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Medication Compliance And Decreases In Viral Load Status In Patients With HIV

Tangela Woodland- Ballard

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A DNP Final Project

by

TANGELA WOODLAND-BALLARD

Submitted to the Office of Graduate Studies of
Prairie View A&M University College of Nursing
in partial fulfillment of the requirements for the degree of

DOCTOR OF NURSING PRACTICE

May 2023

Major Subject: Nursing

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Approved as to style and content by:

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ABSTRACT

Medication Compliance and Decreases in Viral Load Status in Patients with HIV

(May 2023)

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Background: The human immunodeficiency virus (HIV) epidemic has been a worldwide challenge for several decades. Proper medication adherence, following the Centers for Disease Control guidelines, has proven effective in decreasing patients' viral load, thus improving their quality of life, and reducing the spread of the disease. The current literature identifies a lack of knowledge, support, and resources as barriers to medication compliance.

Purpose: To increase medication compliance among persons with HIV.

Methods: This evidence-based practice project utilized the Modified Morisky Scale to help minority HIV patients adhere to strict medication regimens. Repeated measures analysis of variance was conducted to analyze participants on the same measure across multiple time points. Forty patients were selected to participate in the project. The providers sent the patients reminders to take all medications as prescribed through the patient portal. A pre-post design was used for evaluation, and viral loads were analyzed.

Results: Implementation of the Modified Morisky Scale, in combination with scheduled medication reminders, yielded significant improvements in patient knowledge and motivation to adhere to medication regimens. The results showed significant reductions in viral load ($p<0.05$), indicating that the intervention was successful.

Conclusion: Ongoing patient education is necessary to improve medication compliance and reduce HIV viral loads.

***Keywords*:** HIV, Validated Assessment Tool (MMS), Viral Loads, Medication Compliance, Education, Chronic Disease, Medication Regime

DEDICATION

In recognition of this momentous accomplishment, I dedicate this quality improvement project to my late mother, Teresa A. Woodland. Thank you to the heavens above for your unwavering support and eternal love. I love you, mama!

To my loving and supportive husband, Brandon Ballard. Thank you for always being by my side to encourage and push me on this journey.

To my delightful children, Bailey, Landon, and Lennox, who are my heart in living form, know that you are mommy's biggest motivation, and you can accomplish anything God has called you to do.

To my late parents, George, and Teresa Woodland, I give you both the recognition for laying the foundation for me to achieve my dreams. If it were not for your guidance, values, and elevated standards, I would not be the woman I am today. You are both tucked safely away in my heart for eternity. I LOVE YOU!

To my brother, Eric Woodland, and my sister-in-love, Faye Woodland, thank you for believing in me and always standing in the gap supporting me. I could not ask for a better brother. I know you will always take care of your baby sister.

My one and only nephew, Ethan Woodland (University of Tennessee, Knoxville, May 2023 graduate), thank you for not only loving me but making me the proudest aunt ever!

To my best friend, Ashley Patterson-Toney, you have been a pillar of support through this journey and in life with an abundance of love in accompaniment. To all my family and friends, thank you for believing in me. I share this accomplishment with you.

ACKNOWLEDGMENTS

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I would also like to recognize and extend gratitude to St. Hope Clinic for its support. Thank you to Medical Director Dr. James Sims and the entire board for their support of my project.

I give all glory to God! He carried me when I could not walk the path myself. My journey has had many obstacles along the path, which have paved the way for an unfathomable testimony. I am a true example of God's favor and without the support of my family, friends, and, most importantly, the faculty at Prairie View A&M University College of Nursing I would not be able to claim this victory. I have been inspired by so many along the way. The leadership and support are unmatched.

TABLE OF CONTENTS

LIST OF FIGURES

FIGURE Page

LIST OF TABLES

TABLE Page

CHAPTER 1

INTRODUCTION

Human immunodeficiency virus (HIV) attacks the body's CD4 T lymphocytes or helper cells of the immune system, thus weakening the immune system. The virus spreads through certain body fluids, including blood, semen, rectal fluids, and breast milk (CDC, 2017). Contact with HIV-infected blood or blood-contaminated bodily fluids through broken skin, wounds, or mucous membranes may result in a positive diagnosis of HIV, as can unprotected sexual intercourse, contact with blood products, or transmission from mother to infant. The virus weakens the immune system by destroying CD4 cells, and as it replicates and destroys additional cells, it may acquire immunodeficiency syndrome (AIDS) (WHO, 2015). The transition from HIV to AIDS is measured by the number of CD4 cells that remain in the bloodstream. When a patient's level of CD4 cells falls below 200 cells/mm^3, they are diagnosed with AIDS. This stage of the disease is terminal and has killed approximately 1.1 million people per year globally.

Medication compliance has significantly improved not only patients' quality of life but also the disease's transmission rates, and patients with HIV are now able to live long and relatively healthy lives. Furthermore, many patients achieve non-detectable viral loads, which refers to the amount of the virus in an individual's bloodstream. Specifically, the more copies of HIV there are per millimeter of a person's blood, the higher the viral load.

This dissertation follows the style of the American Psychological association, 7th Ed.

Specifically, the more copies of HIV there are per millimeter of a person's blood, the higher the viral load. Due to advancements in antiretroviral therapy (ART), people with HIV can keep the virus from replicating or slow down the process of replication, thus decreasing the amount of the virus until it is undetectable by blood tests (WHO, 1986). Today, this typically occurs when there are fewer than fifty copies of HIV per millimeter of blood.

The goal of ART is for HIV-positive persons to reach and maintain undetectable viral load status, which can help them live longer and healthier lives. Access to proper health care and knowledge and strict medication adherence and compliance are each necessary to increase the probability of achieving an undetectable viral load and the best possible quality of life. Advances in technology through clinical trial testing have brought scientists closer to developing a vaccine for HIV. However, until a vaccine is identified, the best treatment for HIV-positive individuals is highly active antiretroviral therapy (HAART).

Viral load is used to monitor immune function and HAART efficacy, and evidence has shown that people living with HIV who maintain an undetectable viral load do not transmit HIV to their partners (NIH, 2015). "Undetectable" simply means the amount of the virus found in the blood at that time is minimal and less likely to be transmitted than if the virus were detectable. The more people are on effective HIV treatment and have the virus in check, the more HIV infections are prevented, an approach called "treatment as prevention" (Murphy, 2005). Although suppressing the virus to undetectable levels has

clear benefits for both HIV-positive and HIV-negative people, treatment as prevention is just one strategy for preventing new HIV infections.

The HIV/AIDS epidemic has been a worldwide challenge for several decades. Globally as of 2021 over 38.4 million people are living with HIV/AIDS, and it remains a persistent problem in the United States. The virus causes a chronic disease for which there is no cure. The primary goal for patients living with HIV/AIDS is to achieve the best possible quality of life. Scientists and healthcare professionals alike have made tremendous progress in treating the virus. But despite the promising discoveries, much work remains. Health promotion and prevention have become primary targets in the fight against the HIV/AIDS epidemic.

Thousands of people are unknowingly living with the virus; thus, much emphasis has been placed on screening. High-risk groups include people who participate in high-risk behaviors, such as unprotected vaginal and anal sex and intravenous drug use. Certain groups are at higher risk of contracting the virus than others. Because anal penetration represents the highest risk for contracting the virus, men who have sex with men (MSM) have been identified as the highest-risk group. The second highest-risk group includes those who share needles for intravenous drug use. Examining HIV diagnosis by race and ethnicity reveals that Black/African American people are most affected.

Pre-exposure prophylaxis (PrEP) was developed for those who take part in behaviors that place them at higher risk of contracting the virus. The prophylactic treatment can reduce the chances of getting HIV from sex or injection drug use. Although PrEP is considered safe for consumption and has been approved by the Food and Drug Administration, many patients experience a multitude of side effects, such as nausea,

stomach pain, diarrhea, headaches, and fatigue; however, the benefits tend to outweigh the risks, and the side effects often resolve over time with continued use.

There is a worldwide effort to reduce HIV infection rates. The Joint United Nations Programme on HIV/AIDS (UNAIDS) is an international organization working to end the AIDS epidemic by the year 2030. UNAIDS comprises eleven organizations that work together to eradicate HIV/AIDS by ensuring that everyone living with HIV has access to HIV treatment, promoting human rights, and producing data for decision-making (HIV, 2021).

Problem Statement

Patients living with HIV/AIDS often have a multitude of concerns related to disease treatment via chronic medication management. Many face complications associated with severe side effects of HIV drugs, such as long-term nausea and other gastrointestinal-related side effects, which decrease medication adherence. Some patients find it difficult to take multiple medications, and some simply forget to take their medications daily. Patients often report difficulty adhering to a strict medication regimen. A multilayered approach is the best choice for assisting patients with medication adherence. Patients must have their medication readily accessible at the scheduled dosing time to achieve the maximum result from their prescribed medications.

Local Problem

Patients receiving care at the St. Hope Foundation Clinic were the target population for this project. The Ryan White HIV/AIDS Program (RWHAP) funds grants to eligible metropolitan areas (EMAS) and Transitional Grant Areas (TGAS) that are most affected by the HIV epidemic. St. Hope Foundation Clinic is a recipient of this grant. Planning Council

is a local council consisting of 38 members appointed by the CEO to collaborate with consumers, service providers, and other experts to determine what services are needed most by people living with HIV in Houston and the extended metropolitan area. Patients must apply and receive approval prior to being awarded financial assistance via this grant. St. Hope provides patients with a variety of resources at one central location, including social services, primary care, podiatry consultations, psychological sessions, and dental appointments. The clinic also had an on-site pharmacy.

In this project, data collected through observation during patient visits showed a need for support services to assist patients in maintaining their medication regimens as prescribed. Patients often stated that they would forget to take their scheduled medications or leave them at home or that they were no longer taking their prescribed medication. Patients also reported difficulty with taking multiple medications daily, thus possibly requiring a change to combination pills. Laboratory reports often displayed fluctuating viral load levels in blood work. These inconsistencies illustrate a need for an intervention to improve medication compliance and thus achieve a steady viral load. The intervention served to improve medication compliance via an increase in knowledge and motivation to understand the importance of adhering to strict medication compliance in the treatment of HIV/AIDS. Patients found the reminders helpful and often kept their scheduled appointments because of this system.

Purpose of the Project

The purpose of this project was to implement an evidence-based educational tool, i.e., an intervention that would improve viral load suppression in persons infected with HIV. The goal was for infected persons to reduce their viral load and improve adherence to

medications, reaching undetectable viral load status. Both a decreased viral load and undetectable viral load status would mean an improved quality of life, and an increased lifespan, The PICOT question answered through this project was as follows: Can an educational tool consisting of a screening survey, education, and provider-led scheduled reminders help patients reduce their HIV viral load in three months compared with their pre-intervention status?

PICO (T) Format and PICO(T) Question

The PICOT format is a consistent formula for developing answerable, researchable, questions. This mnemonic served as a blueprint for gathering data and organizing and evaluating the information to develop answerable questions. The population or subject of the project included patients with HIV who are either African American or Latinx, and between the ages 18-45. The intervention refers to the treatment that will be provided to subjects enrolled in the project. The comparison identifies what is planned as a reference group to compare with the treatment intervention. The outcome measures the risk of disease, the accuracy of diagnosis, and the rate of occurrence of adverse outcomes. Lastly, time signifies the time it takes for the intervention to achieve an outcome or how long participants are observed. The population for this project included African American and Latinx patients between the ages of 25 and 45 who were HIV positive and receiving HAART during the study period. The intervention involved patients completing a survey to identify patient-specific barriers to medication adherence as well as the provision of evidence-based education to improve the patients' knowledge and help them overcome barriers. The comparison or control was the patients' pre-intervention viral load and knowledge, which were assessed using a repeated measures design. In this type of

longitudinal design, the outcome is measured for the same subjects to assess change over time. The expected outcomes of the educational intervention were increased knowledge of methods of sexual transmission, the importance of medication adherence, and the significance of routine health-risk screening and changes in sexual activity. These outcomes were expected to reduce the patients' viral load levels. The project was conducted over 3 months, and viral load was collected at 2- to 4-week intervals.

P: African American or Latinx patients with HIV

I: Evidence-based educational tool, survey to assess barriers, and provider-led reminders.

C: Pre-intervention viral load and knowledge

O: Changes in viral load status and knowledge

T: Three months

PICOT Question: Can an educational tool consisting of a screening survey, education, and provider-led scheduled reminders help patients reduce their HIV viral load in 3 months compared with their pre-intervention status?

Significance of the Project

Billions of dollars have been spent on global initiatives to support HIV investigation, treatment, and education. The United States alone has spent 20.3 billion which is approximately 58% of the total HIV budget. Much of these funds seem to be poured into data collection and education about the virus but, somehow, the number of new infections continues to rise. Each patient who has contracted the disease has a specialized plan of care tailored specifically to their needs based on their HIV strain and viral load. Additionally, it is important to implement patient-specific HAART along with long-term treatment plans that include wellness initiatives.

Education is essential to improving population health. HAART has transformed HIV/AIDS from an inevitably fatal disease to what is now considered a chronic disease that can be managed through a multidisciplinary approach. The HIV/AIDS pandemic has reached every corner of the earth, and the disease's treatment and management are a global imperative. Twenty-five million people have succumbed to the disease. Although investigators and scientists have created treatment modalities that can improve the quality of life for an HIV-infected person, there is still no cure to date. The disease also disproportionately affects those of lower socioeconomic status and persons of color. It is critical to ignite a fire in those populations by increasing their knowledge of the disease and its transmission and achieving the best quality of life with the disease. The long-term goal is to eradicate the disease; however, it is of grave importance to equip the public with the fundamental knowledge necessary to prevent transmission and educate patients on how to live with this chronic disease. Intuitive healthcare personnel understand that not everyone has equitable access to knowledge and information about HIV/AIDS. Nevertheless, many factors can contribute to a lack of knowledge of the disease, a few of which are fear, lack of exposure, poor education, low socioeconomic status, and inadequate access to health care.

The financial burden of effectively managing and eventually eradicating HIV is inconceivable. Reimbursement for HIV treatment is extremely low (Sosman, 2010). Most patients who succumb to the disease because they were not fortunate enough to obtain and maintain an undetectable viral load typically die from multi-system organ failure or a secondary infection, such as pneumocystis pneumonia. These patients may spend extended periods in the hospital for treatment of these types of infections before their deaths and often require multiple hospital stays, thereby accumulating extreme debt. The treatment and

investigation needed for diseases like HIV affect entire communities both financially and in terms of health and safety. HIV is a complex chronic condition that requires a high degree of specialized clinical skills among managing clinicians (Sosman, 2010). Thus, despite the innovative and successful modes of treating the disease, the quantity of healthcare team members and highly specialized equipment necessary for treatment contributes to increasing costs of health care, which impacts health care as a whole and, more specifically, the nursing profession. There are 4.2 million nurses in the U.S. workforce, and it is nurses who are on the front lines providing bedside care for patients with frequent hospital stays such as those with chronic diseases such as HIV.

Some methodological issues encountered in the use of viral load testing for HIV are medication compliance, accessibility to health care, and affordability of treatment. Not every patient who has contracted HIV has access to treatment. Furthermore, some countries do not have consistent access to the necessary medications, technology for proper testing, or healthcare team members to conduct the treatment. Patients also report treatment fatigue as a barrier to adequate and continuous treatment of the disease (Thompson et. Al, 2009). Severe side effects, drug resistance, and insufficient drug levels in the blood have been reported as barriers to controlling the progression of the disease (Thompson et. Al, 2009).

The common goal of any patient living with the virus is to achieve an undetectable viral load. Achieving undetectable status is a means of controlling the transmission of the disease as well as improving the quality of life of a patient living with the virus. Once a patient's viral load is undetectable, the goal is to maintain that status and to acquire and maintain the best quality of life. The data collected from routine viral load testing is recorded in the patient's medical record. The patient may undergo repeated routine viral

load testing for evaluative purposes. To aid improvements in the treatment of HIV tangible goals must align with how the patient perceives what is most important in their lives such as the patient's ability to live what they would consider a normal life, which includes their ability to feel healthy enough to perform activities of daily living as well as their autonomy in caring for themselves. The sensitivity and specificity of viral load testing vary by method, and viral load point of care testing is the most accurate (Brook, 2018). The challenge with viral load testing and community population is accessibility. However, viral load point of care testing has a higher sensitivity and validity than those of CD4 testing. Both tests have a high specificity of the virus yet can yield different viral load results.

HIV transmission has been definitively linked to the exchange of bodily fluids, including blood and blood products, semen, and other bodily fluids (Figure 1). Most men transmit HIV through sexual contact more specifically anal sex while transmission for women most commonly occurs through vaginal sex with a male partner who has HIV. Unprotected sex is defined as oral, anal, or vaginal sex without the use of a barrier, such as a condom. For an HIV-negative partner, receptive anal sex is the highest-risk sexual behavior, but they may contract HIV from inserted anal sex as well. Either partner may contract HIV through vaginal sex, though it is less risky than receptive anal sex. Sharing needles, syringes, or other equipment used to prepare drugs for injection with someone who has HIV is another method of contracting the virus. Persons who have a drug addiction and utilize needle injection as their method of administering illegal drugs into the bloodstream are at an extremely elevated risk of transmitting the virus. HIV can live in a used needle for up to 42 days, depending on the temperature and other factors. The virus may also be transmitted to a child during pregnancy, birth, or breastfeeding, and the risk can be high if a

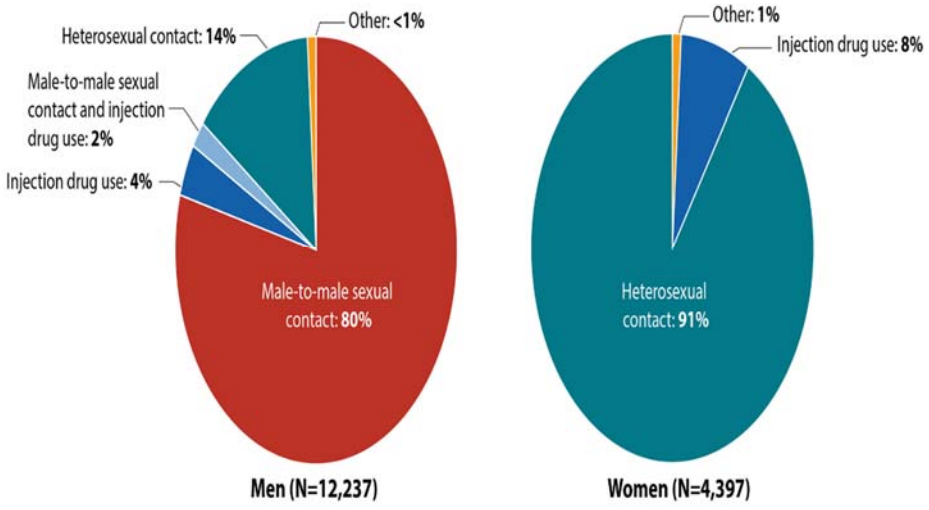
mother is living with HIV and not taking medication. Evaluating all pregnant people for HIV and starting HIV treatment immediately has reduced the number of babies who are born with HIV. Additional modes of transmission include but are not limited to being punctured with an HIV-positive contaminated needle or other sharp objects.

PrEP (brand name, Truvada) is a once-a-day combination pill that contains two medications, tenofovir and emtricitabine, which help to prevent the virus from replicating and establishing a permanent infection, thus reducing transmission. PrEP is indicated for those who take part in high-risk behaviors that may increase their likelihood of contracting the disease. Advertising is now a key marketing tool to reach this audience. Commercials reach the masses—including teens and young adults, who currently have the highest rate of new and existing HIV infections—through outlets such as television and social media.

A range of social, economic, and demographic factors such as stigma, discrimination, income, education, and geographic region, affect a person's risk for contracting HIV. Poverty may account for some of the racial and ethnic disparities found in HIV prevalence rates for the overall U.S. population—46% and 40% of African American and Hispanic people, respectively, live in poverty areas compared with just 10% of white people. HIV prevalence rates in urban poverty areas are inversely related to socioeconomic status. For the overall U.S. population, the HIV prevalence rates for Hispanic (0.6%) and African American people (1.7%) are three times and more than eight times the rate for white people (0.2%), respectively (Figure 1).

Figure 1

Modes of HIV transmission by gender



Gay and bisexual men and other MSM bear the greatest burden by risk group, representing an estimated 26,000 new HIV infections per year. Black/African American gay and bisexual men accounted for the largest number of HIV diagnoses from 2019 to 2021 (9,807), followed by Hispanic/Latino (7,436) and white MSM (6,982). In the United States, HIV diagnoses are not evenly distributed across states and regions. In 2018, the South accounted for more than half (52%) of the new HIV diagnoses in the country,

followed by the West (19%), Northeast (16%), and Midwest (13%), and U.S. dependent areas made up 1% of new HIV diagnoses (CDC, 2018).

Figure 2

Distribution of HIV-positive rates by race in U.S. poverty areas vs. the nation as a whole

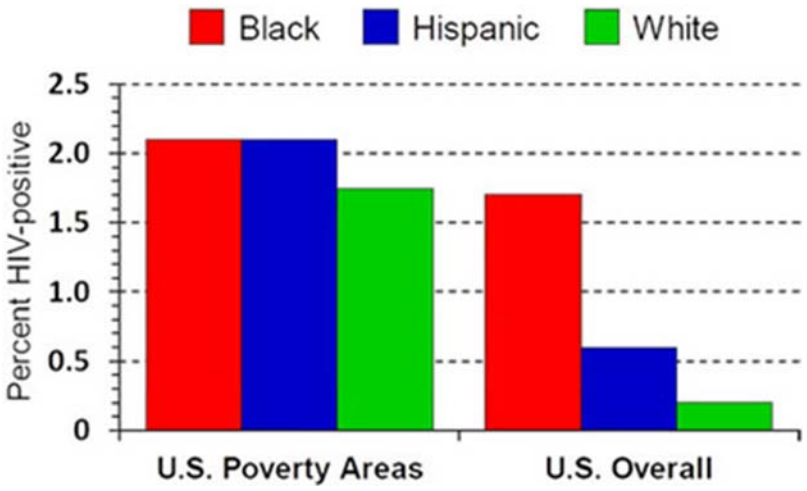


Figure 1 Distribution of HIV-positive rates by race in U.S. poverty areas vs. the nation as a whole.

The Modified Morisky Scale is a short, validated educational tool that can be used to improve patients' adherence to treatment plans by assessing their motivation and knowledge. It identifies a baseline knowledge and motivation of patients' attitudes toward medication compliance. The benefits of the tool are endless, yet the goal for this group of participants is a reduction in viral load and, potentially, undetectable viral load status. The

Modified Morisky Scale aims to significantly increase patients' knowledge and motivation for medication adherence. Health care has continually focused on health promotion, and although there is not currently a cure for HIV, improvements should be made to help any person infected with the disease to obtain undetectable viral load status. One of the main ways to assist in eradicating the virus is to stop the transmission of the disease.

How society views the disease must change. To accomplish this, the stigma surrounding the virus and its diagnosis must be eliminated. HIV-related stigma refers to negative beliefs, feelings, and attitudes toward people living with HIV (Allard, 1989). The anticipated outcome, because of the intervention, is to promote change through improvements in motivation and knowledge as it relates to medication adherence. Patients realize the disease is an infectious disease and must be reported to the health department and understand the backlash that they may face from society, friends, co-workers, and even family. Utilizing an educational tool such as the Modified Morisky Scale in clinical settings over one year may spearhead this much-needed change in perception of HIV. Identifying patients' perceptions about a disease and attitudes towards treatment of the disease are correlated to the Health Belief Model (HBM).

Many factors may contribute to HAART compliance. For example, socioeconomic status and access to proper health care are essential to the successful treatment of the disease. Patients' healthcare plans must also consider their psychosocial needs. The key to successful treatment of HIV is to decrease the rate at which the infected cells replicate. A multidisciplinary approach can be particularly effective in obtaining undetectable viral loads. Reducing the disease transmission rate is a first-line defense against the disease. Furthermore, early diagnosis of HIV and HIV-related secondary illnesses can help to save

lives. Education is essential to understanding disease and controlling the spread of the disease throughout the general population. The Modified Morisky Scale can be added to strategic care plans, program management, and prevention programs worldwide and can be utilized as an online module or part of a downloadable application or interactive webpage that hosts question-and-answer segments based on the assessment tool. The tool can assist in identifying knowledge deficits and highlight a patients' motivation to want to adhere to a medication regimen. Alongside advances in technology to help in the detection, treatment, and eradication of the virus.

Implementation of the Modified Morisky Scale will support participants with medication adherence and decrease their viral load, which will subsequently improve their quality of life. The scale helps to identify participants' attitudes toward treatment and their gaps in knowledge and assess their motivation to learn how to maintain strict adherence to treatment. The providers gave each patient access to the patient portal, daily reminders, and a baseline evaluation of their motivation and knowledge of medication compliance, the resources necessary to improve their medication adherence. This goal was achieved by implementing the Modified Morisky Scale and conducting intermittent viral load testing and provider-led medication reminders through the online patient portal.

Definition of Terms

Many key terms are vital to this body of knowledge. This project's important terms and their definitions are as follows:

- HIV: Human immunodeficiency virus; attacks and destroys CD4 T cells and interferes with the body's ability to fight infections. If left untreated, HIV can turn into AIDS.

- AIDS: Acquired immunodeficiency syndrome; end-stage HIV characterized by a <200 T cells/mm^3 blood. Can leave patients highly susceptible to secondary infections.
- CD4 T cells: White blood cells that fight infection and play a vital role in the immune system.
- Viral Load: The number of HIV copies in a milliliter of blood.
- HAART: Highly active antiretroviral therapy; a combination of three or more drugs used to treat HIV infection.
- Undetectable Viral Load: When HAART reduces HIV to such a small quantity that it can no longer be detected by standard blood tests.
- Medication Compliance: The act of taking medication on the prescribed schedule.
- Medication Adherence: The degree to which a patient correctly follows their prescribed medication regimen.
- Self-Reporting: A common approach for gathering medical data in which a patient reports their own behavior.
- Secondary Infection: An infection that occurs during or after treatment for another infection.
- Untransmittable: When a person with HIV has no chance of transmitting the virus to someone else.

CHAPTER II
LITERATURE REVIEW

Introduction

HIV is no longer labeled as a fatal and terminal illness but is now classified as a chronic and treatable disease. The purpose of this project was to determine whether the intervention—i.e., implementing the Modified Morisky Scale as an evidence-based practice tool in addition to provider-led scheduled reminders to maintain medication compliance throughout treatment—could effectively reduce patients' viral load status and improve their medication compliance. The target population included patients between the ages of 18 and 45 who identified as African American or Latinx Identifying the barriers to successful treatment for patients with HIV, such as poor medication compliance and lack of understanding of chronic illness, contribute to the necessity for improvements in the areas of compliance and education. The Modified Morisky Scale was intended to aid in identifying those barriers in this target population. The anticipated outcomes, such as decreased viral load, were expected to reduce disease transmission, and improve medication modalities and quality of life for persons living with HIV.

Search Strategy

Comprehensive search strategies were performed across a variety of databases and libraries, including the Prairie View A&M University library and the Texas Medical Center library. An advanced search was conducted utilizing CINAHL, Embase, Medline, PUBMED, and Google Scholar. The search strategies included keywords such as interventions, chronic disease, viral loads, medication compliance, HIV, and adherence. The chosen articles were grouped by subject according to reliability, validity, and

interventions noted. The articles specified the effectiveness of the interventions, barriers to successful medication adherence, and how the target population influences the outcome of the project as well as the patients' willingness to improve and post-hospital follow-up. In addition to HIV, articles on other chronic diseases that required long-term medication compliance for successful treatment—i.e., asthma, diabetes, psoriasis, hypertension, chronic obstructive pulmonary disease, prostate cancer, heart failure, cervical cancer, and hyperlipidemia—were also included.

Theoretical Framework

The HBM was developed in the 1950s by a group of U.S. Public Health Service social psychologists to explain why medical screening programs offered by the U.S. Public Health Service, particularly that for tuberculosis, were not phenomenally successful (Hockbaum, 1958). The underlying concept of the original HBM is that health behavior is determined by personal beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Figure 3; Hockbaum, 1958). The model analyses patients' attitudes toward disease and is considered a behavioral health theory, thus classifying the model as a middle-range theory construct. Social psychologist Godfrey Hockbaum was one of the first social scientists hired by the U.S. Public Health Service as part of the new Behavioral Science Section. He was credited with two contributions to health science, the most renowned of which was the HBM, one of the first social-psychological theories that addressed health behavior, health education, data collection, and practice, successfully merging abstract theory with practice. Although Hockbaum was not a nurse, he laid the groundwork for a model construct that has left a lasting impact on the nursing profession. As a psychologist, he proposed a non-clinical perspective of patients and their outward

views of health and health promotion. His display of social influences on health behavior shocked the medical community. The idea of incorporating behavioral science in public health was notable and revolutionary, offering a unique blend of psychology and medicine that has now been extensively utilized for a variety of long- and short-term health behaviors. The model also sparked conversation and highlighted the need for additional investigation into the model itself and how it could apply to other areas of medicine. The model was initially geared toward health promotion and prevention rather than treating a disease post-diagnosis. The HBM has continued its steadfast path of identifying and compartmentalizing information from the perspectives of both patients and initiatives set forth by the CDC. The model has been utilized to understand attitudes regarding health topics that include diabetes, osteoporosis, breast cancer, and HIV. The HBM has been utilized for over 65 years and continues to evolve alongside health care.

The HBM is the most used theory in health education and promotion. The model identifies barriers to adequate health care based on the patient's beliefs and perceptions. Although this theory was birthed from tuberculosis research, it now applies to a broad range of health conditions and behaviors. The model serves as a foundation for analyzing patients' attitudes toward their health. The primary goals of the model are to explain and predict health behaviors. In doing so, the model depicts barriers that may prevent a person from seeking preventive screening, maintenance exams, and treatment for diseases. The HBM attempts to predict health-related behavior in terms of certain belief patterns. These include a person's motivation to undertake a health behavior can be divided into three categories: individual perceptions, modifying factors, and likelihood of action. Many

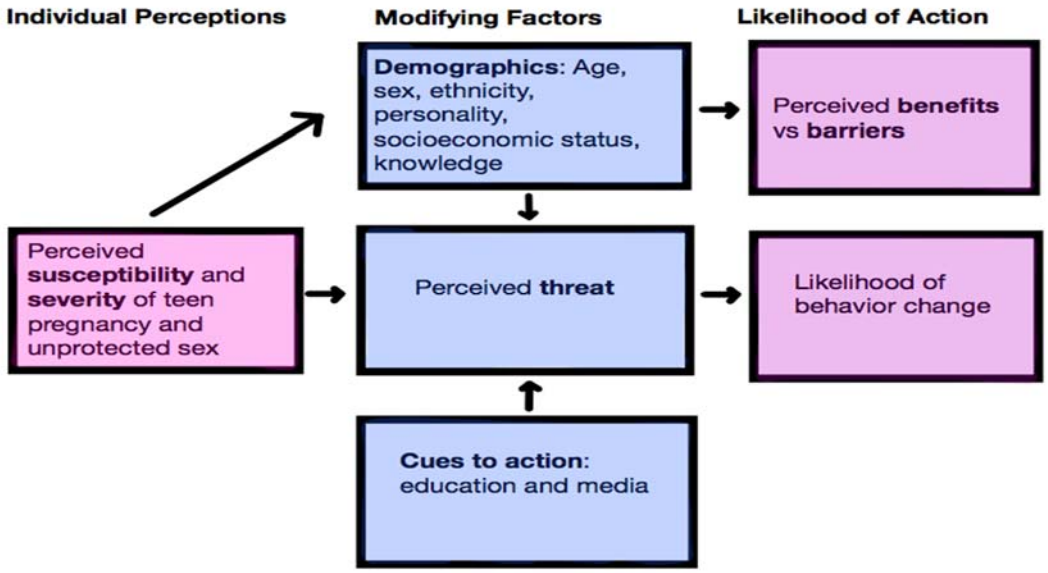
factors that influence these behaviors are a person's culture, religion, and disease-specific sentiments.

The original HBM contained six major concepts and definitions of the health promotion model: perceived susceptibility, perceived severity, perceived benefits, perceived costs, motivation, and enabling or modifying factors (Steers, 1996). Other concepts have been added in recent years, including self-efficacy, and cues to action. The first of the six major concepts, perceived susceptibility, describes a person's belief of their chances of getting a condition. This concept is applied by identifying the population at risk, analyzing their perceptions and behaviors, and, if these risk factors are identified the person is determined to have a heightened perceived susceptibility of acquiring an illness or disease. Next, perceived severity defines a person's beliefs of how serious a condition and its consequences can be. The consequences of the risk and condition are identified. The perceived benefits are a person's belief in the efficacy of the advised action to reduce their risk or seriousness of impact. The HBM also identifies the positive effects the person can expect and describes evidence of the effectiveness. One's belief in the tangible and psychological costs of the advised behavior represents the perceived barriers. The application includes the ability to identify and reduce barriers through reassurance, incentives, and assistance. For a new behavior to be adopted, a person needs to believe that the benefits of the new behavior outweigh the consequences of continuing the old behavior (Centers for Disease Control and Prevention, 2004). The more recent concepts, added as recently as 1988, include cues to action and self-efficacy. Cues to action are strategies to activate readiness and include events, people, or things that move people to change their behavior. They provide how-to information and reminders and promote awareness. Some

examples include the illness of a family member, media reports, mass media campaigns, advice from others, reminder postcards from a healthcare provider, and health warning labels on a product (Ali, 2002). The last of the six concepts of the HBM, self-efficacy, is one's ability to act. If a person does not think they can accomplish a task, they usually will not attempt the task. Thus, change cannot be evoked if the task is viewed as insurmountable. The person must believe that the goal is tangible, and the outcome is worth the challenge. An example would be maintaining a healthy weight through diet and moderate exercise. If the patient is not physically capable of doing physical activity and does not have access to healthy food choices, they may not attempt to adopt the practices necessary to carry out the tasks.

Figure 3

Health Behavior Model flow chart for HIV



Literature Review

The Modified Morisky Scale is a validated tool used to evaluate the medication compliance of patients with chronic diseases. The scale is commonly utilized as a clinical compliance questionnaire, although no gold standard currently exists for evaluating therapeutic compliance. The scale has been noted as simple, economic, and effective (Zhang et al., 2021). The eight-item Morisky Scale (MMAS-8) has exhibited acceptable reliability and validity in evaluating medication compliance in patients with chronic pain; thus, it can be applied to detect non-adherent patients with chronic pain. The tool was utilized for the purpose of this project to determine how well patients comply with their medication regimens, and convergent validity was assessed by comparing the MMAS-8 and a medication adherence visual analog score through Pearson's correlation analysis. Based on these data, the tool was determined to be effective, and convergent validity was high.

Tan et al. (2014) completed a review of the four-item Morisky Medication Adherence Scale and MMAS-8, and although measuring tools are primarily considered subjective, the data supported high reliability in capturing the beliefs, barriers, and behaviors related to medication adherence. Methods of measuring adherence can be classified as direct or indirect. The direct methods include directly observed therapy, measurement of drug concentrations in blood, and measurement of biological markers in the body. The indirect methods include patient self-reports, pill counts, electronic medication monitoring, and assessment of patients' clinical responses.

Pharmacist-Related Interventions

Ali et al. (2015) conducted a six-month prospective study of 149 patients who were non-adherent to prescribed hypolipidemic drug regimens. Pharmacists taught patients about the detailed benefits of medication compliance and lifestyle modifications that reduce the risks of coronary heart disease and followed the patients by phone over two months. The pharmacists improved drug renewal rates and plasma lipid levels. The results showed a significant increase in medication compliance (15.3%) in 11 days. Although a financial barrier could arise in the future due to the $34.50 fee per pharmacist consultation, the intervention produced much-needed improvements, and no other potential barriers were noted for this successful medication compliance intervention. There was a direct correlation between the use of educational material and increases in medication compliance.

A randomized control study by Abdulsalim et al. (2018) evaluated pharmacist-led interventions among chronic obstructive pulmonary disease patients in a teaching hospital. Patients were assigned to either an intervention group or a control group, and medication adherence was assessed with a questionnaire. Pharmacist interventions included educating patients on compliance, smoking cessation, exercise, inhaler use, and the need for timely follow-up. Of 328 patients, 206 completed the follow-up. Medication adherence improved significantly (from 49% to 80%) after the pharmacist intervention in the intervention group. Carelessness about taking medications was the primary reason for non-adherence among chronic obstructive pulmonary disease patients but was effectively reduced by the intervention.

Behavioral Interventions

A systematic review by Reif et al. (2019) of behavioral interventions to reduce viral loads included participants ages 10 to 24 who were HIV positive. The authors determined that adolescents and children with HIV had poorer adherence, viral suppression, and outcomes than other age groups. The study primarily focused on low- and middle-income countries, where the adolescent and youth HIV burden is greatest. The data included a collection of reports on ART adherence measurements or viral load measurement. Such reports highlight the importance of maintaining strict medication adherence, which was the goal of this project. It was determined that intensive home-based care management models hold the most promise for improving outcomes in this population. The results showed an increase in medication compliance from 33.6% to 59.9% among the intervention group. A reduction in the time spent in the clinic improved clinical stability, viral suppression, and medication adherence among adolescents.

Mimiaga et al. (2018) conducted a randomized controlled trial and determined that the overall rate of ART adherence among participants was suboptimal. They further noted that no published interventions efficaciously addressed the specific needs of this population. The trial utilized Positive STEPS, which is a behavioral and technology-driven intervention that optimizes ART adherence and viral suppression. Patients were given daily medication reminders through a two-way text messaging system. Patients received standardized ART adherence education, and had their blood drawn at four, eight, and 12 months to monitor their viral load. The outcomes included improvements in viral load and ART adherence measured via a medication tracking device (Wisepill) and self-reporting.

Dosing-Related Interventions

Rowell-Consolo and Hu (2019) conducted in-depth interviews with 20 formerly incarcerated, HIV-positive African American men in New York City. Viral load testing from their most recent physician visit was recorded at each interview. Four factors were identified as barriers to medication compliance: medication burden, forgetfulness, mental health, and emotional difficulties/perceived conflict with substance abuse. Repeated viral load testing allowed participants to understand how their medication compliance helped improve their disease. Furthermore, changing treatment plans from single- to multi-pill regimens often led to failures in medication compliance, whereas medication compliance increased by approximately 20% for those who were switched from multi- to single-pill regimens. Forty percent of the heterosexual male participants had an undetectable viral load status during this study, and 95% were classified as ethnic minorities.

Incentive Interventions

Kong et al. (2020) evaluated the effectiveness of physician incentives in increasing patient medication adherence for three separate drug classes: diabetes medications, antihypertensive medications, and statins. The authors selected 911 primary care practices for a total of 8,935 participants and measured patients' medication adherence 18 months before the intervention to create a baseline. The physician incentives included $50 per patient per drug class for participation in the study. Medication compliance among the participants remained the same at an average of approximately 50% compliance. The study found that physician incentives of $50 per patient per drug class were not effective for increasing patient medication adherence for the drug classes and primary care practices studied. Such an intervention may be more likely to improve outcomes through direct, face-

to-face physician visits rather than with those that reflect patient behaviors. The current study offered no incentives to participants and based on the results of Kong et al. (2020), it would not have significantly improved medication compliance. The improvements found in this article were more noteworthy during face-to-face visits, which aligns with the concept of the current project: interactions with participants can aid in medication adherence.

Smartphone- and Application-Based Interventions

Xu and Long (2020) performed a meta-analysis and systematic review of eight studies (1,657 total participants) to systematically compile available evidence to determine the overall effect of smartphone apps on blood pressure control, medication adherence, and lifestyle changes for people with hypertension. The pooled analysis demonstrated a significant effect in favor of the intervention group versus the control group. The interventions included self-reported blood pressure readings and required participants to record the medications they took as well as the time of day they took each medication via smartphone input. The results showed a 20% increase in medication compliance among those who self-reported their medications into the smartphone device as well as the times they took those medications. Xu and Long (2020) found that participants had increases in long term medication compliance because the participants had autonomy to self-report and manage their medication regimen.

Linde (2020) analyzed a one-way text message intervention for cervical cancer treatment, aiming to provide an overview of the trial for women in Africa who received a positive rapid test for human papillomavirus during patient screening. The one-way text message system was a mobile health intervention intended to improve health-related outcomes. A random-effects model showed that one-way text messages were effective in

increasing and medication adherence in addition to phone calls via the provider for support. These results of this study align with similar interventions such as the use of an online portal for self-reporting supports the current project's use of online provider-led medication reminders through the patient portal. The intervention consisted of health education and text message reminders to take medications. The results indicated a significant increase in compliance of three percent for those who received telephone calls and those who received one-way text messages.

Syafitri et al. (2021) completed a systematic review of 10 studies on the effectiveness of smartphone application–based self-management interventions in diabetes mellitus patients. The included studies utilized diabetes apps, such as Diaguru, Calendar App, Sidekick Health, and Glyco Leap, and primarily focused on self-management of diabetes, lifestyle modifications, and medication adherence motivation. The results were compiled based on participants' self-reporting of improvements in care and overall health. The participants who used the apps showed significant improvements in self-efficacy, self-care activities, quality of life, clinical outcomes, and medication compliance (average improvement of 25%), illustrating that a smartphone application–based self-management intervention can assist with medication compliance, as this project similarly intended to show.

A systematic review conducted by (Rowell-Cunsolo (2020), evaluated the effectiveness of ART adherence interventions for persons living with HIV. The sample population was 1,752 men. The participants were separated into groups, such as intravenous drug users, heterosexual men, and men who have sex with men (MSM). The interventions, which included text messaging and smartphone data reporting, led to

improvements in medication adherence and biological outcomes. Patients often need interventions to assist in medication compliance for chronic diseases. The current project applied comparable interventions, such as a messaging system, to support medication compliance among the target population.

Web-Based Interventions

Wang et al. (2019) evaluated medication compliance among patients diagnosed with psoriasis. Two hundred participants were selected, and a questionnaire was given to analyze their medication adherence and the factors that influence medication adherence. Of these participants, 117 were determined to have based on the questionnaire low medication adherence. The intervention group received health education and exhibited greater adherence improvements (83.7%) compared with the control group (6.4%). Medication adherence among psoriasis patients is poor but can be improved by a health education intervention, which proves essential in assisting patients with medication compliance; both the article and this project align with that theory.

Cote et al. (2020) evaluated the effectiveness of a personalized, web-based nursing intervention, named VIH-TAVIE, which consists of four 20- to 30-minute computer sessions assessing medication adherence. The ultimate objective of VIH-TAVIE is to make support available to people living with HIV and at their convenience to help them develop the skills needed to meet the challenges inherent to their health condition. Eighty-eight HIV patients aged eighteen and older who had been undergoing ART for at least five years were selected to participate in the study. The outcomes were measured using a self-administered, web-based questionnaire at baseline, three months, and six months, and the results showed a 48% increase in medication adherence among the participants. Although the primary goal

was to measure medication adherence, the study also measured self-efficacy, social support, and skills and strategies. The health education intervention improved medication compliance, which signifies a need for the continued involvement of web-based evaluation studies of electronic health record (eHealth) interventions. Continuous support of HIV patients has proven successful in promoting medication adherence, and the current project provided such support.

According to Jeminiwa et al. (2019), a systematic review of eHealth was necessary to evaluate improvements in adherence to inhaled corticosteroids among patients with persistent asthma. The review evaluated randomized controlled trials, comparing eHealth interventions with usual care in terms of patients' adherence to prescribed inhaled corticosteroids for persistent asthma. Eighty-eight records were identified, and outlets such as social media, eHealth, telehealth, and mobile health records were each utilized in interventions to enhance medication compliance. Patients often need a multi-level approach to care to effectively display efficacious care outcomes, which aligns with the model outlined in the current project. Jeminiwa et al. (2019) used the medication report scale as a recording method and found a small but significant overall effect of eHealth interventions on adherence to inhaled corticosteroids with a mean increase of approximately 15%.

Ampofo et al. (2020) conducted a systematic review and meta-analysis of 12 studies to examine the effect of educational interventions on medication adherence among patients with hypertension. The studies showed low to moderate quality improvements in medication adherence with educational interventions. Frequent contact during patient education showed better medication adherence outcomes, which coincides with the targets of the current project verbal educational interventions can improve health literacy and,

consequently, adherence to medication among individuals with hypertension. Frequent verbal educational interventions were found to enhance patient engagement and participation and promote medication literacy, thus improving adherence by 30% according to self-reporting.

Multidisciplinary Interventions

Ferdinand et al. (2017) evaluated improvements in medication adherence in 1,015 patients with stable coronary artery disease. The study noted a 4.4-fold increase in the risk of stroke and a 3.8-fold increase in the risk of death among patients who self-reported as non-adherent with medication compliance versus those who were adherent. Factors that inhibited adherence included socioeconomic factors, therapy-related factors, and patient-related factors. The multidisciplinary health literacy interventions improved the labels on the medications, access to care, sent patients clinical reminders (cardiac rehabilitation), and promoted communication with the pharmacist. The study implemented methods for measuring and monitoring adherence, such as special watches with alarms, pillbox timers, “smart pill” containers, and automated pill dispensers. The recorded data revealed a 42% increase in medication adherence. The Sentinel System was utilized for adverse events. Much work remains in addressing medication adherence; aligning therapeutic evaluations and labeling could have a profound effect on health outcomes.

Rich et al. (2015) conducted a systematic review of the effects of a multidisciplinary intervention on medication compliance in older patients with congestive heart failure. The review aimed to identify factors associated with reduced medication compliance. The sample population consisted of 156 patients hospitalized with congestive heart failure. The interventions included comprehensive patient education, dietary

consultations, social service visits, medication compliance, and intensive post-discharge follow-up. The results displayed a significant increase in medication compliance 30 days post-discharge and a correlation between multidisciplinary treatment strategy and improved medication compliance during the first 30 days following hospital discharge. The study yielded a 92% success rate of medication adherence.

Ding and Lu (2018) assessed comprehensive nursing interventions to help improve medication compliance in prostate cancer patients undergoing endocrine therapy. Forty-three cancer patients with cancer were selected and monitored at one, three, and six months post-treatment. The study utilized the MMAS-8. The results revealed a baseline score of 7.8% and a decrease in medication compliance to 6.2% at 3 months post-treatment and a final increase to 7.9% at six months post-treatment. The outcome revealed fluctuating results on medication compliance based on the intervention used. Only a marginal increase of .1% increase in medication compliance was noted at the 6-month interval.

Each of the multidisciplinary intervention articles described here highlights the importance of utilizing a comprehensive approach to successfully treat patients with chronic diseases, thus improving their medication compliance, knowledge, and quality of life. All these outcomes were targets of the proposed project.

Self-Efficacy Interventions

Nafradi et al. (2017) examined the relationship between self-efficacy, health locus of control, and medication adherence in a review of state-of-the-art knowledge concerning the relationship between patient empowerment and medication adherence across medical conditions. The authors reviewed 154 articles and found that elevated levels of self-efficacy and internal health locus of control consistently promoted medication adherence. The

benefits of patients' high internal and concurrent physician-attributed control beliefs suggest that a joint empowerment approach can suitably foster medication adherence. Allowing patients with chronic diseases internal control over their health proved beneficial in increasing medication compliance.

Zomahoun et al. (2018) conducted a meta-analysis using a random-effects model to estimate motivational interviewing in a meta-analysis. The results showed that motivational interviewing effectively enhanced medication adherence in adults treated for chronic diseases. The interventionists delivered motivational interviews face-to-face as this format was found to be more effective than interviews delivered over the phone. The study noted that medication adherence increased by 19%. However, because the effect size was small, further investigation is warranted in motivational interviewing to continue the progression of medication compliance for those with chronic diseases. Moreover, patients' internal locus of control contributes to their perception of their illness as well as how they treat the illness through medication compliance. The patients' behaviors and actions are directly associated with health outcomes. The current project aimed to improve the internal locus of control by using the Modified Morisky Scale and sending provider-led medication reminders through the online patient portal.

Conclusion

Chronic disease progression can be slowed by proper medical treatment and collaborative efforts. Interventions that improve medication compliance and adherence are vital components of providing total care to chronically ill patients. Because HIV is now classified as a chronic disease treatment is more widely acceptable. The modification yielded tremendous improvements in prolonging and improving the lifespan of chronically

ill patients living with HIV. Undetectable viral loads are essential in the treatment of HIV/AIDS. Although much work is needed to continue to improve medicinal treatments for HIV, the rate of transmission of HIV has significantly decreased and the ability to treat HIV in the era of widely available anti- retroviral therapy has stabilized. If a patient can consistently maintain their medication regimen, they have the greatest chance of living a healthy lifestyle and prolonging their lifespan. Reduced transmission rates are a direct effect of obtaining and maintaining undetectable viral load status. Viral load levels can be assessed through frequent testing of those with HIV/AIDS. Improving interventions aimed at medication adherence for HIV/AIDS will help patients maintain stricter medication regime for diseases such as HIV. Provider-led interventions are limited at this time, and the results of the literature review did not reflect a substantial quantity of data in this area. The intervention used in this project fills this gap and supports the continued improvement of HIV/AIDS treatment.

CHAPTER III

METHODOLOGY

Introduction

The methodology of this project began with acknowledging how HIV has impacted the world, including how HIV attacks the immune system, how viral load affects a patient's overall health, and how medication adherence impacts the success of viral suppression. It was also imperative to understand how outside influences can affect a patient's ability to maintain medication compliance throughout their HIV treatment. This section discusses the overall structure of the project and outlines the subject, analysis, procedure, and limitations of the project in addition to the procedure and statistical analysis. Successful reduction in viral load status was primarily linked to the changed behaviors of the participant and their willingness to maintain that change.

Project Design

This evidence-based practice implementation project aimed to improve patient outcomes in a clinical setting using a pre-/post-intervention repeated measures design. Involving multiple measures of the same variable. The repeated measure ANOVA compares means across one or more variables that are based on repeated observations. This project focused on the probability that each patient could adequately obtain a reduction in viral load status if they maintained a strict HAART regimen.

Project Setting and Time

This project was conducted across multiple clinics that primarily focused on the care and management of HIV patients, which led to a wealth of participants for this project. The clinics were in urban metropolitan areas and were accessible via multiple modes of

transportation. The setting is unique in that the clinics address many of the patients' needs on-site, including dental, social, pharmaceutical, laboratory, and podiatry services. This style of medical facility complemented the overall success of each patient in receiving and maintaining the care they needed. The environment was conducive to learning, teaching, and developing an individualized care plan for each patient. The clinic provided an optimal environment because all data could be collected on-site, and blood work could be received instantly from the on-site laboratory without a delay in data collection. Participants were followed for a minimum of three months. Participants were interviewed and given provider-led patient reminders to adhere to their medication regimen via the patient portal at two to four week intervals, which fluctuated based on the needs of each patient.

Project Population/Demographics Form

The population for this project included African American and Latinx patients aged 18–45 and of various sexual orientations who were HIV-positive and undergoing HAART at the time of the study. This population reflected that served by the clinics as the focus of this clinical setting was to serve ethnic minority clientele.

Sample Size and Sampling Method

The sample size, or the number of participants needed to successfully conduct the project, was estimated to be 35 participants. An additional five participants were selected in case some participants did not complete the project, resulting in a total of 40 participants. An effect size of .50 was expected after the implementation of the intervention. A power of .80 and a significance level of .05 were used to determine the sample size.

Instrumentation and Measures

This project utilized several instruments, beginning with a pre-clinical assessment interview. Additional instruments included a pre-test of six questions from the Modified Morisky Scale before the start of the project. Provider-led reminders were entered into the patient portal to remind patients to maintain their strict medication regimen. Participants were asked to access their online patient portal at the start of the project to receive the medication reminders. The participants were asked to complete a follow-up questionnaire consisting of the same questions as in the pre-assessment at the 12-week mark (the conclusion of the project) to effectively monitor change.

Table 1

Repeated Measures ANOVA results for the dependent variable (viral load)

Repeated Measures ANOVA					
Measure: Viral Load					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
PCR Measures	18,725,401.856	1.662	11,268,342.222	12.577	<.001

Table 2 illustrates the Modified Morisky Scale, which was utilized during the project to gather information, establish a baseline assessment of each participant's motivation toward medication compliance, and determine their knowledge of the importance of strict medication adherence. The same tool was utilized for post-test measurements to identify changes in those same assessments post-implementation of the intervention.

Data Collection

Pre-test evaluations were given to the patients before the start of the project to establish baseline knowledge and viral load. Medical data, including each patient's viral load, were obtained from their medical records after blood collection. The data were recorded for each patient and reviewed to identify any changes in viral load. The expected outcome was a decrease in viral load because of the evidence-based educational intervention. The data was collected and reviewed by the principal investigator. Viral load calculations—specifically, T-cell counts—were collected from the medical records two to four weeks after the administration of the Modified Morisky Scale and compared with the baseline values collected during the pre-clinical assessment. The pre-clinical assessment also analyzed the patients' current behaviors and attitudes toward medication adherence. Participants were asked, via the Modified Morisky Scale, to document any complications with their medications, barriers to medication compliance, and other factors that could contribute to their lack of success in achieving an undetectable viral load. A complete and thorough health history was recorded for each patient, and their blood work was analyzed. Participants underwent routine blood work at two-to-four-week intervals to evaluate their T-cell count, which represented the strength of their immune system. The intervals were frequent depending on the needs of the patient. Provider-led reminders to maintain medication adherence were sent to patients through the online patient portal. This data helped to identify any barriers to success that participants encountered throughout the project. At the 12-week mark, the project participants were asked to repeat the Modified Morisky Scale as post-intervention assessment to measure changes based on results of the Pre-test.

Data Analysis/Procedure

The primary outcome, change in viral load, was analyzed using repeated measures analysis of variance (ANOVA), which is appropriate to use when the same dependent variable is measured repeatedly over a given period (Singh et al., 2014). Viral load measurements were collected at two-to-four-week intervals. Each participant was expected to provide between two and four viral load measurements throughout the project. ANOVA assesses differences in mean values; therefore, repeated measures ANOVA was used to measure differences in mean viral load during the measurements at 2-, 4-, 8- and 12-week measurements of viral load via lab work. ANOVA uses the F statistic to determine if there are statistically significant differences among the means: in this case, these were the differences in the mean viral load values at each interval. The value of the F-test and the *p*-value were reported. A mean plot was generated to show the change in mean viral load over time. Polymerase chain reaction testing (PCR) was used to detect HIV's genetic material (RNA). The test rapidly produced millions to billions of copies of a specific segment of DNA so that it could be analyzed in greater detail. A chi-squared test was utilized due to the large sample sizes to determine if the motivation scores were independent influencing the test statistic.

Ethical Considerations

Approval was obtained from the Prairie View A&M University Institutional Review Board (IRB) before the start of the project. All participants voluntarily participated in this project and signed an informed consent form to participate. The consent form contained a section for HIPAA authorization to access the patients' protected health information. All subjects were given all the details of the project, including any risks

involved in participating, and the privacy of their protected health information was guaranteed. Participants were informed that no patient identifiers were used throughout the project. Data were collected and documented in a log based on an assigned identification number. This identification number was used on all data collection forms throughout the project. The identification numbers were linked to the participant's identifiers and medical record numbers. The information was kept confidential and secure on a password-protected computer in the office of Dr. James Sims. The log was kept separate from all additional data collected throughout the project. Participants were informed of all uses and disclosures of their medical information and that there was no monetary gain for participating in the project. Confidentiality of all health-related information was always maintained.

Summary

The Modified Morisky Scale was used to establish a baseline of the participant's knowledge and motivation toward medication compliance. The first set of laboratory results collected after consent to participate in the project helped to establish the viral load of the participant. The participants then began to receive reminders to take their medications, via the online patient portal. Participants continued to receive these reminders throughout the project. Upon completion the participants received the Modified Morisky Scale as a post-test questionnaire to analyze the changes in motivation and knowledge of medication compliance.

CHAPTER IV
RESULTS

Introduction

The purpose of this quality improvement project was to increase the knowledge base of a group of HIV-positive African American or Latinx patients. This chapter reports the results via statistical analysis, which highlights an increase in the participants' baseline knowledge of the importance of strict adherence to medication regimens for those diagnosed with chronic diseases. Additionally, the analysis exposed reduced blood viral load levels throughout the project. The chapter also presents the patients' demographics. The project included a total of forty participants, each of whom signed an informed consent form and took a pre-assessment questionnaire to determine their baseline knowledge about taking scheduled medications for a chronic illness.

Answer to the PICOT Question

Repeated measures ANOVA was conducted because the participants' viral load levels were measured at more than two intervals. Each participant was HIV-positive, which created an avenue to assess viral load levels at multiple intervals throughout the project. The results were examined based on an alpha value of .05. The *p*-values for the within-subjects factor and the interactions with the within-subjects factor were calculated using the Greenhouse–Geisser correction to adjust for the violation of the sphericity assumption (Greenhouse & Geisser, 1959). The main effect for the within-subjects factor was significant (F [2, 72] = 12.58, $p < .001$), indicating that there were significant differences between the values of Polymerase Chain Reaction (PCR)_1, PCR_2, and PCR_3. Table 1

presents the ANOVA results. The Polymerase Chain Reaction tests are used to detect HIVs genetic material in a sample to diagnose HIV.

Table 2

Modified Morisky Scale

Instructions: Ask the patient each question and circle the corresponding "yes" or "no" response. Circle the answer to each question and sum the score for the motivation column and sum the score for the knowledge column. Report the results on the CMAG-1 Patient Summary Assessment form.

Question	**Motivation**	**Knowledge**
1. Do you ever forget to take your medicine?	Yes (0) No (1)	
2. Are you careless at times about taking your medicine?	Yes (0) No (1)	
3. When you feel better do you sometimes stop taking your medicine?		Yes (0) No (1)
4. Sometimes if you feel worse when you take your medicine, do you stop taking it?		Yes (0) No (1)
5. Do you know the long-term benefit of taking your medicine as told to you by your doctor or pharmacist?		Yes (1) No (0)
6. Sometimes do you forget to refill your prescription medicine on time?		Yes (0) No (1)
Total score	_____ 0–1 = Low motivation 2–3 = High motivation	_____ 0–1 = Low knowledge 2–3 = High knowledge

Table 3

Contingency table for pre- and post-test motivation and knowledge score (n-40)

		MOTIVATION/ KNOWLEDGE SCORE			Fisher's Exact Test (Sig.)
		High	Low	Total	
POST-TEST	Count	33	3	36	<0.001
	% within POST-TEST	91.7%	8.3%	100.0%	
PRE-TEST	Count	8	32	40	
	% within PRE-TEST	20.0%	80.0%	100.0%	

Table 3 outlines the results of the chi-square test, which evaluated the differences in the proportions of motivation scores both before and after the intervention. The sample size was forty participants. The means of the within-subjects factor are presented in Table 4. There were significant differences between the values of PCR_1, PCR_2, and PCR_3.

Descriptive Statistics

Table 4 further outlines the descriptive statistics of the PCR testing. The observations for PCR_1, PCR_2, and PCR_3 had average values of 1,970.0, 1,605.85, and 1,026.11, respectively. The mean decreased in value at each measurement. The table also displays the minimum and maximum scores for each group. The data revealed a *p*-value less than .05, which indicates that the intervention was a success. The probability value is a value describing how likely it is that your data would have occurred under the null hypothesis of the statistical test. If the p-value is between 0.1 and 0.9 there is no indication to suspect the hypothesis evaluated.

Table 4

Change in viral load over time, including the numbers of participants in each measurement (N) and the range (min/max), mean, and standard deviation

	N	Minimum	Mean	Std. Deviation
PCR_1	40	20.00	1,970.0750	1,714.84371
PCR_2	40	20.00	1,605.8500	1,554.32003
PCR_3	37	20.00	1,026.1081	1,371.79740

The pairwise comparisons (Table 5) explain the difference between the three measurements gathered for this project. No significant difference was noted in the pairwise comparison of PCR_1 and PCR_2 ($p > 0.05$). By contrast, significant differences were found in the comparisons between PCR_1 and PCR_3 and between PCR_2 and PCR_3 (both $p < 0.05$). The I and J columns in Table 5 show the differences in the meaning of PCR_1 versus PCR_2 as well as PCR_1 versus PCR_3.

Table 5

Pairwise Comparison of mean viral load between measurement points

Pairwise Comparisons						
Measure: Viral Load						
		Mean Difference	Std.		95% Confidence Interval for Difference	
(I) factor1	(J) factor1	(I−J)	Error	Sig.	Lower Bound	Upper Bound
1	2	310.243	176.519	.262	-133.003	753.489
	3	983.946*	241.647	<.001	377.160	1,590.732
2	1	-310.243	176.519	.262	-753.489	133.003
	3	673.703*	176.539	.002	230.406	1,116.999
3	1	-983.946*	241.647	<.001	-1,590.732	-377.160
	2	-673.703*	176.539	.002	-1,116.999	-230.406

CHAPTER V
DISCUSSION

This quality improvement project led to an increase in the participants' knowledge about medication compliance for those diagnosed with chronic disease. This increase in knowledge was emphasized by the improvements in the Modified Morisky Scale scores. The participants' understanding of the importance of a strict medication regimen and its direct correlation to medical improvements in overall health, wellness, and lifestyle for patients living with HIV significantly increased. These results were easily identifiable through patient interaction and were also reflected in the overall decrease in the patients' viral load levels via blood work. The cumulative figures depicted in Tables 2 (viral load trend results) and 3 (increased knowledge base via the Modified Morisky Scale) are reflections of such improvements.

The results of this project highlight the need to further investigate the correlation between medication compliance and improvements in the overall clinical profile of those living with HIV. The participants expressed the need to receive prompts from their healthcare provider to take all medications as prescribed and to not run out of their scheduled medications. Reminders sent via the patient portal proved effective in assisting the patients with medication compliance.

Additional interventions related to the results of this project could include collaborations with the research team to utilize reminders to support medication

compliance among HIV patients in research trials. Discussions with members of the research department highlighted a need for an elevated level of consistency to improve patient adherence to medication protocols. Patients with chronic diseases, such as HIV, require an intervention that displays a direct correlation between strict medication compliance and improvements in overall health and, in this case, viral load levels. Intervention helps providers deliver ideal ongoing care to their patients and helps patients maintain optimal health. Emphasis on medication compliance as an intervention resonated with the providers and patients as well as the rest of project participants obtained an undetectable viral load because of strict medication compliance throughout the project.

Relationship to the Literature Review

Ali et al. (2015) used a pharmacist-led intervention to improve medication compliance and lifestyle modifications to reduce the participants' risk of coronary heart disease. During the six month study, 149 patients self-reported non-adherence to hypolipidemic drug regimens. The pharmacists followed patients by phone calls and conducted patient education to encourage medication compliance and lifestyle changes. The results showed a 15.3% increase in medication compliance and drug renewal rates. The patients also increased their routine plasma fibrinogen level checks which is associated with the risk of ischemic heart disease.

A multidisciplinary approach to improving medication compliance among those with chronic diseases has proven effective. Ferdinand et al. (2017) utilized such an approach to discuss the increased risk of stroke and death among patients who self-reported as non-adherent to their medication regimens. The study utilized clinical reminders for cardiac rehabilitation attendance as well as alarms, timers, and automated pill dispensers to

assist with medication compliance. The noted improvements included a 42% increase in medication compliance among the 1,015 study participants via self-reporting.

Xu and Long (2020) applied a smartphone-based intervention to improve medication compliance and lifestyle changes among 1,657 participants with hypertension. Results indicated a 21% improvement in medication compliance. Patients self-reported through an online patient portal and smartphone application. The participants documented their daily medication regimen and blood pressure readings, and the providers were able to communicate with the patients via the smartphone application for support.

Propositions for Practice

Per the results of the project, the continued used of a validated assessment targeted towards education and self-motivation can aid in promoting medication compliance would such as HIV. The plan would include continued assistance with medication compliance via patient reminders initiated by the provider via the online patient portal. Providers may include the reminders in their routine patient education during scheduled office visits and utilize the online patient portal as a means of reminding patients to adhere to their strict medication regimen. The reminders may be sent through the patient portal and either implemented by the provider or delegated to the medical assistant. Educational interventions have proven successful in their ability to drastically improve patients' abilities to adhere to strict regimens. The reminders give the patient confidence in their ability to self-manage their health care. Health literacy is imperative in the fight against HIV, particularly among minority clientele.

Limitations

The results indicate that limitations may arise based on patient willingness and consistent participation. Additionally, providers may have limited time to implement the assessment tool. Lastly, patients may have limited access to resources such as access to healthcare services based on location or socioeconomic concerns.

Conclusion

The results of this project indicate that validated assessment tools focused on improvements in knowledge of medication compliance in the treatment of HIV are beneficial for improving medication compliance and health literacy among chronically ill patients. Through the collaborative efforts of the providers, patients, and staff, the participants were able to improve their medication adherence and decrease their viral load levels, thus improving their healthcare outcomes. Because the intervention was noninvasive and simply involved reminders to take all medications as scheduled by the healthcare provider, the patients were comfortable and obliging. Employing a multidisciplinary approach to improve patient education proved successful in improving patient outcomes. Patients were encouraged both verbally and via the online patient portal by their healthcare provider. The on-site pharmacy and laboratory assisted patients with adhering to their complete plan of care. The reminders also conveniently coincided with other prompts, such as picking up prescriptions and obtaining routine scheduled blood work. Education has always been and continues to be the driving force of change in practice care settings. As with any chronic disease, HIV patients need to maintain strict adherence to their medication regimens. The study's outcomes showed reduced blood viral loads as well as improvements in knowledge and motivation to adhere to strict medication regimen.

Summary

The project outlined improvements in viral load levels among patients with HIV. Viral loads displayed a significant decrease while some participants were able to obtain undetectable status. The use of a validated assessment tool yield improvements in patient knowledge and motivation to adhere to medication regimens. The results identified a 92% increase in knowledge and motivation after implementation of the intervention.

References

Ali, N. S. (2002). Prediction of coronary heart disease preventive behaviors in women: a test of the health belief model. *Women & Health, 35*(1), 83-96. 10.1300/J013v35n01_06

Allard, R. (1989). Beliefs about AIDS as determinants of preventive practices and of support for coercive measures. *American Journal of Public Health, 79*(4), 448-452. 10.2105/ajph.79.4.448

Bangsberg, D. R., Hecht, F. M., Charlebois, E. D., Zolopa, A. R., Holodniy, M., Sheiner, L., Bamberger, J. D., Chesney, M. A., & Moss, A. (2000). Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. *AIDS (London, England), 14*(4), 357-366. 10.1097/00002030-200003100-00008

Benveniste, O., Flahault, A., Rollot, F., Elbim, C., Estaquier, J., Pedron, B., Duval, X., Dereuddre-Bosquet, N., Clayette, P., Sterkers, G., Simon, A., Ameisen, J., & Leport, C. (2005). Mechanisms involved in the low-level regeneration of CD4+ cells in HIV-1-infected patients receiving highly active antiretroviral therapy who have prolonged undetectable plasma viral loads. *The Journal of Infectious Diseases, 191*(10), 1670-1679. 10.1086/429670

Centers for Disease Control, Centers for Disease Control, & Prevention, (. (1993). *HIV/AIDS Prevention*. US Department of Health and Human Services, Public Health Service, Centers ….

Champion, V. L., & Skinner, C. S. (2008). The health belief model. (pp. 45-65). Jossey-Bass.

Coleman, C. I., Limone, B., Sobieraj, D. M., Lee, S., Roberts, M. S., Kaur, R., & Alam, T. (2012). Dosing frequency and medication adherence in chronic disease. *Journal of Managed Care Pharmacy, 18*(7), 527-539.

Côté, J., Rouleau, G., Ramirez-Garcia, M. P., Auger, P., Thomas, R., & Leblanc, J. (2020). Effectiveness of a Web-based intervention to support medication adherence among people living With HIV: web-based randomized controlled trial. *JMIR Public Health and Surveillance, 6*(2), e17733.

Crepaz, N., Lyles, C. M., Wolitski, R. J., Passin, W. F., Rama, S. M., Herbst, J. H., Purcell, D. W., Malow, R. M., Stall, R., & HIV/AIDS Prevention Research Synthesis (PRS) Team. (2006). Do prevention interventions reduce HIV risk behaviours among people living with HIV? A meta-analytic review of controlled trials. *Aids, 20*(2), 143-157.

Gagnon, M., & Guta, A. (2014). HIV viral load: a concept analysis and critique. *Research and Theory for Nursing Practice, 28*(3), 204-227.

Greenhouse, S. W., & Geisser, S. (1959). On methods in the analysis of profile data. *Psychometrika, 24*(2), 95-112. https://doi.org/10.1007/BF02289823

Green, E. C., Murphy, E. M., & Gryboski, K. (2020a). The health belief model. *The Wiley Encyclopedia of Health Psychology,* 211-214.

Green, L. W., & Raeburn, J. M. (1988). Health promotion. What is it? What will it become? *Health Promotion International, 3*(2), 151-159.

Gross, R., Bilker, W. B., Friedman, H. M., & Strom, B. L. (2001). Effect of adherence to newly initiated antiretroviral therapy on plasma viral load. *Aids, 15*(16), 2109-2117.

Intellectus Statistics [Online computer software]. (2022). Intellectus Statistics. https://analyze.intellectusstatistics.com/

Kirwan, M., Vandelanotte, C., Fenning, A., & Duncan, M. J. (2013). Diabetes self-management smartphone application for adults with type 1 diabetes: randomized controlled trial. *Journal of Medical Internet Research, 15*(11), e235.

Rich, M. W., Gray, D. B., Beckham, V., Wittenberg, C., & Luther, P. (1996). Effect of a multidisciplinary intervention on medication compliance in elderly patients with congestive heart failure. *The American Journal of Medicine, 101*(3), 270-276.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs, 2*(4), 328-335.

Rowell-Cunsolo, T. L., & Hu, G. (2020). Barriers to optimal antiretroviral therapy adherence among HIV-infected formerly incarcerated individuals in New York City. *Plos One, 15*(6), e0233842.

Steers, W. N., Elliott, E., Nemiro, J., Ditman, D., & Oskamp, S. (1996). Health beliefs as predictors of HIV-preventive behavior and ethnic differences in prediction. *The Journal of Social Psychology, 136*(1), 99-110.

Syafitri, M. K., Astri, N. A., & Ilmiatun, N. A. (2021). Diabetes Self-management Intervention Based Smartphone Application in Patients With Diabetes Mellitus: Systematic Review. *STRADA Jurnal Ilmiah Kesehatan, 10*(1), 1041-1050.

Wang, W., Qiu, Y., Zhao, F., & Zhang, F. (2019). Poor medication adherence in patients with psoriasis and a successful intervention. *Journal of Dermatological Treatment, 30*(6), 525-528.

Xu, H., & Long, H. (2020). The Effect of Smartphone App-Based Interventions for Patients With Hypertension: Systematic Review and Meta-Analysis. *JMIR mHealth and eHealth, 8*(10), e21759. 10.2196/21759

Zhang, K., Chan, P. S., Li, X., Fang, Y., Cai, Y., Zou, H., Cao, B., Cao, H., Hu, T., Chen, Y., & Wang, Z. (2023). Low Behavioral Intention to Use Any Type of HIV Testing and HIV Self-Testing among Migrant Male Factory Workers Who Are at High Risk of HIV Infection in China: A Secondary Data Analysis. *International Journal of Environmental Research and Public Health, 20*(6), 5029. doi: 10.3390/ijerph20065029. 10.3390/ijerph20065029

Zomahoun, H. T. V., Guenette, L., Gregoire, J., Lauzier, S., Lawani, A. M., Ferdynus, C., Huiart, L., & Moisan, J. (2017a). Effectiveness of motivational interviewing

interventions on medication adherence in adults with chronic diseases: a systematic review and meta-analysis. *International Journal of Epidemiology, 46*(2), 589-602.

Zomahoun, H. T. V., Guenette, L., Gregoire, J., Lauzier, S., Lawani, A. M., Ferdynus, C., Huiart, L., & Moisan, J. (2017b). Effectiveness of motivational interviewing interventions on medication adherence in adults with chronic diseases: a systematic review and meta-analysis. *International Journal of Epidemiology, 46*(2), 589-602. 10.1093/ije/dyw27

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OBJECTIVE:

Experienced medical professional with fourteen years of clinical nursing experience in women's health and seven years in Internal Medicine and Urgent Care. Currently continuing my education with pursuant of a Doctorate of Nursing Practice. Strategic and avid learner prepared to navigate the challenges of the highest level of scholastic achievement. Offering team building, leadership, flexibility, and professionalism.

EDUCATION:

Prairie View A&M University, Prairie View, Texas

- Bachelor of Science in Nursing, 2009
- Master of Science in Nursing, Family Nurse Practitioner, 2016
- Doctorate of Nursing Practice 2023

Texas Southern University, Houston, Texas

- Bachelor of Science in Biology, 2006

PROFESSIONAL EXPERIENCE

Park Plaza Hospital, Houston, TX June 2009-July 2013
Registered Nurse, Charge Nurse, Preceptor (Women Services)

- Provide primary care for mothers who are antepartum, intrapartum and postpartum

- Provide optimum family centered care for patients and families while also providing education and support
- Effectively manage a busy labor and delivery unit while delegating and supporting nursing staff and staff from ancillary areas
- Act as a valuable resource on and off the unit through preceptor leadership roles and as committee chair member

Texas Children's Hospital, Houston, TX June 2011-January 2021
Registered Nurse (Women Services)

- Provide maternal care to mothers and families at a busy level 4 high risk facility on a specialized unit
- Manage patients with high acuity often complicated by compiled comorbidities not associated with pregnancy
- Provide expect care in neonatal resuscitation, pre and post-operative high risk maternity care and recovery care
- Manage lines, drains, and drips of acute maternal patients
- Provide education for post-delivery mother including post-operative mothers
- Provide breastfeeding and lactation services to all breastfeeding patients
- Management of in-vitro fertilization (IVF) patients including oocyte retrievals and placement procedures
- Manage care of intrauterine fetal surgical patients including fetal monitoring via external fetal monitoring including Doppler

Centra Clinic

Family Nurse Practitioner June 2016-January 2021

- Management of wellness visits of infant, adolescent, and adult patients
- Management of acute complexities, complex health morbidities and chronic disease
- Assess, treat and diagnose all patient across the lifespan
- Diagnose and screen patient for referral to specialty care
- Assess necessity of and order radiology and laboratory services
- Provide patient education for health prevention and promotion
- Perform acute care procedures such as I&Ds, suture placement and removal, toenail removal
- Complete well woman exams including breast, pap smear, and pelvic exams

Glen Valley Hospice

Director of Nursing January 2023-current

- Provide leadership and direction for daily business operations
- Management of all clinical operations for patients with terminal illnesses
- Created the development plan for the administration and evaluation of the organization in consultation with the Medical Director
- Over-see the daily operations of patient care according to quality standards and health centered policies
- Direct interdisciplinary team members in excellent standards of care for the terminally ill patient according to acuity
- Evaluate and direct all clinical employees while creating and enforcing compliant healthcare policies
- Maintain comfort and quality of life for terminally-ill patients

LICENSURE and CERTIFICATIONS:

Nurse Licensure

- Texas Compact License RN
- Texas Compact License APRN
- AANP Certification

Certifications

- Basic Life Support
- Advanced Cardiac Life Support
- Neonatal Resuscitation Program

ACADEMIC and PROFESSIONAL ACTIVITIES

- American Association of Nurse Practitioners (2014)
- American Association of College of Nursing (2014)
- National League of Nursing (2014)
- Sigma Theta Tau, International Honor Society (2009)
- Association of Women's Health, Obstetric and Neonatal Nurses (2009)
- Chi Eta Phi, Sorority Incorporated (2008)
- Beta Beta Beta Biological Honor Society (2005)
- National Hospice and Palliative Care Organization (2023)

VOLUNTEER COMMUNITY ACTIVITIES

- Community Health Fair Assisted Living Telephone Road (2015-2020)
- AIDS Fundraiser and Walk (2011-2020)
- Multiple Sclerosis Walk and Booth (2015)
- Susan G. Komen Breast Cancer Walk (2010-2020)
- March of Dimes Walk (2013-2020)
- Annual Food and Clothing donation drive Star of Hope (2010-2020)
- Annual Community Health Seminar and Health Fair-Pink Goes Red (2014-2020)
- Domestic Violence Walk (2011-2017)
- NAMI Greater Houston Walk (2016-2020)

AWARDS AND HONORS

- Daisy Award Nominee (2011) (2013) (2014) (2015)
- Charlotte Cameron Scholarship Recipient (2015)
- Roseann Waindel Scholarship Recipient (2014)
- Health and Education DNP Scholarship (2017-2019)

REFERENCES

Available upon request