ASSESSMENT OF HEALTH LITERACY AND PREFERRED LEARNING STYLE OF PATIENTS IN A RURAL NORTH DAKOTA PRIMARY CARE CLINIC

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DOCTOR OF NURSING PRACTICE

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ABSTRACT

Individuals with low health literacy face many difficulties within the healthcare system, including seeking medical care in inappropriate places, foregoing appointments and preventative health screenings, and misunderstanding self-care instructions. This leads to more hospitalizations, increased healthcare expenses, and use of healthcare resources. Low health literacy is especially significant in rural populations, where there are additional barriers to healthcare such as geography, distance, weather, inadequate financial resources and lower socioeconomic status, and lack of primary care and specialty providers. Furthermore, providers often do not consider patients' preferred learning styles, which may be significant for those who have difficulty understanding instructions. Patient education may be more effective if teaching strategies are individualized to each patient.

The purpose of this project was to assess the health literacy and preferred learning style of patients at a primary care clinic in rural North Dakota and educate healthcare providers in the respective clinic on health literacy and teaching methods, which has the potential to enhance patient education and learning. The implementation of this practice improvement project included assessing patients' health literacy levels and preferred learning styles and an educational session for rural healthcare providers. Health literacy levels and preferred learning styles were tested using the Rapid Estimate of Adult Literacy in Medicine (REALM) and Visual, Auditory, Reading/Writing, and Kinesthetic (VARK) tools, respectively. The education session utilized a presentation to discuss health literacy in rural populations and the importance of assessing health literacy and learning style. A pre- and post-test and follow-up survey assessed providers' knowledge of the importance of testing health literacy and preferred learning style, available tools, and their intent to utilize these tools in practice.

The results of the project indicate there continues to be gaps in knowledge related to risk factors of low health literacy, tools available to measure health literacy and learning styles, and consistent utilization of health literacy and learning style information when educating patients. The project was successful in raising awareness of the problem of low health literacy in rural populations but reflects the need for healthcare facilities to provide education for their healthcare team on these topics.

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DEDICATION

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CHAPTER 1. INTRODUCTION

In recent years, the United States (U.S.) has experienced exponential growth in medical technology and research. The new innovations in the healthcare field have enhanced the quality of patient care and improved life expectancy. While patients are living longer, they are also experiencing more chronic illnesses than ever before. As the complexity of the modern healthcare world continues to grow, patients must be diligent and self-reliant in the management of their health. Therefore, the importance of patients taking an active role in caring for their health is imperative (Masoompour et al., 2017). Ultimately, patients must have the skills and abilities needed to comprehend the instructions of their provider, follow recommended treatment regimens, and make appropriate health decisions in order to achieve a high level of health.

An adequate health literacy level provides patients with the capacity to understand their healthcare needs and act on these needs to live a healthier life. Unfortunately, many patients in the U.S. do not possess the health literacy level, knowledge, or skills required to perform a number of the aforementioned tasks. Marquez and Ladd (2019) reference the 2003 National Assessment of Adult Literacy, which demonstrated that 14% of U.S. adults possess basic health literacy levels. A person with a basic health literacy level may be able to list one to two reasons an asymptomatic person should receive preventative healthcare after reading a simple, easy-to-understand pamphlet on the topic (Temple, 2017). Those with below basic health literacy levels may only be able to perform simple tasks, such as locating the date of an appointment on a medical slip, and often struggle to understand how to correctly take their medication, fill out healthcare documents, or follow self-care instructions from their provider (Seung, 2011; Temple, 2017). Low levels of health literacy are a problem due to the fact that most patient health education materials are written at a high reading level (Marquez & Ladd, 2019). Therefore, many

education pieces become abstruse for patients because they are unable to fully comprehend the information.

Low health literacy also creates further problems within the healthcare system. Patients who have lower health literacy often do not seek medical care in the appropriate places (Giuse et al., 2012; Hewitt et al., 2019). They may forego their scheduled appointments and preventative health screenings due to not understanding the importance of maintenance healthcare. Patients also may not have an appropriate understanding of what qualifies as a medical emergency, so instead of making an appointment with their primary care provider, they may go straight to the emergency department due to lack of medical knowledge and understanding of self-care. This leads to more hospitalizations, uses valuable healthcare resources, and creates increased healthcare expenses (Imoisili, 2017; Wong, 2014).

Background and Significance

The definition of health literacy according to the U.S. Department of Health and Human Services (2008) is "the ability to obtain, process, and understand basic health information and services to make appropriate health decisions" (p. 1). A person's wellbeing can be greatly impacted by their ability to obtain and apply pertinent knowledge regarding their health and the care they receive. Having access to this information and an understanding of health-related problems are important factors in dictating a person's health status (Masoompour et al., 2017).

Individuals from any background or educational level may demonstrate low health literacy skills, particularly when they are dealing with a diagnosis that is new, scary, or complex (Marquez & Ladd, 2019). Even patients who have high literacy levels may have a poor understanding of medical terminology and health knowledge. The use of medical jargon can create confusion and anxiety for patients because they cannot understand what their provider is

trying to communicate. Oftentimes, low health literacy and a limited understanding of medical terms are associated with embarrassment and discomfort for patients (Wong et al., 2014). Because of this discomfort, patients may forego asking important questions, which creates a gap in their knowledge. Additionally, both patients and providers may not be aware of the level of miscommunication. The provider may feel that the information was adequately explained, and the patient may think they understood the main idea of what was being said, even though a few portions of the teaching did not make sense to the patient (Marquez & Ladd, 2019; Seung, 2011). Patients with lower health literacy levels learn significantly less than patients with adequate health literacy levels (Chen et al., 2019).

Approximately 20% of the U.S. population lives in rural areas, and rural communities have been found to have lower levels of health literacy (Chen et al., 2019; Temple, 2017). Rural, as defined by the Health Resources and Services Administration (2021), is all territory, population, and housing not located within an urban area, city, or town. While urban environments often have more health information available to the public, more transportation options, and more accessible healthcare providers, many rural communities struggle with access to care and retention of quality healthcare providers. Additionally, there is an increasing need for both specialty and family practice services in rural settings; however, the availability of these services continues to decrease (Weinhold & Gurtner, 2014). According to Redford (2019), rural communities in the United States have less than half the providers per 10,000 patients compared to urban areas. Many medical schools are attempting to combat this shortage by working rural practice into their curriculum, creating rural track programs for their students, or by requiring students to experience rural practice. However, fewer than 10% of medical students end up participating in rural track programs, and less than half of those that participate in these programs

end up practicing in rural areas. Of the few healthcare providers that do practice rurally, even less stay in that practice for more than seven years (Redford, 2019). Nurse practitioners can help to address the shortage of healthcare providers in rural areas, which can help improve access to care. Ultimately, healthcare providers need education on health literacy to improve outcomes for patients in rural areas.

Another intervention that may improve patient comprehension of information is considering learning styles. Providing education in a patient's preferred method helps facilitate learning by allowing them to understand, evaluate, apply, and retain the information (Giuse et al., 2012; Seung, 2011). This intervention is important for all patients, but especially for patients with low health literacy, as they may be able to understand the teaching in one learning style better than another (Marquez & Ladd, 2019). A combination of different teaching methods and education materials targeted to literacy level is key for optimal learning (Giuse et al., 2012; Koonce et al., 2015; Marquez & Ladd, 2019). By allowing patients to state their preferred learning style, the provider gives them control of one facet of their care. When patients feel more involved in their care and are engaged in the teaching and learning, they begin to build a more trusting relationship with their provider (Chandra et al., 2018; Seung, 2011). Creating therapeutic relationships with patients is essential to success in patients understanding their medical condition, meeting their goals, and establishing healthy behaviors.

Problem Statement

Rural populations are often at a disadvantage compared to urban populations when it comes to healthcare. Rural residents tend to have a number of barriers to healthcare such as geography, distance, weather, inadequate financial resources, and lack of specialty care options (Chen et al., 2019; Cyr et al., 2019). Those in rural areas also commonly have a lower

socioeconomic status, and because of that, less access to healthcare and little use of health information, especially internet information. Rural regions also have a lack of primary care or specialty providers, which reduces the number of options patients have (Cyr et al., 2019; Hewitt et al., 2019). Many people rely on healthcare providers and internet sources as their main references for health-related information, so the lack of these resources creates significant difficulty and adds to the disparity rural patients already face. These patients tend to have lower health literacy due to the additional barriers they must overcome to receive healthcare and fewer opportunities to visit with a provider, ask questions, and obtain health information (Temple, 2017). Lower health literacy leads to poor self-management of disease, and therefore, rural patients have higher rates of early morbidity and mortality from cancer, heart disease, childhood obesity, and other diseases (Chen et al., 2019; Wong, 2014). Hewitt et al. (2019) add that there tend to be higher rates of unintentional injuries, chronic respiratory disease, and stroke in rural populations as well.

Despite the important connection between health literacy and patient health, providers often fail to recognize their patient's literacy level. According to Rajah et al. (2018), many healthcare providers report having little knowledge or understanding of health literacy and the prevalence of low health literacy. Additionally, most healthcare facilities do not have a formal education for providers on this topic, nor do they use a screening tool to measure health literacy. To determine a patient's health literacy level, Rajah et al. (2018) found that many primary care providers (PCPs) report using their gut feelings. This method is clearly not evidence-based and does not provide the PCP with the accurate, tangible results that a health literacy tool would produce.

In addition to lack of formal education and inaccurate assessments of health literacy based on judgement, preferred learning style is often not considered prior to patient education. Two common teaching formats of healthcare providers are written and verbal education, which can be very effective. However, not every patient prefers to hear or read their education, and many patients need a combination of strategies to learn best (Koonce et al., 2015; Seung, 2011). The most common learning styles include visual, aural, reading/writing, and kinesthetic. Healthcare providers may utilize a variety of strategies to supplement their teaching and increase patient understanding, such as videos or audio recordings, written materials, demonstration, or interactive processes. Additionally, patient education may be more effective if the teaching strategies utilized are more memorable for the patient (Seung, 2011).

Purpose of Practice Improvement Project

The purpose of this project is to assess the health literacy and preferred learning style of patients at a primary care clinic in rural North Dakota and educate healthcare providers in the respective clinic on health literacy and teaching methods, which has the potential to enhance patient education and learning. In order to provide the highest level of patient-centered care, rural providers need to address the issue of health literacy, determine each patient's preferred learning method, and utilize that information to improve patient education and literacy levels.

Objectives

Objectives of the proposed practice improvement project include the following:

1. To assess patients' health literacy levels at a rural clinic using the Rapid Estimate of Adult Literacy in Medicine (REALM) screening tool and document the results in each patient's chart.

2. To assess the preferred learning style of patients at a rural clinic using the Visual, Aural, Read/Write, Kinesthetic (VARK) tool and document the results in each patient's chart.
3. To educate providers on health literacy and different teaching styles (verbal, auditory, written, demonstration, etc.).
4. To increase provider intent to incorporate both the REALM and VARK tools into their practice and utilize the results to individualize their patient education.

CHAPTER 2. LITERATURE REVIEW

A literature review was conducted using the electronic databases of Google Scholar, Cochrane, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and PubMed. The key terms searched included "health literacy," "literacy level," "rural," "rural patients," "rural population," "learning style," "preferred learning style," "patient education," "patient teaching," "healthcare provider," and "healthcare provider education methods." The search was narrowed to articles published after 2012. This excludes some articles that were original research or that include original definitions of terms used within this project that were published at a later date. Articles that included adult patients, rural populations, data about health literacy or learning style were included. Articles that focus on health literacy of pediatric patients or urban populations were excluded from this literature review.

Health Literacy

There are three types of health literacy: functional literacy, communicative or interactive literacy, and critical literacy (Brabers et al., 2017; Golboni et al., 2018). Functional health literacy is the ability to read and write. This allows patients to read and understand medication labels and educational materials. Communicative or interactive literacy requires more advanced cognitive and literacy skills that are used in daily life to adapt to changing situations. Critical literacy is the most advanced set of cognitive skills that are used to critically analyze information, allowing the person to understand and take control of life events and situations. Higher levels of health literacy allow patients to communicate with their healthcare provider, understand their medical diagnosis, and take action to enhance their health.

Just as there are different types of health literacy, there are also four main proficiency levels with health literacy: below basic, basic, intermediate, and proficient (Temple, 2017). A

patient with below basic health literacy may be very limited in what they can understand and do. This patient may be able to do simple tasks and would likely not know many healthcare terms. At the basic health literacy level, a patient may be able to comprehend health information that has been clearly stated and describe the importance of different health tests or procedures. A patient with intermediate health literacy may be able to understand moderately difficult health information and have the skills and knowledge to perform self-care activities. At the proficient health literacy level, the patient may be able to understand complex health information and make informed decisions based on information they are given. Please see Figure 1 for additional information on health literacy proficiency levels.

Figure 1

Health Literacy Proficiency Levels

Level	Skill
Below Basic	Might be able to locate and circle the date of a medical appointment on a hospital appointment slip.
Basic	Might be able to state two reasons a person with no symptoms of a disease should be tested for the disease, based on information in a clearly written pamphlet.
Intermediate	Might be able to determine a healthy weight range for a person of a specified height, on the basis of a graph that relates height and weight to body mass index.
Proficient	Might find the information required to define a medical term by searching through a document.

Health literacy is essential to a patient's success in the healthcare world. Traditionally, it has been the responsibility of the patient to have the skills needed to understand the healthcare system and guide themselves. However, this standard has shifted in recent years. Now, healthcare providers and facilities are taking more accountability in this area and are working to make improvements that will help patients feel comfortable and confident. Still, there is a need

for providers and facilities to understand what health literacy is, how it affects patients' health, and what can be done to better the healthcare environment. Blakely (2016) estimates that nearly 90 million adults in the U.S. have low health literacy, which represents a large number of people who may be impacted by difficulties navigating the healthcare system and managing their medical conditions.

Risk Factors for Low Health Literacy

There are many factors that may contribute to low health literacy. Gender, race and ethnicity, language, age, education level, and socioeconomic status have all been identified as risk factors associated with low health literacy (Cyr et al., 2019; Kutner et al., 2016; Weinhold & Gurtner, 2014). Wong et al. (2014) conducted a study investigating the differences between health literacy levels in rural versus urban populations and found that male gender, a non-English primary language, no job or form of employment, and lack of a college education were all possible risk factors for low health literacy.

The well-known National Assessment of Adult Literacy (NAAL) from 2003, which looked at health literacy levels as well as background and demographic characteristics of the participants, produced results that highlighted some of the previously mentioned factors as well (Kutner et al., 2006). According to Kutner et al. (2006), the average health literacy score for women was higher than the average score for men. More men were categorized as having below basic health literacy levels than were women. Race and ethnicity also played a big part in health literacy. The results of the study showed that adults of White and Asian/Pacific Islander backgrounds had, on average, higher health literacy levels compared to Black, Hispanic, American Indian/Alaska Native, and Multiracial adults. Furthermore, Hispanic adults were found to have lower average health literacy scores than any other racial/ethnic group. Another finding

was that adults who spoke only the English language before starting school had higher health literacy than adults who spoke another language only prior to starting school. Adults whose main language was Spanish before attending school had the lowest health literacy, at the below basic level.

Additional results from the NAAL survey were that adults over the age of 65 had lower average health literacy levels than adults in the younger groups (Kutner et al., 2006). Compared to other age groups, adults in the 25 to 39 year-old range had higher average health literacy. According to the NAAL, the average health literacy level increased with each higher level of educational achievement, starting with adults who had graduated from high school or obtained a GED and continuing to college graduate degrees. Adults who had not attended or finished high school made up a higher portion in the below basic literacy level than any other educational group. Lastly, the results showed that adults who were living below the poverty level had lower health literacy scores than adults living at the poverty level or above.

According to Dracup et al. (2014), these risk factors are commonly found in rural areas. Rural populations tend to have lower levels of education, less economic resources, and a larger elderly population. They are also more likely to be uninsured or underinsured, resulting in inadequate access to healthcare (Cyr et al., 2019). Chen et al. (2019) also noted that rural residents have lower health literacy than urban residents and that differences in age, gender, education level, socioeconomic status, and culture likely contribute to this issue. These are all elements that healthcare providers can easily discuss during a thorough patient assessment. Though none of these factors may be singled out as a strong predictor of low health literacy, a combination of these factors may help clinicians recognize at-risk patients (Wong et al., 2014).

Complications and Impacts of Low Health Literacy

A multitude of studies have shown that low health literacy contributes to delayed diagnoses, inadequate disease management, increased cost, increased hospital and emergency department visits, and poorer health outcomes overall (Hersh et al., 2015; Masoompour et al., 2017). The complications of low health literacy are magnified with the fragmented and complex healthcare system of the United States. Patients must manage and coordinate their own care, as well as maneuver their way through the healthcare system. Patients now have more chronic diseases, see multiple providers for their care, and take many medications, all of which contributes to the need for patients to effectively manage of their care. When there is low health literacy, patients are less likely to perform preventative screenings, take their medications correctly, or follow up with their provider (Hersh et al., 2015; Wong et al., 2014). Low health literacy has also been connected to inadequate health knowledge and less self-care behaviors.

Poor Disease Management

Low health literacy often leads to poor management of disease because individuals are unaware of risk factors for disease, causes of disease, or how to get information about the disease (Mikhail et al., 2015; Seung, 2011). Low health literacy also correlates with decreased participation in preventative medicine due to limited knowledge and understanding of the reasons for the screening or procedure (Wong et al., 2014). In addition, those with inadequate health literacy may find it difficult to take their medications or follow a treatment regimen, which may lead to noncompliance (Mikhail et al., 2015). There may be many reasons for noncompliance including a misunderstanding of the instructions, the inability to calculate a medication dosage, or a poor understanding of the diagnosis and the importance of the medication.

Masoompour et al. (2017) explored the correlation between health literacy, self-efficacy, and self-care abilities in diabetic patients, such as checking blood glucose, diet, exercise, smoking and foot care. The results showed a positive relationship between health literacy and self-efficacy, suggesting a higher health literacy level may increase self-efficacy in diabetic patients. There was also a positive relationship between health literacy and self-care behaviors, which suggests diabetic patients' self-care behaviors could likely be enhanced by higher literacy levels. Patients with increased self-efficacy often had higher self-care behaviors scores, which may indicate that patients who believe in their ability to execute a task are more likely to perform the task in the first place (e.g., a self-care action). RobatSarpooshi et al. (2020) also found that increased education and understanding of diabetes and the complications associated with diabetes also increased patients' motivation to care for themselves. Ultimately, higher levels of health literacy have been associated with improved disease management, increased sense of self-efficacy, and enhanced self-care, as well as a stronger motivation to overcome barriers that may arise.

Increased Hospitalizations

Masoompour et al. (2017) discussed the importance of teaching patients the fundamentals of how to care for themselves and their disease, as well as how to use problem-solving to handle new problems that may arise. Lack of knowledge regarding self-care behaviors was found to be a common cause of re-hospitalization in patients with chronic diseases. Hospitalizations may be reduced by providing adequate education to patients and their families, thereby encouraging patients to be engaged and responsible for their health.

Rural areas are often medically underserved; therefore, patients are commonly unable to get the healthcare they need in a prompt or efficient manner. This usually results in inappropriate

use of the emergency department or going without receiving any care at all, which is not efficacious or safe (Hewitt et al., 2019). These patients also tend to bypass routine screenings and preventative care, putting them at higher risk for treatable conditions, chronic illness, increased hospitalizations, and higher morbidity due to delayed diagnosis (Hewitt et al., 2019; Masoompour et al., 2017).

Poor Health Outcomes

Low health literacy often leads to poorer overall health outcomes. Inadequate disease management and increased hospitalizations are both major contributors to this issue (Masoompour et al., 2017). Other contributors include low self-care skills, delayed care, and increased re-hospitalizations for chronic diseases. These issues ultimately lead to increased morbidity and mortality. Wong et al. (2014) states that low literacy correlates with poorer health outcomes such as increased asthma morbidity, worse diabetic control, unstable anticoagulation, and increased mortality. Similarly, Moser et al. (2015) found that low health literacy in patients with heart failure was associated with limited knowledge of heart failure, inadequate compliance with medications, lack of self-care behaviors, higher use of the emergency department for exacerbations of heart failure, and a decreased sense of self-efficacy. Rural residents have been found to have poorer health outcomes for many health issues including human immunodeficiency virus (HIV), stroke, colorectal cancer, and coronary artery disease. This is due to low health literacy and lack of resources in these regions.

Lack of Follow-Up

Wong et al. (2014) found that patients were less likely to attend their scheduled appointments if they had low health literacy. Low health literacy can be a source of embarrassment for patients. Therefore, patients may avoid follow-up appointments to prevent

feelings of humiliation. Another reason patients with lower health literacy may not follow-up was found to be an overall lack of knowledge about healthcare and the reasons for the appointments and screenings that are done. Limited economic resources to spend on healthcare, the complexity of the treatment plan or medication regimen, confusion with the healthcare system, inadequate patient-provider communication, or physical obstacles such as transportation may also contribute to missed appointments (Brin, 2017).

Transportation and distance are often issues for rural patients who are trying to adhere to their treatment plan and follow-up with their providers. Having a vehicle increases the ability to access healthcare and attend appointments. However, in rural areas, even with a vehicle, the distance to healthcare facilities can be very limiting for some patients (Passwater & Itano, 2018). Rural patients commonly live 60 minutes or more from specialty providers, which creates a traveling time that is three times longer than urban patients. If a patient is unable to make it to their scheduled appointment, there are delays in care and missed opportunities for treatment or changes to their regimen, which may result in poorer health outcomes. Quality of life and health outcomes are significantly influenced by lower health literacy among patients residing in rural areas.

Increased Healthcare Costs

According to Wong et al. (2014), low health literacy may affect patients' use of healthcare resources and expenditures. When patients fail to follow their treatment plan, there are costly consequences. The American College of Preventive Medicine found nonadherence to treatment regimens was responsible for an estimated 125,000 deaths each year in the U.S. and around 10% of hospitalizations (Brin, 2017). A study by Johns Hopkins University researchers in 2014 found these outcomes also cost the U.S. healthcare system around $300 billion each year.

Additionally, Haun et al. (2015) also found patients with low health literacy had higher medical expenses and were less efficient in using healthcare services than patients with adequate health literacy. Healthcare costs associated with low health literacy are estimated to be approximately $73 billion annually in the U.S. Hospitals now also take on the costs of readmission penalties for Medicare patients who are readmitted due to adherence issues, and approximately half the U.S. hospitals will be impacted by these penalties and suffer expenses greater than $500 million (Brin, 2017). If the healthcare system were able to meet the needs of patients with marginal and inadequate health literacy, there may be a potential opportunity to generate economic savings (Haun et al., 2015).

Health Literacy Among Rural Populations

Rural America faces many inequities compared to the U.S. as a whole, with low health literacy being one of these inequities. One of the main contributors to low health literacy in these areas is lower education levels (Rural Health Information Hub [RHIH], 2020). Lack of education leads to limited understanding of health terms, inability to read, understand, and follow instructions provided by a healthcare provider, and inadequate management of medical illnesses, leading to poorer health status. According to the Rural Health Information Hub (2020), many studies have shown that more years of education leads to increased use of preventative healthcare services, better health outcomes and healthier behaviors overall, and increased life expectancy.

An additional factor contributing to low health literacy in rural areas is the elderly population that lives in these areas (Healthy People 2020, 2020). According to Smith and Trevelyan (2019), more than one in five older adults live in rural areas. The results from one report showed that in the rural populations, 17.5% were age 65 years or older, compared to only 13.8% of the population in urban areas (Smith & Trevelyan, 2019). The low health literacy in

this age group may be due to poor mental status and physical functioning, as well as limitations in activities of daily living and pain (Healthy People 2020, 2020).

Race and ethnicity are one of the greatest inequities related to health literacy due to the difference in cultural backgrounds and English being a second language (Healthy People 2020, 2020). According to the United States Department of Agriculture Economic Research Service (USDAERS) (2018), there is less diversity with race and ethnicity in rural America than in urban areas; however, this has been slowly evolving as race and ethnic diversity has grown in the U.S. Racial and ethnic minorities have expanded across the U.S. and now account for 19% of non-urban residents (USDAERS, n.d.). Low health literacy in these populations may result from the communication barriers and differences in culture and beliefs related to health (RHIH, 2020).

Social Determinants of Health

In addition to low health literacy, various social determinants of health may also affect rural populations. Social determinants of health are "the conditions in the places where people live, learn, work, and play that affect a wide range of health and quality-of life-risks and outcomes" (Centers for Disease Control and Prevention, 2021, p.1). In rural areas, these may be things such as poverty, unemployment, adequate housing, and limited access to healthy food (RHIH, 2020). Poverty has been an ongoing issue in rural areas for many years. According to a 2014 publication by the Rural Policy Research Institute, 64% of small, rural counties have been continuously in poverty over the past 50 years (RHIH, 2020). Income is lower in most rural communities as well, with the average household income being $52,100 in 2019 compared to $68,703 for the U.S. overall. There is also a lack of available jobs, especially those that offer sufficient hours, pay more than minimum wage, and include benefits such as health insurance.

Therefore, many rural patients may have difficulty paying for their basic needs, much less have the ability to afford healthcare services on top of their everyday expenses.

Poor quality housing is another major concern for many rural populations (RHIH, 2020). Some factors that may affect health include inadequate plumbing and waste systems that can impact the water quality, heating and cooling systems that affect air quality and safety, lack of smoke and carbon monoxide detectors, and concern for lead-based paint, mold, or bugs and rodents in older houses. These issues create challenges to meeting the basic health needs of this population. Not only is shelter a concern, but food insecurity continues to be an issue for rural residents. There are usually fewer places to purchase food, as well as fewer choices of fresh and affordable foods (RHIH, 2020). For some, limited income and transportation options create difficulty in obtaining healthy foods to meet nutritional needs, as well as stay healthy. Each of these social determinants of health, as well as lack of resources, contribute to low health literacy and create barriers to healthy living.

Social Media

The use of social media has exploded in recent years, especially in regard to health and healthcare topics. Social media is Internet-based tools, like websites and applications, that are used to create and share content and participate in social networking (Ndumbe-Eyoha & Mazzuccob, 2016). More than 60% of smartphone owners have used their phone to look up health information, making health information one of the primary search topics on the Internet (Roberts et al., 2017). This also makes social media an ideal platform for health promotion, communication, and health literacy interventions, especially in rural populations where there are barriers to healthcare access. According to Roberts et al. (2017), 40% of rural adults use at least one social media site, and 12% of African Americans and 13% of Latinos rely on their

smartphone for online access. Health organizations should take advantage of this and utilize social media to distribute information to all individuals. The use of social media may help to educate and empower those with health issues, enhance the use of health research, and create opportunities for networking and communication with various health resources (Ndumbe-Eyoha & Mazzuccob, 2016).

Barriers to Healthcare in Rural Populations

Rural citizens are often at a major disadvantage, both socially and economically, when compared to their urban counterparts in regard to healthcare opportunities. Both social and economic stability is needed in order to have quality healthcare due to the advancing technology of today's healthcare system (Weinhold & Gurtner, 2014). Individuals who have lower incomes and less education, as well as those who are a minority race or ethnicity, commonly do not have sufficient access to a variety of healthcare sources. These socioeconomic factors are apparent in many rural areas, indicating that rural citizens face inequality in the availability health resources, which may contribute to the health disparities in these areas (Chen et al., 2019).

According to Weinhold and Gurtner (2014), there are five major categories that contribute to the lack of adequate healthcare in rural communities, and these include shortages and maldistribution of healthcare providers, quality of care deficiencies, inadequate healthcare access, and ineffective use of health care services. Each factor creates challenges for rural patients in seeking care, and when more than one issue is combined, there becomes an immense barrier to receiving adequate healthcare.

Healthcare Provider Shortage

Research has shown that 20% of the United States' population lives in rural areas, and only 10% of physicians practice in rural areas (Hewitt et al., 2019). In addition, nurse

practitioners represent about 25% of rural practice providers (American Association of Nurse Practitioners, 2019). Some contributors to the provider shortage may include provider retirement, lack of time or ability to accept new patients, problems with enlisting and retaining new providers, and few medical students planning to go into family practice upon graduation. The lack of specialty providers in rural areas also forces primary care providers to function as a specialist, even when they do not possess the training or resources needed to manage these health needs (Cyr et al., 2019). Weinhold and Gurtner (2014) noted factors contributing to healthcare provider shortages in rural areas as follows: physical/infrastructural, professional, educational, sociocultural, economical, and political issues.

Long distance to travel, inadequate transportation options, poor framework for communication, and lack of social and cultural facilities or opportunities have been identified as physical/infrastructural factors contributing to shortages (Weinhold & Gurtner, 2014). Examples of professional issues were increased workload and more after-hour duties, more on-call responsibility, lack of support from other providers or healthcare facilities, lack of resources and equipment, fear of unfamiliarity with a medical diagnosis, and the wide range of medical services that have to be provided. Educational problems identified include lack of rural education or orientation programs, few rural providers available as resources, and less continuing education or professional development opportunities. Reluctance from a provider's family, concerns about loneliness or social isolation, and cultural barriers or lack of cultural awareness were listed as sociocultural factors. Economic contributors were recognized as inadequate financial compensation and income and the fact that many rural patients are uninsured or under-insured. Inefficient regulatory interventions, lack of political support, and unawareness by providers of the available opportunities to receive support were categorized as political contributors to

healthcare provider shortages in rural areas. The combination of these complex issues may result in increased hesitancy among healthcare providers to work in rural areas.

Poor Quality of Care

A major contributor to lack of high-quality care in rural healthcare is the lack of continuous, unbroken, and thorough care. In the eye of the patient, a therapeutic relationship with a provider needs trust and continuity in order to obtain the best quality of care and be successful (Weinhold & Gurtner, 2014). However, this is often difficult to achieve in rural settings. Healthcare becomes more fragmented when the health status of patients becomes more complex, requiring specialty services that a primary care provider may not be able to perform. In rural settings, there may be gaps in care with the possible unavailability of certain allied health services (e.g., physical/occupational therapists, dietitians, and counselors), leading to the delay of many basic services. Without proper care management and guidance from someone who understands the healthcare system, patients may have great difficulty in transitioning their care through the various medical settings. As a result, patients become confused, appointments are forgotten or missed, and care is hindered. These occurrences only decrease the quality of care patients receive, not to mention add to the limitations rural patients already face in distance to medical services, time for transportation, and a relative lack of resources.

Healthcare Access Limitations

There are many factors that limit access to healthcare and health information in rural settings. Geographic distance and time needed for travel, lack of transportation options, and inconvenient hours or days of service are all contributors (Weinhold & Gurtner, 2014). Rural patients have to travel two to three times further than urban patients to receive specialty care (Chen et al., 2019). Additional challenges to receiving care, such as long wait times or problems

getting an appointment, further contribute to patients opting to delay or avoid seeking care. Chen et al. (2019) also found that rural patients with lower health literacy often get their health information from companies or corporations that are not healthcare entities. Non-healthcare companies often advertise inappropriate or misleading messages, which can be difficult to discern, even for people with adequate literacy levels. These limitations in access lead to inappropriate and inefficient use of the healthcare system.

Inefficient Utilization

Oftentimes, rural citizens inappropriately utilize the healthcare system because they have to determine the urgency and seriousness of their situation (Weinhold & Gurtner, 2014). Patients may make a compromise in taking care of their health because of the many limitations and challenges mentioned previously. Some services, especially mental health services or preventative health services, tend to be underutilized due to lack of knowledge about the need for that service, lack of interest, or more devotion to other health issues. Patients may not express their needs, and therefore, do not get set up with the services they require, leading to underuse of available services. Confusion with the healthcare system, embarrassment from admitting they need help, or lack of trust in the provider may also contribute to underuse of available services (Chandra et al., 2018; Wong, 2014). Additionally, patients sometimes reject services that have been offered because they do not align with their lifestyle or expectations for their care.

Poor utilization of services in rural areas can also occur because patients may choose to bypass the rural medical center to go to an urban facility. Reasons for this may include lack of confidence in the competency of rural providers or facilities, knowing that the facility may not be able to provide all the care the patient will need, or preferring not to seek care from an acquaintance or family friend who may be the main provider in their area (Weinhold & Gurtner,

2014). The emergency department is frequently used by patients due to lack of walk-in clinics that are available after-hours, or instead of scheduling an appointment with their primary care provider, again, leading to inefficient use of healthcare services. Patients with poor health tend to delay seeking care when they know there will be outcomes they are not prepared for, such as increased expenses, more clinic visits, or unexpected traveling.

The reasons for low health literacy in rural populations are multifaceted and complex. Each of the aforementioned barriers contribute to the lack of adequate health services, which may also be impacted by lower average health literacy levels in rural populations. Because rural patients must overcome barriers of transportation and access and have fewer healthcare providers available to them, they miss out on opportunities for face-to-face health education (Chen et al., 2019). This is the education that will provide them with an understanding of their disease process, their medications, and their at-home instructions. Without time to ask questions, receive feedback, or view demonstrations of health tasks, opportunities to improve patient knowledge may be missed. Inadequate patient education may result in under- or over-utilization of the healthcare services, increasing healthcare costs (Weinhold & Gurtner, 2014). In order to effectively provide patient education, healthcare providers must first assess heath literacy in their patients, which may improve outcomes through enhanced patient understanding, self-management, adherence with treatment regimens, timely preventative screenings, and accurate follow-up.

Tools to Assess Health Literacy

Evaluating health literacy is an important piece of the puzzle when attempting to determine a patient's level of comprehension and confidence. According to Blakely (2016), "one size never fits all," which is in reference to the significance of accurately measuring the health

literacy level of each individual patient. Many healthcare facilities value their time and productivity, so utilizing a health literacy or preferred learning style tool may be seen as unproductive. However, there are multiple reliable tools that can be completed in a timely manner (Seung, 2011).

Two of the most common tools to measure health literacy are the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Test of Functional Health Literacy in Adults (TOFHLA). These tools measure reading comprehension and word recognition. The REALM and TOFHLA can aid in deciding if there is a need for patient education and exactly what type of education may be most effective (Seung, 2011).

Rapid Estimate of Adult Literacy in Medicine (REALM)

The REALM tool was developed in the early 1990's to determine the health literacy level of patients (Dumenci et al., 2013). This tool has since then become one of the most widely used instruments. The REALM determines the patient's ability to read health education material by checking word recognition and pronunciation. The test requires the patient to read 66 common medical terms, including customary terms for body parts and illnesses, aloud to the administrator. These words were chosen from patient education materials and forms (Murphy et al., 1993). The number of words that are pronounced correctly corresponds to the patient's equivalent reading level (Seung, 2011). The reading levels highlighted by the REALM are 3rd grade and below, 4th to 6th grade, 7th to 8th grade, and 9th grade or above. The authors of the instrument state that patients below the 9th grade reading level will likely have trouble reading most patient education materials (Dumenci et al., 2013). Using this tool allows healthcare providers to get an idea of their patient's grade reading level, and therefore, their possible health literacy level (Murphy et al., 1993). This information can then be used to adjust the

communication strategies, language, and educational materials to a more appropriate level for each patient.

There are clear advantages to using the REALM. Healthcare providers can perform this assessment in five minutes or less, which is a positive for circumstances when there are time constraints (Seung, 2011). The tool is easy to understand and administer, as well as provides clear instructions as to how to calculate the number of correct words and determine the patient's health literacy level. The test can easily be performed in a variety of settings and is a practical tool for busy healthcare clinics (Murphy et al., 1993). According to Dumenci et al. (2013), the REALM provides statistically reliable data. The reliability and validity are also confirmed by Chung and Nahm (2015), who state that "reliability has been demonstrated by internal consistency (Cronbach's $\alpha = .96$) and stability (test-retest $r = .99$)" (p. 1). Validity was also shown by comparing the REALM results with three established standardized reading recognition tests.

A disadvantage of this instrument is that it does not assess numeracy or comprehension (Dumenci et al., 2013). The REALM only looks at the patient's ability to correctly pronounce medical terms. The administrator can hypothesize that lack of ability to correctly pronounce the medical terms may also correlate with a lower health literacy level. Therefore, the tool should be used as a predictor of health literacy, not a confirmation of health literacy. Please refer to Appendix B for the REALM tool.

Test of Functional Health Literacy in Adults (TOFHLA)

The TOFHLA is a test of reading and numeral comprehension that takes around 22 minutes to administer. There are 50 reading comprehension questions and 17 numeracy questions. There is also a shortened version of this test available, the S-TOFHLA, with 36

questions that takes around 12 minutes or less (Parker et al., 1995; Seung, 2011). Both versions test the patient's ability to understand and use medical information, such as following instructions to prepare for a test or treatment, reading prescription labels, determining their appointment schedule, or checking blood pressure or blood glucose levels. To check reading comprehension, the test asks patients to complete sentences that have had words purposely left out and has the patient pick from four possible choices to fill in the blank. To assess numeracy, the test gives the patient a set of instructions to read and asks the patient to determine the next step. For example, to combine both components, the patient will figure out when their next appointment is, what time their next medication is due, or whether the blood pressure or blood glucose level was within normal range (Seung, 2011). The scores of the reading and quantitative comprehension are combined to create a total score for each patient.

The obvious disadvantage of the TOFHLA is the time needed to administer the test. The strengths of this test are that it is available in both English and Spanish and that it has been widely used in the healthcare setting (Seung, 2011). According to Parker et al. (1995), the TOFHLA showed good correlation with the REALM, with a correlation coefficient of 0.84. The test has proven to be a reliable and valid measure of patients' ability to read and understand healthcare materials.

Preferred Learning Style

While health literacy is an especially important factor to consider regarding patient comprehension, literacy level is not the only component of this equation. Preferred learning style is another key piece of the puzzle. Measurement of preferred learning style has been used extensively in general education and research settings, however, mainly for students. Peyman et al. (2014) assessed the learning styles of first-year medical students by utilizing the VARK tool

and found that using a tool to determine students' learning style preferences is imperative to the learning process and helped to increase the quality of the education. When the students were aware of the distinctions between learning styles and what their own learning style was, they were able to choose the appropriate studying techniques. The authors recommended that the preferred learning styles of medical students should be determined before they start taking their classes to ensure they achieve their educational goals.

Tools to determine patient learning styles have not received much recognition in the clinic setting (Giuse et al., 2012). Many researchers discuss the need to assess patient learning styles to improve education, yet not many have invested time and effort into doing the necessary interventions. Ultimately, in order for patients to be fully engaged in their care, patients need to be able to comprehend and retain health information that is provided to them, which demonstrates the importance of utilizing preferred learning styles to improve outcomes.

Assessment of Preferred Learning Style

Assessment of preferred learning style can be done through a variety of measures. There are many tools available, such as the VARK questionnaire, Kolb's Learning Style Inventory, and Jackson's Learning Styles Profiler (Auguste et al., 2020; DeCoux, 1990; Hou & Sobieraj, 2010). These tools have all been used in multiple studies and have been found to be an effective tool for determining learning style preference. There are many additional tools available on the Internet; however, many of these tools may not have been as thoroughly studied as the previously mentioned tools.

VARK Questionnaire

The VARK questionnaire was developed by Neil Fleming in 1987 and has been validated for assessing preferred learning style (Auguste et al., 2020). Each letter in the title describes a

style of learning: (V) visual, (A) aural, (R) reading/writing, and (K) kinesthetic. A person may prefer one style of learning, termed unimodal, or may prefer a combination of these learning styles, deemed bimodal or multimodal. The VARK is based on three principles: everyone can learn and everyone has their own style of learning, a learner's motivation increases when their style of learning is accounted for, and educational concepts are learned through the use of senses and perception (Peyman et al., 2014). This philosophy stems from the idea that anyone can learn if their education is individualized, which may also improve the learning experience (Auguste et al., 2020).

The VARK consists of 16 questions in a select-all-that-apply format. Each choice corresponds to a learning style format, and the test taker is able to choose one or more answers, depending on what their preference is (Peyman et al., 2014). The validity of the VARK has been approved by experts, with a Cronbach's alpha coefficient calculated at $\alpha = 0.86$ (Peyman et al., 2014). A study by Fitkov-Norris and Yeghiazarian (2015) also confirms the validity of this questionnaire, stating that the VARK could be used predict a person's learning style preference. The study also supports the reliability and suitability of the instrument for assessment of learning style. This tool is easy to use, shorter than many other questionnaires, helps direct patients to their preferred learning modality, and provides information on what patients can do to improve their studying and learning techniques based on their learning style (Fleming, 2012). A disadvantage of the tool, however, is that it is not diagnostic. The test can only indicate what the learning style preference likely is based on the answers provided.

Additional Tools to Determine Learning Style Preference

Kolb's Learning Style Inventory (LSI) is a well-known tool that has been used to determine learning style. Kolb proposed learning as a four-step cycle that involves four different

kinds of abilities: concrete experience, reflective observation, abstract conceptualization, and active experimentation (DeCoux, 1990). From these four steps, Kolb developed the four learning styles, which are the converger, the accommodator, the assimilator, and the diverger. The original LSI was nine questions; however, the original was later revised to strengthen the scientific measurement requirements and practicality of the instrument. The new LSI has 12 questions, and each question starts with "When I learn," which allows the subject to complete the sentence by choosing one of four responses. Each response corresponds with one of the four learning modes, and the combined final scores help determine the subject's learning style. Information on the characteristics of the learning styles, as well as strengths and weaknesses are provided to the learner. The LSI has been frequently used to gather learning style data on nursing students; however, the reliability and validity of this instrument have been questioned by multiple studies (DeCoux, 1990; Hou & Sobieraj, 2010).

Jackson's Learning Styles Profiler (LSP), developed in 2002, is another newer method to determine learning style. The LSP considers both personality and behaviors (Hou & Sobieraj, 2010). Jackson studied the personality and behaviors of learners in order to come up with the four learning styles: the initiator, the reasoner, the analyst, and the implementer. Jackson's learning styles are conceptualized as fixed personality traits of individuals and are not dependent on a specific learning process. The LSP consists of 80 questions, with 20 questions for each learning style. The strength of this tool is that it is available in a computerized format that provides feedback to the learner. The learner can read about the strengths and weaknesses of their learning profile, as well as receive recommendations on areas to improve their learning capabilities. The weaknesses of the tool are the number of questions and the uncertainty of the reliability and validity.

Benefits of Utilizing Preferred Learning Style in Practice

When healthcare professionals work to individualize educational materials based on unique patient needs, this can improve learning and knowledge of preferred learning styles, which can be used during future patient education (Auguste et al., 2020). Providers may recognize and remember that visual learners prefer diagrams, charts, and graphs, whereas auditory learners perform better with spoken information and tend to rely on discussions and talking aloud. Reading-writing learners do best with looking over manuals, reports, and handouts, while kinesthetic learners prefer demonstrations and simulation experiences. Education that is personalized to each patient often reflects better outcomes than does using the same approach with every patient (Auguste et al., 2020; Giuse et al., 2012).

Auguste et al. (2020) explored how learning styles and patient outcomes are related through use of the VARK questionnaire with home dialysis patients. Most patients were found to be multimodal, with a combination of at least three of the learning styles. No patients were found to be strictly aural learners, and visual learning style was the most common, with more than 60% of patients having visual as part of their combination. Patients received standardized training manuals, educational videos, and hands-on practice with the nurses. Adverse events were more likely to occur if the instruction method did not match with the patients' preferred learning styles, which demonstrates the importance of tailoring patient education to enhance patient confidence and self-management skills, as well as limit the risk of adverse events.

Giuse et al. (2012) also assessed utilizing the combination of health literacy and preferred learning styles to strengthen patient learning among patients receiving education on hypertension in the emergency department. These patients were given a hypertension knowledge test, and the S-TOFHLA was used to assess health literacy. One cohort also took the VARK test to determine

their preferred learning methods. All participants received standard discharge instructions that were within their health literacy level; however, those in the intervention group also received instructions that were customized to their learning preferences. For example, visual learners received handouts with illustrations, aural learners received an audio format of the information, reading/writing learners received materials that utilized lists or bullet points, kinesthetic learners received a card-sorting activity, and multimodal learners received information in all formats matching their preferences. Patients in the intervention group, who received education personalized to their literacy level and learnings style, showed a greater increase in knowledge compared to the patients who only received education personalized to their literacy level. The findings of this study demonstrate the importance of education that is tailored to each individual, and the positive outcomes that arise from assessment of preferred learning styles in practice.

Some studies have shown there is benefit in simply asking patients how they would prefer to learn, without utilizing a specific tool. Seung (2011) assessed the health literacy levels and preferred learning styles of the elderly population. To determine preferred learning style, the researcher asked each patient directly which style they learn best with, while the REALM was used for health literacy measurement. Increased patient comprehension and satisfaction was noted when information was presented in a format that was personalized to them.

A study by Koonce et al. (2015) tried a similar approach by examining the use of health literacy and learning style preferences to improve the delivery of health information among patients with type 2 diabetes in a community care clinic. Participants were asked to take the Michigan Research and Training Center's Diabetes Knowledge Test (DKT), as well as answer questions related to health literacy and preferred learning style. Members of the intervention group were given information presented at the fifth grade reading level and in each of their

specific learning styles. Participants who had adequate health literacy levels also had the option of receiving additional, more in-depth information on diabetes written at the eighth grade reading level. The results indicated that participants in the intervention group rated their level of satisfaction higher on the Likert scale and scored better on all questions at the two-week assessment in comparison to the control group. There was a statistically significant difference in the number of questions answered correctly by the intervention group at two and six weeks when compared to the control group, further validating the importance of using personalized education materials and methods to improve patients' knowledge of medical conditions and treatments.

The outcomes of these studies confirm the effectiveness of utilizing patients' learning preferences within health teaching. Patients have come to expect that they will be considered partners with the provider in their healthcare (Giuse et al., 2012). On the same note, providers want patients to take an active role in their care. To enhance communication and provide quality care, providers should have a knowledge of all modes of communication to allow for the best delivery of information to improve patients' understanding of their health. This approach could be applied to the multiple chronic and acute medical conditions that are addressed in clinics. Even small improvements in patient knowledge have the potential to make a large impact on overall health and quality of life, especially in patients with chronic conditions. These interventions would be particularly paramount in settings where patients tend to have lower health literacy levels, such as rural areas (Koonce et al., 2015).

Common Errors in Education

The health outcomes of patients are influenced by the way the provider conducts the clinic encounter and the caliber of teaching they provide. Patient education is one of the most important jobs providers have because the quality of the education dictates the amount of

knowledge and self-efficacy with which the patient leaves the clinic (Masoompour et al., 2017). Patients also need to comprehend the information presented to them in order to be a contributing partner in their care (Giuse et al., 2012). However, many times healthcare providers miss opportunities for increasing patient knowledge and improving comprehension because they overlook health literacy and learning styles as a part of routine care (Hersh et al., 2015).

Failure to Consider Health Literacy Level

Providers often fail to take health literacy level into consideration when performing their regular screenings and preventative care. Usually, providers overestimate patients' health literacy skills and assume that the provided instructions have been understood (Hersh et al., 2015). Often, yes or no questions are used instead of open-ended questions to determine how much the patient knows, which provides patients with opportunities to hide what they do or do not know (Blevins, 2018). Patients have also learned compensatory mechanisms, such as smiling and nodding, for uncomfortable situations or when they do not comprehend what the provider is saying (Blakely, 2016). In addition, many of the educational materials for patients are written at a higher reading level than the average patient can fully understand (Imoisili et al., 2017). According to Hersh et al. (2015) and Ayyaswami et al. (2019), patient education materials need to be written at the fifth- or sixth-grade reading level for the best comprehension, and most documents are at an eighth-grade reading level or higher.

Failure to Consider Learning Style Preference

In addition to health literacy, patient learning style is often not considered when education is provided; however, both play an important role in comprehension and understanding (Giuse et al., 2012). The learner, not the educator, is the most important person in the learning process (Kitchie, 2016). The educator can help facilitate learning by assisting the learner in

understanding what information needs to be known and by providing an individualized learning experience. The job of the teacher, in this case a healthcare provider, is to assess the needs of the patient, the readiness to learn, and the preferred style of learning. Failure to assess the learning style of each patient creates a barrier to planning and implementing patient education (Inott & Kennedy, 2011; Kitchie, 2016).

When patients are in the healthcare setting, they are likely in a psychological state of anxiety, depression, or fear, all of which affect their ability to process and learn information (Inott & Kennedy, 2011; Marquez & Ladd, 2019). This, combined with healthcare providers failing to consider a different format for teaching the patient, increases the likelihood that the patient will leave with less of an understanding of the health education. Most often, education is provided verbally in the clinic setting, with patients receiving a written material to take home with them. Providers do not usually offer different methods, like a video, demonstration, hands-on activity, or a combination of more than one of those, which is a problem because all patients do not learn in the same way (Kitchie, 2016).

Another important consideration is that learning preferences also change over time, so providers should never assume they know what the patient needs (Koonce et al., 2015). They should have a variety of methods, modes, and materials available for use, as the best learning opportunities arise from use of individual learning styles (Auguste et al., 2020; Inott & Kennedy, 2011). The entire healthcare team should have an awareness of the importance of patient learning style, be consistent in assessing learning preference, and be flexible and willing to change their teaching strategies as able.

Ineffective Teaching Methods

Another common error made by healthcare providers is utilization of ineffective teaching methods. Patients often do not understand the medical jargon that is used by the healthcare team, particularly when discussing the diagnosis or treatment plan (Hersh et al., 2015). These complex medical terms can be confusing for patients, especially when the provider talks quickly or does not repeat the information. Instructions are frequently explained in a long, indirect format as well, which causes patients to be overwhelmed. On top of this, the opportunity to ask questions is commonly bypassed or providers may interrupt the patients' attempt to ask questions (Brega et al., 2015). Patients with the same medical condition are often taught using the same education materials and the same teaching methods as well, which may not benefit some patients (Kitchie, 2016). Each of these errors in teaching, along with not considering literacy level or learning style, may contribute to poor understanding of the education.

Patient Motivation

Providers also need to consider patient motivation. Most patients are motivated to learn because the outcome is improved health (Cochran & Brown, 2017). However, sometimes patients do not care to take an active role in their health and are not engaged in learning. This may be for a number of reasons, such as their past experiences with learning or their readiness to learn. Determining both the patient's learning needs and what is most important for the patient to learn is key for this situation (Blevins, 2018). A patient who has more motivation to learn will also likely have a higher sense of self-efficacy and an ability to handle barriers that may arise in their self-care (Masoompour et al., 2017).

Strategies to Improve Education

Communication between the patient and the provider is a vital part of quality patient care. According to Hersh et al. (2015), patients comprehend and remember about half of what was discussed during their appointment. Most patients also do not feel comfortable asking clarifying questions when they are feeling unsure. However, there are many strategies available to help make communication clearer and more effective.

First, providers should avoid making assumptions about patients' education, literacy level, or preferred learning style. Many literate people have low health literacy and are able to hide behind their verbal abilities, which can lead to providers speaking above a patient's level of knowledge (Office of Disease Prevention and Health Promotion [ODPHP], 2019). Patients also tend to overestimate their reading and comprehension abilities and are unlikely to disclose whether or not they understood the instructions (Wong et al., 2014). Providers should make sure to listen carefully to what the patient has to say, avoid interrupting, and be responsive to their questions (Brega et al., 2015).

Choose Appropriate Language

Using plain language when providing instructions to patients helps to increase their understanding (Hersh et al., 2015). Healthcare providers oftentimes use medical jargon when discussing diagnoses or when creating a plan of care. Patients do not understand these words, and therefore, likely will not fully understand their medical problem. Even medical terms that seem to be more common, or a "layman's term," can be confusing for patients. Providers should aim to mirror the patient's language and vocabulary. When a medical term is used, that term should be clearly explained in more plain language. Additional recommendations for healthcare providers include avoiding the use of subjective terminology. In fact, healthcare providers should

make a point to be specific and concrete so that what they are saying is not interpreted incorrectly (Brega et al., 2015).

Another recommended strategy to improve patient learning is to address any language concerns at the beginning of the clinic visit. If any language assistance services are required, these services should be obtained prior to starting any teaching (Brega et al., 2015). Additionally, patients may find it helpful if clinicians speak slower when describing complicated medical problems or discussing the treatment plan, as these are challenging to understand and remember. Breaking the information down into small steps or sections that are simple and specific and repeating instructions may also be beneficial to ensure patient understanding (Brega et al., 2015; Hersh et al., 2015).

Improve Readability of Written Materials

Written materials should be provided to supplement any verbal information given. The written information should be written at or below a fifth- to sixth-grade reading level (Hersh et al., 2015; Ayyaswami et al., 2019). According to Mikhail et al. (2015), many of the educational brochures in an ophthalmology clinic were written at an eighth grade reading level, which suggests that patients with lower health literacy were not given the opportunity to achieve the same level of understanding as those with higher literacy. Mikhail et al. (2015) also noted that "although our study measured comprehension instead of medication compliance, it is not unreasonable to associate an increase in disease understanding with an increase in medication compliance" (p. 24). All participants, despite literacy level, preferred materials that were written at a fifth grade reading level and that provided illustrations. These results suggest that teaching materials should be written at a lower reading level, which would decrease the need to screen

patients for low health literacy as well as decrease the need to create multiple versions of educational materials.

Ayyaswami et al. (2019) found similar results in their research on the reading levels of cardiovascular disease-related education materials. The top ten articles found on the internet for commonly searched cardiovascular terms were written at about a 10.9 grade reading level, which is much higher than recommended. Furthermore, the authors found that 99.5% of the articles that were recommended for patients by national organizations were written at a reading level greater than the fifth or sixth grade level. Considering the average reading level of U.S. adults is between seventh- and eighth-grade, this demonstrates the level of detachment between patients' reading levels and the available online educational materials.

There are many ways written materials can be made easy to read and understand. Written material should contain short, simple sentences with limited use of words with more than two syllables (Hersh et al., 2015). This material should contain key points that were verbally discussed in order to reinforce learning. Bulleted lists or clearly distinct sections are often better than big paragraphs. In addition, visual aids may help patients further understand the information. Pictures, graphs, models, or videos can be helpful to supplement learned information (Brega et al., 2015). Providers should always review any written material with the patient, circling or underlining vital information to remind the patient later (Hersh et al., 2015).

Confirm Understanding

Patients often fail to disclose whether they truly understood the teaching provided. Patients commonly respond that they do not have any questions when asked for a variety of reasons, such as lack of motivation, fear of appearing incompetent, or lack of time. Providers can implement strategies to confirm each patient's level of understanding. One method to do this is

the chunk and check (Hersh et al., 2015). To do this, providers should stop and ask if there are any questions after each key point has been taught and have the patient repeat the information back to the provider. Providers should make it obvious to the patient that questions are encouraged and can be asked at any point throughout the teaching. Open-ended questions should be asked instead of yes or no questions because this creates more of an opportunity for the patient to talk (Brega et al., 2015).

Similar to the chunk and check method, and more commonly known, is the teach-back method. This method allows the patient to explain the information back to the provider in their own words (Hersh et al., 2015). The provider can then assess the patient's comprehension. The teach-back method is used to determine the effectiveness of the provider's communication instead of the patient's learning. If the provider plans to use this method, the main points of the education should be repeated multiple times throughout the teaching to make it more memorable for the patient. A demonstration may also be warranted depending on the type of education. If a demonstration is done, the provider should allow active participation from the patient (Brega et al., 2015). Addressing and clarifying any misunderstood information is essential to providing quality education.

Assure Patient Follow-Up

Following-up with patients is another way to ensure questions are answered and any confusion is addressed (Brega et al., 2015). Follow-up may be done through another clinic visit, through a phone call, or via telehealth. Appropriate follow-up can allow time for continued assessment and provide the ability to make changes to the plan of care if needed, especially if the patient was monitoring or tracking health information at home. Furthermore, meeting with the patient again promotes a therapeutic relationship.

An intervention that could be used to improve education and help those with low health literacy in rural populations is the use of telemedicine. Telemedicine, or telehealth, makes use of interactive audio-visual tools that allow patients and providers to meet via phone call or video call (Chen et al., 2019). Using this method for clinic visits would allow rural patients to have greater access to health information and specialists. Telehealth also enables rural providers to discuss complex health problems with an interdisciplinary team and receive help in managing patient care (Redford, 2019). The ability to meet with providers from a distance creates opportunities for patients to receive their education sooner than they might have if they had to wait for an in-person appointment.

Patient education is a continuous, ongoing process that must grow and evolve with each visit or change in health status. Education must be multifaceted and use many different techniques and styles to ensure patient understanding (Masoompour et al., 2017). Each visit is an opportunity for education, and individualized education has the potential to better meet patients' learning needs and improve health outcomes (Imoisili et al., 2017).

Theoretical Framework

The Adult Learning Theory was utilized in this project, as the project focused on adult learning and required an understanding of how adults learn in order to be successful. The assumptions of this theory provided guidance on how to enhance patient teaching. The evidenced-based Iowa Model also guided this project by providing direction for each step in the project.

Adult Learning Theory

The Adult Learning Theory, also known as Andragogy, was developed by Malcolm Knowles in 1968. As defined by Knowles, andragogy is "the art and science of helping adults

learn" (Loeng, 2018, p. 4). The theory focuses on adult learners, where past theories mainly focused on child learners, or pedagogy (Cochran & Brown, 2017). While the theory is mainly student-centered and based on the experience of the student, close collaboration between the learner and the instructor is needed. The Adult Learning Theory lays out a process in which the learners must be very motivated and take an active role in bettering their education (Decelle, 2016). Instructors must consider the differences in learning style, pace of learning, and the impact of the environment on each individual learner. Instructors also need to recognize that individuals' preferences can change over time. The Adult Learning Theory is divided into six assumptions that were utilized to guide this practice improvement project.

Assumption One: The Need to Know

Adult learners need to know the reasons why they should learn something before attempting to learn it. The purpose of the teaching and the expected outcomes of the teaching should be thoroughly explained. If the learner understands the importance of the education, there is a greater chance the learner will be motivated to participate (Cochran & Brown, 2017). The purpose of this project was to assess the health literacy level and preferred learning style of adult patients in a rural clinic, as well as educate healthcare providers on the importance of assessing health literacy and preferred learning styles to enhance learning.

Assumption Two: Self-Concept

The second assumption of the Adult Learning Theory is about the adult learner's beliefs about themselves, or self-concept. Because adults have more life experience than they did as children, they are more autonomous in their decisions, and therefore, can take an active role in directing their learning (Cochran & Brown, 2017). This practice improvement project allowed patients to take part in guiding their healthcare experience by providing them with the

opportunity to communicate how they learn best. The project also incorporated an education session with providers at a clinic in rural North Dakota that allowed opportunities for questions and collaboration with the coinvestigator.

Assumption Three: Past Experience

Each learner has a different background and different life experiences, making them unique. This also means that they have their own individual learning styles and preferences. Learners should be encouraged to use their experiences to help them better understand what is being taught (Cochran & Brown, 2017). The education in this project was centered on healthcare providers' current knowledge of health literacy and learning style and also provided them with new information that they can use moving forward to improve their teaching.

Assumption Four: Readiness to Learn

The fourth assumption of Adult Learning Theory addresses the adult's readiness to learn. The readiness to learn involves the need to pursue further development, both personal and societal (Cochran & Brown, 2017). Finding a learner who has a special interest in the teaching will increase the success of the education. Patient education is an integral part of the healthcare provider profession, making them an audience with a particular interest in this project. The providers at the rural North Dakota clinic and the coinvestigator shared a common interest in improving patients' retention and comprehension of teaching, with the goal of patients having a better understanding their health and how to care for themselves. Assisting patients in understanding how they may learn best may also result in improved healthcare engagement and enhanced patient knowledge.

Assumption Five: Orientation to Learning

Adults are often more interested in learning if the subject is stimulating and captures their attention. The teaching should contain relevant points and a variety of activities to keep the learner engaged. Utilization of purposeful learning activities allows the learner to take the education beyond the learning environment and apply the information to their daily life (Cochran & Brown, 2017). The healthcare providers who participated in this project were able to apply the health literacy and learning style education to their current practices.

Assumption Six: Motivation to Learn

Adults have an internal desire to learn that is often driven by their personal goals or interests. Instructors should create an environment that encourages learning and active participation (Cochran & Brown, 2017). Healthcare providers have a strong motivation to learn that is based on improving patient care and ensuring safety for their patients. This project allowed providers to improve their patient education, and in turn, created a better learning environment for their patients. Patients may also develop a better understanding of their health through individualized education, which has the potential to improve outcomes.

The Iowa Model

The Iowa Model is an evidence-based practice model that guides clinicians in making decisions about current practices that will affect healthcare and health outcomes (Melnyk & Fineout-Overholt, 2019). The model was first developed by nurses in the 1900s to assist clinicians in evaluating and applying research into their practice (Buckwalter et al., 2017). The Iowa Model is well known for its applicability and adaptability to any situation. The model features a step-wise process with feedback loops incorporated throughout. This allows researchers to evaluate and make adjustments as needed, which in turn leads to improved

practice. The Iowa Model was chosen for this practice improvement project because of the simple progression of steps to guide each point in the process. The use of an evidence-based practice model such as this will enhance the success of the project. See Appendix E for a visual representation of the Iowa Model.

Identify an Issue

The first step in the Iowa Model is to identify a situation where there is an opportunity to improve clinical practice (Melnyk & Fineout-Overholt, 2019). Problems are often noticed when current practice is questioned. The issues may be identified due to suggestions from a patient, new evidence or research, new requirements or regulations, or changes to principles of care. Once a problem is identified and noted to be a priority within the organization, the question needs to be clearly stated to help establish and define the purpose. Key components of the purpose include the problem, population, intervention, comparison, and outcome (Melnyk & Fineout-Overholt, 2019).

Low health literacy has been identified in the literature as a problem for many patients, especially in rural locations (Temple, 2017). Patients with low health literacy struggle to understand their medical diagnosis, medications, and how to care for themselves, leading to poorer health and increased healthcare expenses diseases (Chen et al., 2019; Wong, 2014). The purpose of this project was to assess the health literacy and preferred learning style of patients at a rural North Dakota clinic and educate healthcare providers in the respective clinic on health literacy and teaching methods, which has the potential to enhance patient education and learning.

Form a Team

The next step in the process is to form a team to develop, implement, and evaluate the project (Melnyk & Fineout-Overholt, 2019). The team should include stakeholders who have an

interest in the topic and who have an education and background that will help in establishing and advancing the project. The team for this project consisted of the coinvestigator, Dr. Allison Peltier, DNP, FNP (committee chair), two members of the graduate school faculty members, Dr. Dean Gross, Ph.D., FNP and Dr. Heidi Saarinen, DNP, FNP, and a graduate-school-appointed faculty member from the Sociology/Anthropology department, Dr. Christopher Whitsel, Ph.D. Other members of the team included the Chief Medical Officer (CMO) of West River Health Services, as well as participating healthcare providers and nurses.

Each stakeholder played an important role in the project. The coinvestigator's duties included selecting a topic, synthesizing the review of literature, designing and implementing the project, evaluating the results, and disseminating the findings. The coinvestigator worked closely with the committee chair, other committee members, and the CMO to receive guidance and support, as well as suggestions for possible changes to the project. The healthcare providers at the rural clinic participated in the project by taking a pre- and post-test, attending the educational session, and declaring their intent to use the health literacy and learning style tools. The nurses at the clinic helped with distributing the tools and gathering data.

Gather Evidence

Gathering and reviewing evidence is an important part of establishing a literature review for the project. The team must determine if there is sufficient, high-quality evidence in support of the topic. If there is enough evidence, a practice change can be designed (Melnyk & Fineout-Overholt, 2019). A literature review was conducted on relevant topics, and a gap in health literacy levels was identified in rural areas compared to urban areas.

Design and Implement the Practice Change

Designing and trialing the project is an important step because this allows the organization to address problems before implementing the change (Melnyk & Fineout-Overholt, 2019). In this step, any necessary changes can be made, alternatives can be considered, or parts of the project can be redesigned if needed. Once each stakeholder and the organization are satisfied with the project, implementation of the intervention can occur.

The coinvestigator discussed the issue with other healthcare providers, who agreed that low health literacy and lack of variety in patient teaching is a problem. The CMO of the rural clinic also felt that low health literacy is a problem with their patients. To design this project, the coinvestigator discussed ideas and created a plan with the chair and committee members. The CMO also gave direction for the project by suggesting an education session with all healthcare providers within the rural healthcare system, not just the providers at the clinic where the project was implemented. The CMO also suggested using health literacy and preferred learning style tools that are quick and easy-to-use. Therefore, the REALM and VARK tools were chosen based on these criteria. The REALM is simple and takes only minutes to administer. The VARK is a select-all-that-apply question format that takes less than ten minutes to complete on the computer.

Sustain the Practice Change

The intervention must then be sustained in order to evaluate results (Melnyk & Fineout-Overholt, 2019). The coinvestigator met with healthcare providers at the clinic to gather information and ideas on how the practice change can best be continued. There was an educational session held by the coinvestigator to present information on the use of the tools and importance of testing health literacy and learning style. With more knowledge on these subjects,

the providers will likely have more confidence utilizing them in practice. The intent of the providers to continue utilizing the tools and implementing the changes was also be measured in the post-test.

Disseminate the Results

Sharing the results is an important way to expand knowledge and make evidence-based changes across a system. Dissemination of results prompts others to change their processes and ask further questions (Melnyk & Fineout-Overholt, 2019). The coinvestigator shared the results with the healthcare providers involved in the project, as well as other healthcare providers at the clinic and the committee members involved. The coinvestigator disseminated the results at the North Dakota Nurse Practitioner Association Pharmacy Conference through a poster presentation. Members of the coinvestigator's Doctor of Nursing Practice cohort were educated on the outcomes of the project. The project will be published in North Dakota State University's dissertation database so all students will have access to the information in the future.

CHAPTER 3. METHODS

Project Objectives

The overall goal of this practice improvement project was to improve patient education by encouraging healthcare providers to utilize patients' health literacy level and preferred learning style in their teaching. The project objectives included the following:

1. To assess patients' health literacy levels at a rural clinic using the Rapid Estimate of Adult Literacy in Medicine (REALM) screening tool and document the results in each patient's chart.
2. To assess the preferred learning style of patients at a rural clinic using the Visual, Aural, Read/Write, Kinesthetic (VARK) tool and document the results in each patient's chart.
3. To educate providers on health literacy and different teaching styles (verbal, auditory, written, demonstration, etc.).
4. To increase provider intent to incorporate both the REALM and VARK tools into their practice and utilize the results to improve their patient education.

Project Design

This practice improvement project was a pilot study involving the implementation of the REALM and VARK tools into a primary care clinic in rural North Dakota. The focus was on the importance of providing quality education to patients in order to prevent confusion, errors, and complications. This type of design fit well with the project because a practice improvement project recognizes the need for change in the current processes and utilizes evidence-based interventions to invoke change (Melnyk & Fineout-Overholt, 2019). The interventions were meant to produce improved outcomes and sustainable results for those involved, including both

patients and healthcare providers. The interventions within this project were evidence-based, and the potential outcomes included incorporation of the REALM and VARK tools into the clinic after completion of the study and improved understanding of health literacy among healthcare providers. Improved understanding of patient learning can also result in more effective education and enhance patient understanding of their care.

Setting

This study was conducted in southwestern North Dakota. The setting was the West River Health Services Clinic in Bowman, ND. This clinic is located in Bowman County, which has a total population of 3,148 according to the United States Census Bureau (n.d.). The county covers 1,161.6 square miles. The majority of the population is Caucasian at 96.1%, with 1.2% American Indian or Alaskan Native, 0% Asian or African American, 0.1% Native Hawaiian or Other Pacific Islander alone, 1.3% some other race alone, and1.3% two or more races. Most of the population in Bowman County are high school graduates or higher at 89.1%. The population of the county that is Hispanic or Latino, without regard to race, is 5.5%. The median household income was $62,442 in 2019 (United States Census Bureau, n.d). Adults ages 18 and older make up the biggest portion of Bowman County at 75.5%, with those ages 65 and older at 20.6%.

The Bowman Clinic is part of the West River Health Services healthcare system. West River Health Services serves a big portion of southwest North Dakota, covering about 20,000 square miles. West River has one hospital, six clinics, an assisted living center and nursing home, an eye center, and a wellness center with locations in Bowman, ND, Hettinger, ND, Mott, ND, New England, ND, Scranton, ND, and Lemmon, SD (West River Health Services, 2015). The specialties offered by the 20 providers include family practice, internal medicine/geriatrics, obstetrics/birth and gynecology, radiology, optometry, podiatry, general surgery, and pediatrics.

The Bowman Clinic has one nurse practitioner who is available daily, as well as a variety of physicians who rotate there on different days during the week. Many of the clinics in this system do the same thing, with rotating physicians.

Sample

There were 18 healthcare providers who work at various clinics throughout the West River Health Services healthcare system that were invited to participate in the educational session. All providers were included in this session if they were interested and volunteered to participate. The REALM and VARK scores were implemented into clinical practice at the Bowman Clinic. There was one family nurse practitioner (FNP), one registered nurse (RN), and one licensed practical nurse (LPN) from the Bowman Clinic who participated in the project by administering the tools to the patients. See Appendix F for healthcare provider consent to participate.

The patients who participated in the project were recruited via convenience sampling. Patients who presented to the Bowman Clinic for a visit with a healthcare provider during the two month implementation period were asked if they were willing to participate. Participating patients received information about the project and were asked to give consent to take part in the project. Inclusion criteria included adults, ages 18 and older, who live in Bowman and in the rural areas surrounding the Bowman Clinic. The patients had to be English-speaking. Exclusion criteria included patients who visited from urban areas that do not receive routine care at the facility and patients who were not going to be following up at the clinic at a later date. Please see Appendix G for the patient consent to participate.

Implementation Plan

The development of an educational session was a key step in the implementation of this project. A PowerPoint presentation was created to discuss health literacy in rural populations and the importance of using a health literacy tool and a preferred learning style questionnaire in practice, as well as to discuss the results of the surveys that were implemented in the Bowman clinic. A pre- and post-test and follow-up survey were developed to test healthcare providers' knowledge of the importance of testing health literacy and preferred learning style in practice, the tools available to do so, and their intent to utilize this information and the tools in their future practice. There was also a small focus group with the nurses and FNP at the Bowman clinic following the project to discuss if the intervention changed their patient interactions.

A short demographics questionnaire was also developed for the patients who participated in the project to help the coinvestigator determine their age, gender, race, and the highest level of education completed. The demographics questionnaire was administered in addition to the health literacy and learning style tools to gather adequate background information about each participant. This project was implemented over a two-month time period. Each week during these two months, the clinic chose two days out of the week to implement the REALM and VARK tools. This was to decrease the complexity of the project, as well as mitigate time restrictions for the clinic. The pre-test may be found in Appendix H, post-test in Appendix I, follow-up survey in Appendix J, focus group questions in Appendix K, demographic questionnaire in Appendix L, and education session PowerPoint in Appendix M.

Interventions

The first phase of the project included administering the demographics questionnaire, health literacy test, and preferred learning style questionnaire to the patient participants. Prior to

the start of this intervention, the coinvestigator held a short education session with the FNP, RN, and LPN at the participating clinic to show them how to administer the tools. The RN and LPN also received education on the purpose of this project, health literacy and learning style, and the importance of using this information in practice, as they were not in attendance at the provider education session. Each patient received information about this project at the front desk of the clinic during check-in and was asked about participation. The patients who chose to participate received the demographics questionnaire at that time. When the nurse roomed the patient, the REALM was administered orally. The nurse scored the patient and placed that information, along with the demographic questionnaire, in a folder with no patient identifiers. Next, the patient was given an iPad, provided by the coinvestigator from North Dakota State University, to take the VARK questionnaire to determine their learning style. Once the patient was done with the VARK, the nurse wrote down the results on a piece of paper and placed it into the patient's folder. The nurse then took this folder out of the room and stored it in the FNP's office. There was a checklist for the nurse to utilize and mark off when each of these items had been completed. The FNP then viewed the results for accuracy and educated the patient about what their results meant. The nurse documented the information in each patient's electronic medical record (EMR) via a note for future use and then marked on the checklist when this was done.

The educational session for providers was held after the first intervention had taken place, which allowed for the results to be shared with the healthcare providers in attendance. This session was held during one of the WRHS weekly provider meetings on October 1, 2021. These weekly meetings usually consist of six to eight physicians, nurse practitioners, or physician assistants. The educational session lasted approximately 50 minutes, and there were 12 participants in attendance, including physicians, nurse practitioners, physician assistants, and

medical students. The presentation was given in-person, using the PowerPoint presentation and Zoom to communicate with those not present at the clinic. Prior to the presentation, a pre-test was administered. During the presentation, the coinvestigator provided examples of the health literacy and learning style questionnaires to the participants, as well as emailed those tools to the participants who attended online. The post-test was administered immediately after the session and was distributed by the CMO via email. Because some providers attend the weekly meeting online from other clinics, the pre- and post-tests were in an online format using Qualtrics. Approximately two months after the educational session, a follow-up survey was emailed to the CMO to be distributed to the providers who were in attendance to determine if their practices and patient interactions have changed. This survey was also in an online format using Qualtrics. There was a small focus group with the FNP and nurses on December 7, 2021, as well to determine if the notes in the patients' EMR prompted them to individualize their education.

Protection of Human Subjects

Institutional Review Board (IRB) approval was obtained through North Dakota State University, and the project was approved for exempt (Category 2) status on May 25, 2021. The IRB approval letter can be found in Appendix N. The project did not include children. No patient was excluded based on their race, ethnicity, economic status, or educational level. The potential participants were made aware that participation was voluntary, and they were required to give consent to participate. The participants were assured that no names or identifying information would be used throughout the entire project and that only authorized users, such as the nurses and the FNP, would be able to access any protected information. The nurses provided a brief description of the risks and benefits of the project.

Data Collection and Analysis

The data collection process occurred over a two-month time period from June 3, 2021 to August 4, 2021. During that time, quantitative data was gathered. Quantitative data included the demographics questionnaire for patients, as well as the VARK questionnaire and REALM test results. The data from the demographics questionnaire was compiled to obtain generalized information about the participants, and the REALM and VARK scores were collected and analyzed. Additional data came from the pre-test, post-test, and follow-up survey distributed to the providers and included scores on the Likert scale, multiple choice, and true and false questions.

Resources

A number of resources were utilized throughout the planning, implementation, and evaluation processes of this project. The dissertation chair and committee, the participating healthcare providers and patients, and the Bowman clinic were key contributors to the success of the project. Technology, such as PowerPoint software and survey software, was a major resource utilized heavily in the implementation and evaluation phases. Other resources needed were a variety of educational tools that were used to teach patients in their specific learning style. The Bowman clinic and the coinvestigator provided these tools. Time was another resource needed from those involved, including the dissertation committee, healthcare providers, and patients. The cost to complete this project was minimal.

Evaluation Plan

Evaluation of the practice improvement project is essential to determine success and generate change in future practice. Once data was collected, the results were analyzed to

determine if each objective was met through the interventions performed during the project. Evaluation is an important step that helps provide insight for future practice.

Objectives One and Two

To measure the first objective, the REALM test was administered to all participants, and the results of each participant's health literacy level were documented in the coinvestigator's record. Then, the nurse placed the results in each patient's EMR. The nurse then recorded when this had been done on a checklist.

The measurement of objective two was similar to that of objective one. Each participant took the VARK questionnaire to determine how they learn best. The results were documented in the same place as the health literacy results, and then the nurse placed the results in the patient's EMR. The nurse noted when this had been done on the same checklist. The patients were also informed of the results of the VARK questionnaire and were educated on which ways they may learn best.

Objective Three

The coinvestigator provided the educational session on health literacy and learning styles to multiple healthcare providers during the implementation process. This session took place on October 1, 2021. A pre-test and post-test were also administered to determine if the providers had an improved understanding of health literacy and learning style after the education. The pre- and post-tests were measured using Likert scale, multiple choice, and true and false questions, which provided quantitative data.

Objective Four

The last objective determined the participating providers' intent to implement the REALM and VARK tools into their practice. The fourth objective also asked providers about

their plans to utilize individual patient information, including their health literacy scores and preferred learning styles, to improve their education and teaching techniques. The pre- and post-tests were, again, utilized to measure this objective by asking the providers to rate their intent to use what they had learned in the education session. The follow-up survey further augmented the measurement of this objective by asking providers to respond to questions about whether their patient interactions, as well as thoughts about literacy and learning style, had changed since the intervention.

CHAPTER 4. RESULTS

After implementing the practice improvement project, the results were evaluated. The following sections will review the demographic data of the patient participants, as well as their REALM scores and VARK questionnaire results. The demographic data of the healthcare provider participants will also be discussed, as well as results from the pre- and post-tests, follow-up survey, and focus group.

Demographics

The patients who participated in the project completed a five-question form regarding their demographic information. There were 27 total participants who responded to this questionnaire during the two-month implementation period. Of those 27 participants, 59.3% (n=16) were female and 40.7% (n=11) were male. The age of the participants varied; there were 2 (7.4%) participants in the 18-30 year-old age range, 11 (40.7%) in the 30-50 age range, 7 (25.9%) in both the 50-70 and 70-90 age range, and no participants ages 90 or older. The majority of the participants (n=26; 96.3%) were of Caucasian race, and one (3.7%) participant categorized themselves as Other.

The participants were also asked about their highest education level achieved. Of the participants, 3.7% (n=1) reported they had an elementary education, 48.1% (n=13) reported a high school education, 14.8% (n=4) an associate degree, 29.6% (n=8) a bachelor's degree, and 3.7% (n=1) a master's degree or higher. Participants were also asked if they felt they fully comprehend the information provided to them by healthcare professionals. Most participants (n = 14; 51.9%) answered Strongly Agree, reporting they feel they understand the information given to them. Twelve (44.4%) participants agreed with this statement, one (3.7%) participant was

neutral, and zero patients disagreed or strongly disagreed with the statement. Please see Table 1 and Figure 2 for additional information on participant demographics related the patients.

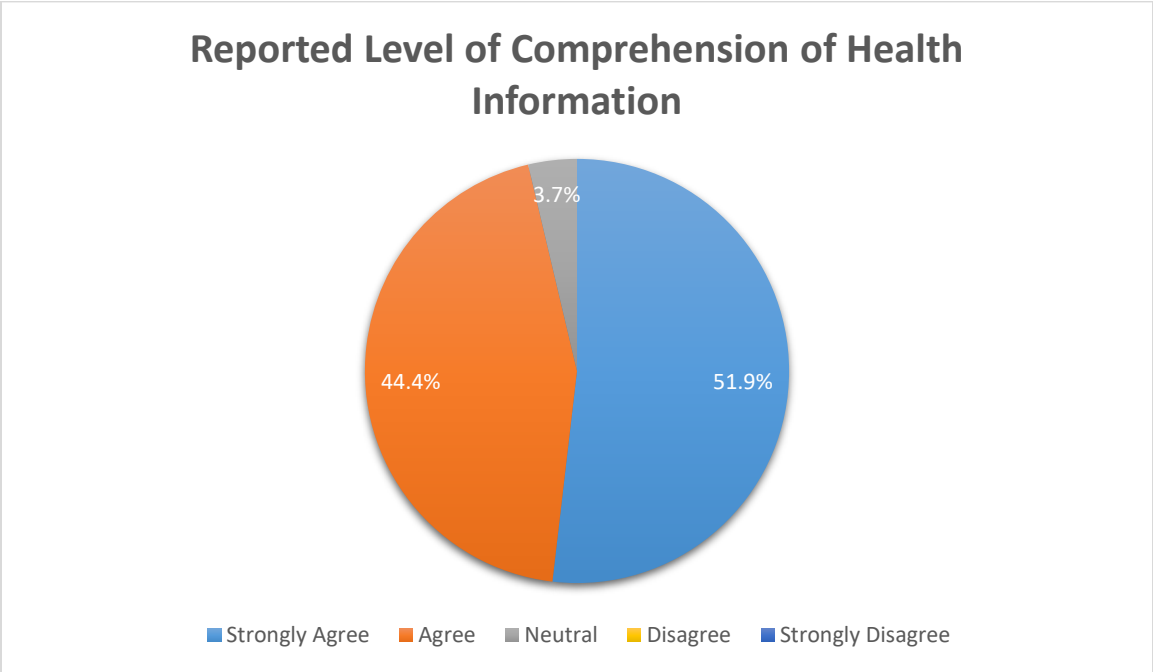
Table 1

Patient Demographics: Gender, Age, Race, Education Level, Level of Comprehension

Question	Response	Mean (%)
Gender		
Male	11	40.7%
Female	16	59.3%
Age		
18-30	2	7.4%
30-50	11	40.7%
50-70	7	25.9%
70-90	7	25.9%
90 or older	0	0.0%
Race		
Caucasian	26	96.3%
African American	0	0.0%
Hispanic	0	0.0%
American Indian or Alaskan	0	0.0%
Native	0	0.0%
Other	1	3.7%
Education Level		
Elementary	1	3.7%
High school	13	48.1%
Associate Degree	4	14.8%
Bachelor’s Degree	8	29.6%
Master’s Degree or higher	1	3.7%

Figure 2

Reported Level of Comprehension of Health Information of Patient Participants



Objective One: Health Literacy Scores

The first objective of this practice improvement project was to assess patients' health literacy levels at a rural clinic using the Rapid Estimate of Adult Literacy in Medicine (REALM) screening tool and document the results in each patient's chart. The results are listed in the next paragraph, as well as in Table 2.

The health literacy scores of the 27 participants were measured using the REALM tool. The results showed that 11.1% (n=3) participants had a 7th-8th grade health literacy level, and 88.9% (n=24) participants had a high school health literacy level. No participants were in the 4th-6th grade or 3rd grade or below health literacy levels. The REALM results were placed into all (N=27; 100%) participants' computer chart.

Table 2

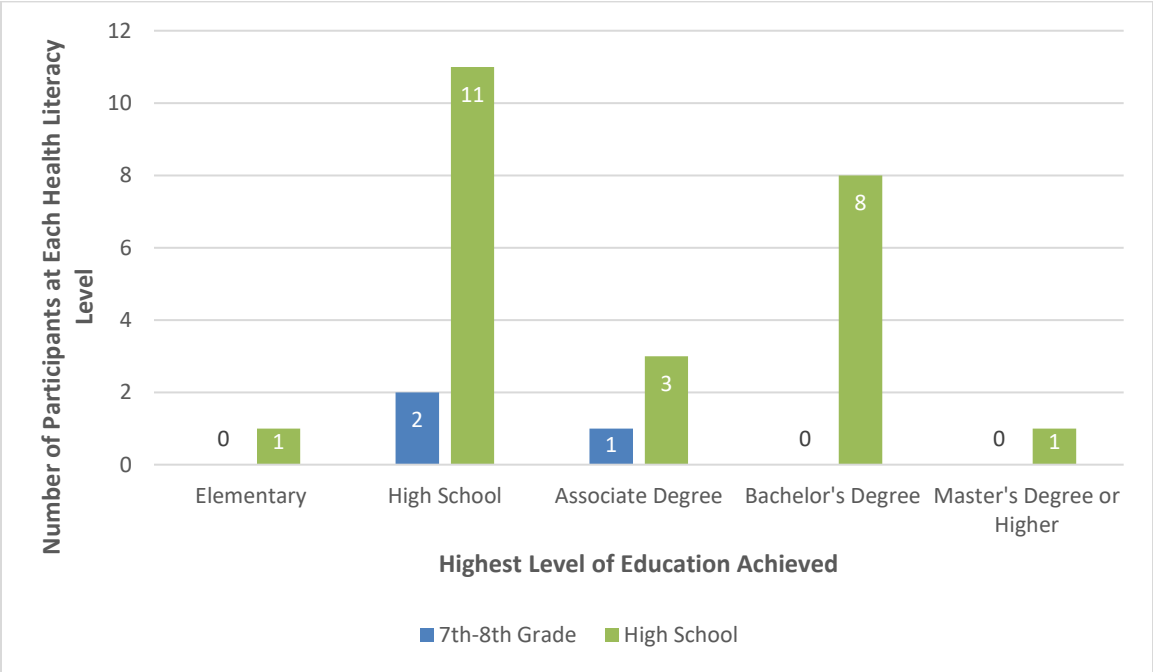
Health Literacy Scores

Health Literacy Level Based on REALM Score	Number of Participants
3rd grade or below	0
4th-6th grade	0
7th-8th grade	3
High school	24

Please refer to Figure 3 for information on education levels and health literacy scores. Most patients (n=11; 40.7%) had a high school education and also received a high school health literacy score. There was 1 (3.7%) participant who had an elementary education and a high school health literacy level, 11 (40.7%) participants who had a high school education and health literacy level, 3 (11.1%) who had an associate degree and a high school literacy level, 8 (29.6%) participants with a bachelor's degree and a high school literacy level, and 1 (3.7%) with a master's degree or higher and a high school health literacy level. There were two (7.4%) participants who had a high school education and received a 7th-8th grade health literacy level, and one (3.7%) participant who had an associate degree and received a 7th-8th grade health literacy level.

Figure 3

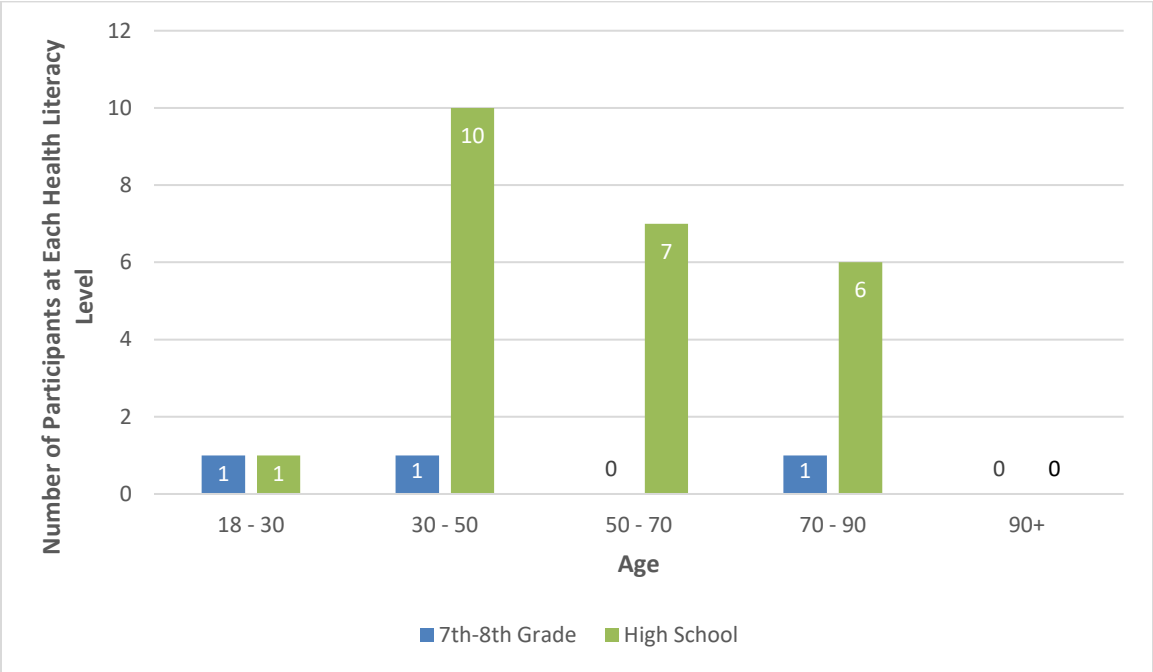
Health Literacy Scores Compared to Highest Level of Education Achieved



Please refer to Figure 4 for information on age of the participants in relation to health literacy scores. Participants between ages 18 and 30 demonstrated high school (n=1; 3.7%) and 7th-8th grade health literacy levels (n=1; 3.7%). There were 10 (37%) participants in the 30-50 age range with a high school health literacy, and 1 participant (3.7%) with a 7th-8th grade health literacy level. Seven (25.9%) participants in the 50-70 age range had a high school literacy level. In the 70-90 age range, there were six (22.2%) participants with a high school health literacy level and one (3.7%) with a 7th-8th grade health literacy level.

Figure 4

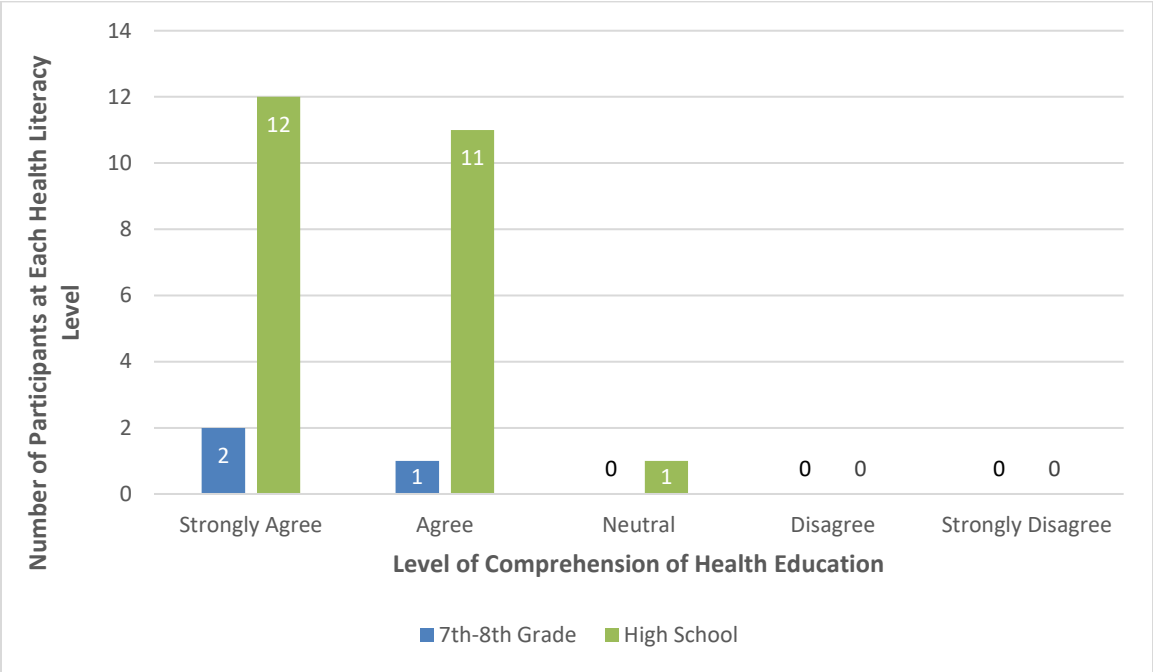
Health Literacy Scores Compared to Age of Participants



Please see Figure 5 for information regarding participants' reported level of comprehension of health education and health literacy levels. Most participants strongly agreed (n=12; 44.4%) or agreed (n=11; 40.7%) that they understood the health education presented to them, and these participants also received a high school health literacy level. Of the participants that had a high school health literacy level, one participant (3.7%) responded "neutral" to feeling that they understand the education. Two (7.4%) participants with a 7^{th}-8^{th} grade health literacy level responded "strongly agree," and one (3.7%) with the same literacy level responded "agree." No participants responded "disagree" or "strongly disagree."

Figure 5

Health Literacy Scores Compared to Level of Comprehension of Health Education



Objective Two: Preferred Learning Styles

The second objective of this practice improvement project was to assess the preferred learning style of patients at a rural clinic using the VARK tool and document the results in each patient's chart. Following the administration of the REALM, the preferred learning styles of the participants (N=27) were assessed using the VARK questionnaire.

The participants' preferred learning style(s) were recorded in all (N=27; 100%) of the patients' charts. According to the VARK questionnaire results, the majority (n=11; 40.7%) of the participants preferred more than one learning method, or multimodal. Visual was the preferred learning method of one (3.7%) participant, four (14.8%) participants preferred aural, three (11.1%) participants preferred reading/writing, and eight (29.6%) participants preferred kinesthetic learning. Please refer to Table 3 for a visual representation of these results.

Table 3

Preferred Learning Styles of Participants

Learning Style	Number of Participants
Visual	1
Aural	4
Reading/Writing	3
Kinesthetic	8
Multimodal	11

Objective Three: Healthcare Provider Education

The third objective was to educate providers on health literacy and different teaching styles (verbal, auditory, written, demonstration, etc.). This objective was achieved through holding an education session with WRHS healthcare providers who were interested in attending. The session was held on October 1, 2021, during a weekly education meeting at the WRHS Hospital. There were 12 participants in attendance. Of the attendees, six (50%) were medical doctors, two (16.7%) were nurse practitioners, one (8.3%) was a physician assistant, and three (25.0%) were medical students. The session lasted approximately 45 minutes, including the presentation and discussion afterwards.

Healthcare Provider Demographics

The healthcare providers were asked to take a pre-test prior to attending the education session and a post-test following the session. The pre- and post-tests did not have identifiers to include only the participants that completed both the pre- and post-tests; therefore, there were 13 healthcare providers who took the pre-test and 10 who took the post-test. Demographic questions were included on both tests, and those results can be found in Table 4. The majority of the participants on both the pre- and post-test were medical doctors, at 53.8% (n=7) and 50% (n=5), respectively. Most participants (n=7; 58.8% [pre-test]; n=6; 60.0% [post-test]) have been practicing in their current role for less than five years. A majority of providers (n=7; 53.8% [pre-

test]; n=6; 60.0% [post-test]) had also been practicing in a rural facility for less than five years, though there was also a high number of providers (n=4; 30.8% [pre-test]; n=4; 40.0% [post-test]) who had also been practicing in a rural facility for more than 20 years as well. The primary field of practice was Family Practice/Internal Medicine.

Table 4

Demographic Questions and Responses on Pre- and Post-Tests

Question	Response to Pre-Test (N=13)	Mean (%)	Response to Post-Test (N=10)	Mean (%)
Credentials/Profession				
Medical Doctor	7	53.8%	5	50.0%
Doctor of Osteopathic Medicine	0	0.0%	0	0.0%
Nurse Practitioner	2	15.4%	2	20.0%
Physician Assistant	1	7.7%	1	10.0%
Other	3	23.1%	2	20.0%
Years of Practice in Current Role				
Less than 5 years	7	53.8%	6	60.0%
5-10 years	2	15.4%	0	0.0%
11-20years	0	0.0%	0	0.0%
More than 20 years	4	30.8%	4	40.0%
Years of Practice in a Rural Facility				
Less than 5 years	7	53.8%	6	60.0%
5-10 years	2	15.4%	0	0.0%
11-20 years	0	0.0%	0	0.0%
More than 20 years	4	30.8%	4	40.0%
Primary Field of Practice				
Family Practice/Internal Medicine	8	61.5%	7	70.0%
Hospital Medicine	0	0.0%	0	0.0%
Emergency Medicine	0	0.0%	0	0.0%
Specialty	1	7.7%	1	10.0%
Other	4	30.8%	2	20.0%

Pre- and Post-Test Results

The pre-test included eight questions to assess healthcare providers' current knowledge of risk factors for health literacy, health literacy in rural populations, preferred learning styles,

and the importance of utilizing health literacy and learning style in practice. Question one required the participants to select the appropriate definition of health literacy. All (N=13; 100%) participants on the pre-test selected the correct response of "the ability to obtain, process, and understand basic health information and services to make appropriate health decisions." Additionally, all (N=10; 100%) of the participants who took the post-test also selected the correct answer for this question.

The second question asked participants to respond "true" or "false" to whether health literacy is lower in rural populations. Of the 13 pre-test participants, 11 (84.6%) correctly selected true, and 2 (15.4%) selected the incorrect answer of false. On the post-test, all (N=10; 100%) participants selected the correct answer of true.

Participants were asked to identify risk factors for low health literacy in patients in a select-all-that-apply format. There were three correct responses out of the five possible responses. The first correct response was "an 88-year-old male who is hard of hearing, attends his appointment alone, and needs information and instructions repeated multiple times," and 12 (92.3%) selected this answer on the pre-test, while 9 (90%) selected this answer on the post-test. The second correct response was "a Native American female who skipped her last dialysis treatment because she did not have transportation." Eight (61.5%) participants selected this answer on the pre-test, and ten (100%) participants selected this answer on the post-test. The last correct response was "a 50-year-old male who is refusing a colonoscopy because he has never had any blood in his stool." All of the participants chose the correct answer on the pre-test (N=13; 100%) and post-test (N=10; 100%).

Participants were also asked to describe what a learning style is. All (N=13; 100%) pre-test participants answered with the correct answer of "the unique way each person absorbs,

processes, and comprehends new information based on past experience, as well as cognitive, emotional, and environmental factors." All (N=10; 100%) post-test participants also chose the correct answer as well.

Participants were asked to identify different types of learning styles using a select-all-that-apply format. Due to the formatting of the questions, participants were able to choose more than one answer. All responses were correct, but the most correct answer was "all of the above." Of the 13 respondents to the pre-test, 3 (23.1%) chose the answers of "visual," "auditory," and "kinesthetic," 2 (15.4%) also chose "reading/writing," and 12 (92.3%) chose "all of the above." The post-test results were similar, as three (30%) participants answered "visual," "auditory," and "reading/writing," two (20%) also answered kinesthetic, and nine (90%) answered "all of the above."

Question six helped to determine the participants' understanding of how those in each of the different styles would prefer to learn. All (N=13; 100%) pre-test and (N=10; 100%) post-test participants chose the correct answer, which was "visual learners may need a chart, graph, or picture to fully understand the education provided."

Participants were asked to rank how important they feel health literacy and preferred learning style are in patient comprehension of education. Of the pre-test participants, nine (69.2%) chose "very important" and four (30.8%) chose "extremely important." Of the post-test participants, two (20%) chose "moderately important," five (50%) chose "very important," and three (30%) chose "extremely important." No (0%) participants on the pre-test or post-test chose "not important" or "slightly important."

Participants were also asked if they currently utilize a tool to measure health literacy or learning style. Two (15.4%) of the thirteen participants answered "never," six (46.2%) answered

"sometimes," three (23.1%) answered "about half the time," two (15.4%) answered "most of the time," and zero (0%) answered "always." This question was changed on the post-test to determine provider intent to implement these tools into their practice and will be discussed with the next objective. See Table 5 for the pre- and post-test questions and responses.

Table 5

Comparison of Pre- and Post-Test Knowledge Questions and Responses

Question	Response to Pre-Test (n=13)	Mean (%)	Response to Post-Test (n=10)	Mean (%)
What is health literacy?				
The ability to read health education materials.	0	0.0%	0	0.0%
The ability to communicate with a healthcare provider.	0	0.0%	0	0.0%
The ability to obtain, process, and understand basic health information and services to make appropriate health decisions.	13	100.0%	10	100.0%
The ability to provide care for oneself.	0	0.0%	0	0.0%
True or False: Health literacy tends to be lower in rural populations.				
True	11	84.6%	0	0.0%
False	2	15.4%	10	100.0%
Which of these patients are demonstrating risk factors for low health literacy? Select all that apply.				
A 30-year-old female with a high school education who asks multiple questions during her visit with her healthcare provider to gather more information.	1	7.7%	3	30.0%
An 88-year-old male who is hard of hearing, attends his appointment alone, and needs information and instructions repeated multiple times.	12	92.3%	9	90.0%
A Native American female who skipped her last dialysis treatment because she did not have transportation.	8	61.5%	10	100.0%
A 50-year-old male who is refusing a colonoscopy because "he has never had any blood in his stool."	13	100.0%	10	100.0%
A 27-year-old male with a full-time job who attends his yearly physical.	0	0.0%	4	40.0%
Which of these statements BEST describes learning style?				
The way a person communicates.	0	0.0%	0	0.0%
The unique way each person absorbs, processes, and comprehends new information based on past experience, as well as cognitive, emotional, and environmental factors.	13	100.0%	10	100.0%
The way a person masters new information.	0	0.0%	0	0.0%
Which of these are common learning styles? Select all that apply.	3	23.1%	3	30.0%
Visual.	3	23.1%	3	30.0%
Auditory.	2	15.4%	3	30.0%
Reading/writing.	3	23.1%	2	20.0%
Kinesthetic.	12	92.3%	9	90.0%
All of the above.				

Table 5. *Comparison of Pre- and Post-Test Knowledge Questions and Responses (continued)*

Question	Response to Pre-Test (n=13)	Mean (%)	Response to Post-Test (n=10)	Mean (%)
Which of these statements is TRUE regarding learning styles?				
Auditory learners prefer reading a brochure to learn about a topic.	0	0.0%	0	0.0%
Every patient learns best by listening to the healthcare provider talk about the information.	0	0.0%	0	0.0%
Visual learners may need a chart, graph, or picture to fully understand the education provided.	13	100.0%	10	100.0%
Learning styles do not change over the lifetime.	0	0.0%	0	0.0%
How important do you feel health literacy and preferred learning style are in patient comprehension of education?				
Not important.	0	0.0%	0	0.0%
Slightly important.	0	0.0%	0	0.0%
Moderately important.	0	0.0%	2	20.0%
Very important.	9	69.2%	5	50.0%
Extremely important.	4	30.8%	3	30.0%
Pre-Test: Do you currently utilize tools to assess patients' health literacy and preferred styles of learning in practice?				
Never.	2	15.4%		
Sometimes.	6	46.2%		
About half the time.	3	23.1%		
Most of the time.	2	15.4%		
Always.	0	0.0%		
Post-Test: Do you intend to utilize tools to assess patients' health literacy and preferred styles of learning in practice?				
Never.			0	0.0%
Sometimes.			7	70.0%
About half the time.			1	10.0%
Most of the time.			2	20.0%
Always.			0	0.0%

Objective Four: Healthcare Provider Intent

The final objective was to increase provider intent to incorporate both the REALM and VARK tools into their practice and utilize the results to individualize their patient education. This objective was measured by the last question on the post-test, as well as with additional open-ended questions. These questions were geared towards gathering information on what tools the healthcare providers may be interested in using in their practice, what barriers there would be to implementing these tools, and how this information was relevant to them.

Participants were asked after the educational session if they intend to utilize a tool to measure health literacy and preferred learning style. Seven (70%) of the participants reported that they plan to use a tool to measure health literacy and preferred learning style sometimes. Additionally, one (10%) participant reported intent to utilize tools half of the time, and two (20%) reported intent to utilize tools most of the time.

Healthcare providers were asked about what tools they intend to implement in their practice. Five participants answered the question. Four (80%) of the participants that answered the question stated they planned to implement the VARK tool. One (20%) of these participants also planned to implement the health literacy tool as well. There was also one (20%) participant who responded "none."

Healthcare providers were asked to state how they might work these tools into an appointment. There were five responses, and the answers included:

"Assess annually at preventative health exam."

- Healthcare provider participant

"Pre-visit or first visit."

- Healthcare provider participant

"Best applied to yearly physical or Medicare annual wellness visit by the nursing staff for a quick assessment."

- Healthcare provider participant

"During wellness exams and [with] new patients."

- Healthcare provider participant

"They would be part of the nurse intake in an annual wellness visit."

- Healthcare provider participant

The third question asked about potential barriers to utilizing health literacy and preferred learning style tools in practice. The five responses all included time as a barrier. Some of the other answers were:

"Time and effect- just assume every patient is at a low level and over-educate."

- Healthcare provider participant

"Time to complete and patient unwillingness."

- Healthcare provider participant

"Time. I think that literacy can be addressed by speaking at the patient's level and using common world examples. However, I think that in most situations I will be unable to cater to a patient's learning style because there simply isn't enough time to come up with a different way to explain my assessment and plan to the patient in each style at every 15 minute visit."

- Healthcare provider participant

The last question asked providers to describe how the information provided during the education session was relevant to them. Again, there were five responses. Overall, the participants felt this information was "very relevant" to them. Other responses were:

"Helps to better understand that even if the patient states understanding, they may not have received the information in a way that they are able to process it fully."

- Healthcare provider participant

"Helps improve outcomes."

- Healthcare provider participant

"It helped me to be more aware of the language that I use in the clinic in light of the patients' health literacy levels."

- Healthcare provider participant

"Made me aware of this aspect of patient communication and will try various learning aids in explaining the patient's problem."

- Healthcare provider participant

Follow-Up Survey Results

Additionally, a follow-up survey was sent out two months after the education session on December 1, 2021. This survey assessed whether the educational session had influenced healthcare providers' interactions with patients and prompted them to consider patients' health literacy and learning style. There were six healthcare providers who responded to the follow-up survey. In response to taking patient health literacy and learning style into consideration, one

(16.7%) responded “sometimes,” three (50%) responded “about half the time,” two (33.3%) responded “most of the time,” and zero (0%) responded “always.” Participants were also asked if the educational session changed how they interacted with patients and responded sometimes (n=2; 33.3%), about half of the time (n=3; 50%), and most of the time (n=1; 16.7%). The last question on the follow-up survey was a yes/no question about whether it would be helpful for patient charts to contain their health literacy level and preferred learning style. One (16.7%) participant answered “yes,” and five (83.3%) participants answered “no.” The results can be seen in Table 6.

Table 6

Follow-Up Survey Results

Question	Response to Follow-Up Survey (n=6)	Mean (%)
Since the educational session on health literacy and preferred learning style, have you noticed yourself considering health literacy levels and preferred learning styles during patient encounters?		
Never.	0	0.0%
Sometimes.	1	16.7%
About half the time.	3	50.0%
Most of the time.	2	33.3%
Always.	0	0.0%
Did the educational session change how you interact with your patients?		
Never.	0	0.0%
Sometimes.	2	33.3%
About half the time.	3	50.0%
Most of the time.	1	16.7%
Always.	0	0.0%
Do you feel it would be helpful for patient charts to contain information with their preferred learning style and health literacy level?		
Yes.	1	16.7%
No.	5	83.3%

Focus Group Answers

A focus group was held with the FNP and the two nurses at the Bowman Clinic on December 7, 2021, as this was the group of individuals who implemented the tools into practice for the two month period. The session was held via Zoom and lasted 10 minutes. There were five questions (Table 7) that assessed whether the nurses and FNP were able to see the health literacy and learning style results in the patients' charts and if seeing this information changed how they interacted with their patients. The response rate was 100%, as all five questions were answered by the FNP, RN, and LPN. One of the participants stated that she did like having the health literacy and learning style results available to her in the charts; however, she also pointed out that sometimes, she forgot to look for this information prior to her patient encounter. She reported after the project took place, she did find herself considering her patients' potential learning styles and health literacy levels more but that these thoughts very often occurred after the visit had taken place. After the visit, she would consider other teaching methods she possibly could have considered to help the patient learn more. She reported the intervention of assessing patients' health literacy and learning styles "sometimes" changed how she interacted with patients after the project was over. While one of the participants felt that this prompted her to change her interaction with the patient, the other two participants did not feel the project encouraged them to interact differently with the patients.

Table 7

Focus Group Questions and Responses

Questions	Responses
Did you like having notes in the patient charts with the health literacy and learning style information?	"Yes, though I didn't always remember to look for it."
Could you easily see the note, and did it prompt you to utilize different teaching methods to individualize your education?	"It is on the face sheet and not difficult to find, but we did not always see a lot of these patients again before the end of the study. I did sometimes remember to utilize different teaching methods."
Do you find yourself thinking about patients' health literacy level during your interactions?	"Usually; I didn't think about it so much during the visit as after. I often considered things I should have taught differently to accommodate afterwards when documenting."
Do you find yourself thinking about patients' preferred learning style?	"Not really after the chart is completed."
Did the intervention change how you interact with your patients?	"Sometimes, if I remembered to consider their learning style when teaching."

CHAPTER 5. DISCUSSION AND RECOMMENDATIONS

Interpretation of Results

In summary, low health literacy is a prominent issue in the United States, and gaps still exist in knowledge of this problem among healthcare professionals (Fabbri et al., 2018; Rajah et al., 2018). Prior to the educational session, knowledge deficits were identified among healthcare providers regarding lower health literacy in rural populations and in recognizing risk factors for low health literacy. While the percentage of providers that answered these questions correctly on the post-test increased, there continues to be gaps in knowledge related to risk factors of low health literacy and tools available to test health literacy and learning styles. Additionally, most of the healthcare providers participating in this project noted that they do not utilize tools to assess patients' health literacy and preferred learning style.

Lack of testing for health literacy and learning style in healthcare settings, as well the detriment low health literacy may have for patients and their health, is well documented in literature (Giuse et al., 2012; Peyman et al., 2014; Rajah et al., 2018). Low health literacy may impede an individual's ability to obtain and comprehend health information, utilize health services, and engage in self-care behaviors, posing serious consequences (Hewitt et al., 2019; Masoompour et al., 2017; Temple, 2017). Although low health literacy levels have been connected to worse patient health outcomes, many healthcare providers still do not recognize the health literacy status of their patients, nor do they have tools readily available to them to create interventions for those with low health literacy (Giuse et al., 2012; Peyman et al., 2014; Rajah et al., 2018). This is true of the clinic in this project, as there were no current tools being used by providers to test health literacy or preferred learning styles. By regularly screening patients' health literacy and preferred learning styles and having this information available in the patients'

computer charts, healthcare providers would have access to important information that could help them save time, as well as potentially improve patient satisfaction and outcomes.

The purpose of this practice improvement project was to assess health literacy and preferred learning styles in a rural area, utilize evidence-based research to educate healthcare providers about health literacy and learning styles, and provide tools for them to incorporate into clinical practice. Through this project, healthcare providers were encouraged to tailor their teaching to each individual patient's learning needs, which has the potential to improve patient education and increase patient comprehension of health education. A synthesis of the main findings and results of each objective have been interpreted and are reviewed in the following sections.

Objective One

Objective one was aimed at assessing patients' health literacy levels and documenting the results in their computer chart. To provide effective patient education, healthcare providers must assess the heath literacy of their patients (Weinhold & Gurtner, 2014). Evaluating health literacy is important to determine a patient's level of comprehension, as no two patients are the same when it comes to learning (Blakely, 2016). The REALM tool was utilized to measure the health literacy of 100% (N=27) of the patient participants. The results can be seen in Table 2. The results were then documented in all 27 (100%) participants' computer charts, accomplishing this objective.

The majority of participants "agreed" or "strongly agreed" that they comprehend the health information provided to them by healthcare professionals. Most of these participants had a high school health literacy level, showing that they likely do understand what their healthcare provider is telling them. However, some of these participants also had a lower health literacy

level, at the 7th-8th grade level. Therefore, these participants may not be understanding as much of the health information as they feel they are. In fact, many patients fail to identify their insufficiency in comprehension of information and overestimate their ability to recall important information (Hersh et al., 2015; Wong et al., 2014). This could be due to lack of awareness of what they did and did not understand or even embarrassment at their difficulty in understanding instructions, which further demonstrates the importance of utilization of health literacy assessment tools in the clinic setting (Marquez & Ladd, 2019).

When comparing the health literacy score of males to females, females often have a higher health literacy level (Lee et al., 2015). The results of the NAAL support this finding, as well as several other studies (Kutner et al., 2006; Moser et al., 2015; Wong et al., 2014). In this project, more females had a high school health literacy level than males. There were more female participants in the project than male participants; however, these results may suggest women are more likely to seek healthcare. According to Lee et al. (2015), these results have been produced in other studies as well and may be associated with women being more familiar with the healthcare system, as women tend to report more health problems and have higher usage of medical services. Another relevant explanation is that women traditionally have the role as of the family caretaker. This role provides women with more opportunities to interact with the healthcare system, helping to build their knowledge base, and likely resulting in higher health literacy levels than men.

Another comparison made in this project was education level with health literacy level. The results of the NAAL demonstrated that adults who had completed a high school education or higher often had higher health literacy levels (Kutner et al., 2006). However, a person's education level does not always necessarily relate to their health literacy level, as evidenced by

the results of this project. Most of the participants had a high school or higher education level and also a high school health literacy level; however, there was one participant who had an elementary education level and had a high school health literacy level. There was also a participant who had a high school education level but a 7th-8th grade health literacy. Additionally, another participant had an associate degree and a 7th-8th grade health literacy level, demonstrating that differences in education level and health literacy are common. Watts et al. (2017) stated in their research that while years of school and education level are variables associated with health literacy level, they may not accurately indicate a patient's health literacy level. Some patients may have finished high school or college, may be high-functioning with professional jobs, and may articulate well in the healthcare setting but still have a lower health literacy level. Education level and health literacy level are not completely correlated, and therefore, education level alone does not provide enough information to direct care.

The NAAL results show that those age 65 and older had lower average health literacy than adults who were younger and that the percentage of adults age 65 or older with intermediate or proficient literacy levels was lower than adults in other age groups (Kutner et al., 2006). Masoompour et al. (2017) noted that increased age could lead to a decreased level of health literacy. This project presented similar results because as the age of the participants went up, the percentage of participants with high school health literacy decreased. Older age is often associated with lower literacy due to diminished cognitive performance, longer time since receiving formal education, and decreased sensory abilities (Masoompour et al., 2017). These factors may have played a role in the results of this project as well.

Objective Two

Objective two was aimed at assessing patient's learning style preferences and documenting the results in their computer chart. The measurement of learning style preferences for patients in the clinic setting is not often done, according to Giuse et al. (2012). The WRHS clinic did not have a learning style tool in place prior to this intervention. The VARK questionnaire was used to accomplish this objective and was performed on 100% (N=27) of the participants. The results can be seen in Table 3. The preferred learning styles of each of the 27 (100%) participants were documented in their charts. Therefore, this goal was successfully achieved.

The majority of participants in this project preferred more than one method to learn, or multimodal learning. These results mirror the results of other studies, such as the one by Seung (2011), which demonstrated that over half of the participants preferred a combination of learning methods. The results of studies done by Auguste et al. (2020) and Peyman et al. (2014) also showed that a majority of the participants displayed multimodal learning preferences. Multimodal learning is a common finding, as using multiple formats to learn and presenting the information in different ways may help with long-term retention of the information. However, in practice, most healthcare providers use verbal education that is supported with written materials, an approach that likely does not satisfy the needs of visual and kinesthetic learners (Bullen et al., 2017). Providers should use educational interventions that are sensitive to all types of learning needs and complement the traditional verbal and written format. Offering multimodal learning strategies may encourage patients to participate and increase their level of understanding.

The most common unimodal learning style in this project was kinesthetic, which does not match with either of the previously mentioned studies. Seung (2011) identified reading/writing

as the most common unimodal method, while the results of Auguste et al. (2020) showed that visual is the most popular unimodal learning style. Additionally, auditory was the most common learning style in the Peyman et al. (2014) study. The differences in preferred learning styles may be related to the different patient populations used in the studies and the fact that multimodal learning is popular, making each learning style equally important. Understanding how to provide education tailored to each of the learning styles is an important skill providers must possess.

Knowing the learning style of the participants in this project was helpful for the nurse practitioner because teaching styles can be adapted to match each individual's learning needs. Good communication is key to providing a high level of patient care (Hersh et al., 2015). Therefore, providers should know the learning style of their patients because this information has the potential to change the way providers communicate with their patients. If the communication is more effective, the patient is likely to understand and retain more of the information and potentially have better self-care and health outcomes.

Healthcare providers can work to meet the multimodal or unimodal learning styles of their patients by utilizing a preferred learning style tool, such as the VARK, or by simply asking their patient how they would like to be taught. With this information in mind, providers can then use the available resources at their facility to change their teaching methods. Examples may include utilizing videos, if there are any available on the specific topic needed, or simply discussing the topic for the auditory learners; using a pen and paper to draw a picture for the visual learners; a model or figure to demonstrate how a body part functions or supplies to show how to change a wound dressing for the kinesthetic learners; or a printout or brochure for the reading/writing learners (Auguste et al., 2020).

Objective Three

The third objective was directed at educating healthcare providers on health literacy, learning style, and different teaching styles. This was accomplished during the educational session and measured using the pre- and post-tests. Most healthcare facilities do not provide any education on health literacy and learning style, so this leaves healthcare providers with little to no knowledge regarding these subjects (Rajah et al., 2018). The WRHS Clinic also does not provide any formal education on these topics.

The results, seen in Table 5, showed an increase in knowledge on some questions from the pre- to post-test. Results of other questions stayed the same from pre-test to post-test, demonstrating that providers had some baseline knowledge prior to the education. Overall, providers were able to identify the definition of health literacy. However, when asked to identify patients showing risk factors for low health literacy, providers displayed mixed results, showing that this is an area where more education needs to be provided to help health professionals better identify patients at risk for low health literacy.

As previously stated, healthcare providers often have little knowledge of the health literacy of their patients, so these results are not surprising. Patients may be able to disguise low health literacy with excellent verbal abilities or a high level of education, making them seem like they would also have a high health literacy level (ODPHP, 2019). Rajah et al. (2018) revealed that healthcare providers in their study had inadequate knowledge or understanding of health literacy, including risk factors for identifying low health literacy. Healthcare providers were asked to list factors that help determine a patient's health literacy, and the three major factors identified were socioeconomic characteristics, age, and education level. While these are all determining factors, there are also many other contributors to patients' health literacy levels.

This, again, shows that more information surrounding health literacy and identification of risk factors for low health literacy is needed by healthcare providers.

Providers in this project showed knowledge of learning styles by identifying the definition of learning styles, as well as different learning interventions for each style. Both Peyman et al. (2014) and Giuse et al. (2012) agreed that information about learning style preferences and tools to measure learning styles have not received much attention in the medical field. While WRHS does not have formal education on learning styles or currently use a tool to measure their patients' learning styles, these results are encouraging as they show that providers are able to recognize different learning methods and identify how patients in each style might learn best.

The healthcare providers also rated the importance of health literacy and learning style in patient comprehension between "moderately important" and "extremely important," showing their agreement that these factors do influence how well the patient understands the health education. Assessing and utilizing the combination of health literacy and learning preferences may provide a more dynamic mechanism to enhance learning than either factor alone (Giuse et al., 2012). Overall, the results demonstrate an increased understanding of health literacy and learning styles.

Objective Four

The last objective was focused on increasing provider intent to utilize tools, such as the REALM and VARK, in their practice to make their teaching more individualized to each patient. Rajah et al. (2018) found that most healthcare providers do not formally assess the health literacy of their patients and, in fact, turn to their gut feelings as a way to estimate the health literacy level. This demonstrates the need for an accurate and verified tool for providers to utilize. After

the educational session, a greater number of providers planned to implement a tool compared to the number who reported currently using a tool. Several providers also noted specific tools they would be interested in implementing and when would be the best time to implement these tools. Overall, the results demonstrated an intent to implement a health literacy or preferred learning style tool into their practice.

Most of the healthcare providers reported they would be interested in implementing the VARK questionnaire. The providers also identified that the best time to potentially implement a tool would be during an annual wellness visit, during a first visit with a new patient, or prior to the visit. The theme in these answers was that there is typically more time during these types of visits. Contradictorily, the most common barrier to implementation of a tool identified by the providers was time. Time has been frequently mentioned as a barrier by healthcare providers in other studies as well (Rajah et al., 2018; Seung, 2011). There can be a large work burden in busy clinic settings that have numerous patients waiting to be seen. If healthcare providers spend extra time implementing new tools, this may restrict the time they can spend with their patients and be seen as unproductive.

Though time may be a barrier to utilizing tools such as the VARK or REALM, there are ways to combat this issue. Some possible interventions were identified by the providers themselves, such as having the patient fill out the questionnaire before they come to their visit, perhaps in an online format. Another suggestion was to have the nurses administer the tools during the patient intake. Rajah et al. (2018) also agreed with utilizing other members of the healthcare team to accomplish these tasks. There are also other options for tools that can be used to measure health literacy and learning styles, such as the Newest Vital Sign, Health Literacy Questionnaire, Myers-Briggs Type Indicator, among various other tools. Some of these tools

contain less questions, making them shorter and quicker to use. Providers can also consider asking patients how they learn best and if there are any specific methods that would be beneficial for the provider to try to incorporate into the visit.

The focus group with the FNP, RN, and LPN, as well as the follow-up survey with the healthcare provider participants, provided insight as to whether the project and educational session encouraged them to change how they interacted with the patients. The RN and LPN did not feel the project encouraged them to interact differently with patients, which may have been because the nurses did not place the patients' health literacy and learning style results into the patients' charts, and therefore, did not know where to look to find the information. Many of the healthcare providers felt the project prompted them to individualize their teaching methods and patient interactions. These findings are consistent with the research by Campbell et al. (2019), where the authors determined having information on patients' health literacy is clinically useful to primary care providers. Having this information available in the patient's computer chart or electronic health record could help providers with managing patients' care and lead to additional interventions. Despite this evidence, there was only one participant on the follow-up survey who felt that having patient health literacy and learning style information available in the chart would be helpful, demonstrating the continued gaps in this area and the need for improvement. Mor-Anavy et al. (2021) recommended making health literacy a priority for the entire healthcare team. While the nurses in this project did not feel the project made a difference in their interactions with patients, research does suggest including nurses in health literacy interventions could lead to improved communication and better patient outcomes (Ballard & Hill, 2016; Blakely, 2016; Mor-Anavy, 2021). Nurses frequently provide education to patients and may be able to explain the information in a different way than the information shared by the provider.

Therefore, clear and concise communication is necessary for nurses as they are in a unique position to serve as mediators for the patient and the healthcare team (Ballard & Hill, 2016).

Effectiveness of the Theoretical Framework

The Adult Learning Theory was utilized as the theoretical framework to guide this project. This theory was chosen because the project focused on adult learning and required an understanding of how adults learn. This theory also lays out a process in which the learners must be very motivated and take an active role in bettering their education, which was important for this project to be successful (Decelle, 2016). Each of the six assumptions helped to guide steps in this project. The first assumption, "the need to know," helped to guide the purpose of the project, while the second and third assumptions assisted in recognizing how to utilize the participants' past experiences and current knowledge to create interventions. Assumption four, "readiness to learn," influenced the objectives of the project. Assumptions five and six provided direction on how to apply the interventions and encourage healthcare providers to make changes to their current practice and continue to educate themselves.

The Iowa Model, an evidence-based practice model, was also used in this project due to its applicability and adaptability to any situation (Melnyk & Fineout-Overholt, 2019). The step-wise process of the model guided each step of the process, allowing the coinvestigator to evaluate and adjust as needed, leading to improved practice. The use of an evidence-based practice model such as this enhanced the success of the project.

Overall, the use of a theoretical framework and practice model within this project was beneficial. The Iowa Model was an effective way to evaluate each step of the project and provided a structure for determining the next step (Melnyk & Fineout-Overholt, 2019). The Adult Learning Theory provided direction and guidance for the project by assisting the

coinvestigator to understand the key pieces involved in adult learning, as well as how to apply the project to each of the six assumptions (Decelle, 2016). The coinvestigator would recommend the use of the Adult Learning Theory and Iowa Model for future practice improvement projects.

Implications for Advanced Practice Nursing

Nursing has been described as both an art and a science by many (Motter, Hassler, & Anthony, 2021). Science serves as the foundation of advance nursing practice, which is a necessity to continue serving the health needs of humans. The art aspect defines the nurse's ability to show compassion, as well as the ability to care and communicate. The advanced practice nurse utilizes both of these aspects when considering the health literacy and preferred learning styles of their patients during patient education. Consideration of health literacy and learning style when teaching demonstrates patient-centered care and assists patients in understanding health information and reaching their health goals.

Patient-centered care has long been an underpinning of nursing practice (Seung, 2011). Patient-centered care relies on healthcare providers being in tune to the needs, values, and preferences of the patients for whom they are providing care (Health Leads, 2018). The advanced practice nurse is in an excellent position to practice patient-centered care by recognizing the health literacy and learning styles of their patients and utilizing this information to incorporate new interventions into routine practice.

The role of advanced practice nurses has been expanding, especially in rural primary care positions, which is a perfect setting to begin addressing the issue of low health literacy (Redford, 2019). Furthermore, advanced practice nursing has progressed to a Doctor of Nursing Practice (DNP) degree. The DNP degree allows the advanced practice nurse to be educated on delivering patient-centered care and emphasizes evidence-based practice (Androus, 2021). Through

evidence-based practice and utilization of verified tools, advance practice nurses can maximize their knowledge of low health literacy and implement interventions to improve patient understanding. Tools such as the REALM and VARK can help advanced practice nurses to recognize individual patient needs and help them to provide appropriate health information in the manner that will be best understood by the patient (Auguste et al., 2020; Giuse et al., 2012). Effective communication of health information may positively influence patients' ability to provide care for themselves and improve their health outcomes (Hersh et al., 2015; Masoompour et al., 2017).

This practice improvement project helped to build awareness of health literacy among rural primary care providers, which has been shown to be beneficial for both providers and their patients (Campbell et al., 2019; Mor-Anavy et al., 2021). The educational session provided a means for the coinvestigator to report the results of the assessment of patient health literacy, as well as information about health literacy and learning styles. The interactive discussion among the healthcare providers and the coinvestigator allowed the participants to ask important questions and gain knowledge. Additionally, an anticipated benefit of the educational session is that healthcare providers were encouraged to perform their own research on health literacy, learning styles, and available tools and consider how these could be implemented into their practice (Mor-Anavy et al., 2021). Spreading awareness of the importance of assessing health literacy and learning style promotes health promotion and disease prevention, which are key concepts of the care provided by advanced practice nurses.

Recommendations for Future Practice

Given the feedback from the healthcare providers in this project, one recommendation for practice is to include health literacy and preferred learning style screening tools within the

primary care setting. Primary care clinics have been cited in numerous studies as a good choice for implementing these screening tools (Altin & Stock, 2016; Brega et al., 2015; Campbell et al., 2019; Mor-Anavy et al., 2021). Brega et al. (2015) stated that patient outcomes can be improved if primary care practices address health literacy in the office setting and make health literacy screening part of clinical procedures. Altin and Stock (2016) stated that healthcare organizations should become more responsive to low health literate patients by redesigning their processes to help these patients understand and use health information and services. The authors encourage healthcare organizations to move from disease-oriented care to patient-centered care. This type of change is especially relevant for primary care, which is a setting where inequalities in health literacy can be reduced. Mor-Anavy et al. (2021) agreed that health literacy needs to be addressed in the community clinic setting versus in the hospital setting, as patients in this setting require support and encouragement to provide adequate care for themselves. Campbell et al. (2019) also reported that the identification of low health literacy within primary care is important as this is a setting where vital care and guidance is provided.

Mor-Anavy et al. (2021) discussed a survey that describes interventions that can be performed during a clinic visit to improve the experience of patients with low health literacy. The first intervention was to make the improvement of health literacy a group effort, beginning at the reception desk, to the nurse, to the healthcare provider. The second intervention is to use standard health communication tools, as well as use simple language and educational materials during patient interactions. The patient and provider should also work together to determine treatment goals. Lastly, the healthcare organization should create an environment that promotes awareness of low health literacy and encourages learning. These interventions were utilized within this project by including the nurses and the receptionist, as well as the healthcare

providers, in facilitating the project, using standard educational tools to explain topics to the patients, and generating an environment that recognized low health literacy and applied interventions to stimulate learning.

Just as health literacy screening in the primary care setting is important, so is assessing patients' learning styles (Inott & Kennedy, 2011). Studies by both Giuse et al. (2012) and Koonce et al. (2015) looked at the implementation of preferred learning style screening in the clinic setting. In both studies, there were positive and encouraging results that supported the implementation of preferred learning style screening for patients. Bullen et al. (2017) also discussed the need for assessment of patient learning styles in patients who are receiving diabetic foot care education in the clinic. The authors state that patients' individual learning needs and preferences should be taken into consideration, as this promotes effective self-care behaviors. New approaches to patient education should be promptly integrated into clinical practice and should complement the educational formats that are already being used. These interventions should include techniques that are sensitive multimodal learning preferences as well (Bullen et al., 2017). To deliver health education in a variety of formats, patients' learning style preferences must first be assessed in primary care. Research should also continue to be done on learning style preferences in rural populations as there is a gap in the literature on this topic.

Screening As Part of Annual Wellness Exam

As recommended by the healthcare providers within this project, annual wellness exams may be a good place to incorporate the screening tools. Suggestions were made to include the tools as part of the paperwork that patients fill out prior to the visit or as part of the intake forms the nurses complete during rooming the patient. Further research is needed to identify the effects of the implementation of these screening tools at the annual wellness exam. Regardless of where

in the clinic visit these screening tools are implemented, providers should remember to avoid stigmatization of low health literacy levels (Chandra et al., 2018).

Routine Education for the Healthcare Team

Another recommendation is that healthcare facilities should also provide routine education for their healthcare team on health literacy and learning styles. To promote health literacy among patients and improve their overall health, providers must acquire skills related to assessing health literacy and implement strategies and interventions to assess health literacy (Mor-Anavy et al., 2021). Healthcare providers should be trained on health literacy to raise awareness and increase their knowledge, help identify needs in their healthcare organization, and improve interpersonal and organizational communication. According to Campbell et al. (2019), when primary care providers know the health literacy status and learning style of their patients, they are more likely to change and adapt their teaching style to correspond with the level of understanding of the patient. The authors also discussed that when providers make these changes, there is a reduction in emergency department visits and hospitalizations, a decrease in the severity of disease, and an improvement in disease management and self-care abilities in patients.

Use of Pre-Designed Tools

Healthcare organizations can implement interventions related to health literacy and learning style by using a pre-designed tool to guide their practice. The Agency for Healthcare Research and Quality has designed a toolkit with the purpose of providing evidence-based guidance to primary care practices as the work to address health literacy (Brega et al., 2015). The Health Literacy Universal Precautions Toolkit provides simple steps that may help healthcare organizations decrease the complexity of their healthcare, increase their patients' understanding

of health information, and support patients at all literacy levels. The Toolkit may help facilities that have never addressed health literacy, as well as those that are already working to improve the health literacy of their patients.

The first step is to form a team that will work together to plan and implement health literacy-related interventions (Brega et al., 2015). The team should hold regular meetings, as well as have educational meetings for other staff to attend. An action plan should be created with health literacy improvement goals that are time-specific and achievable. A health literacy screening tool should be identified and then how to implement the tool in the clinic setting should be determined. Lastly, measures of success and an evaluation plan should be established. There are also other guides within the Toolkit that help healthcare facilities with raising awareness, patient communication, addressing language and cultural differences, and using health educational materials effectively, all of which work to address health literacy. A process similar to this may help primary care clinics in establishing a process to implement both a health literacy and preferred learning style screening tool.

Utilization of Various Teaching Strategies

The last recommendation is that healthcare providers should include a variety of teaching methods in their practice to support patients with limited health literacy. Adaptation of patient-provider communication strategies and style has been shown to benefit patients (Campbell et al., 2019). As discussed previously, healthcare organizations may implement specific interventions that target the improvement of patients' health literacy skills, or they may respond to the health literacy needs of patients by encouraging providers to change the way they interact with patients (Altin & Stock, 2016). Altin and Stock (2016) suggested providers switch to patient-centered communication, which focuses on the patient's preferences and values and also takes into

consideration the patient's resources and skills. One potential intervention the authors suggest to begin making these changes is to hold trainings for healthcare staff that provide them with the skills to use standardized communication tools such as the teach-back method and the chunk and check method. Providers should also use plain language without medical jargon. Recommendations are made for using audio and visual health information to augment written information and ensuring educational materials are adjusted to the reading level of patients with low health literacy. Campbell et al. (2019) also noted these interventions and adds that focusing on key teaching points may benefit the patient.

Recommendations for Future Practice Improvement Projects

Since low health literacy will likely always be a problem in healthcare, there is great likelihood that others will conduct practice improvement projects similar to this one. For future projects, some recommendations include offering more than one educational session for healthcare providers to attend, including more providers in the project, receiving approval for the educational session to be counted towards continuing education credits, and being available at the implementation site to discuss the project with the potential patient participants. Additionally, there may be benefit in meeting with participants directly to discuss the practice improvement project in order to increase participation and ensure the same number of participants complete both the pre- and post-tests. Another intervention that may improve participation is having the pre- and post-tests taken in person prior to the educational session and directly following. Implementing the project over a longer period of time may help to better determine if having patients' health literacy and learning style information available in the computer charts was helpful at follow-up visits.

Another recommendation is to include more nurses in the project, as patient education is an essential part of their job. Nurses must know how to use different teaching methods to make the education clear and concise (Ballard & Hill, 2016). Future projects should consider a discussion with the nurses taking part in the project to gain their support for the project in an effort to make the project more successful. An educational session on health literacy and preferred learning style specific to the nurse's role may help them gain a better understanding of health literacy, enable them to recognize patients at risk for low health literacy, and encourage them to utilize a variety of teaching methods during patient education.

The front desk staff should be considered essential team members in the project. Since the receptionist is the person who first asked the patients if they would like to participate in the project, the receptionist should be provided education on what the project is about and the importance of assessing health literacy and learning styles. Future projects may also consider gathering information from the receptionist regarding the burden of explaining the project to patients, as well as handing out the informed consent. The receptionist may potentially have insight as to why some patients participated and why others did not participate.

Finally, future projects should consider checking in regularly with the project site and team members throughout the project implementation. This will help ensure all steps of the project are being completed accurately and according to the plan, as well as allow for revision and changes, if necessary. The coinvestigator may want to be present for one or more days of project implementation at the beginning the project to confirm participants' understanding of the process.

Project Limitations

After implementation and evaluation of the practice improvement project, limitations were noted. One limitation that was identified was a small sample size of patients. There was also a difference in the response rates between the pre- and post-tests and follow-up survey, as well as with the number of attendees at the education session. Furthermore, the coinvestigator was familiar with the setting of the project and some of the participating healthcare providers. Lastly, the nurses at the project site administered the tools but did not place the results into the patient charts.

The first limitation is a small sample size in regard to patient participants, which affects the generalizability of the results. A greater number of patient participants would have allowed for greater variability in the demographic factors and health literacy levels. Contributing to the lower number of patient participants were factors such as implementation of the project on certain days based on clinic preference, the COVID-19 pandemic, and limitation of time. Other factors included that the FNP saw many children during the two-month implementation period, and the FNP was out of office for a vacation during the implementation period.

The difference in response rates between the pre- and post-tests, follow-up survey, and number of providers at the education session is the second limitation. There were 13 providers who took the pre-test, 12 who attended the education session, and 10 who took the post-test. Therefore, difference in the response rates creates difficulty when trying to compare the data from the pre- and post-tests. The percentage of increase shown in each question within the knowledge-based questions and the changes in the Likert scale questions may not be accurately represented. Because the pre- and post-tests did not have identifiers, the coinvestigator was not able to track which providers completed both, which would have allowed the coinvestigator to

eliminate the pre-tests of those who did not respond to the post-test. There were six providers who responded to the follow-up survey, making the response rate 50% of those who attended the education session. One factor contributing to the lower response rate may have been due to the four medical students who attended no longer placed at the facility.

During the focus group, the coinvestigator learned that although the nurses at the clinic had administered the health literacy and preferred learning style screening tools, they had not placed the results in the charts, as was originally planned. The FNP was the one to place them in a note in the patients' charts. This created a limitation as the nurses then did not know where to look for the information and did not use it to alter their interactions with the patients. The nurses also reported they did not find themselves considering patient learning styles or health literacy after the project, which may be due to their limited involvement with the project.

Dissemination

The final step of this practice improvement project is to disseminate the results. Prior to the completion of the project, some results were shared through a poster presentation at the North Dakota Nurse Practitioner Association Pharmacology Conference in September 2021. Results were also shared with the healthcare providers who attended the education session. The results were shared with the CMO and WRHS upon completion of the project. The results of the project will be disseminated in a three-minute thesis video as well. The final dissertation will be published and shared to the ProQuest database on the NDSU Library's website. Additional opportunities for dissemination will continue to be explored.

Conclusion

Overall, this practice improvement project was successful. The problem of low health literacy in rural populations was addressed, and each of the objectives were achieved. The

coinvestigator was also able to educate a group of rural healthcare providers and provide them with tools to work into their current practice if they so choose. Initiating a change in their practice to address health literacy levels and learning styles has the potential to improve patient-provider communication and impact patient care and health outcomes (Imoisili et al., 2017).

Health literacy is an important determinant of health outcomes and self-care behaviors (Masoompour et al., 2017). An adequate health literacy level is essential for patients to be successful in caring for themselves. Not only is health literacy of utmost importance, but so, too, is preferred learning style when it comes to teaching patients and ensuring they are comprehending the information. Thus, healthcare providers have a responsibility to become more aware of their patients' health literacy levels and preferred learning styles. This information provides them with the details of each patient's possible level of understanding and limits, as well as gives them the ability to initiate interventions to improve the effectiveness of their patient education. Making these changes has the potential to improve patient satisfaction, quality of care, and overall health outcomes.

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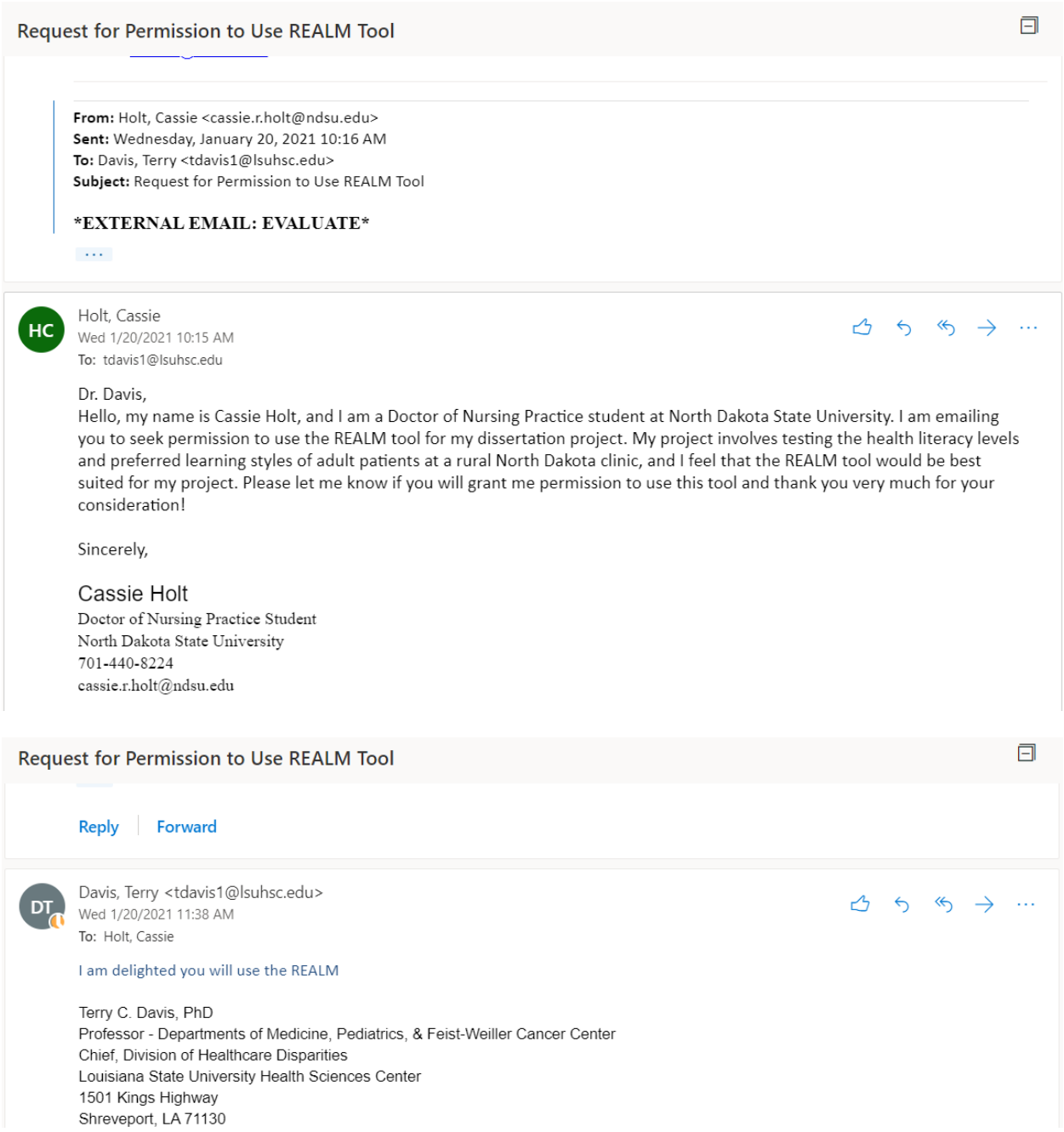
APPENDIX A. PERMISSION TO USE RAPID ESTIMATE OF ADULT LITERACY IN MEDICINE TOOL



Request for Permission to Use REALM Tool

From: Holt, Cassie <cassie.r.holt@ndsu.edu>
Sent: Wednesday, January 20, 2021 10:16 AM
To: Davis, Terry <tdavis1@lsuhsc.edu>
Subject: Request for Permission to Use REALM Tool

EXTERNAL EMAIL: EVALUATE

HC

Holt, Cassie
Wed 1/20/2021 10:15 AM
To: tdavis1@lsuhsc.edu

Dr. Davis,
Hello, my name is Cassie Holt, and I am a Doctor of Nursing Practice student at North Dakota State University. I am emailing you to seek permission to use the REALM tool for my dissertation project. My project involves testing the health literacy levels and preferred learning styles of adult patients at a rural North Dakota clinic, and I feel that the REALM tool would be best suited for my project. Please let me know if you will grant me permission to use this tool and thank you very much for your consideration!

Sincerely,

Cassie Holt
Doctor of Nursing Practice Student
North Dakota State University
701-440-8224
cassie.r.holt@ndsu.edu

Request for Permission to Use REALM Tool

Reply | Forward

DT

Davis, Terry <tdavis1@lsuhsc.edu>
Wed 1/20/2021 11:38 AM
To: Holt, Cassie

I am delighted you will use the REALM

Terry C. Davis, PhD
Professor - Departments of Medicine, Pediatrics, & Feist-Weiller Cancer Center
Chief, Division of Healthcare Disparities
Louisiana State University Health Sciences Center
1501 Kings Highway
Shreveport, LA 71130

APPENDIX B. RAPID ESTIMATE OF ADULT LITERACY IN MEDICINE TOOL

List 1	List 2	List 3
fat	fatigue	allergic
flu	pelvic	menstrual
pill	jaundice	testicle
dose	infection	colitis
eye	exercise	emergency
stress	behavior	medication
smear	prescription	occupation
nerves	notify	sexually
germs	gallbladder	alcoholism
meals	calories	irritation
disease	depression	constipation
cancer	miscarriage	gonorrhea
caffeine	pregnancy	inflammatory
attack	arthritis	diabetes
kidney	nutrition	hepatitis
hormones	menopause	antibiotics
herpes	appendix	diagnosis
seizure	abnormal	potassium
bowel	syphilis	anemia
asthma	hemorrhoids	obesity
rectal	nausea	osteoporosis
incest	directed	impetigo

Score Interpretation

Table 3

Raw Score	Grade Range Equivalent	Literacy Skills
0 - 18	3rd Grade and Below	Will not be able to read most low-literacy materials; probably not able to read appointment and prescription labels/warning labels. Will need repeated, individual oral instructions.
19 - 44	4th to 6th Grade	Will need low literacy materials with accompanying verbal instructions; may not be able to read low literacy materials independently.
45 - 60	7th to 8th Grade	Will struggle with many patient education materials; may be able to pronounce words but not fully comprehend the message
61 - 66	High School	Will be able to read most patient education materials; will not be offended by low literacy materials

APPENDIX C. VARK QUESTIONNAIRE

visual * aural * read/write * kinesthetic

VARK®

a guide to learning styles

The VARK Questionnaire (Version 8.01)

How Do I Learn Best?

Choose the answer which best explains your preference and circle the letter(s) next to it.
Please **circle more than one** if a single answer does not match your perception. Leave blank any question that does not apply.

1. I need to find the way to a shop that a friend has recommended. I would:
    a. find out where the shop is in relation to somewhere I know.
    b. ask my friend to tell me the directions.
    c. write down the street directions I need to remember.
    d. use a map.

2. A website has a video showing how to make a special graph or chart. There is a person speaking, some lists and words describing what to do and some diagrams. I would learn most from:
    a. seeing the diagrams.
    b. listening.
    c. reading the words.
    d. watching the actions.

3. I want to find out more about a tour that I am going on. I would:
    a. look at details about the highlights and activities on the tour.
    b. use a map and see where the places are.
    c. read about the tour on the itinerary.
    d. talk with the person who planned the tour or others who are going on the tour.

4. When choosing a career or area of study, these are important for me:
    a. Applying my knowledge in real situations.
    b. Communicating with others through discussion.
    c. Working with designs, maps or charts.
    d. Using words well in written communications.

5. When I am learning I:
    a. like to talk things through.
    b. see patterns in things.
    c. use examples and applications.
    d. read books, articles and handouts.

6. I want to save more money and to decide between a range of options. I would:
    a. consider examples of each option using my financial information.
    b. read a print brochure that describes the options in detail.
    c. use graphs showing different options for different time periods.
    d. talk with an expert about the options.

7. I want to learn how to play a new board game or card game. I would:
    a. watch others play the game before joining in.
    b. listen to somebody explaining it and ask questions.
    c. use the diagrams that explain the various stages, moves and strategies in the game.
    d. read the instructions.

8. I have a problem with my heart. I would prefer that the doctor:
    a. gave me something to read to explain what was wrong.
    b. used a plastic model to show me what was wrong.
    c. described what was wrong.
    d. showed me a diagram of what was wrong.

9. I want to learn to do something new on a computer. I would:
    a. read the written instructions that came with the program.
    b. talk with people who know about the program.
    c. start using it and learn by trial and error.
    d. follow the diagrams in a book.

10. When learning from the Internet I like:
    a. videos showing how to do or make things.
    b. interesting design and visual features.
    c. interesting written descriptions, lists and explanations.
    d. audio channels where I can listen to podcasts or interviews.

11. I want to learn about a new project. I would ask for:
    a. diagrams to show the project stages with charts of benefits and costs.
    b. a written report describing the main features of the project.
    c. an opportunity to discuss the project.
    d. examples where the project has been used successfully.

12. I want to learn how to take better photos. I would:
    a. ask questions and talk about the camera and its features.
    b. use the written instructions about what to do.
    c. use diagrams showing the camera and what each part does.
    d. use examples of good and poor photos showing how to improve them.

13. I prefer a presenter or a teacher who uses:
    a. demonstrations, models or practical sessions.
    b. question and answer, talk, group discussion, or guest speakers.
    c. handouts, books, or readings.
    d. diagrams, charts, maps or graphs.

14. I have finished a competition or test and I would like some feedback. I would like to have feedback:
    a. using examples from what I have done.
    b. using a written description of my results.
    c. from somebody who talks it through with me.
    d. using graphs showing what I achieved.

15. I want to find out about a house or an apartment. Before visiting it I would want:
    a. to view a video of the property.
    b. a discussion with the owner.
    c. a printed description of the rooms and features.
    d. a plan showing the rooms and a map of the area.

16. I want to assemble a wooden table that came in parts (kitset). I would learn best from:
    a. diagrams showing each stage of the assembly.
    b. advice from someone who has done it before.
    c. written instructions that came with the parts for the table.
    d. watching a video of a person assembling a similar table.

visual * aural * read/write * kinesthetic

VARK®

a guide to learning styles

The VARK Questionnaire – Scoring Chart

Use the following scoring chart to find the VARK category that each of your answers corresponds to. Circle the letters that correspond to your answers.

e.g. If you answered b and c for question 3, circle V and R in the question 3 row:

Question	a category	b category	c category	d category
3	K	V	R	A

Scoring Chart

Question	**a** category	**b** category	**c** category	**d** category
1	K	A	R	V
2	V	A	R	K
3	K	V	R	A
4	K	A	V	R
5	A	V	K	R
6	K	R	V	A
7	K	A	V	R
8	R	K	A	V
9	R	A	K	V
10	K	V	R	A
11	V	R	A	K
12	A	R	V	K
13	K	A	R	V
14	K	R	A	V
15	K	A	R	V
16	V	A	R	K

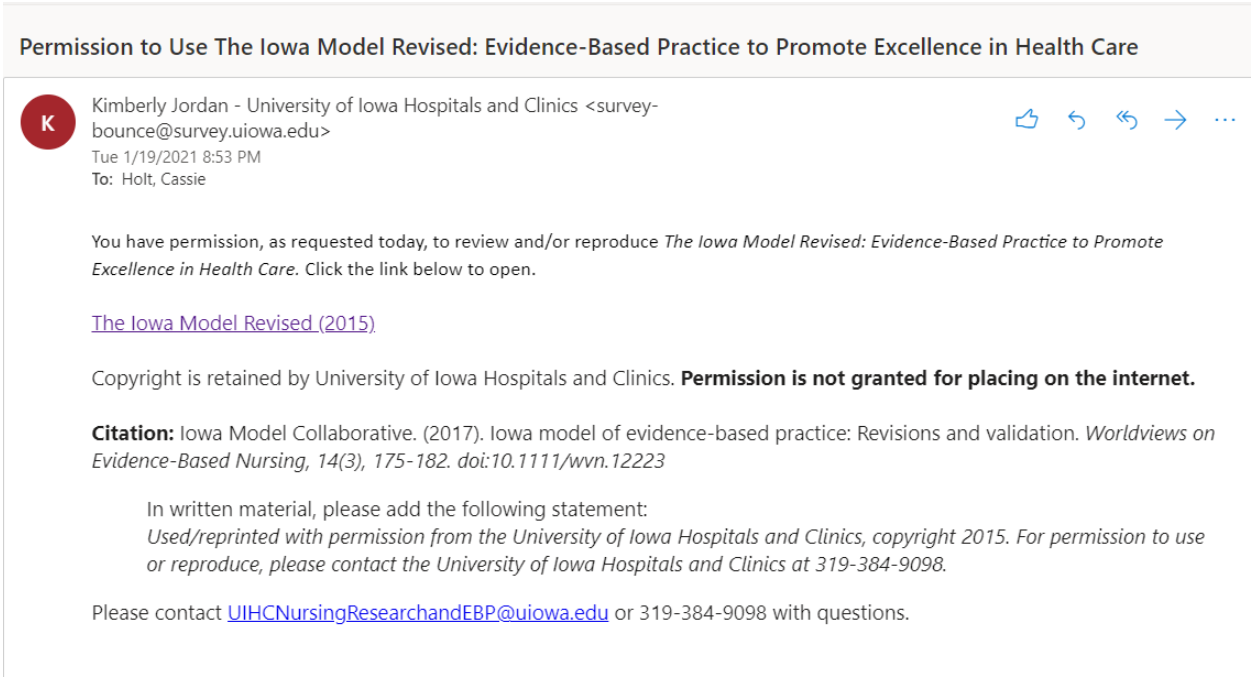
Calculating Your Scores

Count the number of each of the VARK letters you have circled to get your score for each category:

Total number of **V**s circled =	
Total number of **A**s circled =	
Total number of **R**s circled =	
Total number of **K**s circled =	

Fill in the questionnaire online at http://vark-learn.com/the-vark-questionnaire/ to find out your VARK learning preference.

APPENDIX D. PERMISSION TO USE THE IOWA MODEL OF EVIDENCE-BASED PRACTICE



Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

K

Kimberly Jordan - University of Iowa Hospitals and Clinics <survey-bounce@survey.uiowa.edu>
Tue 1/19/2021 8:53 PM
To: Holt, Cassie

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

The Iowa Model Revised (2015)

Copyright is retained by University of Iowa Hospitals and Clinics. **Permission is not granted for placing on the internet.**

Citation: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

In written material, please add the following statement:
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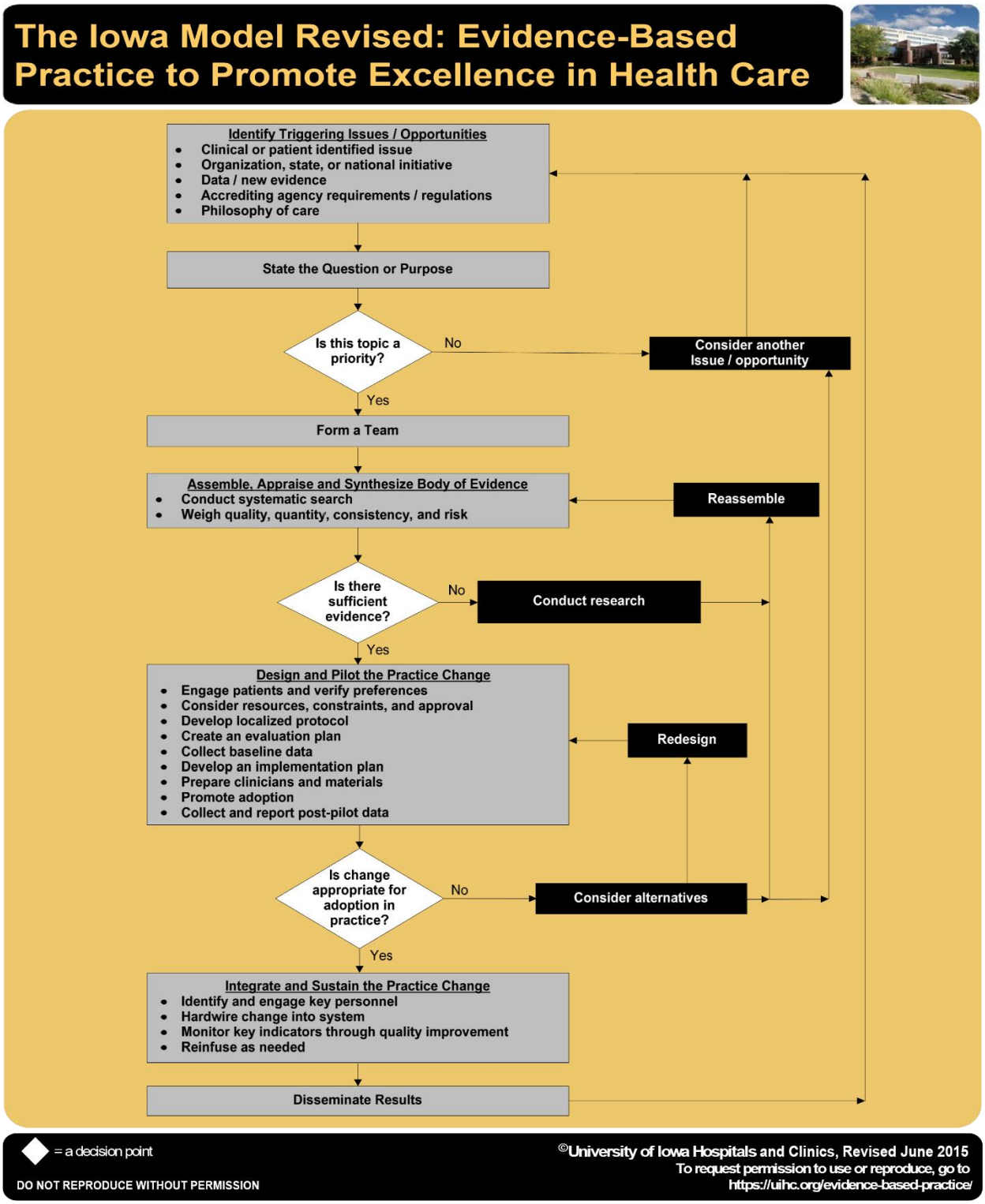
Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

APPENDIX E. THE IOWA MODEL OF EVIDENCE-BASED PRACTICE



APPENDIX F. HEALTHCARE PROVIDER CONSENT TO PARTICIPATE

NDSU | SCHOOL OF NURSING

Assessment of Health Literacy and Preferred Learning Style of Patients in a Rural North Dakota Primary Care Clinic

My name is Cassie Holt, and I am a graduate student in the Doctor of Nursing Practice program at North Dakota State University (NDSU). I am doing a practice improvement project to increase healthcare provider awareness of the health literacy levels and learning styles of adult patients in the rural population. A proficient health literacy level allows patients to understand complex health information and make informed decisions.

Health Literacy- the ability to obtain, process, and understand basic health information and services to make appropriate health decisions.

Purpose of this project:

- To assess the health literacy levels and preferred learning style of patients
- To educate healthcare providers on health literacy and teaching methods
- To enhance patient education and learning by encouraging providers to individualize patient teaching

Because you are a healthcare provider at West River Health Services, you are invited to participate in this project. If you agree to participate, you will be asked to:

- Attend an educational session on health literacy and preferred learning styles
- Complete a post-test following the educational session
- Complete a survey 2 months after the educational session

Your results will from each of these will be kept confidential and will only be used by myself to gather generalized data for the purpose of this project.

If you choose to participate, please do not write any identifying information on the questionnaire. Your information will be kept confidential, and you will not be identifiable in the overall results. Your results and information will be combined with other participants' information and be reported in sum only. The results will be part of my Doctor of Nursing Practice dissertation at NDSU and may be published in a professional journal, but again, no personal or identifying information will be used.

Participation in the project is voluntary. You will not incur cost, nor will you be reimbursed for participation. The total expected time commitment for participation is 30 minutes. If you feel uncomfortable in any way while filling out the questionnaire or post-test, you have the right to decline to answer any question(s) and/or stop at any time without consequence.

If you have any questions about completing the questionnaires or participation, please feel free to contact me at 701-440-8224 or at cassie.r.holt@ndsu.edu. You can also contact my advisor, Dr. Allison Peltier at allison.peltier@ndsu.edu.

You have rights as a project participant. If you have questions about your rights or complaints about this project, you may talk to the me or contact the NDSU Human Research Protection Program at 701-231-8995 or 855-800-6717, by email at ndsu.irb@ndsu.edu, or by mail at NDSU HRPP Office, NDSU Dept. 4000, and P.O. Box 6050, Fargo, ND 58108-6050.

Thank you for your time and consideration.

Sincerely,

Cassie Holt, RN, BSN, DNP-S

APPENDIX G. PATIENT CONSENT TO PARTICIPATE

NDSU | SCHOOL OF NURSING

Assessment of Health Literacy and Preferred Learning Style of Patients in a Rural North Dakota Primary Care Clinic

My name is Cassie Holt, and I am a graduate student in the Doctor of Nursing Practice program at North Dakota State University (NDSU). I am doing a project to increase healthcare provider knowledge of the health literacy levels and learning styles of adult patients in rural areas. A high health literacy level helps a person understand difficult health information and make educated choices.

Health Literacy- the ability to obtain, process, and understand basic health information and services to make appropriate health decisions.

Purpose of this project:

- To assess the health literacy levels and preferred learning style of patients
- To educate healthcare providers on health literacy and teaching methods
- To improve patient education by encouraging healthcare providers to individualize their teaching methods

Because you are an adult patient at a rural clinic, you are invited to participate in this project. If you agree to participate, you will be asked to complete:

- A demographic questionnaire that asks about gender, age, race, and education level
- A health literacy screening tool
- A quiz to determine the way you learn best

Your results will be kept confidential and will only be used by myself and your healthcare provider to improve the teaching provided to you in the clinic. The results will also provide you with knowledge of your own health literacy level and the style in which you learn best for future use.

If you choose to participate, please do not write your name or other identifying information on the questionnaire. Your information will be kept confidential, and you will not be identifiable in the overall results. Your results and information will be combined with other participants' information and be reported in sum only. The results will be part of my Doctor of Nursing Practice dissertation at NDSU and may be published in a professional journal, but again, no personal or identifying information will be used.

Participation in the project is voluntary. There will be no cost to you, nor will you receive payment for participation. The total expected time commitment for participation is 10 minutes. If you feel uncomfortable in any way while filling out the questionnaire or screening tools, you have the right to decline to answer any question(s) and/or stop at any time without consequence.

If you have any questions about completing the questionnaires or participation, please feel free to contact me at 701-440-8224 or at cassie.r.holt@ndsu.edu. You can also contact my advisor, Dr. Allison Peltier at allison.peltier@ndsu.edu.

You have rights as a project participant. If you have questions about your rights or complaints about this project, you may talk to the me or contact the NDSU Human Research Protection Program at 701-231-8995 or 855-800-6717, by email at ndsu.irb@ndsu.edu, or by mail at NDSU HRPP Office, NDSU Dept. 4000, and P.O. Box 6050, Fargo, ND 58108-6050.

Thank you for your time.

Sincerely,

Cassie Holt, RN, BSN, DNP-S

APPENDIX H. HEALTH LITERACY AND PREFERRED LEARNING STYLES PRE-TEST

Demographic Information

1. What are your credentials?
    a. Medical Doctor (MD)
    b. Doctor of Osteopathic Medicine (DO)
    c. Nurse Practitioner (NP)
    d. Physician Assistant (PA)
    e. Other

2. How many years have you been practicing in your current role?
    a. Less than 5 years
    b. 5-10 years
    c. 11-20 years
    d. More than 20 years

3. How many of your years of practice have been in a rural facility?
    a. Less than 5 years
    b. 5-10 years
    c. 11-20 years
    d. More than 20 years

4. What is your primary field of practice?
    a. Family Practice/Internal Medicine
    b. Hospital Medicine
    c. Emergency Medicine
    d. Specialty
    e. Other

Health Literacy and Preferred Learning Style Questions

1. What is health literacy?
    a. The ability to read health education materials
    b. The ability to communicate with a healthcare provider
    c. The ability to obtain, process, and understand basic health information and services to make appropriate health decisions
    d. The ability to provide care for oneself

2. True or False: Health literacy tends to be lower in rural populations.
    a. True
    b. False

3. Which of these patients is demonstrating risk factors for low health literacy?
    a. A 30-year-old female with a high school education who asks multiple questions during her visit with her healthcare provider to gather more information.
    b. An 88-year-old male who is hard of hearing, attends his appointment alone, and needs information and instructions repeated multiple times.
    c. A Native American female who skipped her last dialysis treatment because she did not have transportation.
    d. A 50-year-old male who is refusing a colonoscopy because "he has never had any blood in his stool."
    e. A 27-year-old male with a full-time job who attends his yearly physical.

4. Which of these statements BEST describes learning style?
    a. The way a person communicates
    b. The unique way each person absorbs, processes, and comprehends new information based on past experience, as well as cognitive, emotional, and environmental factors
    c. The way a person masters new information

5. Which of these are common learning styles?
    a. Visual
    b. Auditory
    c. Reading/writing
    d. Kinesthetic
    e. All of the above

6. Which of these statements is TRUE regarding learning styles?
    a. Auditory learners prefer reading a brochure to learn about a topic
    b. Every patient learns best by listening to the healthcare provider talk about the information
    c. Visual learners may need a chart, graph, or picture to fully understand the education provided
    d. Learning styles do not change over the lifetime

7. How important do you feel health literacy and preferred learning style are in patient comprehension of education?
    Never Sometimes About half the time Most of the time Always

8. Do you currently utilize tools to assess patients' health literacy and preferred styles of learning in practice?
    Never Sometimes About half the time Most of the time Always

APPENDIX I. HEALTH LITERACY AND PREFERRED LEARNING STYLES POST-TEST

Demographic Information

1. What are your credentials?
    f. Medical Doctor (MD)
    g. Doctor of Osteopathic Medicine (DO)
    h. Nurse Practitioner (NP)
    i. Physician Assistant (PA)
    j. Other
2. How many years have you been practicing in your current role?
    a. Less than 5 years
    b. 5-10 years
    c. 11-20 years
    d. More than 20 years

3. How many of your years of practice have been in a rural facility?
    a. Less than 5 years
    b. 5-10 years
    c. 11-20 years
    d. More than 20 years

4. What is your primary field of practice?
    a. Family Practice/Internal Medicine
    b. Hospital Medicine
    c. Emergency Medicine
    d. Specialty
    e. Other

Health Literacy and Preferred Learning Style Questions

5. What is health literacy?
    a. The ability to read health education materials
    b. The ability to communicate with a healthcare provider
    c. The ability to obtain, process, and understand basic health information and services to make appropriate health decisions
    d. The ability to provide care for oneself

6. True or False: Health literacy tends to be lower in rural populations.
    a. True
    b. False

7. Which of these patients is demonstrating risk factors for low health literacy?
    a. A 30-year-old female with a high school education who asks multiple questions during her visit with her healthcare provider to gather more information.
    b. An 88-year-old male who is hard of hearing, attends his appointment alone, and needs information and instructions repeated multiple times.
    c. A Native American female who skipped her last dialysis treatment because she did not have transportation.
    d. A 50-year-old male who is refusing a colonoscopy because "he has never had any blood in his stool."
    e. A 27-year-old male with a full-time job who attends his yearly physical.

8. Which of these statements BEST describes learning style?
    a. The way a person communicates
    b. The unique way each person absorbs, processes, and comprehends new information based on past experience, as well as cognitive, emotional, and environmental factors
    c. The way a person masters new information

9. Which of these are common learning styles?
    a. Visual
    b. Auditory
    c. Reading/writing
    d. Kinesthetic
    e. All of the above

10. Which of these statements is TRUE regarding learning styles?
    a. Auditory learners prefer reading a brochure to learn about a topic
    b. Every patient learns best by listening to the healthcare provider talk about the information
    c. Visual learners may need a chart, graph, or picture to fully understand the education provided
    d. Learning styles do not change over the lifetime

11. How important do you feel health literacy and preferred learning style are in patient comprehension of education?
    Never Sometimes About half the time Most of the time Always

12. Do you intend to utilize tools to assess patients' health literacy and preferred styles of learning in your future practice?
    Never Sometimes About half the time Most of the time Always

13. What tools do you plan to implement, if any?

_____
_____
_____

14. How might you work these tools into an appointment?

_____
_____
_____

15. How is this information relevant to you?

_____
_____
_____

16. What do you feel are barriers to utilizing health literacy and learning style tools in practice?

_____
_____
_____

APPENDIX J. HEALTH LITERACY AND PREFERRED LEARNING STYLE

FOLLOW-UP SURVEY

1. Since the educational session on health literacy and preferred learning style, have you noticed yourself considering health literacy levels and preferred learning styles during patient encounters?

   Never Sometimes About half the time Most of the time Always

2. Did the educational session change how you interact with your patients?

   Never Sometimes About half the time Most of the time Always

3. Do you feel it would be helpful for patient charts to contain information with their preferred learning style and health literacy level?
   a. Yes
   b. No

APPENDIX K. FOCUS GROUP QUESTIONS

1. Did you like having notes in the patient charts with the health literacy and learning style information?
2. Could you easily see the note, and did it prompt you to utilize different teaching methods to individualize your education?
3. Do you find yourself thinking about patients' health literacy level during your interactions?
4. Do you find yourself thinking about patients' preferred learning style?
5. Did the intervention change how you interact with your patients?

APPENDIX L. DEMOGRAPHIC QUESTIONNAIRE

Please circle the answer that applies to you.

Gender:

Male

Female

Age:

18-30

30-50

50-70

70-90

90 or older

Race:

Caucasian

African American

Hispanic

American Indian or Alaskan Native

Other _____

Highest level of education achieved:

Elementary

High school

Associate Degree

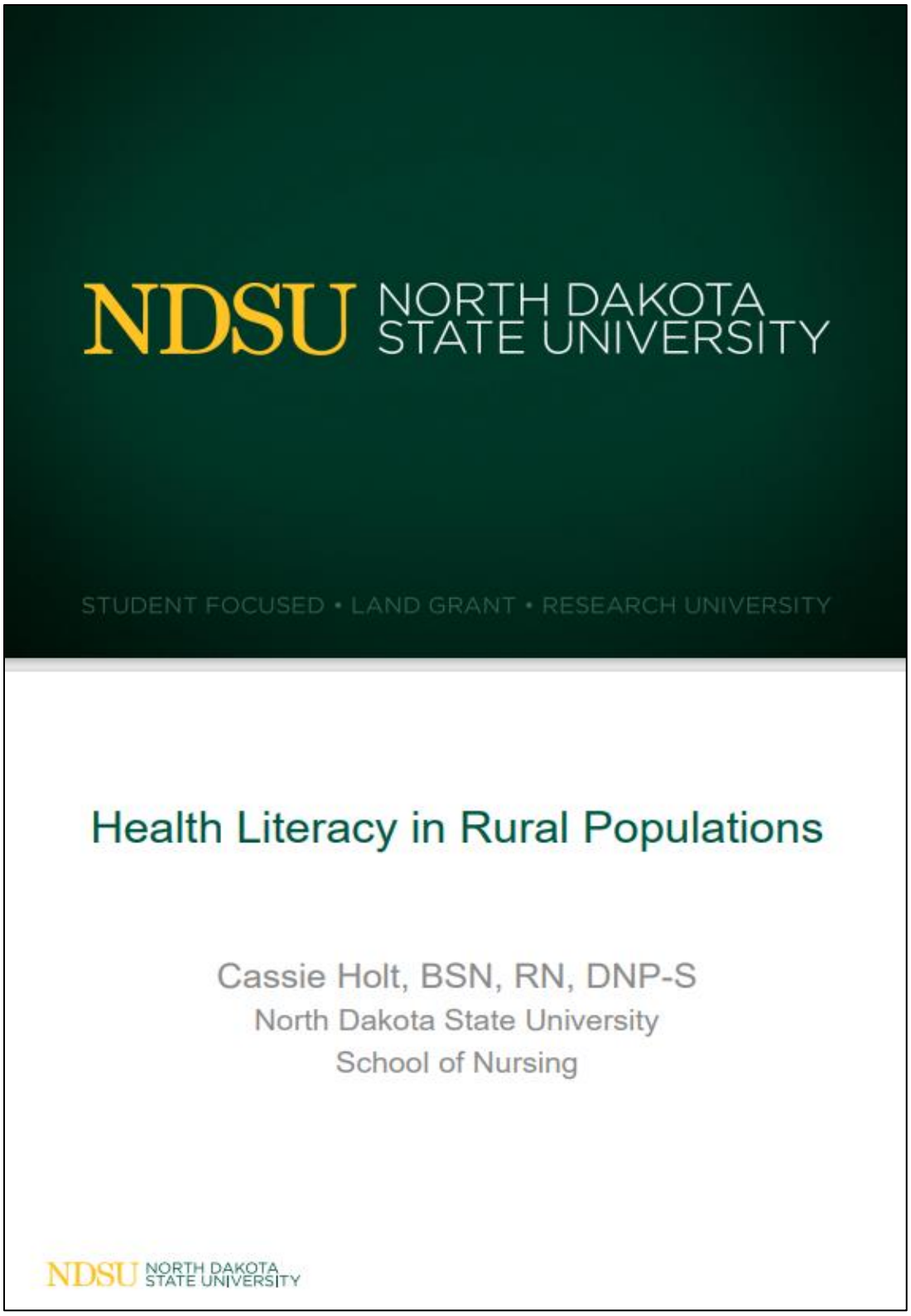
Bachelor's Degree

Master's Degree or higher

I feel that I fully comprehend the information that is being provided to me by healthcare professionals.

Strongly agree Agree Neutral Disagree Strongly disagree

APPENDIX M. HEALTHCARE PROVIDER EDUCATION SESSION POWERPOINT



Objectives

- To discuss the health literacy levels of rural populations
- To describe different learning styles and patient education techniques
- To discuss tools available to assess health literacy and learning styles
- To inform of the importance of utilizing patients' learning styles and health literacy levels to individualize patient education

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Introduction

- Patients must have the skills and abilities to provide care for themselves and the knowledge necessary to make appropriate health decisions (Masoompour et al., 2017).
  - An adequate health literacy level is needed to accomplish these tasks.
- Low health literacy levels lead to more hospitalizations, use of healthcare resources, and increased healthcare expenses (Imoisili, 2017; Wong, 2014).
- Patients with lower health literacy levels learn significantly less than patients with adequate health literacy levels (Chen et al., 2019).

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What is health literacy?

- "The ability to obtain, process, and understand basic health information and services to make appropriate health decisions" (U.S. Department of Health and Human Services, 2008)
- Four proficiency levels with health literacy- see graphic (Temple, 2017).
  - According to the National Assessment of Adult Literacy, 14% of U.S. adults possess a basic health literacy level (Kutner, 2006).
  - 90 million U.S. adults have limited health literacy (Blakely, 2016)

Level	Skill
Below Basic	Might be able to locate and circle the date of a medical appointment on a hospital appointment slip.
Basic	Might be able to state two reasons a person with no symptoms of a disease should be tested for the disease, based on information in a clearly written pamphlet.
Intermediate	Might be able to determine a healthy weight range for a person of a specified height, on the basis of a graph that relates height and weight to body mass index.
Proficient	Might find the information required to define a medical term by searching through a document.

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Health Literacy in Rural Populations

- Rural populations are often at a disadvantage compared to urban populations when it comes to healthcare (Chen et al., 2019; Cyr et al., 2019).
- Rural patients tend to have lower health literacy due to the additional barriers they must overcome to receive healthcare and fewer opportunities to visit with a provider, ask questions, and obtain health information (Cyr et al., 2019; Hewitt et al., 2019; Temple, 2017).
  - Geography, distance, weather
  - Inadequate financial resources/lower socioeconomic status
  - Lack of primary care and specialty care providers
- Lower health literacy leads to poor self-management of disease (Chen et al., 2019; Hewitt et al., 2019; Wong, 2014).
  - Higher rates of early morbidity Aand mortality from cancer, heart disease, childhood obesity, and other diseases
  - Unintentional injuries, chronic respiratory disease, and stroke
- Healthcare providers fail to recognize their patient's health literacy level (Rajah et al., 2018).

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Risk Factors for Low Health Literacy

- Male gender
- Race and ethnicity
  - White and Asian/Pacific Islander backgrounds tend to have higher health literacy levels when compared to Black, Hispanic, American Indian/Alaska Native, and Multiracial adults
- Non-English primary language
- Age >65
- Education level
  - Health literacy level increases with each higher level of educational achievement
- Socioeconomic status
  - Those living below the poverty level had lower health literacy scores than adults living at the poverty level or above

(Cyr et al., 2019; Kutner et al., 2016; Weinhold & Gurtner, 2014)

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Complications of Low Health Literacy

Poor disease management	Increased hospitalizations	Poor health outcomes
Lack of follow-up	Increased healthcare costs	Inadequate disease management

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(Hersh et al., 2015; Masoompour et al., 2017)

Rapid Estimate of Adult Literacy in Medicine (REALM) Tool

- Determines ability to read health education material by checking word recognition and pronunciation
- 66 common medical terms
  - Number of words pronounced correctly corresponds to equivalent reading level
- Advantages:
  - Takes 5 minutes or less
  - Easy to understand and administer
  - Can be performed in a variety of settings

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List 1	List 2	List 3
fat	fatigue	allergic
flu	pelvic	menstrual
pill	jaundice	testicle
dose	infection	colitis
eye	exercise	emergency
stress	behavior	medication
smear	prescription	occupation
nerves	notify	sexually
germs	gallbladder	alcoholism
meals	calories	irritation
disease	depression	constipation
cancer	miscarriage	gonorrhea
caffeine	pregnancy	inflammatory
attack	arthritis	diabetes
kidney	nutrition	hepatitis
hormones	menopause	antibiotics
herpes	appendix	diagnosis
seizure	abnormal	potassium
bowel	syphilis	anemia
asthma	hemorrhoids	obesity
rectal	nausea	osteoporosis
incest	directed	impetigo

Score Interpretation

Table 3

Raw Score	Grade Range Equivalent	Literacy Skills
0 - 18	3rd Grade and Below	Will not be able to read most low-literacy materials; probably not able to read appointment and prescription labels/warning labels. Will need repeated, individual oral instructions.
19 - 44	4th to 6th Grade	Will need low literacy materials with accompanying verbal instructions; may not be able to read low literacy materials independently.
45 - 60	7th to 8th Grade	Will struggle with many patient education materials; may be able to pronounce words but not fully comprehend the message
61 - 66	High School	Will be able to read most patient education materials; will not be offended by low literacy materials

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Learning Styles

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What is learning style?

The unique way each person absorbs, processes, and comprehends new information based on past experience, as well as cognitive, emotional, and environmental factors

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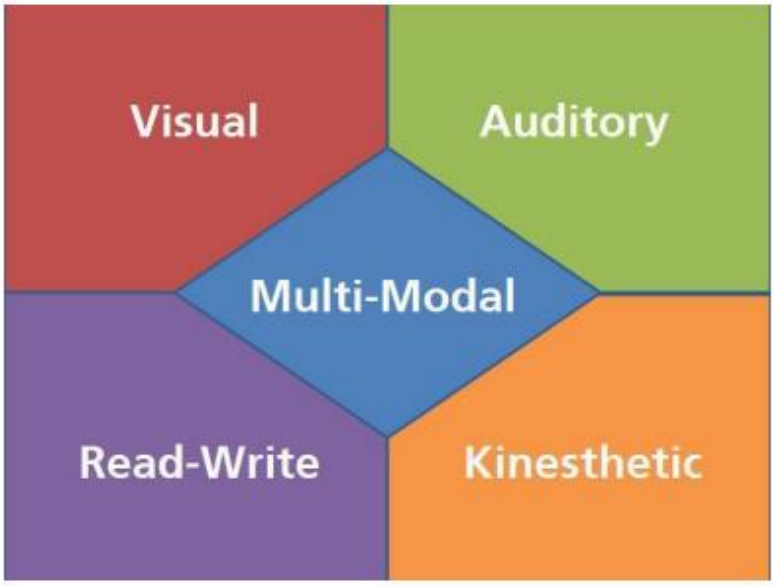
Types of Learners



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Preferred Learning Style

- Preferred learning style is another part of the equation.
- Few studies have tested interventions using learning styles in patients (Guise et al., 2012).
- Preferred learning style of patients is not considered prior to patient education (Seung, 2011).
- May be able to understand the teaching with one learning style better than another (Marquez & Ladd, 2019).

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Visual, Aural, Reading/Writing, Kinesthetic (VARK) Tool

- Helps determine unimodal vs. bimodal or multimodal learning
- 16 questions in a select-all-that-apply format
  - Each choice corresponds to a learning style format
- Advantages:
  - Easy to use
  - Shorter than most other questionnaires
  - Provides information to the test taker

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visual ˙ aural ˙ read/write ˙ kinesthetic

VARK®

a guide to learning styles

The VARK Questionnaire (Version 8.01)

How Do I Learn Best?

Choose the answer which best explains your preference and circle the letter(s) next to it.
Please **circle more than one** if a single answer does not match your perception. Leave blank any question that does not apply.

1. I need to find the way to a shop that a friend has recommended. I would:
   a. find out where the shop is in relation to somewhere I know.
   b. ask my friend to tell me the directions.
   c. write down the street directions I need to remember.
   d. use a map.
2. A website has a video showing how to make a special graph or chart. There is a person speaking, some lists and words describing what to do and some diagrams. I would learn most from:
   a. seeing the diagrams.
   b. listening.
   c. reading the words.
   d. watching the actions.
3. I want to find out more about a tour that I am going on. I would:
   a. look at details about the highlights and activities on the tour.
   b. use a map and see where the places are.
   c. read about the tour on the itinerary.
   d. talk with the person who planned the tour or others who are going on the tour.
4. When choosing a career or area of study, these are important for me:
   a. Applying my knowledge in real situations.
   b. Communicating with others through discussion.
   c. Working with designs, maps or charts.
   d. Using words well in written communications.
5. When I am learning I:
   a. like to talk things through.
   b. see patterns in things.
   c. use examples and applications.
   d. read books, articles and handouts.
6. I want to save more money and to decide between a range of options. I would:
   a. consider examples of each option using my financial information.
   b. read a print brochure that describes the options in detail.
   c. use graphs showing different options for different time periods.
   d. talk with an expert about the options.
7. I want to learn how to play a new board game or card game. I would:
   a. watch others play the game before joining in.
   b. listen to somebody explaining it and ask questions.
   c. use the diagrams that explain the various stages, moves and strategies in the game.
   d. read the instructions.

 http://vark-learn.com

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Importance of Utilizing Tools in Practice

- REALM gives an idea of possible health literacy level
- VARK gives an idea of best way to teach the patient
- Utilizing this information → improved teaching strategies → increased comprehension of health education → potential for better overall health

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Errors in Patient Education

- Failure to consider health literacy level or learning style
- Ineffective teaching methods:
  - Yes or no questions vs. open-ended questions
  - Use of medical jargon
  - Long/indirect instructions
  - Failure to use individualized teaching methods
  - Bypassing opportunities for questions
  - Health education materials written at higher reading levels
- Lack of patient motivation

(Blevins, 2018; Hersh et al., 2015, Masoompour et al., 2017)

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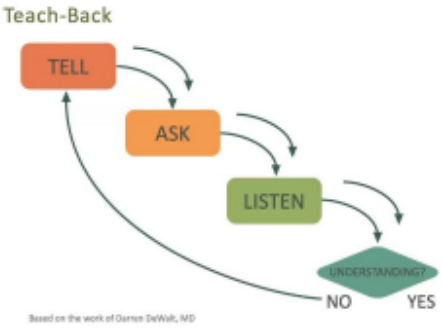
Patient Education Strategies

- Strategies to improve education:
  - Avoid assumptions about patients' education, health literacy, and preferred learning style
  - Choose appropriate language
    - Mirror the patient's language/vocabulary
    - Explain medical terms in a simple, concrete way
    - Break information down into smaller steps/sections
    - Repeat instructions
  - Improve readability of written materials
    - Short, simple sentences
    - Limited use of words with > 2 syllables
    - Key points
    - Bulleted lists
    - Visual aids
  - Confirm understanding
    - Chunk and check method
    - Teach-back method
    - Open-ended questions
  - Patient follow-up

(Hersh et al., 2015)



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How does this apply to SW ND?

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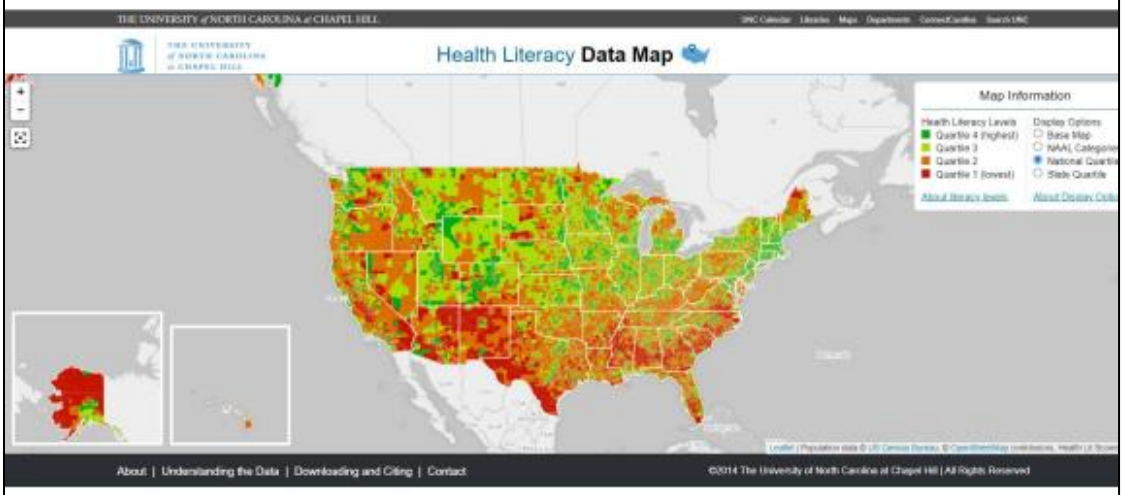
Health Literacy Data Map



Based on 2003 National Assessment of Adult Literacy

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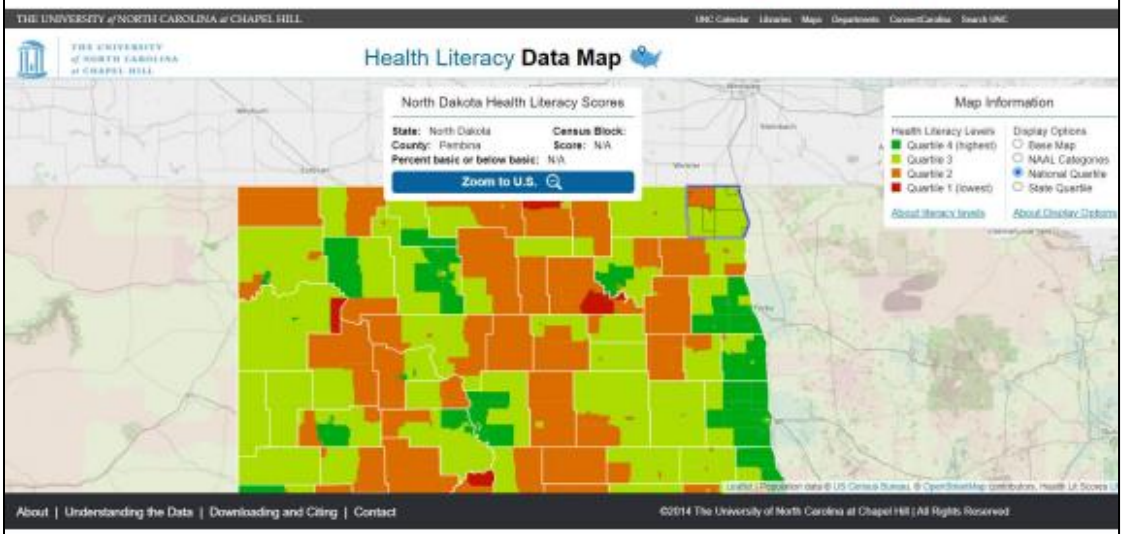
ND Health Literacy Map



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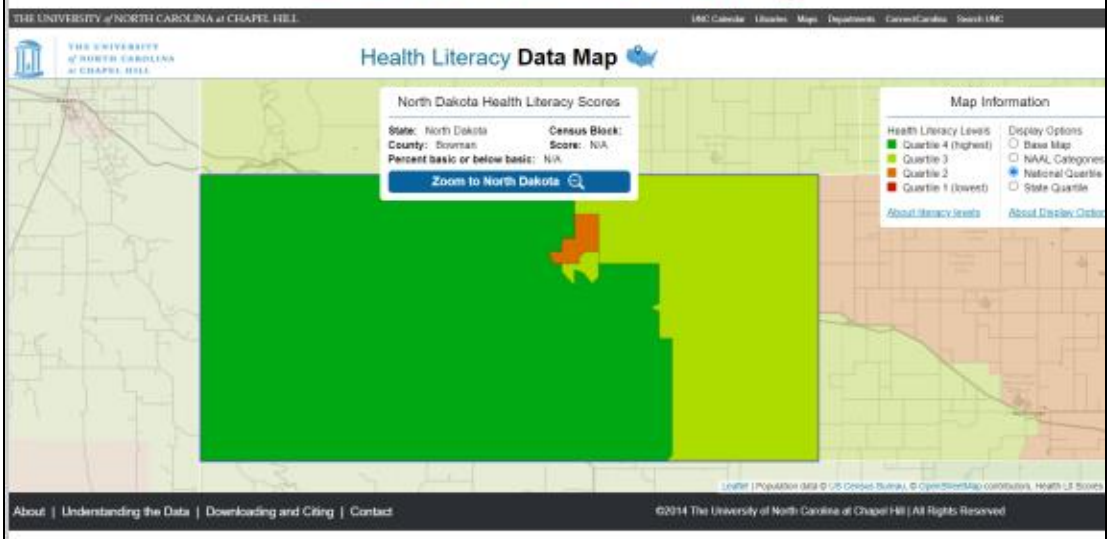
Bowman County



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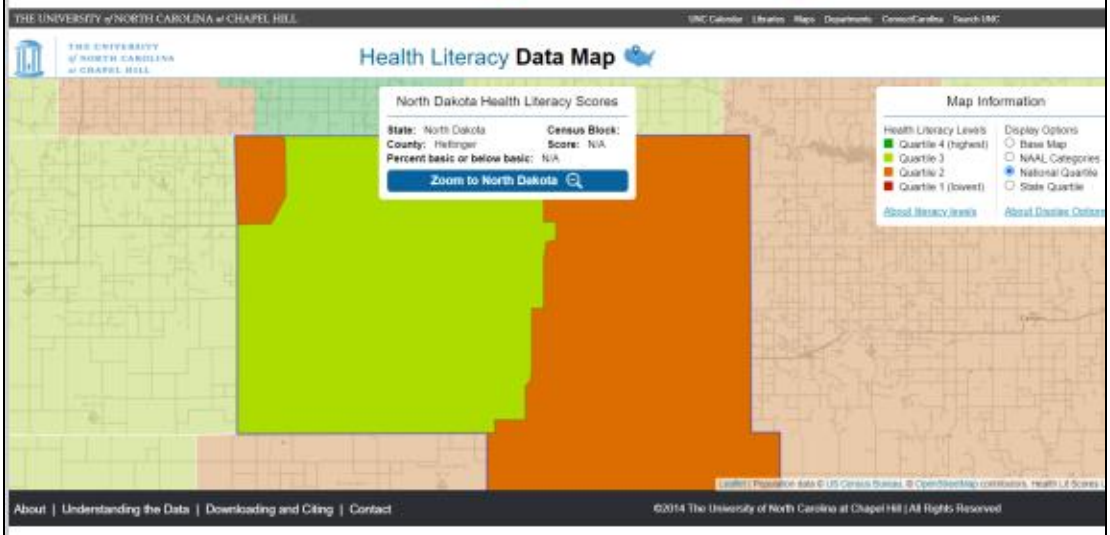
Hettinger County



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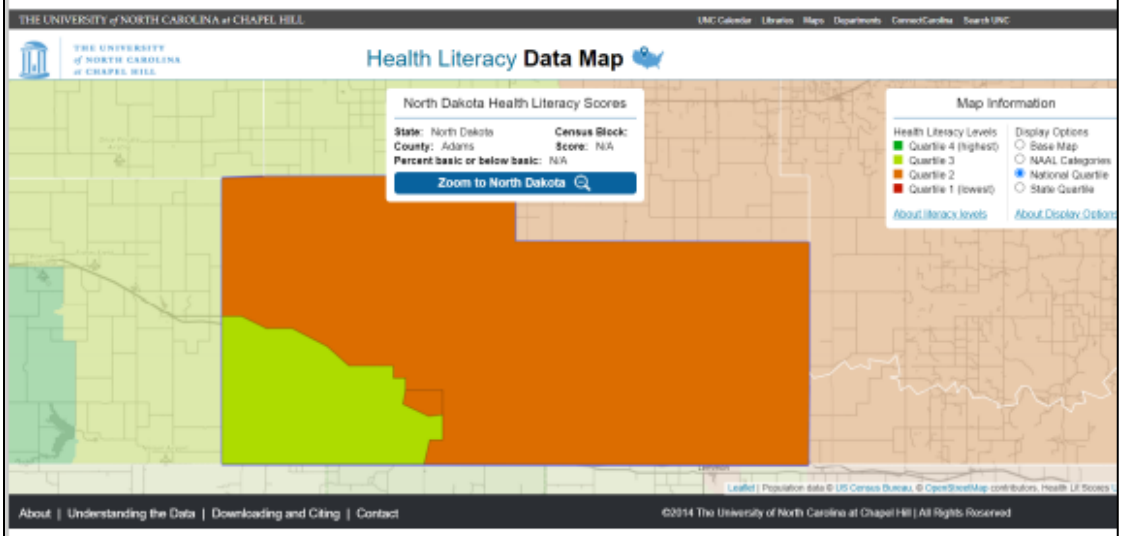
Adams County



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Assessment of Health Literacy and Preferred Learning Style of Patients in a Rural North Dakota Primary Care Clinic

Dissertation Project Results

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Results

- 27 participants
  - 16 female
  - 11 male

Age Ranges	Number of Participants
18-30	2
30-50	11
50-70	7
70-90	7
90 +	0

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Education Level of Participants

Education Level	Number of Participants
Elementary	1
High School	13
Associate Degree	4
Bachelor's Degree	8
Master's Degree or higher	1

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Health Literacy Scores

Health Literacy Scores	Number of Participants
3rd grade or below	0
4th-6th grade	0
7th-8th grade	3
High school	24

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Preferred Learning Style

Learning Style	Number of Participants
Visual	1
Aural	4
Reading/Writing	3
Kinesthetic	8
Multimodal	11

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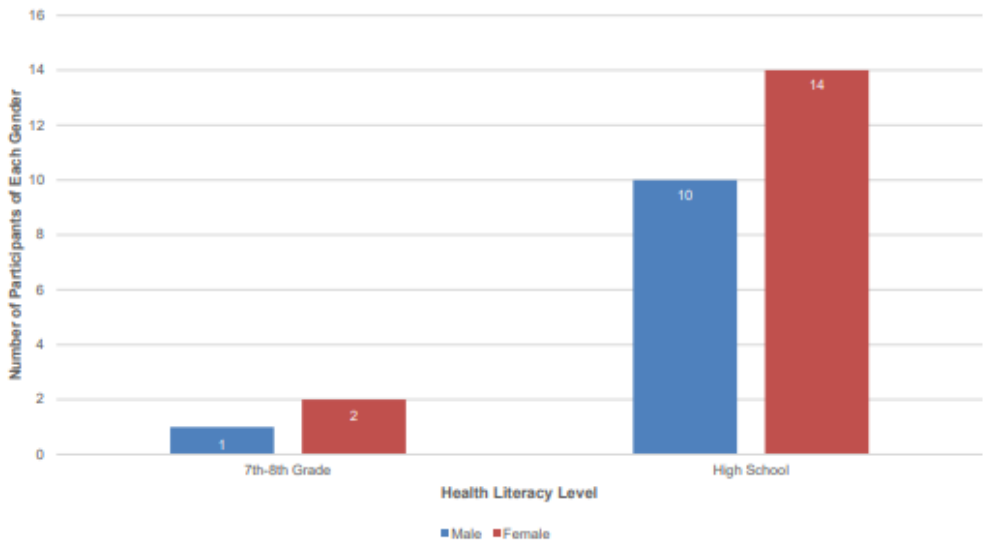
Health Literacy Scores: Males vs. Females



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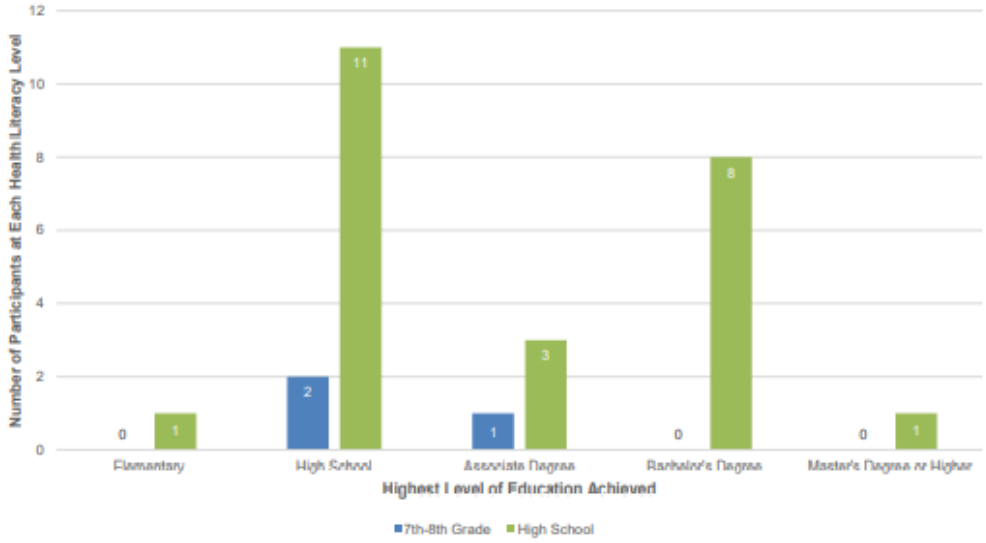
Health Literacy Scores vs. Education Level



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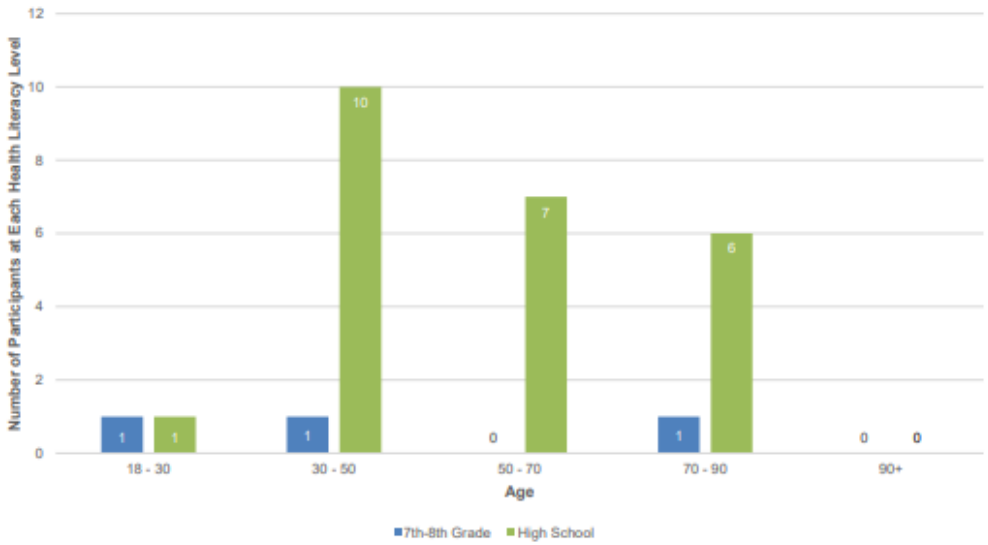
Health Literacy Scores vs. Age



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Clinical Application

- Low health literacy in rural populations is a problem
  - Healthcare providers must work to minimize barriers and improve teaching strategies
- REALM & VARK tools can help determine most appropriate way to teach patient

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Questions?

Thank you all for participating!

Please fill out the post-test that will be emailed to you from Dr. Houle.

Please keep an eye out for a follow-up survey around 2 months from now.

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APPENDIX N. IRB APPROVAL LETTER

NDSU NORTH DAKOTA STATE UNIVERSITY

05/25/2021

Dr. Allison Evelyn Peltier
Nursing, Sanford Bismarck

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #IRB0003653, "Assessment of Health Literacy and Preferred Learning Style of Patients in a Rural North Dakota Primary Care Clinic"

NDSU Co-investigator(s) and research team:

- Allison Evelyn Peltier
- Cassie Holt

Approval Date: 05/25/2021
Expiration Date: 05/24/2024
Study site(s): West River Health Services Clinic in Bowman, North Dakota
Funding Agency:
The above referenced human subjects research project has been determined exempt (category 2) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*).

Please also note the following:

- The study must be conducted as described in the approved protocol.
- Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Promptly report adverse events, unanticipated problems involving risks to subjects or others, or protocol deviations related to this project.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.

NDSU has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

RESEARCH INTEGRITY AND COMPLIANCE
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | ndsu.research@ndsu.edu
Shipping Address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

EXECUTIVE SUMMARY

Health Literacy in Rural Populations: Assessing Patients' Health Literacy and Preferred Learning Style in Primary Care

Introduction

Individuals with low health literacy face many difficulties within the healthcare system, including seeking medical care in inappropriate places, foregoing appointments and preventative health screenings, and misunderstanding self-care instructions. This leads to more hospitalizations, increased healthcare expenses, and use of healthcare resources. Low health literacy is especially significant in rural populations, where there are additional barriers to healthcare such as geography, distance, weather, inadequate financial resources and lower socioeconomic status, and lack of primary care and specialty providers. Furthermore, providers often do not consider patients' preferred learning styles, which may be significant for those who have difficulty understanding instructions. Patient education may be more effective if teaching strategies are individualized to each patient.

Purpose

The purpose of this project was to assess the health literacy and preferred learning style of patients at a primary care clinic in rural North Dakota and educate healthcare providers in the respective clinic on health literacy and teaching methods, which has the potential to enhance patient education and learning. To provide the highest level of patient-centered care, rural providers need to address the issue of health literacy, determine each patient's preferred learning method, and utilize that information to improve patient education and literacy levels.

Project Design

Implementation of the practice improvement project included assessing patients' health literacy levels and preferred learning styles using the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Visual, Auditory, Reading/Writing, Kinesthetic (VARK) tools, respectively. An educational session was also held with rural healthcare providers to discuss health literacy in rural populations and the importance of assessing health literacy and learning style. A pre- and post-test and follow-up survey assessed providers' knowledge of the importance of testing health literacy and preferred learning style, available tools, and their intent to utilize these tools in practice.

Results and Conclusion

- There were 27 patient participants and 10 healthcare providers who completed the pre-test, educational session, and post-test.
- The results indicate there continues to be gaps in providers' knowledge of risk factors of low health literacy, tools available to measure health literacy and learning styles, and consistent utilization of health literacy and learning style information when educating patients.
- Most patients had a high school health literacy level. The most common preferred learning style was multimodal, or more than one style of learning.

- Overall, there was an increase in knowledge on some questions from the pre- to post-test. Healthcare providers displayed mixed results when asked to identify patients showing risk factors for low health literacy, showing that this is an area where more education needs to be provided.
- The healthcare providers rated the importance of health literacy and learning style in patient comprehension between "moderately important" and "extremely important," showing their agreement that these factors do influence how well the patient understands the health education.
- After the educational session, 70% of providers planned to implement a tool sometimes compared to the 46.2% of providers who indicated on the pre-test that they sometimes use a tool in their current practice.
- The project was successful in raising awareness of the problem of low health literacy in rural populations but reflects the need for healthcare facilities to provide education for their healthcare team on these topics.

Recommendations for Implementation

- Health literacy and preferred learning style screening tools should be used in the primary care setting to gain a better understanding of how a patient may learn best. Annual wellness exams may be a good place to incorporate the screening tools.
- The improvement of health literacy should be a group effort, beginning at the reception desk, to the nurse, to the healthcare provider. Healthcare organizations should provide routine education for their healthcare team on health literacy and learning styles.
- New approaches to patient education should be promptly integrated into clinical practice and should complement the educational formats that are already being used.
- Healthcare providers should include a variety of teaching methods in their practice to support patients with limited health literacy. The use of audio and visual health information to augment written information, as well as ensuring educational materials are adjusted to the reading level of patients with low health literacy, may improve patients' comprehension of the material.
- Recommendations for future practice improvement projects include:
    - Including more providers in the project and offering more than one educational session for providers to attend
    - Receiving approval for the educational session to be counted as continuing education credits
    - Coinvestigator being available at the implementation site to discuss the project with the potential patient participants
    - Coinvestigator meeting with the healthcare providers directly to discuss the project to increase participation and ensure the same number of participants complete both the pre- and post-tests
    - Have the pre- and post-tests taken in person prior to the educational session and directly following
    - Implement the project over a longer period to better determine if having patients' health literacy and learning style information available in the computer charts is helpful at follow-up visits
    - Include more nurses in the project and provide an educational session on health literacy and preferred learning style specific to nurses to help them gain a better understanding of health literacy, enable them to recognize patients at risk for low health literacy, and encourage them to utilize a variety of teaching methods during patient education.