Search terms. The review questions guided the search terms utilized for this integrative review. Search terms were adjusted throughout the literature search to provide relevant results. These search terms included *health literacy, patient education, health education, diabetes, diabetes literacy, diabetes knowledge, rural, remote, isolated, regional, provider, clinician, practitioner, and physician*. Boolean phrases such as *or, and, and not* were utilized to expand and limit the search per inclusion and exclusion criteria. Truncation was utilized to enhance the likelihood of finding relevant studies (Toronto & Remington, 2020). A research librarian was consulted to help refine the search and ensure there was no limitation of relevant articles.

Selection criteria.

Population. The focus of this review is providers (including physicians, nurses, advanced practice nurses, and pharmacists). The secondary audience is patients 18 years of age or older

living with chronic diabetes (Type 1 or Type 2). The setting considered is rural primary care, but all primary care, clinics, and diabetes clinic settings were considered as part of the literature search.

Intervention. The intervention for this review was increasing DHL in the rural population.

Outcomes. The principal outcome of interest was identifying barriers and facilitators to DHL and strategies shown to improve DHL in the rural population.

Study design. The literature search was not limited by study design. All study designs were included in the literature search.

Eligibility criteria. Data collection was guided by eligibility criteria that included the target audience, setting, the disease of diabetes, and inclusion and exclusion criteria. Inclusion and exclusion criteria were utilized to help identify literature that pertained to the guiding review questions and minimize the risk of bias (Toronto & Remington, 2020). Studies were considered if the publication was within the defined time period (2010–2020); the patient population was greater than or equal to 18 years of age; the study was peer reviewed; the article was written in the English language; the setting was a primary care office, clinic, or diabetes clinic; references were available; and the research included interventions to improve DHL. All study designs were considered, as were articles focusing on all types of providers. The following literature was excluded: dissertations, editorials, and research pertaining to gestational diabetes.

Literature Search Results

Over 4,000 articles were identified utilizing the search criteria and methods. An additional 13 records were identified from gray literature. The PRISMA flow diagram (Appendix C) was utilized to guide the process of narrowing down the search results to the

articles included in the integrative review. Of the original 4,013 articles identified, there were 3,012 after removing duplicate articles. The number was further reduced by reviewing abstracts and excluding articles that were not about diabetes I or II, did not pertain to diabetes literacy or knowledge, or were editorials, commentaries, or conference proceedings. This resulted in 179 full-text articles to assess for eligibility. Articles were further excluded for insufficient data, unacceptable quality, high risk for bias, or research before 2010. The result was a total of 43 articles that were included in this integrative review. These comprise, one guideline, one systematic review of randomized controlled trials, two systematic review and meta-analyses of randomized controlled trials, three randomized controlled trials, seven systematic reviews and meta-analyses of qualitative studies, six cross-sectional studies, four qualitative studies, two mixed-method studies, one integrative review, and three professional opinion manuscripts. The remaining literature consisted of government and agency reports.

Methods for Quality Assessment

A single reviewer critically appraised the quality of each manuscript by use of several methods. Initially, each study was assigned and organized by LOE, from the highest level of evidence (Level I) to the lowest level (Level VII; University of Michigan, 2020). Clinical guidelines were then appraised using the AGREE II tool, which provides a framework for assessing quality by appraising six domains that should be included within guidelines (Brouwers et al., 2010). Systematic reviews and meta-analyses were appraised using the PRISMA checklist, and the remaining studies were appraised using the JBI tools to appraise individual study designs (JBI, 2020; Liberati et al., 2009). The remaining manuscripts were gray literature and not included in the critical appraisal due to the nature of work but are included in the integrative review background and discussion due to their useful contextual information.

SECTION FOUR: CRITICAL APPRAISAL

Guidelines

Rigorous and well-developed evidence-based practice guidelines bridge the gap between scientific evidence and practitioner decision-making (Melnik & Fineout-Overton, 2015). The 2020 ADA guidelines do not address DHL directly or provide recommendations for assessing DHL. However, the guidelines do strongly recommend high-quality DMES to improve self-management, patient satisfaction, and glucose control and provide patient-centered care (ADA, 2020). Patient-centered care requires providers to be respectful and responsive to patient preferences to interventions. Consideration of the patient's needs and values should guide decision-making pertaining to interventions. An additional recommendation for improving patient education and compliance is incorporating social support, which may be accomplished through family but also through community health workers and lay persons (such as well-controlled diabetes patients who can mentor).

The ADA (2020) guidelines recommend the use of telemedicine in the rural population. The guidelines point out there is a growing body of evidence showing that telemedicine can be as effective at controlling A1c levels as in-person care. The use of interactive strategies that facilitate communication between providers and patients is encouraged because there the research increasingly shows that these strategies are the most effective. Guidelines for how to assess for the need of DSMES are not provided, leaving this up to providers to decide. In addition, it was found there are no best practices for establishing frequency of DHL assessment.

Additional guidelines pertaining to DHL were sought during the literature search. Closure of the National Guideline Clearinghouse limited further access to possible national DHL guidelines. While it is possible there are other guidelines available for DHL, none were found

during the extensive literature search conducted for this review. However, there were several professional opinion articles included in this integrative review that provide recommendations. These are included in the final category of critical appraisal articles—professional opinion.

Systematic Review and Meta-Analysis of Randomized Controlled Trials

One systematic review and two systematic reviews/meta-analyses of randomized controlled studies were considered for this integrative review. The systematic review included 14 randomized controlled trials that examined the association between DHL and self-management of Type 2 diabetes (Dahal & Hosseinzadeh, 2019). Two researchers were used for the review. There was no third party to resolve any disagreements; instead, the researchers relied on discussions together. Their findings support an association between DHL and significant improvement in self-management behaviors, diabetes knowledge, self-efficacy, and quality of life. However, associations between DHL and glycemic control, self-monitoring of blood glucose, foot care, diet management, and medication adherence were inconclusive. Findings suggested that structured, customized, and community-based strategies to increase DHL were more likely to empower patients and lead to improved self-management behaviors.

The two systematic review/meta-analyses involved diabetes and the rural population. One examined quality improvement initiatives that included randomized controlled trials but also a mixture of other controlled trials (Ricci-Cabello, Ruiz-Perez, Rojas-García, Pastor & Gonçalves, 2013). This study utilized gray literature as well as multiple databases and evaluated the research for internal and external validity utilizing a quality assessment tool for quantitative studies. The results of this review and meta-analysis showed that quality improvement initiatives aimed at the health care system and provider involving multiple strategies produced a greater impact on patient DHL in the rural community than those interventions focused solely on patient

education (Ricci-Cabello et al., 2013). The use of group supports, efforts to minimize barriers to health care, and face-to-face provider contact all had positive influences on DHL in this population. Limitations of this study were the considerable differences in the studies' characteristics, which may have impacted internal validity. In addition, the meta-analysis included in this review only examined the effect on glycemic control, which is only one of several desirable outcomes for patients with diabetes.

The second systemic review/meta-analysis examined the role of technology in providing DSMES to the rural population and its impact on glycemic control (Heitkemper et al., 2017). Thirteen randomized controlled trials were included in the systematic review, and 10 of these were eligible for meta-analysis. Two researchers reviewed the studies, and a third researcher was utilized to resolve any disputes. The studies were appraised for quality/bias utilizing critical appraisal tools. The studies included in the review involved phone applications or the Internet, and all utilized interactive video conferencing. These applications were found to have similar reductions in A1c levels and glycemic control in the rural population as seen with face-to-face education provided by diabetes educators (Heitkemper et al., 2017). A limitation of the review is that bias could have been introduced in some of the studies reviewed where questionnaires were used to obtain results.

Randomized Controlled Trials

Three randomized controlled trials were included in this integrative review (Abbott, Slate, & Graven, 2019; Ali et al., 2012; Safford et al., 2015); two of these are cluster-randomized trials (Abbott et al., 2019; Safford et al., 2015). All of the trials took place in the community setting, with two of them specifically targeting the rural community (Abbott et al., 2019; Safford et al., 2015). These randomized controlled trials examined the role of peer support (Safford et

al., 2015), a culturally relevant diabetes knowledge program (Abbott et al., 2019), and the impact of community pharmacists on diabetes education and outcomes (Ali et al, 2012).

The cluster-randomized controlled trial examining peer support was implemented in a rural, underserved region for the purpose of testing the effectiveness of a telephone-delivered peer coaching program (Safford et al., 2015). This randomized controlled trial involved 424 participants in eight counties, of which 360 completed the trial. Both the intervention group and control group received brief diabetes education and a personalized diabetes report card. In addition, the control group was assigned a peer coach who provided weekly calls for eight weeks, then monthly calls for 10 months. The peer coach focused on the patient's personal goals and provided emotional and social support for the patient. Outcomes were measured at 15 months and included A1c, systolic blood pressure, low density lipoprotein cholesterol, body mass index (BMI), quality of life, diabetes distress, and patient activation (Safford et al., 2015).

This randomized controlled trial was not truly randomized; sampling was respondent-driven for recruitment, and convenience sampling was utilized for recruitment of the eight communities (Safford et al., 2015). This creates a possible threat to internal validity of the study. However, the researchers did utilize a number generator to randomly assign participants to groups. Another risk to internal validity was significant differences between the groups related to race, education level, and baseline quality of life. In addition, neither participants nor researchers were blinded: They knew what group they were a part of for the trial, which introduces a risk of bias with the results.

Findings from this study revealed statistically significant changes in systolic blood pressure, BMI, quality of life, diabetes distress, and patient activation (Safford et al., 2015). There was also high patient satisfaction with the program, and it was found that many of the peer

coaches continued to follow up with patients after the 10-month trial period, implying a strong community peer connection. Related to this strong community peer connection was the discovery that diabetes distress increased at the 15-month follow-up point, suggesting the need for emotional support to be considered.

The second cluster-randomized controlled trial examined the effect of an evidence-based culturally relevant health promotion program on diabetes knowledge and self-reported self-care behaviors in a rural setting (Abbott et al., 2019). The clusters were 12 rural Black churches in Alabama randomized to either the intervention group or control group by means of random-number sequencing. Individual people from these groups were then identified as eligible for the trial, resulting in 146 Black participants in the study. The researchers knew who was in each group, which potentially affected internal validity of the study. There were no statistically significant differences between the groups, but it was noted the majority of participants were female (75%). The control group received a diabetes education pamphlet. The intervention group received the same education pamphlet in addition to a diabetes health promotion curriculum developed by the ADA. The curriculum was provided by the same public health nurse to all groups via three 90-minute sessions covering general diabetes health, pathology of diabetes, diet and exercise, monitoring of blood sugar, A1c levels, and avoiding health consequences of diabetes such as heart disease, kidney disease, and stroke.

Results of this randomized controlled trial were that diabetes knowledge increased as evidenced by pre/post-test results and patients reported increased self-care behaviors such as diet, carbohydrate counting, and monitoring blood glucose (Abbott et al., 2019). There were no changes in activity levels, fat intake, medication adherence, or foot care. The results of the study suggest the importance of a culturally sensitive approach to diabetes education and the role of

social support resources, as these were present among church members. Limitations of this study included no measurement of A1c levels to provide evidence of glucose control as a result of the intervention, and it was unknown if the results are sustainable over time.

The final randomized controlled trial evaluated a community pharmacist led patient diabetes education and monitoring program, and its effects on A1c levels and cardiovascular risk factors (Ali et al, 2012). The trial was implemented in two community pharmacies in England by a university school of pharmacy. The trial utilized true randomization, but the persons providing the intervention were not blind to treatment assignments, which was a noted risk for internal validity of the trial. In addition, the participants were all Caucasian, threatening the generalization of the findings to other populations. Both the control group and the intervention group were under the care of their general practitioner and had face-to-face contact with a pharmacist who had received training for the intervention. The control group was assessed by the pharmacist for BMI, blood pressure, blood glucose, A1c, lipid profile and quality of life at the start of the trial and again at 12 months. In addition, the intervention group received a pharmacy care package designed for patients with Type 2 diabetes and received regular monitoring and consultation with the pharmacist every month for two months, then every three months for the remaining 12 months. Monitoring included BMI, blood pressure, and blood glucose at each visit. A1c levels and lipid profile were measured at the start of the intervention and then at five months and 12 months. The intervention group also completed questionnaires related to secondary outcomes such as quality of life, satisfaction with information received regarding medicine, concerns and necessities regarding medications, health status, and diabetes knowledge.

Findings of this study included a significant reduction in blood pressure, blood glucose, and A1c levels (from 8.2% average to 6.6%) at the 12-month point (Ali et al., 2012). All secondary outcomes had significant improvement as well except for quality of life. Patient acceptance and satisfaction for the intervention was high, and it was noted there were fewer hypoglycemic episodes for the intervention group. The findings suggest that pharmacists can provide an important role in managing Type 2 diabetes in the community setting.

Systematic Reviews and Meta-Analyses of Descriptive and Qualitative Studies

There was one systematic review/meta-analysis and one meta-analysis. The remaining studies in this group were systematic reviews only. The PRISMA checklist was utilized to appraise the articles for quality. The systematic review/meta-analysis focused on identifying strategies to accommodate low HL and the efficacy of these interventions (Kim & Lee, 2016). This review included 13 studies, of which six were randomized controlled trials. There were two reviewers, and no third party was utilized to settle any disagreement pertaining to quality assessment, potentially limiting relevant literature. Decisions to include studies were made through discussion. The results showed that communication strategies improved DHL, as evidenced by lowered A1c levels and improved clinical outcomes. These communication strategies included face-to-face contact with providers, involved context that was appropriate to the client (culturally sensitive), utilized the teach-back method, and involved clear communication (Kim & Lee, 2016).

The meta-analysis review examined the relationship between DHL and diabetes knowledge, self-care, and glycemic control (Marciano, Camerini, & Schulz, 2019). This analysis examined 61 studies with 58 unique samples that resulted in a total of 18,905 patients. The majority of studies utilized a cross-sectional design. The analysis revealed that increasing DHL

did not always result in improved self-care activity but did result in lower A1c levels. However, the researchers pointed out that the studies assessed HL utilizing different measures, such as performance-based measures, perception-based measures, and a combination of the two. The findings demonstrated that diabetes knowledge is more responsive to performance-based assessment tools, self-care to perception-based assessment tools, and glycemic control to performance-based tools (Marciano et al., 2019). All three of these areas were shown to relate to DHL.

The remaining five systematic reviews examined the connections that DHL had to health outcomes, self-efficacy, and the roles of providers and health systems. While there were multiple items from the PRISMA checklist absent from one study, the study did provide insight regarding the impact of rural providers on DHL (Ross, Benavides-Vaello, Schumann, & Haberman, 2014). The study results showed that rural providers were not consistently employing national diabetes recommendations or guidelines that have been shown to improve clinical support and patient self-management behaviors. However, it was found that when rural providers utilized culturally sensitive approaches and face-to-face contact, DHL was positively impacted, and patients had increased self-management behaviors (Ross et al., 2014). One systematic review found that while higher DHL correlated with greater diabetes knowledge greater self-management behaviors among patients, there was a weak association between DHL and clinical outcomes (Al Sayah, Majumdar, Williams, Robertson, & Johnson, 2012). The review examined 34 publications of 24 separate studies. While there was a noted weak association between DHL and clinical outcomes, the studies reviewed utilized different tools to measure HL, making it possible that these variations impacted the results of these studies. In

addition, the cross-sectional research design of the studies and lack of experimental studies make causal inferences challenging.

The remaining systematic reviews were also of good quality, meeting the majority of the PRISMA checklist, and examined the role of DHL and self-efficacy (Xu et al., 2018), perspectives regarding general HL (Rajah et al., 2018), and the role that health systems play in DHL, adherence, and outcomes (Ong et al., 2018). The systematic review completed by Xu et al. (2018) examined the three domains of HL (functional, communicative and critical) and how the provider and social support positively impact DHL and the patient's self-efficacy to manage their chronic disease. This review included 11 articles that involved 3,471 participants. The methodology was good according to the PRISMA checklist. However, a major limitation of this study was that it only examined cross-sectional studies, making causal inferences difficult when examining outcomes.

The systematic review that examined perspectives of patients and providers related to general HL reviewed a total of 30 studies (Rajah et al., 2018). There were discrepancies noted between the provider's assessment of a patient's HL versus the patient's actual HL; often, the providers overestimated the patient's HL. Providers frequently relied on their "gut feeling" regarding a patient's HL rather than taking steps to assess HL. The review emphasizes the need for providers to learn and be informed about HL and for patients to have access to HL information that takes into account perceived barriers. This review met most of the criteria of the PRISMA checklist. However, there were two limitations noted with this study: (a) the review did not address screening for bias or (b) use a standardized quality assessment tool. The authors utilized a self-developed quality assessment tool. However, there is a lack of tool explanation, which may have addressed bias as part of the quality assessment.

The final systematic review examined the role of the health system in DHL (Ong et al., 2018). The review identified barriers and facilitators within health systems that impact DHL, control, and outcomes. Barriers included increased travel distances, out-of-pocket expenses, and lack of access to services and providers. Innovative care models, involvement of pharmacists on the health care team, the provider-patient relationship, and peer support were found to best support DHL. This review included studies that were from multiple countries, non-English speaking as well as English speaking, studies located in smaller regional databases as well as larger well-known medical databases, and 21 random controlled trials in the 93 studies. These strategies resulted in diverse and rich source of data. A limitation of the study was that while the researchers did assess studies for bias, they did not exclude any studies for bias.

Cross-Sectional Studies

There were six cross-sectional studies included in this integrative review. Three out of six of these cross-sectional studies examined the impact of the provider role on both general HL and DHL (Mohn et al., 2015; Storms et al., 2017; White et al., 2016). The degree of trust in a provider, as well as the patient's autonomy received from the provider, were shown to impact HL (Mohn et al., 2015; White et al., 2016). However, one study noted that providers often overestimated a patient's HL based on either the patient's level of education or the time period they had been a patient with that provider (Storms et al., 2017).

Yeh et al. (2018) examined the association between DHL, level of diabetes knowledge, and adherence behaviors. The findings of this study supported the role of family/social support to increase DHL and self-care. These findings were supported by other studies that were part of this integrative review.

Ferguson et al. (2015) identified factors associated with patients' perceived control of diabetes in a group of patients with poorly controlled diabetes. Findings of this study were that 40% of patients living with poorly controlled diabetes believed they were managing their disease well, and their perception was affected by low DHL. Due to poor understanding of how to manage their disease, these patients had little motivation to adopt appropriate behaviors to prevent future complications.

The final cross-sectional study investigated the relationship between DHL and three years of medication costs in a sample of insured patients living with Type 2 diabetes (Mantwill & Schultz, 2015). The authors found that low DHL was associated with increased medication costs due to nonadherence, medication misuse, and incorrect dosage. The authors suggested that these complications of low DHL can result in higher medical costs due to a revolving door effect because patients require hospital admissions for complications and additional medications and lab work.

Limitations of these cross-sectional studies were mainly the result of the cross-sectional design: convenience sampling (Yeh et al., 2018); and lack of clear identification of confounding factors (Mantwill & Schultz, 2015; Storms et al., 2017). In addition, most of the studies only examined one type of HL (functional HL), which may not provide sufficient evidence. One study utilized an invitation letter to contact possible participants, which may have excluded a sample that had general low literacy (Mantwill & Schultz, 2015).

Qualitative Studies

This integrative review included five qualitative studies (Black, Maitland, Hilbers, & Orinuela, 2017; Hawkins, Gill, Batterham, Elsworth, & Osborne, 2017; Jones et al., 2014). All of the studies examined the different perspective of patients versus providers regarding diabetes

management (Black et al., 2017; Jones et al., 2014) and HL (Hawkins et al., 2017). The study by Jones et al. (2014) identified factors that prevent and facilitate Type 2 diabetes management in the rural setting. They utilized a socioecological framework that states that health is determined by biological, behavioral, and sociocultural needs of individuals. The findings of barriers to diabetes management in the rural setting were related to time and access. Time as a barrier to effective management of diabetes was due to the farming lifestyle that requires a large time commitment and often competes for priority with disease management; the decision to get fields planted with good weather will supersede the scheduled health appointment to manage diabetes (Jones et al., 2014). Access also served as a barrier in multiple ways—access to specialists, continuity of care related to shortage of health professionals, access to food and medication needed to manage diabetes, lack of access to transportation, and lack of access to Internet in rural areas were shown to contribute to DHL and management. Facilitation of diabetes management was most effective when support from spouses or family was present in conjunction with regular contact with health professionals (Jones et al., 2014).

Black et al. (2017) explored resources that culturally diverse patients with Type 2 diabetes drew upon to manage the disease in their daily lives. The study utilized a framework that focused on the role social support plays in DHL with the understanding that general HL is the shared knowledge and expertise that resides in a patient's social network. The findings were that social supports were a large factor in successful diabetes management for patients and that providers were not actively promoting these potential roles (Black et al., 2017). While this was a small study conducted in only one center, the findings of a correlation between social supports and DHL are supported by other literature (Jones et al., 2014; Rajah et al., 2018; Ross et al., 2014; Yet et al., 2018).

The final study of this design utilized the Health Literacy Questionnaire to explore similarities and differences between patient and clinician perspectives of HL (Hawkins et al., 2017). The Health Literacy Questionnaire provided a framework for the researchers to examine nine independent domains of HL that would improve understanding of the lived experience of people attempting to access, understand, and use health information and services. The nine domains of the Health Literacy Questionnaire were: feeling understood and supported by health care providers, having sufficient information to manage their disease, actively managing their disease, having social support for health, having the ability to determine good and reliable health information, having the ability to actively engage with health care providers, having the ability to navigate the health care system, having access to health care information, and having the ability to understand health care information enough to know what to do (Hawkins et al., 2017). While this study did not look at DHL specifically, it still provides valuable information for providers to consider. Findings revealed that providers and patients often had different perspectives because they are coming from different reference points (Hawkins et al., 2017). Patients believed that intention to manage their health was equal to managing their health, while providers expected that intentions would lead to action on the part of the patient. The implication to care is providers can miss opportunities for social and clinical support by not detecting these differences in perspectives. The providers were more intimately involved with the patients who took part in the study than the average clinician, including those conducting home visits. This implies that the difference in perspectives may be even wider when there is a less intimate relationship between clinician and patient.

These studies met the majority of the JBI checklist items for qualitative studies. There was some concern regarding the influence of the researcher, as one of the studies involved the

researcher approaching patients to invite them to participate (Black et al., 2017). This may have led to bias and affected overall results, as it is possible their implicit bias affected who they approached and caused them to miss out on alternate findings. In addition, all of the studies were done in one center, which made generalization to a larger population challenging.

Mixed-Method Studies

This integrative review incorporates three mixed-method studies. Appraisal of these studies presented a challenge in utilizing all appropriate appraisal tools due to multiple methodologies within each study. The first study included both a qualitative quasi-experimental methodology and a quantitative methodology (McLendon et al., 2019). The study evaluated a grant-funded pilot diabetes care program targeted for rural adult patients living with poorly controlled diabetes. Two primary care offices were the setting for the program. The primary care providers referred patients with an A1c level greater than 8% to the program. The program offered telehealth with an endocrinology specialists and supplemental education regarding diabetes management and medications, DSME delivered by a public health nurse specialist, and healthy lifestyle classes. The findings were evaluated for: clinical outcomes (A1c levels), patient and provider satisfaction with telehealth access to endocrinology, effectiveness of an interdisciplinary community advising network, and the cost benefit of the rural pilot program by looking at hospital utilization pre/post program. Results of the study showed that there was a statistically significant reduction in A1c levels, total cholesterol, and blood pressure, although body mass index (BMI) was unchanged (McLendon et al., 2019). Additionally, there was a decrease in hospital utilization after enrollment in the program, leading to decreased hospital system costs, and there was a high rate of patient and provider satisfaction with the program. However, the rural setting presented challenges for implementing this telehealth program, such

as broadband Internet strength and limited health information technology personnel as well as other health personnel to implement the program, thus placing an additional burden on current staff in the two primary care practices.

Critical appraisal of this study was conducted using the JBI tools to appraise separately the quasi-experimental and qualitative methodology. There was no control group for this study other than the experimental group acting as their own control, thus making causal relationships difficult to deduce from the data. It was difficult to tell which measure (the endocrinologist, the DSME provided by the public health nurse specialist, or the peer support through the healthy lifestyle classes) was the cause of the outcomes for the study. In addition, only 39% of the participants received the endocrinology telehealth access, although why only this percentage had access was not explained, nor did the data analysis separate this group of participants from the rest. A qualitative appraisal showed the study met the majority of the checklist items for the JBI tool with the exception of the researchers' influence. The study did not explicitly address the researcher's influence, but it did state the researchers did not recruit participants for the study; instead, it was the primary care providers who enrolled patients in the study (McLendon et al., 2019).

The second mixed-method study utilized mainly qualitative methodology (interviews of patients regarding why they did or did not perform a prescribed action by their physician) but also incorporated nonexperimental quantitative methodology (measurements of A1c levels and descriptive statistics), making it difficult to appraise (Alvarez et al., 2018). The study purposed to measure the association between DHL with both patient-reported as well as clinical outcomes in patients living with non-insulin-dependent Type 2 diabetes. The outcomes measured were numeracy of self-monitoring blood glucose use (SMBG), how often physicians advised patients

to conduct SMBG testing, and glycemic control measured by A1c levels. Results of the study indicated that low DHL was associated with poorer glycemic control but more frequent SMBG compared to those with adequate DHL (Alvarez et al., 2018). This indicates a need for further exploration and patient education. In this study, 29.45% of patients were not conducting the recommended SMBG per their physician because of costs for test supplies, pain of testing, or lack of understanding regarding the benefits of testing (Alvarez et al., 2018).

This study had a large sample population that consisted of 448 participants from 15 different primary care practices (Alvarez et al., 2018). The population lacked diversity, as most were well educated, married, and female. Data were only obtained from patient interviews and not verified by medical records. A qualitative appraisal revealed the absence of the theoretical, philosophical, or cultural view of the researchers for this study. A broad research critical appraisal showed that there was no mention of an ethical body that reviewed and approved the study. However, the findings still contributed meaningful data to this integrative review by providing further insight into the complexities of DHL.

The final study in the mixed-method design category examined the feasibility of an intervention to enhance preventative care for primary care patients with low HL related to diabetes and cardiovascular disease (Faruqi et al., 2015). The intervention targeted both providers and patients. Providers had chart audits completed for their patients between 40 and 69 years of age related to assessment and management of risk factors for diabetes and cardiovascular disease. They then participated in interviews before and after an education intervention regarding changes they made for patients with low HL, prevention care, and the skills and support they needed to provide preventative care to these vulnerable patients. The education intervention for providers consisted of communication strategies for patients with low

HL, such as the teach-back method (Faruqi et al., 2015). Patients aged 40–69 years were offered the opportunity to participate by filling out a HL screening as well as a survey. The survey asked questions regarding HL, self-reported assessment and management of diabetes and cardiovascular risk factors, referrals, and barriers to preventative care.

Results of this study showed that while it was feasible to implement the intervention to improve preventative care for patients with low HL, obtaining changes in providers' approach to patients with low HL was difficult. Additional findings pertained to the providers' understanding of HL and barriers to addressing low HL; often, the providers mistakenly understood low HL to be the same as low general literacy or speaking a foreign language. In addition, providers reported that addressing low HL took time and a different approach than their usual approach with patients. While they recognized the importance of addressing low HL, time constraints were a barrier for them (Faruqi et al., 2015).

This study design is described by the authors as “mixed-methods” (Faruqi et al, 2015). However, there was no clarification of which methods were utilized for the development of the study. There are multiple methods identified by the reviewer that were utilized in this study, making it difficult to appraise, but the two predominate methods were quasi-experimental (interviewing before and after intervention to determine if there was a change in behavior as well as multiple measurements before and after the intervention) and qualitative design (the use of interviewing and surveys to obtain data). There was no control group utilized to allow for drawing causal relationships between the intervention and results. However, there was use of measurements and statistics regarding the frequency that providers assessed for HL and assisted patients with low HL before and after the education intervention, showing a statistical improvement. During the appraisal of the qualitative design, there was no theoretical or

philosophical perspective recorded. The combination of an absence of perspective and limited methodology description made it difficult to appraise the appropriateness of either. However, the introduction to the study clearly states both the concerns of low HL and the importance of enhancing preventative care for diabetes and cardiovascular risk factors in the primary care setting, while the primary participants are providers working in primary care settings.

Integrative Review

One integrative review was included. The review evaluated the response of nursing and other health professional schools to the Institute of Medicine's recommendations regarding preparation of students to take care of patients with low HL (Toronto & Weatherford, 2015). The PRISMA systematic review checklist was utilized to appraise the review. The review included nine studies that examined pharmacy, nursing, and medical schools. The findings were that health professional schools are beginning to address HL in the curriculum. The curriculum focus is on oral communication as a useful strategy to mitigate poor patient understanding. This is done through effective communication that includes clear language, avoidance of medical jargon, open-ended questions, and the teach-back method (Toronto & Weatherford, 2015). The review met the majority of the PRISMA checklist but did not address bias within the studies reviewed.

Professional Opinion

This literature category is represented by three articles in this integrative review (American Association of Diabetes Educators [AADE], 2019; Burke et al., 2014; IUHPE, 2018). The position statement published by IUHPE (2018) calls for global action to improve HL across populations, emphasizing the necessity of a systems approach to HL. The statement relies on 52 studies, professional medical, educational, and public health publications, and publications from

the WHO and Joint Commission International to summarize key evidence to guide practice and policy development to advance global health. Principles put forth by the position statement were noted as: HL requires global action; multiple formats should be used when providing patient education such as written, oral, and social media; context of patient education should be appropriate to the patient's culture and understanding; and organizations need to actively monitor and understand the HL of people being served and respond accordingly (IUHPE, 2018). The IUHPE (2018) statement points out barriers to HL such as time restrictions with provider appointments, ineffective communication skills on the part of providers, and the lack of HL screening tool utilization.

The second professional opinion article outlined aspects involved in patient comprehension and ongoing diabetes education and support to demonstrate the value of partnering with credentialed diabetes educators (Burke et al., 2014). Two out of the three authors were affiliated with the AADE, which introduces implied bias. However, the article relied on 72 studies and medical, nursing, public health, and patient education references, providing a varied and sound body of evidence to support claims. The article emphasized the importance of DSME because the process incorporates an individual's needs, goals, and life experiences with evidence-based standards to motivate behavior changes that will lead to improved outcomes. Empowering the patient, rather than the provider, to set goals is suggested for successful health outcomes. Part of the success of DSME is the patient-centered approach. While diabetes educators play a vital role in DSME, the authors acknowledge that access to credentialed diabetes educators in rural areas is challenging (Burke et al., 2014). They recommend recruiting and embedding diabetes educators into primary care practices and using telehealth to improve patient access to this vital resource.

The final opinion article recommended an individualized approach to manage the needs of patients with diabetes by identifying cultural and DHL considerations (AADE, 2019). The article relied on 51 studies, guidelines of care, medical publications, and recommendations from national organizations. While the authorship of this opinion is not clearly stated, there is an acknowledgement at the end of the article regarding two individuals—one a doctor of clinical nutrition and the other a PharmD. In addition, the article clearly states it was reviewed and published by the AADE (2019), indicating support for the opinion. The article’s target population is providers, and it was written as a “how-to” for providers to reduce outcome disparities related to general HL and DHL. There is recommendation to assess general HL and DHL by the use of formal (Rapid Estimate of Adult Literacy in Medicine) and informal assessments (taking note of the patient who always has the provider reading material to them for various reasons). Additional recommendations included the use of plain and simple language, use of the teach-back method, consideration of the patient’s culture when devising a care plan, consideration of the patient’s electronic HL (patient’s ease of phone application and internet use), and the utilization of diabetes-sensitive language to avoid a stigma (AADE, 2019).

SECTION FIVE: DATA ANALYSIS AND SYNTHESIS

For Rural Patients Living With Diabetes, What Are Outcomes Related to DHL?

In patients living with diabetes, the prevalence of low DHL is 22%–38%, depending on the population, and is not routinely assessed by providers (Ferguson et al., 2015; Mohn et al., 2015). Yet research consistently shows that DHL plays a substantial role in successful management of the disease (Dahal & Hosseinzadeh, 2019; Mantwill & Schultz, 2015; Marciano et al., 2019; McLendon et al., 2019). Low DHL is associated with poor knowledge and

understanding of diabetes, poor outcomes, and increased medical and medication costs, (Ferguson et al., 2015; Kim & Lee, 2016; Mantwill & Schultz, 2015; Mohn et al., 2015).

Patients with lower levels of HL have difficulty discussing treatment decisions with their providers because of a lack of knowledge and understanding (Mantwill & Schultz, 2015). The literature also shows that clients with low DHL may mistakenly perceive they are managing their diabetes well. For instance, Alvarez et al. (2018) found there was poor glycemic control in patients with limited DHL. Yet these same patients were found to be performing more than the once-a-day self-monitoring glucose testing recommended by their provider, as opposed to those with adequate DHL. The assumption is these patients believe more frequent monitoring is a benefit but do not understand how their daily choices could affect their blood sugar levels (e.g., health food options, increased activity, changes in insulin dosing, etc.). One study found that 40% of patients with poorly controlled diabetes believed they were managing their disease well, and their perception was affected by low DHL (Ferguson et al., 2015). These findings indicate that with low DHL, clients have poor understanding of how to manage their disease, resulting in little motivation to adopt behaviors that prevent future complications.

Conflicts in the literature centered on the association of DHL with glycemic control, A1c levels, and medication adherence. While DHL was found in some research to be associated with A1c levels (Heitkemper et al., 2017; Kim & Lee, 2016; Marciano et al., 2019; McLendon et al., 2019; Mohn et al., 2015; Xu et al., 2018), the associations were weaker in other research (Al Sayah et al., 2012; Dahal & Hosseinzadeh, 2019). One explanation for this is that DHL assessment studies were found to utilize different measures, raising the possibility of producing different findings (Al Sayah et al., 2012). Another possible explanation is there are other factors influencing DHL such as social support and the provider-patient relationship.

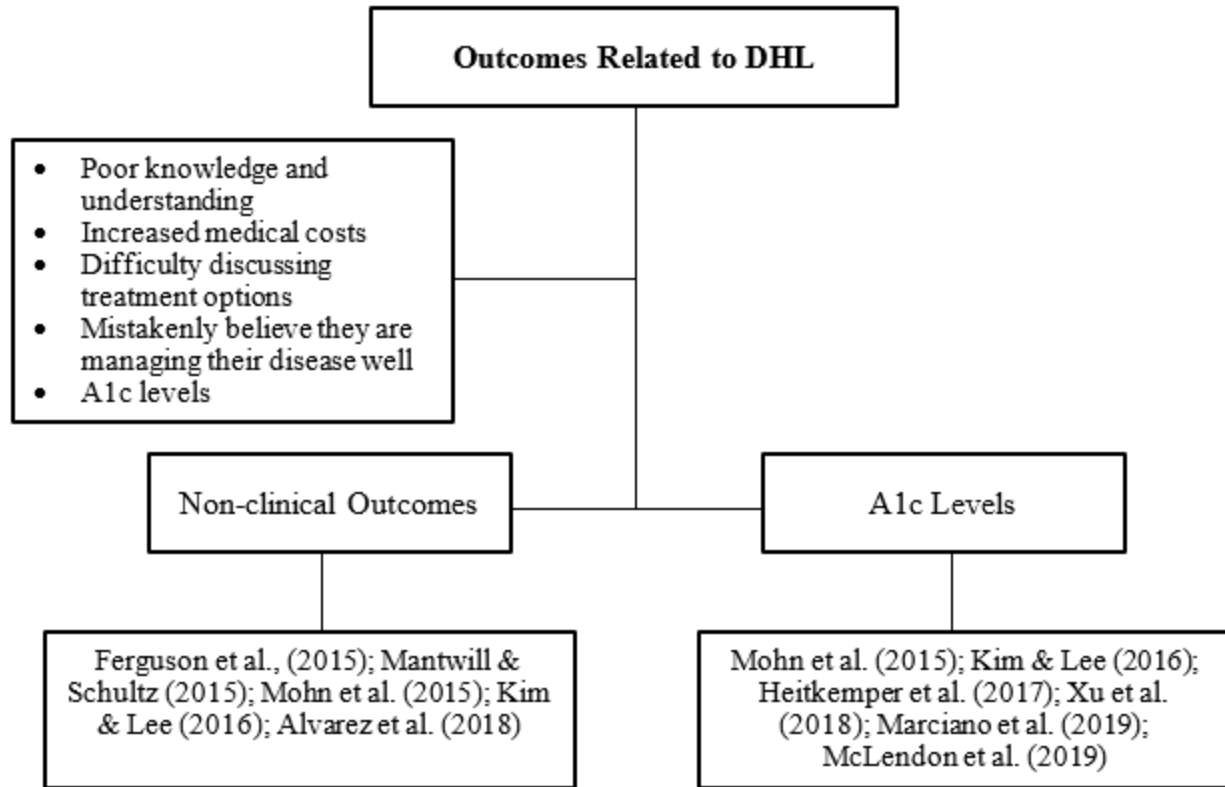


Figure 1. Flowchart of outcomes related to diabetes health literacy.

For Rural Patients Living With Diabetes, Are There Rural-Specific Variables That Impact DHL?

The rural population living with diabetes lacks access to the resources of their urban counterparts that are shown to improve knowledge of self-care behaviors and health outcomes. The shortage of health professionals and specialists such as endocrinologists and diabetes educators in the rural community impedes continuity of care and DHL (Burke et al., 2014; Jones et al., 2014; Ross et al., 2014; Yeh et al., 2018). Literature consistently showed that rural populations have unique challenges related to diabetes literacy. These challenges included: lower incomes, less education, limited financial resources, lower general literacy, longer travel distances, lack of access to food and medication necessary to manage diabetes, lack of Internet access, and lack of transportation to health services (Jones et al., 2014; McLendon et al., 2019;

Ong et al., 2018; Ricci-Cabello et al., 2013; Ross et al., 2014). Longer travel distances were associated with decreased insulin compliance (Ong et al., 2018). The best medication compliance was observed when patients lived within 10 kilometers (approximately six miles) from their provider, again suggesting the challenges of living in a rural community where one may be traveling large distances to see one's provider (Ong et al., 2018).

The demographics of the rural population are found to provide challenges for accessing health care and thus impacting DHL. These included an aging population in rural areas, lower education levels, multi-ethnic and culturally diverse population, and lower incomes (McLendon et al., 2019; Ong et al., 2018; Ross et al., 2014). The aging population has higher risk factors for poor outcomes, higher rates of overall HL, and often limited financial resources (Ross et al., 2014). Lower education levels were found to be present in rural areas where few residents obtain bachelor's degrees, creating challenges for DHL and successful management of diabetes. Rural areas are often communities of multi-ethnic and culturally diverse populations such as Black, Hispanic, and Native Americans that make it necessary to modify plans of care to accommodate these diverse cultural backgrounds (Ross et al., 2014). Lower incomes were found to create barriers to DHL and adherence to plans of care: The higher the out of pocket expense, the poorer the outcomes (Ong et al., 2018).

Literature also showed that rural health care systems can be barriers to DHL and successful disease management (Ong et al., 2018; Ricci-Cabello et al., 2013; Ross et al., 2014). For instance, rural providers were found to not consistently employ national diabetes recommendations and guidelines (Ross et al., 2014). This lack of guideline usage impedes not only clinical support for patients living with diabetes, but also assisting patients with self-management behaviors. In addition, the lack of access to health services and providers within

the rural health care system creates barriers to improving DHL and health status for patients living in these communities (Ong et al., 2018; Ricci-Cabello et al., 2013).

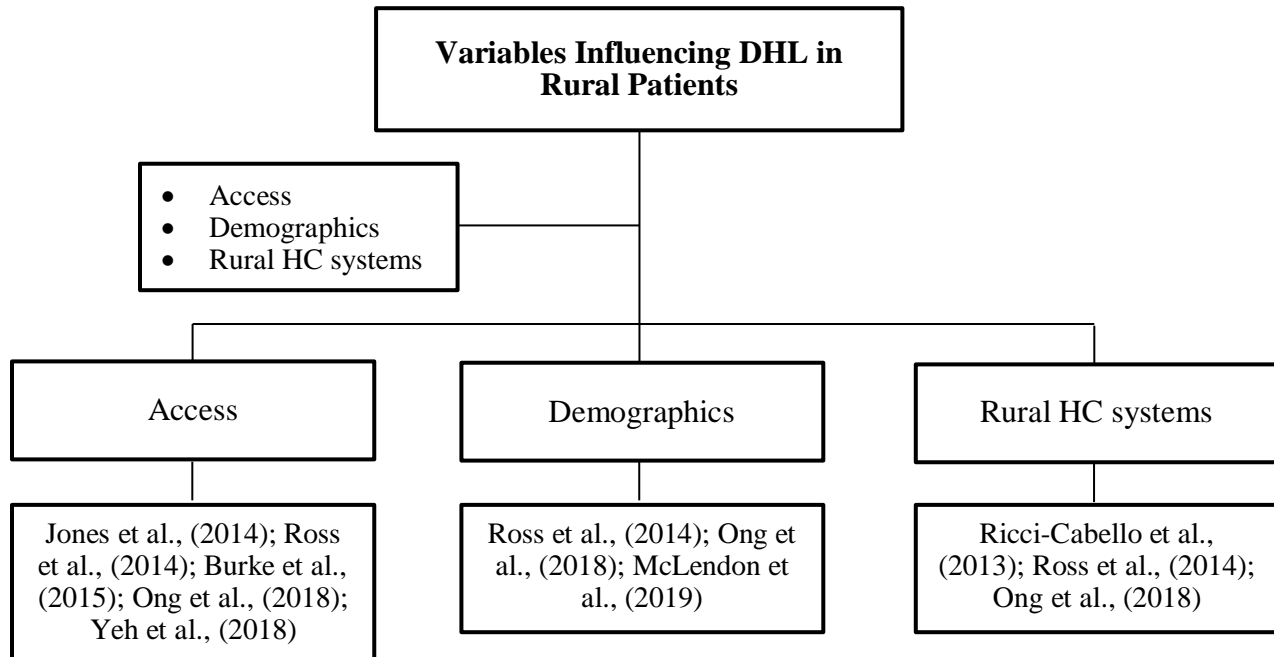


Figure 2. Flowchart of variables influencing diabetes health literacy in rural patients.

For Rural Patients Living With Diabetes, What Provider Interventions and Strategies

Increase DHL?

The rural primary care provider has an important role in the health and well-being of the rural patient living with diabetes. Literature demonstrated the impact of support through regular contact with providers (Heitkemper et al., 2017; Jones et al., 2014; Kim & Lee, 2016; Xu et al., 2018). Providers consistently underestimate their impact on DHL and self-management behaviors, causing them to miss opportunities to intervene. There were eight strategies for how primary care providers could impact DHL in the rural setting gleaned from the literature review: face-to-face contact, provider rapport, assistance with problem solving, communication strategies, patient-centered communication and care, encouraging social supports, technology,

and a collaborative, multi-disciplinary approach (AADE, 2019; Black et al., 2017; Heitkemper et al., 2017; Jones et al., 2014; Kim & Lee, 2016; Ong et al., 2018; Rajah et al., 2018; Ricci-Cabello et al., 2013; Ross et al., 2014; Xu et al., 2018; Yeh et al., 2018).

Face-to-face contact. Face-to-face contact was consistently shown to be an essential element to impact DHL, increase the patient's confidence and autonomy to manage their disease, and encourage self-management behaviors (Heitkemper et al., 2017; Kim & Lee, 2016; Mohn et al., 2015; Ricci-Cabello et al., 2013; White et al., 2016; Xu et al., 2019). This common theme appeared whether the study was examining the role of the rural provider; the use of telehealth to link rural patients with endocrinologists or diabetes educators; face-to-face contact via in-person or videoconferencing results in improved outcomes.

Provider rapport. Establishing a therapeutic alliance between the provider and patient that involves regular contact, trust, encourages autonomy, and considers perspectives was found to impact DHL (ADA, 2020; Hawkins et al., 2017; Jones et al., 2014; Mohn et al., 2015; Storms et al., 2019; White et al., 2016; Xu et al., 2018). Feeling connected to the provider allows patients to embrace health information and gain confidence (Xu et al., 2018). The connection between provider and patient is important; therefore providers need to address any mistrust to positively impact DHL (White et al., 2016). DHL is indirectly proportional to trust – the more a patient mistrusts a provider, the more likely they are to have lower DHL. Provider communication skills that were found to be essential to establish trust included: the provider speaking slowly with easy to understand language (avoiding medical jargon); listening to the patient; explaining results of diagnostics; and ensuring patient understanding (White et al., 2016).

Provider support can have a powerful influence on patients managing their disease. As patients become more autonomous, they perceive themselves as more competent attaining goals for their disease (Mohn et al., 2015). The provider can encourage autonomy by creating positive, empowering interactions with patients that are open to alternative treatment choices, encourage patient questions, and encourage patients to embrace self-care behaviors (Xu et al., 2018). This form of support communicates a level of trust in the patient's ability to self-manage their disease.

Literature shows that patient perspective can be very different from the provider's (Hawkins et al., 2017; Storms et al., 2019). Primary care providers were found to considerably overestimate HL levels for patients who have inadequate or problematic literacy, leading to misunderstandings and confusion during communication (Storms et al., 2019). One example regarding misunderstanding and confusion found in the literature pertained to intentions; understanding about intentions to change behaviors differed between patient and provider (Hawkins et al., 2017). Patients considered intentions to make behavior changes as managing their health, while not actually taking any action. On the other hand, providers were found to believe that a patient's stated intentions would lead to behavior changes. Open ended questions and clarifying patient understanding can provide opportunities to better understand the patient's perspective in order to provide clarity and support where it is needed.

Assisting with problem solving. Problem solving is critical to HL and requires advanced cognitive and social skills (IUHPE, 2018). Critical HL refers to the capacity to analyze health information and then perform appropriate actions to exert greater control over health decisions (IUHPE, 2018; Xu et al., 2018). While not all patients will have the capacity for critical DHL, providers can assist patients with problem-solving skills by dialoging, encouraging patient-directed questions, making joint prioritizing, and collaborating with patients (Heitkemper, 2017).

Communication strategies. Effective communication strategies impact DHL. Spoken communication was shown to have the best health outcomes related to diabetes self-management behaviors (Kim & Lee, 2016). Clear communication with simple, plain language and follow-up with patients after interaction were helpful strategies to improve DHL, self-management behaviors and feelings of self-efficacy (AADE, 2019; Kim & Lee, 2016; Xu et al., 2018). Use of the teach-back method allowed the provider to be able to determine if clarification was needed based on the patient's answers (AADE, 2019; Kim & Lee, 2016). Future follow-up with the patient can address areas where the patient's understanding may be lacking.

Written communication was shown to improve cognitive outcomes, such as increasing diabetes knowledge (Kim & Lee, 2016). However, improved self-management behaviors or health status was not shown to be affected by written communication. Without face-to-face contact between provider and patient, there are limitations in achieving positive health outcomes.

As mentioned earlier, provider communication that empowers the patient was shown to positively impact DHL (ADA, 2020; Kim & Lee, 2016; Ong et al., 2018; Xu et al., 2018). Empowerment focuses on behavior rather than medical content. The use of motivational interviewing is one example provided by Kim and Lee (2016) of empowerment communication that can be utilized by the provider. However, this style of communication is most effective with frequent contact between provider and patient (Kim & Lee, 2016).

Patient-centered communication and care. While face-to-face contact was overwhelmingly shown to positively impact DHL, patient-centered communication and care is also imperative. Patient-centered communication and care considers the patient's preferences and values, and incorporates these into shared decision-making (Burke et al., 2014). Another term for consideration of the patient's preferences and values is cultural consideration. Health

education that was most likely to improve DHL and self-management was when the intervention, message and delivery of education are tailored to the needs of the individual patient, and thus culturally relevant (Burke et al., 2014; Kim & Lee, 2016; IUHPE, 2018; Dahal & Hosseinzadeh, 2019). This approach takes time and a different approach for the provider because the clinician does not set the goals; instead it is the patient who sets the goals, under the provider's guidance (Ricci-Cabello et al., 2013; Burke et al., 2014; Ong et al., 2018; Xu et al., 2018).

Encouraging social supports. DHL includes shared knowledge and expertise that resides in patients' social networks (Black et al., 2017). The literature consistently emphasized the impact of social support and self-efficacy on DHL, which is especially important in the rural population where resources are limited (Black et al., 2017; Jones et al., 2014; Ong et al., 2018; Rajah et al., 2018; Xu et al., 2018; Yeh et al., 2018). Yet, providers are often not actively promoting these roles (Black et al., 2017). The patient's social support may consist of a spouse, children, church, or peers (Abbott et al., 2019; Black et al., 2017; Xu et al., 2018; Yeh et al., 2018). Patients who care for themselves with assistance from others perform better in DHL assessments, diabetes-specific knowledge, and management of disease (Black et al., 2017; Yeh et al., 2018).

The role of social support can be extended outside of family members to the community and peers, suggesting a role for support groups and peer support for rural patients living with diabetes to improve DHL (Abbott et al., 2019; Ong et al., 2018; Ricci-Cabella et al., 2013; Safford et al., 2015). Primary care or other rural providers can encourage or facilitate group support through churches, support groups offered in the community or through the provider's office, and the training and use of peer coaches or community health workers to support rural patients living with diabetes who may have little or no support network (Abbott et al., 2019; Ong

et al., 2018; Ricci-Cabella et al., 2013; Safford et al., 2015). These support groups could offer educational programs provided by health professionals who may not be the primary care provider, but may be public health nurses or even community pharmacists (Abbott et al., 2019; Ali et al., 2012; Ong et al., 2018).

Use of technology. Access to specialists and diabetes educators is challenging for providers and patients in rural communities. Health information technology offers intervention opportunities to impact DHL and is recommended by the ADA (ADA, 2020; Heitkemper et al., 2017; McLendon et al., 2019). The use of videoconferencing, Internet-based applications, and phone applications impact DHL and improve glycemic control in ways similar to that seen with in-person interventions (Heitkemper et al., 2017; McLendon et al., 2019). Interventions that involve human interaction as seen through Internet-based and telehealth interventions are the most likely to succeed in terms of outcomes (Heitkemper et al., 2017). However, there are challenges to implementing technology in the rural setting that include broadband strength, limited health information technology personnel to implement these programs, and potential additional work burden on staff working in the provider offices where these interventions are implemented (Burke et al., 2014; Heitkemper et al., 2017; Jones et al., 2014; McLendon et al., 2019). It would be important to consider these challenges and develop possible solutions prior to implementing such programs within the rural setting.

Collaborative, multi-disciplinary strategies/innovative healthcare systems.

Addressing DHL in the rural community where resources are limited requires consideration of health system barriers and all community resources. Initiatives that are aimed at the health care system and providers can impact DHL in the rural community (Ricci-Cabello et al., 2013). The rural health care system creates barriers for patients' DHL through limited or nonexistent access

to specialists, shortage of health providers, transportation difficulties, and lack of access to food and medication needed to manage diabetes (Jones et al., 2014; Ong et al., 2018). Innovative care models that involve multiple strategies to address these barriers facilitate the patient receiving the health education and care they need to impact DHL and outcomes (Ong et al., 2018; Ricci-Cabello et al., 2013).

Examples of innovative care models incorporate collaborative patient-centered care, evidence-based practices such as goal setting, empowerment and a focus on problem solving, and training peer/community health workers to provide support systems and health education to patients to help them reach their health goals and address gaps and barriers in the rural health care system (AADE, 2019; Abbott et al., 2019; Ali et al., 2012; Ong et al., 2018; Ricci-Cabello et al., 2013; Safford et al., 2015). The literature review revealed successful strategies that included the utilization of community pharmacists to impact DHL by not only providing diabetes and medication education but also by collaborating with providers to manage patient care (Ali et al., 2012).

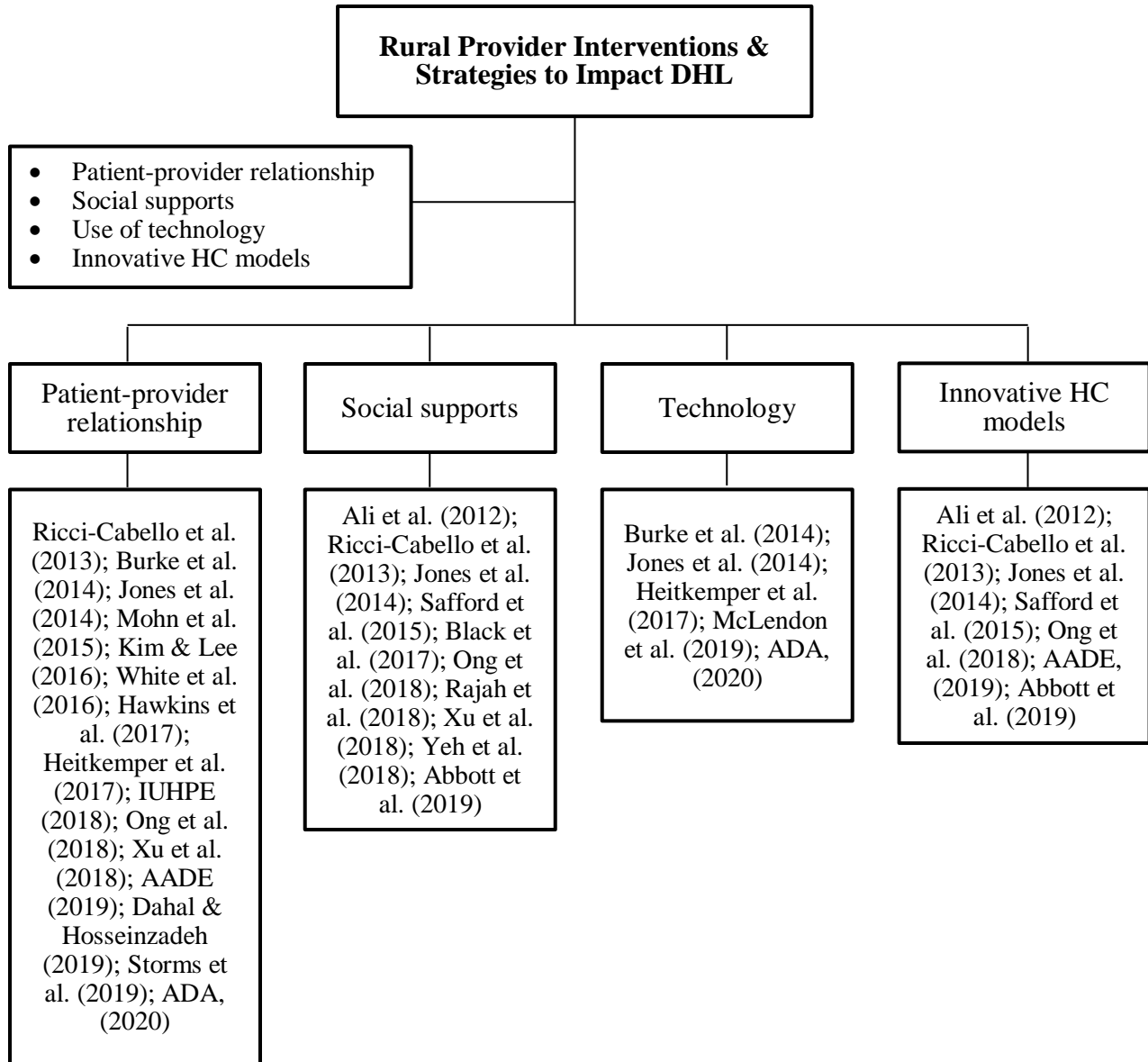


Figure 3. Flowchart of rural provider interventions and strategies.

SECTION SIX: DISCUSSION

This integrative review suggests that patients living with diabetes in rural areas have unique and significant barriers to DHL that need to be addressed by the health care system with evidence-based innovative and culturally sensitive interventions and strategies. While there is no perfect combination of interventions that will result in improved DHL in the rural population,

there is sufficient evidence regarding the impact of providers, patient-centered care, and social support.

Face-to-face contact on a regular and frequent basis with the provider was shown to overwhelmingly result in improved DHL. Utilizing easy-to-understand language, motivational interviewing, and the teach-back method during communication was shown to foster learning and provide opportunities to clarify misunderstandings. A culturally sensitive approach and the presence of a support system were also found to impact adherence to medications and self-monitoring of blood glucose, resulting in improved clinical outcomes (Abbott et al., 2019). This suggests that providers need to inquire about what the patient values and incorporate these values into goal-setting (Abbott et al, 2019; Dahal & Hosseinzadeh, 2019; Ong et al., 2018).

Social support, while valuable in many disease processes and populations, was found to be an integral component of success in improving DHL in the rural community (Black et al., 2017; Mohn et al., 2015; White et al., 2016; Yeh et al., 2018). The most influential social supports were spouses and children, but peer support groups, community health workers, and fellow parishioners were also found to support DHL in the rural community (Abbott et al., 2019; Black et al., 2017). Patient support systems are able to clarify instructions received from providers and encourage patients to attain their health goals. The literature showed that providers are not routinely assessing or considering support systems when caring for patients with diabetes, suggesting there may be missed opportunities to positively impact patient DHL and health outcomes (Black et al., 2017).

Clinical outcomes such as A1c levels, BMI, lipid profile, and blood pressure were not always considered or measured in the studies reviewed. Al Sayah et al. (2012) noted a weak association between clinical outcomes and DHL. However, the use of multiple tools to measure

DHL in literature makes it difficult to generalize findings. That being said, this review examined several studies that measured clinical outcomes and showed positive associations between interventions to improve DHL and clinical outcomes (Ali et al., 2012; Marciano et al., 2019; McLendon et al., 2019; Safford et al., 2015). A community pharmacist intervention demonstrated the greatest clinical impact; the pharmacist partnered with general practitioner care to provide in-person DHL and monitoring (Ali et al., 2012). This resulted in a significant drop in A1c levels, but this study had a fairly homogenous sampling with little diversity, making the findings more difficult to generalize to a multidiverse rural setting. However, the common theme in these studies was the use of face-to-face or in-person interventions.

The use of technology also showed great promise in addressing the access issues faced by patients living with diabetes in the rural population (Heitkemper et al., 2017; McLendon et al., 2019). This review found that incorporating face-to-face interaction with the telehealth interventions resulted in positive self-management behavior changes and clinical outcomes. However, these studies also showed there were limitations with telehealth interventions in the rural community due to limited Internet bandwidth and the additional work burden on the rural health care personnel. These limitations need to be considered and addressed in future interventions.

The utilization of general HL or DHL assessments was not found to be consistently performed by providers for several reasons. Providers often relied on their “gut” rather than a formalized assessment tool (Rajah et al., 2018). The results were that providers often overestimated patients’ HL. Measurement tools to assess DHL are not uniform and do not utilize the same form of measurement, making it difficult for providers to choose a DHL assessment that will work for all patients in their practice (Al Sayah et al., 2012). In addition, there are no

guideline recommendations for assessing DHL or how often to do so, leaving providers to research and make these decisions on their own. And lastly, time constraints within the day-to-day operations of rural primary care practices contributed to providers not performing any type of DHL assessment (Faruqi et al., 2015; IUHPE, 2018; Jones et al., 2014; Rajah et al., 2018). The development and implementation of easy-to-use DHL assessment tools is necessary to assist providers with efficient and timely DHL assessment.

This integrative review suggests the health care system is problematic for DHL, and this is further complicated by the dynamic of a rural setting. The health care system has historically been provider focused. In addition, the barriers present in the rural community (travel distances, limited provider and specialist access, an aging population, financial constraints, etc.) compound the problem of DHL. However, nursing, pharmacy, and medical schools are increasingly incorporating HL into curriculums as the health community continues to recognize the critical impact HL has on patient adherence to evidence-based treatment plans and resulting patient outcomes (Toronto & Weatherford, 2015). Innovative care models that include treatment plans related to patient values, collaboration among rural community health providers (community pharmacists, public health nurses, and primary care providers), recruitment and training of community health workers, development of peer support, and examination as well as removal of barriers to health care are required to improve DHL and patient outcomes in the rural setting (Dahal & Hosseinzadeh, 2019; Ong et al., 2018; Ricci-Cabello et al, 2013; Ross et al., 2014; Xu et al, 2018).

Limitations

There were noted limitations to this review. While there is a vast amount of literature regarding HL, there is less regarding DHL and less still regarding DHL in the rural population.

This limitation required utilizing HL literature pertaining to the rural population at times, as well as other methods of searching literature to include ancestry searching and a search of gray literature. The PRISMA checklist and JBI checklist results did not always coincide with nursing's Melnyk LOE pyramid, making it necessary to include some articles that may have not had a good rating based on the PRISMA or JBI checklist. This limitation was further compounded by the use of only one reviewer, who was also the primary researcher. There was also some degree of bias, as multiple studies relied on self-reporting or did not address confounding factors, causing a threat to internal validity.

Implications for Research

Additional research is necessary to further explore health care initiatives to address DHL specific to the rural population, technology solutions to improve access to specialists for the rural population, innovative models of care to address the barriers to DHL in the rural population, and guidelines for addressing DHL. This additional research should focus on interventions that increase face-to-face contact, incorporate patient/community values, and increase social support, as researchers have already demonstrated positive impacts on DHL and outcomes in studies utilizing these styles of interventions.

Implications for Practice

Limited DHL is a threat to the health of rural patients living with diabetes. Healthy People 2020 and Rural Healthy People 2020 have both identified diabetes as a priority for national health, and particularly for rural health. Rural health care providers are on the front lines for addressing the health care inequities noted in these reports by improving DHL in their patients.

Rural providers need to take a DHL universal-precautions approach and assume that all patients have some degree of DHL. This requires clarifying patient understanding by asking questions of the patient, encouraging the patient to ask questions, using simple language, and utilizing the teach-back method. Covering HL in health professional education curriculums will provide awareness of general HL and develop the required communication skill set to address HL in providers, thereby improving DHL (Toronto & Weatherfield, 2015). In addition, AHRQ (2015) provides a Health Literacy Universal Precautions Toolkit for providers that can be utilized to learn communication strategies for addressing DHL.

Historically, the health care system has held a paternalistic role in patient care; providers and the health care system determined the patient plan of care with little input from the patient. However, this integrative review has shown the importance of a patient-centered approach to care in order to impact DHL. Partnering with patients by considering their values, personal goals, and culture can result in improved patient self-management and clinical outcomes (Burke et al., 2014; Dahal & Hosseinzadeh, 2019; IUHPE, 2018; Kim & Lee, 2016; Xu et al., 2018). Further strategies for facilitating a patient-centered environment include integrating social supports when addressing DHL in rural communities where resources are limited (Abbott et al., 2019; Black et al., 2017; Jones et al., 2014; Ong et al., 2018; Rajah et al., 2018; Xu et al., 2018; Yeh et al., 2018). Rural providers need to include social support in their social assessment of patients, and when it is not present, providers should look for innovative options. These options may include developing or identifying a peer leader to start a support group of patients within the practice/community who are living with diabetes and provide the necessary social support to improve DHL (Abbott et al., 2019; Ong et al., 2018; Ricci-Cabello et al., 2013; Safford et al., 2015).

There is a need for rural providers and community leaders to work together to remove barriers to DHL in the rural community. Developing a rural network of health care and community leaders is imperative. This network can assess and then partner to address health care barriers, such as limited providers, transportation issues, and health care costs, in order to improve access to opportunities to develop DHL for patients living with diabetes in these communities (Jones et al., 2014; Ong et al., 2018; Ricci-Cabello, 2013). This integrative review provided multiple examples of strategies involving community pharmacists, trained community health workers, telehealth, and peer support groups that all serve to improve access to opportunities to improve DHL for the rural patient and improve self-management behaviors and clinical outcomes without the patient needing to travel long distances to obtain care with specialists (AADE, 2019; Abbott et al., 2019; Ali et al., 2012; Burke et al., 2014; Heitkemper et al., 2017; Jones et al., 2014; McLendon et al., 2019; Ong et al., 2018; Ricci-Cabello et al., 2013; Safford et al., 2015).

DNP Essentials

The Doctor of Nursing Practice Essentials put forth by the American Association of Colleges of Nursing provides foundational competencies for all advanced practice nursing roles (American Association of Colleges of Nursing [AACN], 2006). These Essentials are met by this scholarly project.

Essential I: Scientific underpinnings for practice. The DNP scholarly project sought to raise awareness of DHL in the rural community by examining outcomes related to DHL and the variables that impact DHL in the rural community. This integrative review relied on the principles of nursing science integrated with knowledge from other sciences to suggest possible solutions to an important practice issue in an often-overlooked population (AACN, 2006).

Essential II: Organizational and systems leadership for quality improvement and systems thinking. In order to improve patient and health care outcomes and limit health disparities, the Doctor of Nursing Practice (DNP) graduate needs to have knowledge and skill in organizational and systems leadership (AACN, 2006). This integrative review demonstrated this Essential by examining rural health care barriers related to DHL and identifying gaps where nursing and medical providers can improve current systems to improve health outcomes for patients living with diabetes in these communities.

Essential III: Clinical scholarship and analytical methods for evidence-based practice. Doctoral education is marked by clinical scholarship and research (AACN, 2006). The DNP role involves the translation of research into evidence-based practice. This integrative review examined the evidence available from diverse sources and then synthesized and applied this knowledge to the practice issue of DHL in the rural community. Evidence-based practices are recommended within the integrative review to address the issue of DHL in the rural community from multiple platforms.

Essential IV: Information systems/technology and patient care technology for the improvement and transformation of health care. The DNP is able to provide leadership with information systems and technology that support and improve both patient care and health care systems (AACN, 2006). This integrative review applied this Essential to present solutions for improving and transforming health care in the rural community. This was accomplished by utilizing electronic health care databases to search for evidence related to DHL in the rural community, as well as analyzing and integrating evidence-based health information technology solutions to be utilized in the rural community.

Essential V: Health care policy for advocacy in health care. The DNP has the skills, leadership, and practice experience to be a powerful influence on health care policy (AACN, 2006). The ability to analyze health care policies and apply evidence-based research and practice experience prepares the DNP to assume the role of leader and advocate with policy changes in their local health care system as well as the national health care system. This integrative review applies this Essential by examining the state of evidence regarding DHL in the rural community and providing evidence-based solutions for health care system changes on a local and national level. This can be further expanded upon with dissemination of this integrative review via conference presentations, publishing, or meetings with local, state, and national leadership.

Essential VI: Interprofessional collaboration for improving patient and population health outcomes. The current complex health care environment requires effective interprofessional collaboration to address patient and population issues of health. The DNP leader has preparation to lead and establish interprofessional teams based upon patient needs (AACN, 2006). This integrative review incorporates solutions for the practice problem of DHL in the rural community that involve interprofessional collaboration among providers, pharmacists, public health, Community Health Workers, and community leaders. Solutions for addressing DHL in the rural community require more than one dimension of involvement, and thus an interprofessional team is required to provide effective and thoughtful solutions that are community and patient centered.

Essential VII: Clinical prevention and population health for improving the nation's health. The AACN (2006) defines *clinical prevention* as health promotion, risk reduction, and illness prevention and defines *population health* as groups of individuals with shared

characteristics, community, environment, and cultural dimensions of health. These two concepts are imperative for improving the health of the nation. This DNP Essential, in combination with nursing's historical focus on prevention, provides a strong foundation that enables the DNP to engage, lead, and collaborate with other leaders to integrate evidence-based clinical prevention and population health strategies for individuals, groups of people, and communities to improve the nation's health. This integrative review focuses on the improvement of health outcomes of rural patients living with diabetes, as well as preventing future complications and risks associated with uncontrolled diabetes in these at-risk populations.

Essential VIII: Advanced nursing practice. The current highly complex health care system requires a specialization in nursing for an individual to be competent to address the complex clinical practice issues (AACN, 2006). The DNP is prepared to examine and inform patient practice decisions and patient care consequences of decisions based on expertise, advanced knowledge, and mastery within nursing (AACN, 2006). This integrative review addresses this Essential by combining clinical knowledge, systems thinking, and analytical skills to evaluate the multidimensional practice issue of DHL in the rural community as well as evidence-based solutions.

SECTION SEVEN: CONCLUSIONS

The rural diabetes health crisis is a national concern. Low DHL in the rural community must be addressed in order to improve health outcomes and quality of life and mitigate rising medical costs for patients living with diabetes. Improving DHL in these communities is documented to improve health outcomes, quality of life, and medical costs. Improving rural DHL has unique challenges and barriers. However, it is imperative that rural providers and health care systems address these barriers and employ strong evidence-based interventions and

strategies to overcome them. Providers must assume DHL universal precautions for all patients by providing face-to-face interactions, fostering trust, utilizing key communication skills, and employing patient support systems. This integrative review supports rural providers to make a strong impact on DHL in the rural community. Future research should continue to examine the role of relationships for improving DHL in this population, solutions for addressing the burden that technology-based interventions place on the rural health care system, and the development of efficient, easy-to-use DHL assessment tools that can be included in the rural provider's "toolkit" for addressing DHL. Given the current state of chronic disease in the US and the state of diabetes in rural communities, the push for evidence-based and patient-centered care addressing DHL is a vital part of the plan of action to improve national health.

References

- Abbott, L. S., Slate, E. H., & Graven, L. J. (2019). Cardiovascular disease risk among rural residents living with diabetes and prediabetes: A cluster randomized trial. *Public Health Nursing, 37*, 16–24. doi:10.1111/phn.12659
- Agency for Healthcare Research and Quality. (2020). *Health literacy universal precautions toolkit, 2nd edition* (AHRQ Publication No. 15-0023-EF). Retrieved from <https://www.ahrq.gov/health-literacy/quality-resources/tools/literacy-toolkit/healthlittoolkit2.html>
- Ali, F., Schifano, P., Robinson, G., Phillips, L., Doherty, P., Melnick, L., . . . Dhillon, S. (2012). Impact of community pharmacy diabetes monitoring and education programme on diabetes management: A randomized controlled study. *Diabetic Medicine, 29*, e326–e333. doi:10.1111/j.1464-5491.2012.03725.x
- Al Sayah, F., Majumdar, S. R., Williams, B., Robertson, S., & Johnson, J. A. (2012). Health literacy and health outcomes in diabetes: A systematic review. *Journal of General Internal Medicine, 28*, 444–452. doi:10.1007/s11606-012-2241-z
- Alvarez, P. M., Young, L. A., Mitchell, M., Blakeney, T. G., Buse, J. B., Vu, M. B., . . . Donahue, K. E. (2018). Health literacy, glycemic control, and physician-advised glucose self-monitoring use in type 2 diabetes. *Diabetes Spectrum*. doi:10.2337/ds17-0064
- American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice*. Retrieved from <https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf>
- American Association of Diabetes Educators. (2019). *AADE practice paper: Cultural and health literacy considerations with diabetes*. Retrieved from

<https://www.diabeteseducator.org/docs/default-source/practice/practice-documents/practice-papers/adces-cultural-and-health-literacy-considerations-with-diabetes-final-4-1-20.pdf?sfvrsn=4>

American Diabetes Association. (2018). Economic costs of diabetes in the U.S. in 2017.

Diabetes Care, 41(5), 917–928. doi:10.2337/dci18-0007

American Diabetes Association. (n.d.). *Statistics about diabetes*. Retrieved August 16, 2020

from <https://www.diabetes.org/resources/statistics/statistics-about-diabetes>

American Diabetes Association. (2020). Standards of medical care in diabetes—2020 abridged for primary care providers. *Clinical Diabetes*, 38(1), 10–38. doi:10.2337/cd20-as01

Black, S., Maitland, C., Hilbers, J., & Orinuela, K. (2017). Diabetes literacy and informal social support: A qualitative study of patients at a diabetes center. *Journal of Clinical Nursing*, 26(1–2), 248–257. doi:10.1111/jocn.13383

Bolin, J. N., Schulze, A., Helduser, J., & Ory, M. G. (2015). The burden of diabetes in rural America. In J. N. Bolin, G. Bellamy, A. O. Ferdinand, B. A. Kash, & J. W. Helduser (Eds.), *Rural Healthy People 2020 School of Public Health, Southwest Rural Health Research Center*, (Vol. 1., pp. 43–53). College Station: Texas A&M Health Science Center School of Public Health, Southwest Rural Health Research Center.

Brouwers, M., Kho, M. E., Browman, G. P., Cluzeau, F., Feder, G., Fervers, B., . . .

Zitzelsberger, L. (2010). AGREE II: Advancing guideline development, reporting and evaluation in healthcare. *Canadian Medical Association Journal*, 182(18), E839–E842, doi:10.1503/cmaj.090449

- Burke, S. D., Sherr, D., & Lipman, R. D. (2014). Partnering with diabetes educators to improve patient outcomes. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 7, 45–53. doi:10.2147/DMSO.S40036
- Callaghan, T. H., Towne, S. D., Bolin, J., & Ferdinand, A. O. (2017). *Diabetes mortality in rural America: 1999-2015* (Policy Brief). Retrieved from Southwest Rural Health Research Center website: <https://srhrc.tamhsc.edu/docs/srhrc-pb2-callaghan-diabetes.pdf>
- Centers for Disease Control and Prevention. (2017). *Fighting diabetic complications*. Retrieved from <https://www.cdc.gov/diabetes/diabetesatwork/pdfs/FightingDiabetesComp.pdf>
- Centers for Disease Control and Prevention. (2019). *Diabetes: Put the brakes on diabetes complications*. Retrieved from <https://www.cdc.gov/diabetes/library/features/prevent-complications.html>
- Centers for Medicare and Medicaid Services. (2018). *CMS rural health strategy*. Retrieved from <https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Rural-Strategy-2018.pdf>
- Dahal, P. K., & Hosseinzadeh, H. (2019). Association of health literacy and diabetes self-management: A systematic review. *Australian Journal of Primary Health*, 25, 526–533. doi:10.1071/PY19007
- Dart, M. A. (2011). *Motivational interviewing in nursing practice: Empowering the patient*. Sudbury, MA: Jones & Bartlett.
- Faruqi, N., Lloyd, J., Ahmad, R., Yeong, L. & Harris, M. (2015). Feasibility of an intervention to enhance preventive care for people with low health literacy in primary health care. *Australian Journal of Primary Health*, 21(3), 321–326. Retrieved from doi:10.1071/PY14061

- Ferguson, M. O., Long, J. A., Zhu, J., Small, D. S., Lawson, B., Glick, H. A., & Schapira, M. M. (2015). Low health literacy predicts misperceptions of diabetes control in patients with persistently elevated A1c. *The Diabetes Educator, 41*(3), 309–319. doi:10.1177/0145721715572446
- Hawkins, M., Gill, S. D., Batterham, R., Elsworth, G. R., & Osborne, R. H. (2017). The Health Literacy Questionnaire (HLQ) at the patient-clinician interface: A qualitative study of what patients and providers mean by their HLQ scores. *BMC Health Services Research, 17*, 309. doi:10.1186/s12913-017-2254-8
- Heitkemper, E. M., Mamykina, L., Travers, J., & Smaldone, A. (2017). Do health information technology self-management interventions improve glycemic control in medically underserved adults with diabetes? A systematic review and meta-analysis. *Journal of the American Medical Informatics Association, 24*, 1024–1035. doi:10.1093/jamia/ocx025
- International Union for Health Promotion and Education Global Working Group on Health Literacy. (2018). IUHPE position statement on health literacy: A practical vision for a health literate world. *Global Health Promotion, 25*, 79–88. doi:10.1177/1757975918814421
- Joanna Briggs Institute. (n.d.). *Critical appraisal tools*. Retrieved May 5, 2020 from <https://joannabriggs.org/critical-appraisal-tools>
- Jones, L., Crabb, S., Turnbull, D., & Oxlad, M. (2014). Barriers and facilitators to effective type 2 diabetes management in a rural context: A qualitative study with diabetic patients and health professionals. *Journal of Health Psychology, 19*, 441–453. doi:10.1177/1359105312473786

- Kim, S. H., & Lee, A. (2016). Health-literacy-sensitive diabetes self-management interventions: A systematic review and meta-analysis. *Worldviews on Evidence-Based Nursing, 13*, 324–333. doi:10.1111/wvn.12157.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, P. A., . . . Moher, D. (2009) The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Med, 6*, e1000100. doi:10.1371/journal.pmed.1000100
- Mantwill, S., & Schultz, P. (2015). Low health literacy associated with higher medication costs in patients with type 2 diabetes mellitus: Evidence from matched survey and health insurance data. *Patient Education and Counseling, 98*, 1625–1630. doi:10.1016/j.pec.2015.07.006
- Marciano, L., Camerini, A., & Schulz, P. J. (2019). The role of health literacy in diabetes knowledge, self-care, and glycemic control: A Meta-Analysis. *Journal of General Internal Medicine, 34*, 1007–1017. doi:10.7/s11606-019-04832-y
- McLendon, S. F., Wood, F. G., & Stanley, N. (2019). Enhancing diabetes care through care coordination, telemedicine, and education: Evaluation of a rural pilot program. *Public Health Nursing, 36*(3), 310–320. doi:10.1111/phn.12601
- Melnyk, B. M., & Fineout-Overholt, E. (2015). *Evidenced-based practice in nursing and healthcare: A guide to best practice* (3rd ed.). Philadelphia, PA: Wolters Kluwer.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *BMJ, 339*, b2535. doi:10.1136/bmj.b2535

- Mohn, J., Graue, M., Assmus, J., Zoffmann, V., Thordarson, H. B., Peyro, M., & Rokne, R. (2015). Self-reported diabetes self-management competence and support from healthcare providers in achieving autonomy are negatively associated with diabetes distress in adults with Type 1 diabetes. *Diabetes Medicine*, *32*(11), 1513–1519. doi:10.1111/dme.12818
- National Center for Chronic Disease Prevention and Health Promotion. (2017). *National diabetes statistics report, 2017: Estimates of diabetes and its burden in the United States*. Retrieved September 5, 2019 from <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>
- National Center for Chronic Disease Prevention and Health Promotion. (2019). *Chronic diseases in America*. Retrieved from <https://www.cdc.gov/chronicdisease/resources/infographic/chronic-diseases.htm>
- National Rural Health Association. (n.d.). *About rural health care*. Retrieved May 1, 2020 from <https://www.ruralhealthweb.org/about-nrha/about-rural-health-care>
- Office of Disease Prevention and Health Promotion. (2010). *National action plan to improve health literacy*. Retrieved from <https://health.gov/our-work/health-literacy/national-action-plan-improve-health-literacy>
- Office of Disease Prevention and Health Promotion. (2020). *Healthy people 2020 social determinants of health*. Retrieved September 5, 2019 from <https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health>
- Office of Disease Prevention and Health Promotion. (2020). *Healthy people 2020 topics and objectives: Diabetes*. Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/diabetes>

Ong, S. E., Koh, J. J., Toh, S., Chia, K. S., Balabanova, D., McKee, M., . . . Legido-Quigley, H.

(2018). Assessing the influence of health systems on Type 2 Diabetes Mellitus awareness, treatment, adherence, and control: A systematic review. *Plos One*, *13*, e0195086. doi:10.1371/journal.pone.0195086

Rajah, R., Hassali, M., Jou, L., Murugiah, M. (2018). The perspective of healthcare providers and patients on health literacy: A systematic review of the quantitative and qualitative studies. *Perspectives in Public Health*, *138*(2), 122–132. doi:10.1177/1757913917733775

Ricci-Cabello, I., Ruiz-Perez, I., Rojas-García, A., Pastor, G., & Gonçalves, D. C. (2013).

Improving diabetes care in rural areas: A systematic review and meta-analysis of quality improvement interventions in OECD countries. *PLoS ONE*, *8*, e84464. doi:10.1371/journal.pone.0084464

Ross, S., Benavides-Vaello, S., Schumann, L., & Haberman, M. (2014). Issues that impact type-

2 diabetes self-management in rural communities. *Journal of the American Association of Nurse Practitioners* *27*(11), 653–660. doi:10.1002/2327-6924.12225

Safford, M. M., Andreae, S., Cherrington, A. L., Martin, M. Y., Halanych, J., Lewis, M., . . .

Richman, J. S. (2015). Peer coaches to improve diabetes outcomes in rural Alabama: A cluster randomized trial. *Annals of Family Medicine*, *13*(Suppl. 1), S18–S26.

doi:10.1370/afm.1798

Southwest Rural Health Research Center. (n.d.). *About us*. Retrieved from

<https://srhrc.tamhsc.edu/about.html>

Storms, H., Aertgeerts, B., Vandenabeele, F., & Claes, N. (2017). General practitioners' predictions of their own patients' health literacy: A cross-sectional study in Belgium.

BMJ Open, *9*, e029357. doi:10.1136/bmjopen-2019-029357

- Toronto, C. E., & Remington, R. (Ed.). (2020). *A step-by-step guide to conducting an integrative review*. Switzerland: Springer.
- Toronto, C. E., & Weatherford, B. (2015). Health literacy education in health professions schools: An integrative review. *Journal of Nursing Education, 54*(12), 669–676. doi:10.3928/01484834-20151110-02
- University of Michigan Library. (2020). *Research guides: Nursing*. Retrieved from <https://guides.lib.umich.edu/c.php?g=282802&p=1888246>
- U.S. Department of Health and Human Services. (n.d.). *Quick guide to health literacy*. Retrieved September 5, 2019 from <https://healthliteracycentre.eu/wpcontent/uploads/2015/11/Quick-guide-to-health-literacy.pdf>
- U.S. Department of Health and Human Services. (2019). *Health literacy*. Retrieved from <https://www.hrsa.gov/about/organization/bureaus/ohe/health-literacy/index.html#:~:text=Health%20literacy%20is%20the%20degree,Minority%20populations>
- White, R. O., Chakkalakal, R. J., Presley, C. A., Bian, A., Schildcrout, J. S., Wallston, K. A., . . . Rothman, R. (2016). Perceptions of provider communication among vulnerable patients with diabetes: Influences of medical mistrust and health literacy. *Journal of Health Communication, 21*(Suppl. 2), 127–134. doi:10.1080/10810730.2016.1207116
- Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing, 52*, 546–553.
- World Health Organization. (2020). *Diabetes*. Retrieved from <https://www.who.int/health-topics/diabetes>

Xu, X., Leung, A., & Chau, P. (2018). Health literacy, self-efficacy, and associated factors among patients with diabetes. *Health Literacy Research and Practice, 2*(2), e67–e77. doi:10.3928/24748307-20180313-01

Yeh, J., Wei, C., Weng, S., Tsai, C., Shih, J., Shih, C., & Chiu, C. (2018). Disease-specific health literacy, disease knowledge, and adherence behavior among patients with type 2 diabetes in Taiwan. *BMC Public Health, 18*, 1062. doi:10.1186/s12889-018-5972-x

**Appendix A: Collaborative Institutional Training Initiative Program Completion
Certificate**



Appendix B: Institutional Review Board Letter

July 15, 2020

Shannon Elrod
Dana Woody

Re: IRB Application - IRB-FY20-21-19 An Integrative Review of Diabetes Health Literacy in the Rural Population

Dear Shannon Elrod, Dana Woody:

The Liberty University Institutional Review Board (IRB) 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.

Decision: No Human Subjects Research

Explanation: Your study does not classify as human subjects research because:

(1) it will not involve the collection of identifiable, private information.

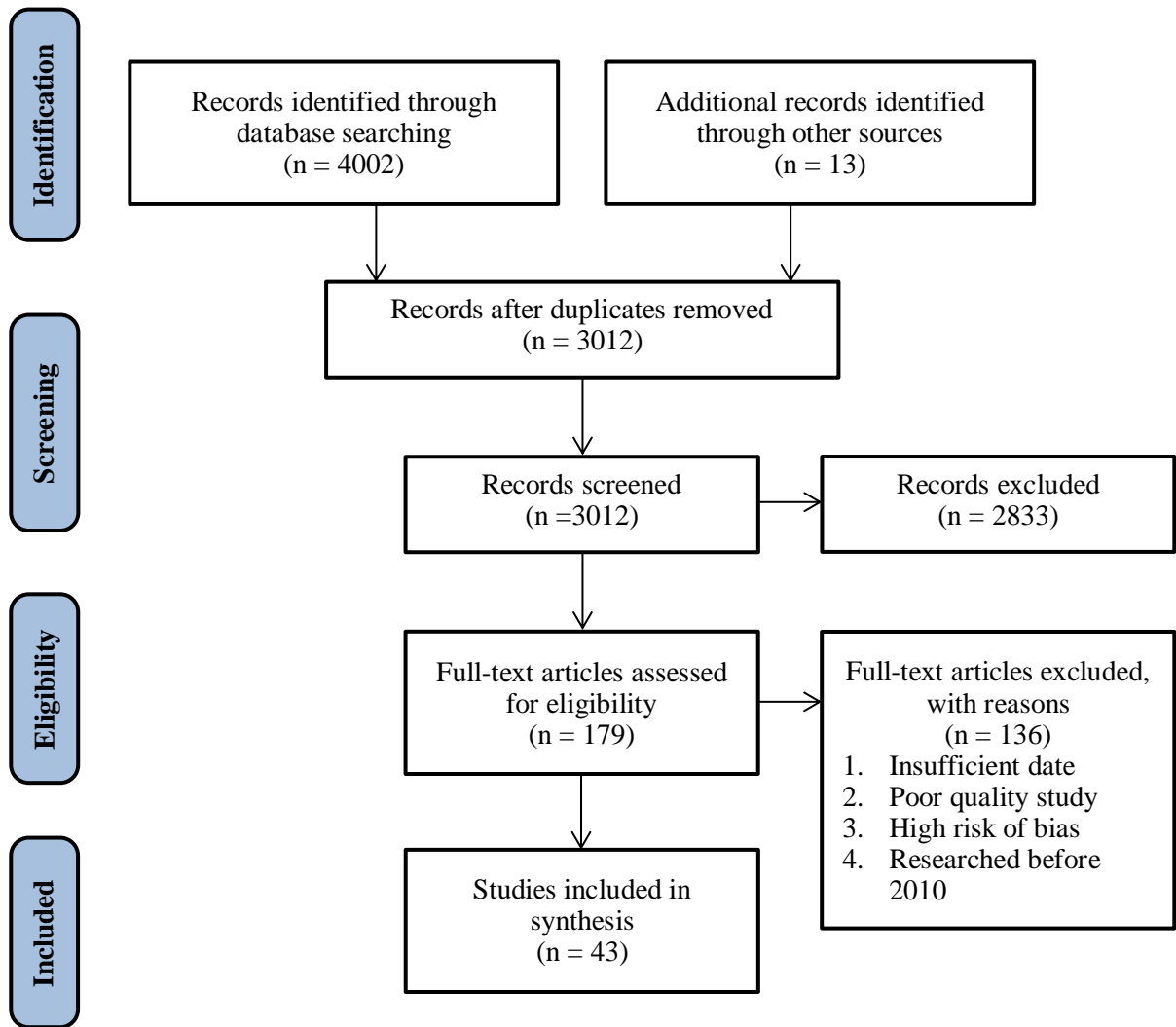
Please note that this decision only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued non-human subjects research status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this determination or need assistance in determining whether possible modifications 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
Research Ethics Office

Appendix C: PRISMA Flow Diagram



From: Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *PLoS Med*, 6, e1000097. doi:10.1371/journal.pmed1000097

Appendix D: Review Question Matrices

Table D-1

Outcomes Related to Diabetes Health Literacy

Article and Author	Study Purpose	Level of Evidence	Results	Strengths or Limitations and Implications to Practice
<p>Dahal, P. K., & Hosseinzadeh, H. (2019). Association of health literacy and diabetes self-management: A systematic review. <i>Australian Journal of Primary Health</i>, 25, 526–533. https://doi.org/10.1071/PY19007</p>	<p>Examine the association between DHL and self-management in type II DM.</p>	<p>Level I</p>	<p>Findings support association between DHL and significant improvement in self-management, diabetes knowledge, self-efficacy and QOL. Association between DHL and glycemic control, SMBG, foot care, diet and medication adherence inconclusive.</p>	<p>Two researchers; no third party to resolve disagreement; Suggest structured, customized and community-based DHL interventions more likely to empower patients and facilitate self-management behaviors.</p>
<p>Heitkemper, E. M., Mamykina, L., Travers, J., & Smaldone, A. (2017). Do health information technology self-management interventions improve glycemic control in medically underserved adults with diabetes? A systematic review and meta-analysis. <i>Journal of the American Medical Informatics Association</i>, 24, 1024–1035. doi: 10.1093/jamia/ocx025</p>	<p>Examine impact of DSMES provided by health information technology (HIT) in the rural population and impact on glycemic</p>	<p>Level I</p>	<p>HIT diabetes self-management education was found to have similar results as face-to-face interaction diabetes education for medically underserved, especially at 6</p>	<p>3,257 patients included in 13 RCTs with meta-analysis of 10; possible bias related to some of the studies utilizing questionnaires to obtain results; need HIT to</p>

	control.		months. Incorporated human interaction with HIT. Use of A1c measurement.	include face-to-face human interaction to have similar A1c results as in person DSMES.
Marciano, L., Camerini, A., & Schulz, P. J. (2019). The role of health literacy in diabetes knowledge, self-care, and glycemic control: A Meta-Analysis. <i>Journal of General Internal Medicine</i> , 34, 1007-1017. doi: 10.7/s11606-019-04832-y.	Examine relationship between HL and diabetes knowledge, self-care and glycemic control.	Level V	Higher levels of HL=better diabetes knowledge and lower A1c levels, but not associated with higher self-care activities. HL assessments for performance (reading skills, comprehension, and numeracy) better at gauging glycemic control.	Examined bias and the 3 different types of health literacy; limited number of studies reporting diabetes outcomes for all 3 health literacy types and majority of studies being cross-sectional make causation difficult; need consensus on DHL assessment tools and guidelines of when to use them.
Kim, S. H., & Lee, A. (2016). Health-literacy-sensitive diabetes self-management interventions: A systematic review and meta-analysis. <i>Worldviews on Evidence-Based Nursing</i> , 13, 324–333.	To review health-literacy-sensitive diabetes management interventions and identify	Level V	Written communication, spoken communication, empowerment, and language/cultural consideration	Measured A1c levels and clinical outcomes; bias present in some of the studies and external validity lacking.

	effective strategies for low literacy.		were effective methods to increase health literacy, as evidenced by lowered A1c levels.	
Xu, X., Leung, A., & Chau, P. (2018). Health literacy, self-efficacy, and associated factors among patients with diabetes. <i>Health Literacy Research and Practice</i> , 2, e67-e77. doi:10.3928/24748307-20180313-01	Investigate the relationship between HL and self-efficacy in diabetes	Level V	Communicative and critical HL had positive relationship with self-efficacy. Provider and social report positively impact DHL and patient's self-efficacy to manage their disease.	Methodology meets most of PRISMA checklist; only used cross-sectional studies making causal inferences difficult; emphasizes the provider-patient relationship and support system.
Al Sayah, F., Majumdar, S. R., Williams, B., Robertson, S., & Johnson, J. A. (2012). Health literacy and health outcomes in diabetes: A systematic review. <i>Journal of General Internal Medicine</i> , 28, 444-52. doi: 10.1007/s11606-012-2241-z	To identify, appraise and synthesize research evidence on the relationship between health literacy and health outcomes in people with diabetes.	Level V	Low health literacy associated with poor diabetes knowledge but insufficient evidence to connect with clinical outcomes.	Provides alternative results regarding the lack of evidence regarding health literacy and health outcomes. Appears to affect behaviors more; different tools used to measure HL in the different

				studies and lack of experimental studies; suggests there may be other factors influencing DHL
<p>McLendon, S. F., Wood, F. G., & Stanley, N. (2019). Enhancing diabetes care through care coordination, telemedicine, and education: Evaluation of a rural pilot program. <i>Public Health Nursing, 36</i>, 310–320. doi: 10.1111/phn.12601</p>	<p>The purpose of this study was to evaluate the effectiveness of a rural pilot diabetes program for patients with poorly controlled DM.</p>	<p>Level VI</p>	<p>The findings of the study were that utilization of the Chronic Care Model in the rural setting with the combined use of telemedicine and patient preventative health education were successful. This was evidenced by lowered A1c levels, total cholesterol and BP as well as reduced hospital utilization, reduced personnel and organizational costs, as well as high patient satisfaction.</p>	<p>Multi-faceted program, measured A1c levels; difficult to determine which intervention was the cause of the outcomes of the study and small sample size; need to consider Internet-limitations and health personnel burden with implementation of HIT in the rural provider office.</p>
<p>Mohn, J., Graue, M., Assmus, J., Zoffmann, V., H. B. Thordarson, H. B., M. Peyro, M., & Rokne, R. (2015).</p>	<p>To investigate the</p>	<p>Level VI</p>	<p>A lower self-perceived competency</p>	<p>Cross-sectional study limits</p>

<p>Self-reported diabetes self-management competence and support from healthcare providers in achieving autonomy are negatively associated with diabetes distress in adults with Type 1 diabetes. <i>Diabetes Medicine</i>, 32, 1513–1519. doi: 10.1111/dme.12818</p>	<p>association of self-perceived competence in diabetes management and autonomy support from healthcare provider when diabetes (type I) poorly controlled.</p>		<p>to handle their diabetes was related to poor control of diabetes. Autonomy support by providers led to improved self-management and diabetes control</p>	<p>ability to draw conclusions about relationships; only one third of potentially eligible patients enrolled limiting generalizations; points out the importance of the provider-patient relationship</p>
<p>Ferguson, M. O., Long, J. A., Zhu, J., Small, D. S., Lawson, B., Glick, H. A., & Schapira, M. M. (2015). Low health literacy predicts misperceptions of diabetes control in patients with persistently elevated A1c. <i>The Diabetes Educator</i>, 41, 309-319. doi: 10.1177/0145721715572446</p>	<p>Examine factors associated with patient's perceived control of DM in a group of poorly controlled patients with DM.</p>	<p>Level VI</p>	<p>40% of the poorly controlled patients living with DM believed they were managing their disease well; perception was affected by low DHL.</p>	<p>Limitation was cross-sectional design; practice implications are that if there is poor understanding, there is little motivation to prompt a change in behaviors.</p>
<p>Mantwill, S., & Schultz, P. (2015). Low health literacy associated with higher medication costs in patients with type 2 diabetes mellitus: Evidence from matched survey and health insurance data. <i>Patient Education and Counseling</i>, 98, 1625–1630. http://dx.doi.org/10.1016/j.pec.2015.07.006</p>	<p>Examined relationship between DHL and medication costs in a sample of insured patients living with type II DM.</p>	<p>Level VI</p>	<p>Low DHL associated with increased medication costs and hospitalizations due to non-adherence, misuse and taking wrong dose of prescribed</p>	<p>Limitations due to not identifying confounding factors. Implications for practice – low DHL affects medication and medical costs.</p>

			medications.	
Alvarez, P. M., Young, L. A., Mitchell, M., Blakeney, T. G., Buse, J. B., Vu, M. B.,...Donahue, K. E. (2018). Health literacy, glycemic control, and physician-advised glucose self-monitoring use in type 2 diabetes. <i>Diabetes Spectrum</i> . https://doi.org/10.2337/ds17-0064	Measure the association between DHL and both patient – reported outcomes as well as clinical outcomes.	Level VI	Low DHL associated with poor glycemic control, but more frequent SMBG compared with those patients with adequate DHL.	Large number of participants; study design missing key factors and diversity of population limited, data obtained from patient interviews, but not verified. Providers need to clarify patient understanding and behaviors.

DHL= Diabetes Health Literacy; DM=Diabetes Mellitus; DSMES= Diabetes Self-Management Education Support; HIT=Health Information Technology; HL= Health Literacy; SMBG=Self-Monitoring Blood Glucose

Table D-2

Variables Influencing DHL in Rural Populations

Article and Author	Purpose	Level of Evidence	Results	Strengths or Limitations and Implications for Practice
<p>Ricci-Cabello, I., Ruiz-Perez, I., Rojas-García, A., Pastor, G., & Gonçalves, D. C. (2013). Improving diabetes care in rural areas: A systematic review and meta-analysis of quality improvement interventions in OECD countries. <i>PLoS ONE</i> 8, e84464. doi:10.1371/journal.pone.0084464</p>	<p>Assess the effectiveness of QI strategies designed to improve rural diabetes care and identify characteristics associated with success.</p>	<p>Level I</p>	<p>QI that addressed the HC system and providers found that interventions which involved multiple strategies had greater impact than interventions focused on patient education.</p>	<p>Emphasizes impact of HC systems and providers on diabetes literacy and outcomes; utilized non-controlled trials with controlled and only examined glycemic control; addressing DHL in the rural community requires assessing the HC system that may be creating barriers for DHL.</p>
<p>McLendon, S. F., Wood, F. G., & Stanley, N. (2019). Enhancing diabetes care through care coordination, telemedicine, and education: Evaluation of a rural pilot program. <i>Public Health Nursing</i>, 36, 310–320. doi: 10.1111/phn.12601</p>	<p>The purpose of this study was to evaluate the effectiveness of a rural pilot diabetes program for patients with poorly controlled DM.</p>	<p>Level IV</p>	<p>The findings of the study were that utilization of the Chronic Care Model in the rural setting with the combined use of telemedicine and patient preventative</p>	<p>Multi-faceted program, measured A1c levels; difficult to determine which intervention was the cause of the outcomes of the study and small sample</p>

			health education were successful. This was evidenced by lowered A1c levels, total cholesterol and BP as well as reduced hospital utilization, reduced personnel and organizational costs, as well as high patient satisfaction.	size; need to consider Internet-limitations and health personnel burden with implementation of HIT in the rural provider office.
Ross, S., Sandra Benavides-Vaello, S., Schumann, L., & Haberman, M. (2015). Issues that impact type-2 diabetes self-management in rural communities. <i>Journal of the American Association of Nurse Practitioners</i> 27, 653–660. doi: 10.1002/2327-6924.12225	To evaluate and synthesize evidence related to issues that impact SM in the rural community.	Level V	Identified barriers to SM in the rural community as well as facilitators of DHL and SM that involve support systems, culturally-sensitive interventions and provider impact.	Weak on the PRISMA checklist, but provides informative data; identifies barriers to DHL and SM in the rural community that need to be and can be addressed by innovative solutions provided.
Ong, S. E., Koh, J. J., Toh, S., Chia, K. S., Balabanova, D., McKee, M., Perel, P., Legido-Quigley, H. (2018). Assessing the influence of health systems on Type 2 Diabetes Mellitus awareness, treatment, adherence, and control: A systematic review. <i>Plos One</i> , 13, e0195086. https://doi.org/10.1371/journal.pone.0195086	Examine literature regarding healthcare system factors influencing Type II DM awareness, treatment, adherence	Level V	Barriers identified: financial constraints, lack of access to health services/providers. Facilitators: innovative care models,	Examines healthcare system; support system importance; use of pharmacist; unable to exclude bias, unable to

	and control; make recommendations for future research and policy.		involving pharmacists, peer support, +provider/patient relationship.	perform meta-analysis due to studies; need to examine HC system and consider intercollaboration with resources available.
Yeh, J., Wei, C., Weng, S., Tsai, C., Shih, J., Shih, C., & Chiu, C. (2018). Disease-specific health literacy, disease knowledge, and adherence behavior among patients with type 2 diabetes in Taiwan. <i>BMC Public Health, 18</i> , 1062. https://doi.org/10.1186/s12889-018-5972-x	Examine relationship between health literacy, level of disease knowledge, and adherence behaviors among people with Type 2 DM.	Level VI	Role of family/social support to increase DHL and self-care.	Convenience sampling, sample was younger and better adherence than general population; findings supported by other literature; importance of support system and DHL.
Jones, L., Crabb, S., Turnbull, D., & Oxlad, M. (2014). Barriers and facilitators to effective type 2 diabetes management in a rural context: A qualitative study with diabetic patients and health professionals. <i>Journal of Health Psychology, 19</i> , 441–453. doi: 10.1177/1359105312473786	Identify factors that prevent and facilitate type II DM management in the rural setting.	Level VI	Barriers to DHL and DM management in rural setting are time and access. Facilitators are support from spouses, family and regular contact with health professionals.	Done in one center only; importance of support systems and provider-patient relationship to impact DHL and DM management.
Burke, S. D., Sherr, D., & Lipman, R. D. (2014). Partnering with diabetes educators to improve patient outcomes. <i>Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 7</i> , 45–53.	Professional opinion literature: Value of diabetes educators	Level VII	Importance of DSME to improve SM and clinical outcomes. Recognizes	Relies on 72 studies to provide a varied and sound body of evidence to

<p>http://dx.doi.org/10.2147/DMSO.S40036</p>	<p>improving self-management outcomes for diabetes</p>		<p>rural challenges and recommends utilizing HIT to improve access to diabetes educators.</p>	<p>support recommendations; incorporating principles from DSMES into provider-patient relationship such as patient-centered approach, patient sets goals.</p>
--	--	--	---	---

DHL=Diabetes Health Literacy; DM= Diabetes; DSMES = Diabetes Self-Management Education Support; HC= Health Care; HL= Health Literacy; HIT= Health Information Technology

Table D-3

Rural Provider Interventions and Strategies that Increase DHL

Article and Author	Purpose	Level of Evidence	Results	Strengths, Limitations or Implications for Practice
American Diabetes Association. (2020). Standards of medical care in diabetes—2020 abridged for primary care providers. <i>Clinical Diabetes</i> , 38, 10-38. https://doi.org/10.2337/cd20-as01	Evidence-based guidelines for practice	Level I	Evidence-based guidelines for practice	Recommends DSMES for all patients with diabetes and strong support for implementing technology in rural areas to facilitate access to DSMES and specialists.
Dahal, P. K., & Hosseinzadeh, H. (2019). Association of health literacy and diabetes self-management: A systematic review. <i>Australian Journal of Primary Health</i> , 25, 526–533. https://doi.org/10.1071/PY19007	Examine the association between DHL and self-management in type II DM.	Level I	Findings support association between DHL and significant improvement in self-management, diabetes knowledge, self-efficacy and QOL. Association between DHL and glycemic control, SMBG, foot care, diet and medication adherence inconclusive.	Two researchers; no third party to resolve disagreement; Suggest structured, customized and community-based DHL interventions more likely to empower patients and facilitate self-management behaviors.
Heitkemper, E. M., Mamykina, L., Travers, J., & Smaldone, A. (2017). Do health information technology self-management interventions	Examine impact of health information	Level I	HIT diabetes self-management education was	3,257 patients included in 13 RCTs with meta-analysis

<p>improve glycemic control in medically underserved adults with diabetes? A systematic review and meta-analysis. <i>Journal of the American Medical Informatics Association</i>, 24, 1024–1035. doi:10.1093/jamia/ocx025</p>	<p>technology (HIT) diabetes self-management education interventions on the medically underserved.</p>		<p>found to have similar results as face-to-face interaction diabetes education for medically underserved, especially at 6 months. Incorporated human interaction with HIT. Use of A1c measurement.</p>	<p>of 10; possible bias related to some of the studies utilizing questionnaires to obtain results; need HIT to include face-to-face human interaction to have similar A1c results as in person DSMES.</p>
<p>Ricci-Cabello, I., Ruiz-Perez, I., Rojas-García, A., Pastor, G., & Gonçalves, D. C. (2013). Improving diabetes care in rural areas: A systematic review and meta-analysis of quality improvement interventions in OECD countries. <i>PLoS ONE</i> 8, e84464. doi:10.1371/journal.pone.0084464</p>	<p>Assess the effectiveness of QI strategies designed to improve rural diabetes care and identify characteristic that associated with success.</p>	<p>Level I</p>	<p>QI that addressed the HC system and providers found that interventions which involved multiple strategies had greater impact than interventions focused on patient education.</p>	<p>Emphasizes impact of HC systems and providers on diabetes literacy and outcomes; utilized non-controlled trials with controlled and only examined glycemic control; addressing DHL in the rural community requires assessing the HC system that may be creating barriers for DHL.</p>
<p>Abbott, L. S., Slate, E. H., & Graven, L. J. (2019). Cardiovascular disease risk among rural residents</p>	<p>Determine effect of a culturally-</p>	<p>Level II</p>	<p>DHL and self-management behaviors</p>	<p>RCT; education regarding A1c</p>

<p>living with diabetes and prediabetes: A cluster randomized trial. <i>Public Health Nursing</i>, 37, 16–24. doi: 10.1111/phn.12659</p>	<p>relevant diabetes health promotion program on diabetes knowledge and self-management behaviors.</p>		<p>increased as a result of incorporating public health nurse leading DHL sessions in 12 rural Black churches.</p>	<p>levels, but never measured as part of study; results suggest importance of culturally-relevant approach to diabetes and role of community support which was the fellow church members in this study.</p>
<p>Safford, M. M., Andreae, S., Cherrington, A. L., Martin, M. Y., Halanych, J., Lewis, M.,...Richman, J. S. (2015). Peer coaches to improve diabetes outcomes in rural Alabama: A cluster randomized trial. <i>Annals of Family Medicine</i>, 13, S18-S26. doi: 10.1370/afm.1798.</p>	<p>Examined the effect of a peer-coaching and patient education program vs just patient education.</p>	<p>Level II</p>	<p>Statistically significant changes in BP, BMI, QOL, diabetes distress and patient activation.</p>	<p>Not truly randomized creating threat to internal validity; results indicated an emphasis on the role of emotional support with DHL</p>
<p>Ali, F., Schifano, P., Robinson, G., Phillips, L., Doherty, P., Melnick, L., Laming, A.,...Dhillon, S. (2012). Impact of community pharmacy diabetes monitoring and education programme on diabetes management: A randomized controlled study. <i>Diabetic Medicine</i>, 29, e326–e333. doi: 10.1111/j.1464-5491.2012.03725.x</p>	<p>Evaluate the impact of a pharmacist-led patient education and DM monitoring program on A1c and other CV risk factors in the community setting.</p>	<p>Level II</p>	<p>Significant reduction in BP, BG, A1c levels at the 12 month point. Pt acceptance and satisfaction high and fewer hypoglycemic episodes compared to control group.</p>	<p>Lack of diversity in intervention group making generalizations difficult; impacted A1c levels and clinical outcomes; provides a strong evidence-based role for intercollaboration with</p>

				community pharmacist.
Ross, S., Sandra Benavides-Vaello, S., Schumann, L., & Haberman, M. (2015). Issues that impact type-2 diabetes self-management in rural communities. <i>Journal of the American Association of Nurse Practitioners</i> 27, 653–660. doi: 10.1002/2327-6924.12225	To evaluate and synthesize evidence related to issues that impact SM in the rural community.	Level V	Identified barriers to SM in the rural community as well as facilitators of DHL and SM that involve support systems, culturally-sensitive interventions and provider impact.	Weak on the PRISMA checklist, but provides informative data; identifies barriers to DHL and SM in the rural community that need to be and can be addressed by innovative solutions provided.
Kim, S. H., & Lee, A. (2016). Health-literacy-sensitive diabetes self-management interventions: A systematic review and meta-analysis. <i>Worldviews on Evidence-Based Nursing</i> , 13, 324–333.	To review health-literacy-sensitive diabetes management interventions and identify effective strategies for low literacy.	Level V	Written communication, spoken communication, empowerment, and language/cultural consideration were effective methods to increase health literacy, as evidenced by lowered A1c levels.	Measured A1c levels and clinical outcomes; bias present in some of the studies and external validity lacking; provides effective communication methods to impact DHL and clinical outcomes of A1c levels.
Xu, X., Leung, A., & Chau, P. (2018). Health literacy, self-efficacy, and associated factors among patients with diabetes. <i>Health Literacy Research and Practice</i> , 2, e67–e77. doi:10.3928/24748307-20180313-01	Investigate the relationship between HL and self-efficacy in diabetes	Level V	Communicative and critical HL had positive relationship with self-efficacy. Provider and social report	Methodology meets most of PRISMA checklist; only used cross-sectional studies making causal

			positively impact DHL and patient's self-efficacy to manage their disease.	inferences difficult; emphasizes the provider-patient relationship and support system.
Ong, S. E., Koh, J. J., Toh, S., Chia, K. S., Balabanova, D., McKee, M., Perel, P., Legido-Quigley, H. (2018). Assessing the influence of health systems on Type 2 Diabetes Mellitus awareness, treatment, adherence, and control: A systematic review. <i>Plos One</i> , 13, e0195086. https://doi.org/10.1371/journal.pone.0195086	Examine literature regarding healthcare system factors influencing Type II DM awareness, treatment, adherence and control; make recommendations for future research and policy.	Level V	Barriers identified: financial constraints, lack of access to health services/providers. Facilitators: innovative care models, involving pharmacists, peer support, +provider/patient relationship.	Examines healthcare system; support system importance; use of pharmacist; unable to exclude bias, unable to perform meta-analysis due to studies; need to examine HC system and consider intercollaboration with resources available.
Rajah, R., Hassali, M., Jou, L., Murugiah, M. (2018). The perspective of healthcare providers and patients on health literacy: a systematic review of the quantitative and qualitative studies. <i>Perspectives in Public Health</i> , 138, 122-132. doi: 10.1177/1757913917733775	Examine and synthesize studies on HL-related knowledge, attitude, practice, and perceived barriers. Focused on functional HL (reading, comprehension).	Level V	Identified patient-related barriers: education, age, family support, medical jargon. Provider perceived barriers: health care system (time constraints, lack of education	Addresses, patient, provider and healthcare system barriers to health literacy; focused mainly on functional HL and mainly interview studies; DHL may be more complex than

			material), depend on gut feeling to assess HL.	patient barriers; need to examine health care system; emphasizes role of support as well.
Jones, L., Crabb, S., Turnbull, D., & Oxlad, M. (2014). Barriers and facilitators to effective type 2 diabetes management in a rural context: A qualitative study with diabetic patients and health professionals. <i>Journal of Health Psychology, 19</i> , 441–453. doi: 10.1177/1359105312473786	Identify factors that prevent and facilitate type II DM management in the rural setting.	Level VI	Barriers to DHL and DM management in rural setting are time and access. Facilitators are support from spouses, family and regular contact with health professionals.	Done in one center only; importance of support systems and provider-patient relationship to impact DHL and DM management.
Black, S., Maitland, C., Hilbers, J., & Orinuela, K. (2016). Diabetes literacy and informal social support: a qualitative study of patients at a diabetes center. <i>Journal of Clinical Nursing, 26</i> , 248–257. doi: 10.1111/jocn.13383	Explore resources that culturally diverse patients with type II DM draw upon to manage their disease.	Level VI	Social supports a large factor in successful diabetes management; clinicians not actively promoting these potential roles	Small study; clinicians need to assess for and promote social supports.
White R. O., Chakkalakal, R. J., Presley, C. A., Bian, A., Schildcrout, J. S., Wallston, K. A., Barto, S.,... Rothman, R. (2016). Perceptions of provider communication among vulnerable patients with diabetes: Influences of medical mistrust and health literacy. <i>Journal of Health Communication, 21</i> , 127–134. doi: 10.1080/10810730.2016.1207116	Examined association of medical mistrust with perceptions of provider communication quality for patients with diabetes.	Level VI	Low DHL=mistrust of provider. Mistrust related to provider's ability to speak slowly, use easy to understand language, gather	Convenience sampling; providers need to address mistrust to impact DHL; provider's communication skills paramount to fostering

			information from patient and explain results while verifying patient's understanding.	trust.
Yeh, J., Wei, C., Weng, S., Tsai, C., Shih, J., Shih, C., & Chiu, C. (2018). Disease-specific health literacy, disease knowledge, and adherence behavior among patients with type 2 diabetes in Taiwan. <i>BMC Public Health, 18</i> , 1062. https://doi.org/10.1186/s12889-018-5972-x	Examine relationship between health literacy, level of disease knowledge, and adherence behaviors among people with Type 2 DM.	Level VI	Role of family/social support to increase DHL and self-care.	Convenience sampling, sample was younger and better adherence than general population; findings supported by other literature; importance of support system and DHL.
Hawkins, M., Gill, S. D., Batterham, R., Elsworth, G. R., & Osborne, R. H. (2017). The Health Literacy Questionnaire (HLQ) at the patient-clinician interface: A qualitative study of what patients and clinicians mean by their HLQ scores. <i>BMC Health Services Research, 17</i> . Doi:10.1186/s12913-017-2254-8	Examine discordance between patient and provider view of patient HL.	Level VI	Pt and provider often have differing perspectives of patient's HL; patient believes intentions are managing their health, while providers expect intentions would lead to change of action.	Provider's perspective of patient's DHL may keep them from employing necessary social and clinical support for patient.
Storms, H., Aertgeerts, B., Vandenaabeele, F., & Claes, N. (2017). General practitioners' predictions of their own patients' health literacy: A cross-sectional study in Belgium. <i>BMJ Open, 9</i> , 1-	Examined patient's perception of HL and provider's estimation of	Level VI	Providers often base assessment of HL on patient's education	Convenience sampling and did not clearly identify confounding factors;

12. doi:10.1136/bmjopen-2019-029357	HL.		level or length of time as a patient under their care; generally overestimate patient HL.	provides insight regarding how providers can overestimate HL and miss opportunities.
Mohn, J., Graue, M., Assmus, J., Zoffmann, V., H. B. Thordarson, H. B., M. Peyro, M., & Rokne, R. (2015). Self-reported diabetes self-management competence and support from healthcare providers in achieving autonomy are negatively associated with diabetes distress in adults with Type 1 diabetes. <i>Diabetes Medicine</i> , 32, 1513–1519. doi: 10.1111/dme.12818	To investigate the association of self-perceived competence in diabetes management and autonomy support from healthcare provider when diabetes (type I) poorly controlled.	Level IV	A lower self-perceived competency to handle their diabetes was related to poor control of diabetes. Autonomy support by providers led to improved self-management and diabetes control	Cross-sectional study limits ability to draw conclusions about relationships; only one third of potentially eligible patients enrolled limiting generalization s; points out the importance of the provider-patient relationship
McLendon, S. F., Wood, F. G., & Stanley, N. (2019). Enhancing diabetes care through care coordination, telemedicine, and education: Evaluation of a rural pilot program. <i>Public Health Nursing</i> , 36, 310–320. doi: 10.1111/phn.12601	The purpose of this study was to evaluate the effectiveness of a rural pilot diabetes program for patients with poorly controlled DM.	Level VI	The findings of the study were that utilization of the Chronic Care Model in the rural setting with the combined use of telemedicine and patient preventative health education were successful. This was	Multi-faceted program, measured A1c levels; difficult to determine which intervention was the cause of the outcomes of the study and small sample size; need to consider Internet-limitations and health

			evidenced by lowered A1c levels, total cholesterol and BP as well as reduced hospital utilization, reduced personnel and organizational costs, as well as high patient satisfaction.	personnel burden with implementation of HIT in the rural provider office.
American Association of Diabetes Educators. (2019). AADE Practice paper: Cultural and health literacy considerations with diabetes. Retrieved from https://www.diabeteseducator.org/docs/default-source/practice/practice-documents/practice-papers/adces-cultural-and-health-literacy-considerations-with-diabetes-final-4-1-20.pdf?sfvrsn=4	Provide recommendations for individualizing the approach to manage needs of patients living with diabetes.	Level VII	Recommends formal and informal DHL assessment; use of simple language, teach-back method and consideration of patient's culture when devising a plan of care.	Opinion piece; relies on 51 studies and guidelines of care; need to utilize communication skills, teach-back method and incorporate cultural considerations to impact DHL.
International Union for Health Promotion and Education Global Working Group on Health Literacy. (2018). IUHPE position statement on health literacy: A practical vision for a health literate world. <i>Global Health Promotion, 25</i> , 79-88. doi: 10.1177/1757975918814421	Promoting global action to improve HL.	Level VII	Identifies action areas for improving health literacy, identifies growing evidence for measuring HL, and encourages use of HL to guide clinical practice.	Opinion piece but relies on 52 studies from varied health and educational journals. Identifies barriers to HL. Recommends communication techniques to improve HL.
Burke, S. D., Sherr, D., & Lipman,	Professional	Level	Importance of	Relies on 72

<p>R. D. (2014). Partnering with diabetes educators to improve patient outcomes. <i>Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy</i>, 7, 45–53. http://dx.doi.org/10.2147/DMSO.S40036</p>	<p>opinion literature: Value of diabetes educators improving self-management outcomes for diabetes</p>	<p>VII</p>	<p>DSME to improve SM and clinical outcomes. Recognizes rural challenges and recommends utilizing HIT to improve access to diabetes educators.</p>	<p>studies to provide a varied and sound body of evidence to support recommendations; incorporating principles from DSMES into provider-patient relationship such as patient-centered approach, patient sets goals.</p>
---	---	------------	--	---

DHL=Diabetes Health Literacy; DM= Diabetes; DSMES = Diabetes Self-Management Education Support; HC= Health Care; HL= Health Literacy; HIT= Health Information Technology