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Atherosclerosis in HIV Positive Patients: A Clinical Practice Guideline for Cardiovascular Risk Assessment and Treatment

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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

ATHEROSCLEROSIS IN HIV POSITIVE PATIENTS: A CLINICAL
PRACTICE GUIDELINE FOR CARDIOVASCULAR
RISK ASSESSMENT AND TREATMENT

A Capstone Research Project Submitted in Partial Fulfillment
of the Requirements of the Degree of
Doctor of Nursing Practice

Margaret Heath

College of Natural and Health Sciences
School of Nursing
Nursing Practice

December 2017

This Capstone Project by: Margaret Heath

Entitled: *Atherosclerosis in HIV Positive Patients: A Clinical Practice Guideline for Cardiovascular Risk Assessment and Treatment*

has been approved as meeting the requirement for the Degree of Doctor of Nursing Practice in the College of Natural and Health Sciences in School of Nursing, Program of Nursing Practice

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EXECUTIVE SUMMARY

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As modern medicine allows for an increase in lifespan, patients with Human Immunodeficiency Virus (HIV) face the same chronic health issues as other aging adults. Among the top killers of older adult HIV patients is atherosclerosis. The following review of literature will support the belief that HIV patients are at a higher risk for atherosclerosis due to their chronic inflammatory state. This state in which the immune response is elevated for a prolonged period of time provides an optimal environment for the development of atherosclerotic plaques, as the research evidence will demonstrate. The following guideline has been designed to assist providers in assessing an individual's risk and appropriate interventions in order to preserve the quality of life that this population cherishes deeply.

There has been a growing interest in this topic as anti-retroviral therapy (ART) becomes more targeted and effective. The importance of this guideline is to identify high risk patients and equip providers with the knowledge to implement appropriate interventions as quickly as possible. Early intervention will drastically decrease the levels of atherosclerotic plaques in HIV positive patients. In conjunction with lifestyle modifications, adherence to anti-retroviral therapy and initiating statin therapy if appropriate, these high risk patients would be adequately prepared for the aging process.

ACKNOWLEDGEMENTS

I would like to thank Matthew, my husband and best friend, for unconditional love. You are my greatest blessing and I could not have completed this project without your encouragement and unwavering support. I am grateful to my brother and sister who frequently spoke words of encouragement when they were needed most. Mom and Dad: I am grateful for you always believing in me. The sacrifices you made to provide for me and keep me on the straight and narrow have made me the woman I am today.

I owe a debt of gratitude to my committee members, whom I now consider friends. Each of you has been instrumental in my success. Thank you, Mark, Kim, Kathy and Kathleen.

I pray that this project and this degree will be used as a tool in God's hands, for without His provision, guidance, and grace none of this would be possible.

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CHAPTER I

INTRODUCTION

Patients with human immunodeficiency virus (HIV) exhibit a two-fold increased risk of atherosclerotic plaque development (Fitch et al., 2013). Because of this, the primary goal for practitioners has been to identify patients who were deemed high risk and implement appropriate measures to prevent negative sequelae of cardiovascular disease related to plaque formation. As patients with HIV live longer, the early detection and treatment of cardiovascular disease must take precedence in the care plan for this population.

According to a cross-sectional study of 60 infected women and 30 non-HIV infected women ages 18-60, HIV positive women have had an increased risk of developing non-calcified plaques resulting in myocardial infarction and atherosclerosis (Fitch et al., 2013). This study also correlated specific factors of the HIV disease process (inflammation and immune activation) to the production of atherosclerosis. Further, this risk could be compounded by lifestyle factors such as obesity, smoking, and frequent infections.

Furthermore, the Journal for Vascular Health and Risk Management examined HIV positive patients who were concurrently diagnosed with cardiovascular disease and found that chronic inflammation secondary to HIV increased the severity and rate of progression of endothelial dysfunction (Beltran et al., 2015).

Background and Significance

Evidence has supported screening during a primary care wellness visit for an HIV patient that would begin with a fasting lipid panel and obtainment of vital signs as well as screening for hyperlipidemia (Depairon et al., 2001; Fitch & Grinspoon, 2011; Hulten, Mitchell, Scally, Gibbs, & Villines, 2009; Maggi et al., 2009). These screening techniques should be utilized for every patient, regardless of risk factors. Also, because advanced age, sex, smoking status, and inflammatory markers all influence cardiovascular risk in HIV positive patients (Depairon et al., 2001; Fitch et al., 2013; Maggi et al., 2009), lifestyle modifications should be an integral part of every patient's care plan. Age greater than 65 years has been identified as a high-risk factor, and elderly HIV patients must receive frequent and comprehensive screenings to prevent heart disease.

The Framingham Risk Score (FRS) calculates the 10-year risk of coronary artery events based upon the investigation of risk factors including sex, age, total cholesterol level, high-density lipoprotein (HDL) level, systolic blood pressure, blood glucose level, and smoking status. As a valid tool to predict atherosclerosis risk in HIV patients (Maggie et al., 2009; Martin et al., 2005), the FRS should be assessed annually to detect cardiovascular disease earlier in this high risk population (Cheruvu & Holloway 2014). New practice recommendations advised risk factors compilation into a FRS to determine the level of risk, then diagnostic screening by carotid intima-media thickness or coronary angiography if the clinician deems appropriate.

Patients with HIV should be carefully monitored for compliance to the ART regimen. These drugs have diminished HIV mortality rates and have been found to reduce chronic inflammation and immune activation (Beltran et al., 2015).

Problem Statement

Health care providers must have access to a comprehensive guideline that addresses all aspects and characteristics of the HIV disease process (endothelial dysfunction, chronic inflammation and immune system activation, and metabolic abnormalities). Coinfections have both contributed to and accelerated atherosclerosis; thus, prevention of cardiovascular disease, treatment of chronic inflammation, and continuation of ART would be key components to achieving better quality of life (Beltran et al., 2015). Patients with HIV should be managed as a chronic infectious disease, as high viral loads have been associated with endothelial dysfunction and the development of atherosclerosis (Muhlestein, 2011). Treatment compliance has been influenced by stigma, access to care, personal empowerment, and available support systems (Cahill & Valadez, 2013). For this reason, health care providers must provide holistic care to the HIV patient and encourage self-management of this chronic disease. Therefore, this guideline has addressed these components and has also included the expert opinions of those on the frontline of care for this population.

Theoretical Framework: The Stetler Model

For the purposes of this project, the Stetler model was utilized to determine availability of resources and the readiness of the providers being included in this project (Terry, 2015). The five steps of the Stetler model allowed for the translation of research into practice. Phase I was largely preparatory and included a literature review and

identification of the problem in current practice. This project aimed to give providers one guideline which included all the aspects recommended by current literature as well as the provider preferences for additions to existing guidelines.

Phase II included a systematic review of literature which supported the development of a guideline directing the diagnosis and treatment of atherosclerosis in HIV patients. This guideline was also evaluated by the Delphi participants and adjusted as needed. Delphi participants included one nurse practitioner, one physician assistant, and one medical doctor. Including three different professions resulted in interdisciplinary collaboration which ultimately increased the applicability of the results of the Delphi survey. Two rounds of surveys were administered, the first being in Phase II and the second being in Phase III.

Phase III was the evaluation and decision-making stage which included the second Delphi method questionnaire to identify areas which required revision and addendums to the guideline. Participants in the Delphi survey were also asked to reach an agreement on the items they wanted included in the guideline. The agreement reached in the survey directly influenced the development of the guideline. Stakeholders in this project included all providers who participated in the Delphi survey and those who may utilize the final guideline in their practice. The stakeholders' willingness to change was also addressed in this stage and all were eager to participate.

Phase IV included translation and application of the guideline. During this stage, the guideline was created for use at a clinic which focused on the primary care of HIV positive patients. Should a clinic with this composite choose to adopt it, the guideline would then be included in the clinical practice recommendations used by providers. This

stage was completed after the conclusion of this capstone project as additional time was necessary to receive approval.

Lastly, Phase V evaluated the clinical practice guideline and included a final questionnaire for providers after 3 weeks of use regarding its helpfulness and applicability. In this stage, the objectives were evaluated to determine the project's success.

Literature Review

The analysis of the literature included 19 scholarly articles. Seven of these articles supported the suspicion that there were links between atherosclerotic plaque development and chronic inflammation and specifically addressed the key risk factors of atherosclerosis development. Of the treatment recommendations, preventative screening commonly included the following tests: Carotid intima media thickness testing, coronary computed tomography angiography, and blood laboratory testing of inflammatory markers in high risk patients.

The majority of the studies evaluated demonstrated a positive correlation between chronic inflammatory markers and atherosclerosis. This link validated the fact that HIV patients, who have had prolonged elevation of their inflammatory markers, would be susceptible to atherosclerosis. Working off of this premise, there was additional literature examined to determine methods to decrease these risk factors such as the continuation of ART therapy, the initiation of statin therapy, and lifestyle modifications. The review of literature further supported the use of the Framingham Risk Score (FRS) in order to assess the patient's age and high sensitivity C-Reactive Protein (hs-CRP) count to determine risk and individualized treatment plan.

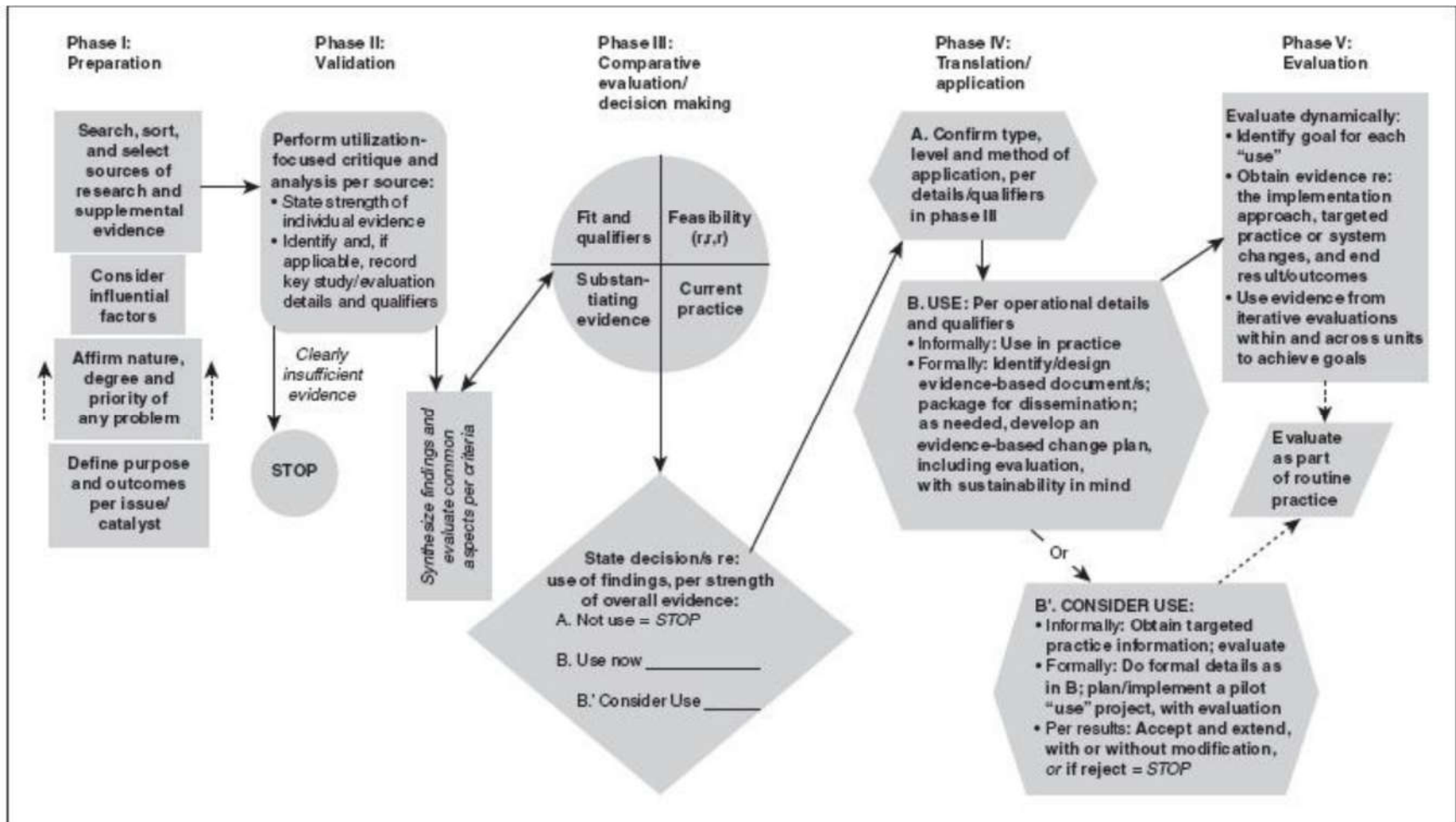


Figure 1. Settler Model and its phases.

Screening Recommendations

Regardless of risk level, screening during a primary care wellness visit for an HIV patient should begin with a fasting lipid panel and obtainment of vital signs (Depairon et al., 2001; Fitch & Grinspoon, 2011; Hulten et al., 2009; Maggi et al., 2009). Also, advanced age, sex, smoking status, and inflammatory markers all influence cardiovascular risk in HIV positive patients (Depairon et al., 2001; Fitch et al., 2013; Maggi et al., 2009). Because age greater than 65 years has been identified as a high-risk factor, elderly HIV patients must receive frequent and comprehensive screenings to prevent heart disease. Therefore, being an older adult and/or current smoker would automatically constitute high risk treatment recommendations.

In developed countries, HIV positive patients with a preliminary CD4 count greater than 200 and compliant with long-term antiretroviral treatments (ART) have demonstrated life expectancies past 70 years of age (Cahill & Valadez, 2013). Because of this, a CD4 count less than 200 should result in that patient being categorized as high risk, independent of other factors.

An extensive study by the American Heart Association and Center for Disease Control demonstrated the inflammatory marker known as the high sensitivity C-Reactive Protein (hs-CRP) as a strong indicator of cardiovascular disease risk in HIV patients, (with a 10-20% risk of developing heart disease within the next 10 years), as well as a predictor of coronary events in patients with established heart disease (Pearson et al., 2003). Therefore, an hs-CRP should be obtained and, if greater than 3.0 mg/L, the provider would proceed with the high risk recommendations.

Treatment Recommendations

Once deemed high risk, these patients should be carefully monitored for Antiretroviral Therapy (ART) regimen compliance. These drugs have diminished HIV mortality rates and have been found to reduce chronic inflammation and immune activation (Beltran et al., 2015). Due to adverse metabolic effects of dyslipidemia and insulin resistance, ART, especially protease inhibitors (PIs), has remained under scrutiny for their potentially detrimental effects. Nevertheless, a consensus of research studies have revealed a weak relationship between HIV positive patients using protease inhibitors and subsequent atherosclerosis development, supporting their continuation (Beltran et al., 2015; Hulten et al., 2009; Martin et al., 2005). While PI use has not modified values of Coronary Artery Calcification (CAC) or carotid plaque in HIV positive patients (Hulten et al., 2009), smoking and hyperlipidemia have been identified as having a causal relationship with thickened CIMT (Depairon et al., 2001). This supported not only continuation of ART therapy in high risk patients but further supported measures to increase medication regimen adherence. Methods in which providers could assist patients with this are discussed at a later time.

Statin therapy has been another debated treatment option. Statins have been a recommended practice for individuals greater than 75 years old with cardiovascular disease, diabetes, and/or high low-density lipoprotein (LDL) levels (Miedema et al., 2015). Yet, research has failed to indicate whether these findings were applicable to HIV positive patients. Another study highlighted how targeting high LDL-cholesterol levels in HIV infected patients were safe and effective in decreasing the FRS, however, failed to influence CIMT development or inflammatory biomarkers after 1 year (Masiá et al.,

2009). Rosuvastatin has currently been a lipid-lowering therapy undergoing clinical laboratory analyses to determine its safety in HIV patients (De Lorenzo et al., 2009). Niacin, fibrates, and fish oil have been suggested as safe medications to treat dyslipidemia (Fitch & Grinspoon, 2011) and could be helpful in the management of LDL levels in this population. Patients with HIV who were on statins would require frequent fasting lipid levels, liver function tests, and creatine kinase levels, thus, the following alternatives which require less monitoring have been encouraged as a first line treatment: lifestyle modifications, switching the type of ART, and adding fibrates (Cheruvu & Holloway, 2014). Research has illuminated concern that concurrent ART and statin therapy could cause liver toxicity (Cahill & Valadez, 2013; Depairon et al., 2001). Because of this potential harm, the implementation of statin therapy in high risk patients has been recommended only under the following conditions: the aforementioned first line suggestions were ineffective, the patient received frequent laboratory monitoring, and a thorough medical history was obtained.

The major causes of death in elderly HIV patients have included cardiovascular disease and liver disease, both adverse effects of long-term ART (Cahill & Valadez, 2013). For this reason, it has been advised to receive Computed tomography (CT) coronary angiography and stress echocardiography to assess for coronary artery disease in HIV patients using long-term ART (Cheruvu & Holloway, 2014). In summary, this new proposal for treatment suggested continuation of ART as the primary medication in HIV patients, yet long-term use would require further testing to confirm safety and investigation of other possible medication regimens if adverse effects were predominant.

Many HIV positive patients have exhibited significant risk factors for atherosclerosis such as obesity, lack of exercise, diabetes, hyperlipidemia, smoking, poor diet, ART, and sedentary lifestyle. Effective lifestyle adaptations that could decrease atherosclerosis risk in HIV patients included: weight reduction, more than 30 minutes of daily exercise, smoking cessation, and consuming a healthy diet (Cheruvu & Holloway, 2014; Depairon, 2001; Fitch & Grinspoon, 2011; Hulten et al., 2009). To lessen insulin resistance, patients should be screened via oral glucose tolerance tests, switched from PIs to another form of ART with less metabolic effects (Cheruvu & Holloway, 2014), and treated with Metformin (Cheruvu & Holloway 2014; Fitch & Grinspoon, 2011). When treating insulin resistance and dyslipidemia, liver and kidney functioning would require careful monitoring (Fitch & Grinspoon, 2011). In summary, a new practice guideline would enhance the treatment of HIV through nutrition and lifestyle modifications to lessen cardiovascular disease risk in this population.

CHAPTER II

PROJECT DESCRIPTION

Project Plan

The primary goal for practitioners has been to identify patients who were deemed high risk and implement appropriate measures to prevent negative sequelae of cardiovascular disease related to plaque formation. This project aimed to create a guideline for providers which included evidence-based recommendations for screening and subsequent treatment of atherosclerosis in HIV patients.

Project Objectives

The aforementioned evidence supported the need for aggressive preventative screening and treatment in this population, which this guideline aimed to address. Three objectives were identified to direct this project and the development of said guideline.

1. Evaluate utilization of current guidelines which direct atherosclerosis screening and treatment.
 - a. Assess for deficits in current guidelines
 - b. Determine differing clinical guideline preferences among providers by using the Delphi method
2. After reaching a consensus among the Delphi participants, create a guideline to assist providers in the screening and treatment of atherosclerosis in HIV patients

- a. Establish current recommendations regarding screening and treatment of atherosclerosis in the HIV positive population
3. Assess for the guideline's usefulness, effectiveness, and applicability according to the providers who implement it

Project Design and Method

This project was a non-experimental, quality improvement project which aimed to translate current research evidence into practice. The Delphi model was utilized to obtain unanimity among providers regarding the aspects of this guideline. The Delphi model uses questionnaires to obtain commonalities and ultimately consensus among a panel of experts. Participation in this project was voluntary and the panelists will remain anonymous.

Setting and Resources

This project was completed for a generic clinic setting and made available to primary care providers. Upon completion of this capstone project, these providers were invited to implement the guideline as part of the clinical reference directory at their respective clinics.

There was no financial support required for this project as it was completed as part of the requirements of the Doctor of Nursing Practice degree.

Protection of Human Subjects

This project did not involve a chart review or a database of patient information. Providers who were included on the panel of experts were encouraged to utilize the guideline during their assessment of patients during routine visits. No patient identifiers were collected.

Timeline

- Phase I: Preparation
 - Topic identified: August 2016
 - Capstone committee established: January 2017
 - Committee approved: March 2017
- Phase II: Validation
 - Literature review: December 2016
 - Capstone proposal approved: June 30 2017
- Phase III: Evaluation
 - Approval from the University of Northern Colorado Institutional Review Board: September 15 2017
 - First Delphi questionnaire and informed consent sent to providers: September 16 2017
- Phase IV: Translation of Evidence into Practice
 - Synthesis of literature, evaluation of current practice guidelines: completed September 30 2017
 - Cardiovascular Screening and Treatment Guideline developed: September 20 2017
- Phase V: Evaluation
 - Second Delphi questionnaire sent: September 25 2017

Feasibility and Sustainability

The literature review and provider input via Delphi survey was used to direct the development of this guideline. Once it was completed, providers were able to access the guideline and make changes to it as needed.

CHAPTER III

EVALUATION PLAN

Three objectives were established to evaluate the success of this project. The capstone ultimately aimed to provide a comprehensive, user-friendly guideline to providers who were caring for HIV patients.

Objective One

The current guidelines and tools used both nationally and locally were evaluated. They were reviewed specifically in light of the most current research evidence (obtained during the literature review) and then all providers were asked to complete the first Delphi questionnaire.

Objective Two

Research evidence and the results of the first Delphi survey were evaluated for usefulness within the context of this guideline. Providers were invited to make requests of information to include in this guideline.

Objective Three

Objective three included the creation of the guideline as well as the assessment of usability and overall provider perception by means of the questionnaire. Additions and adjustments were made to the guideline. The final Delphi questionnaire was sent out to obtain consensus and changes were made according to the comments and feedback of the providers interviewed.

CHAPTER IV

RESULTS AND OUTCOME STATEMENTS

This Capstone project aimed to assist providers in determining the best course of action for HIV positive patients who require cardiovascular risk assessment and subsequent treatment. There were currently several guidelines that provided direction, but all have differences in the screening techniques and treatment recommendations. The first objective of this project was to collect data and evaluate existing guidelines in order to compare and contrast current recommendations being implemented by providers.

Objective One: Results from Literature Review

Objective one was achieved through a comprehensive literature review wherein guidelines were weighed and measured against existing literature. Several commonalities found throughout the various guidelines were implemented into this project.

National guidelines were aimed to initiate screening for the high risk patients, as well as implement treatment strategies to prevent or slow progression of negative sequelae. The evidence and current guidelines overwhelming favored early and frequent evaluation of HIV patients. If the patient exhibited additional risk factors such as advanced age, smoking, frequent co-infections, or existing cardiovascular disease, this warranted more in-depth diagnostic testing such as carotid intima-media thickness (CIMT) testing and plaque visualization testing via computed tomography (CT) angiography (Fitch & Grinspoon, 2011).

The most prominent medical databases were scrutinized and five guidelines were found to be commonly utilized in the treatment of dyslipidemia and cardiovascular disease in the HIV population. The guidelines put forth by the following agencies were closely examined: the U.S. Preventative Services Task Force (USPSTF), the American College of Cardiology/American Heart Association (ACC/AHA), the Agency for Healthcare Research and Quality (AHRQ), the National Institute of Health (NIH), and the Infectious Disease Society of America (IDSA), respectively.

U.S. Preventative Services Task Force (USPTF)

This agency provides direction and recommendations regarding the early screening and subsequent treatment of cardiovascular disease and dyslipidemia. The USPSTF reported reviewing literature regarding diagnostic accuracy and the efficacy of various treatment options. Although this guideline did not specifically mention the HIV population, it did summarize recommendations for individuals above 20 years of age and placed them into a higher risk category. This risk level would also apply to patients who had chronic elevation of inflammatory mediators.

The recommendation concluded that there was evidence to support the lipid measurement of men and women who were candidates for therapy and the benefits of screening and treating lipid disorders in high risk patients overwhelmingly outweighed the potential harms. The preferred tests to screen for dyslipidemia were a total cholesterol level and a HDL-C level. Abnormal results should be confirmed by repeated testing and an average of the results should be used for subsequent treatment.

**American College of Cardiology/
American Heart Association
(ACC/AHA)**

The ACC/AHA also produced a prevention guideline for the assessment of cardiovascular risk in 2013. The guideline provided an estimated 10-year risk stratification based on the patient's age, gender, and race. If completion of the quantitative risk assessment resulted in unclear treatment recommendations, the patient's family history, coronary artery calcification (CAC) score, and high sensitivity C-Reactive Protein (hs-CRP) levels should be obtained to inform medical decision making. The guideline recommended the assessment of cardiovascular risk factors every 4 to 6 years in patients 20-79 years of age who did not have cardiovascular disease (CVD).

The guideline was summarized in an algorithm that assessed for current CVD, the patient's age as well as the 10-year risk using the Pooled Cohort Equation. The guideline assessed the 10-year risk based on the following factors: smoking and diabetes status, cholesterol levels, the presence of hypertension, age, gender, and race. Although the recommendation did not specifically address HIV status, many patients with HIV had hyperlipidemia and thus, would be captured in the high risk stratification.

**The Agency for Healthcare Research
and Quality-American Association
of Clinical Endocrinologists
(AHRQ)**

This guideline was published in 2012 and updated a previous version from 2000. In a four-step process, the AACE recommended a global risk assessment, screening based on age, selection of screening tests, and the treatment of specific diagnostic findings, respectively. The target population was anyone above the age of 2 and those at risk or with current dyslipidemia or atherosclerosis. While the study noted that measurement of

specific inflammatory markers were considered in the evaluation of CVD risk, they were not recommended to be included in the screening process. This may be partly a result of cost consideration and the expense of obtaining these laboratory results. However, CRP levels were recommended in the screening process of adults with dyslipidemia.

The guideline also made an addendum for specific high-risk populations and recommended close monitoring of these patients. For all patients, the lipid status should be reassessed 6 weeks after initiation of pharmacotherapy and then 6 to 12 month intervals. Additionally, if patients did not initially respond to pharmacotherapy, the clinician should consider combination therapy such as Niacin added to an existing Simvastatin regimen.

The National Institute of Health (NIH)

In step one of this seven-step guideline, the clinician was instructed to obtain a complete lipoprotein profile on the fasting patient. After the classification of LDL, total, and HDL cholesterol, the provider identified the presence of other atherosclerotic disease risk factors. In step three, the presence of major risk factors were established. These included positive smoking status, hypertension, advanced age, and positive family history for CVD. The Framingham Risk Assessment tool was employed to assess 10-year risk. After this, the clinician could determine the patient's risk category and initiate therapeutic lifestyle changes, pharmacotherapy, or combination therapy if appropriate.

Infectious Diseases Society of America (IDSA)

This guideline specifically addressed the abnormalities of lipid metabolism in the HIV patient receiving antiretroviral therapy. Research demonstrated that a reduction of

total cholesterol and an increase in serum triglycerides were associated with advanced HIV disease and contributed to an elevated risk of CVD. The guideline recommended obtaining a fasting lipid profile followed by the assessment of coronary artery disease risk. The implementation of lifestyle modifications was recommended as a preliminary step, but the alteration of ART or initiation of lipid-lowering medication was suggested if the non-pharmacological methods are ineffective.

Objective Two: Results from Delphi Questionnaire

The Delphi questionnaire was utilized to complete objective two by obtaining consensus among current providers who, through their clinical practice experience and research knowledge, were willing to participate in the formation of this guideline. The goals of the Delphi survey were to address areas in which current guidelines were insufficient or lacking and to utilize provider feedback to increase the usability of this guideline. Participants represented three different specialties: nurse practitioner, physician assistant, and a physician. All providers who participated in the survey were currently practicing and had at least 4 years of experience. Additionally, the geographical locations in which these providers practiced spanned across state lines. These factors added to the usability and diverse applicability of the guideline as it was fitting for a variety of different patient care settings because of the diversity of providers and locations included in its creation.

Questions included in round one of the survey addressed the provider location of current clinical practice, discipline, and specialty. The survey also inquired about whether the provider felt like a specific guideline for cardiovascular risk in HIV patients was currently being utilized at their respective practices, and, if so, what percentage of the

time did they perceive providers were following it. All but one participant said that the recommended guidelines were followed by providers “almost always.” They were also asked about the frequency of which HIV patients were screened for cardiovascular disease in their practice. Responses to this question varied greatly depending on the location and type of practice. Providers at specialty clinics caring exclusively for HIV patients said that, at least 70% of the time, patients underwent some method of screening annually, however, in the family practice setting, the response indicated that they simply did not know and could not provide a percentage.

Finally, the survey asked participants to indicate which of the following they would like to have included on a guideline designed to screen for HIV cardiovascular risk: Age, current CD4 count, current white blood cell count, length of time since HIV diagnosis, family history as it pertained to cardiovascular health, presence of substance abuse (alcohol, tobacco, recreational drugs), and presence of current symptoms (dyspnea, chest pain, dizziness, hypertension). They were asked to add any other items that they would like to see in the guideline.

Once the Delphi responses were returned, the data was recorded by the primary investigator. Nearly all responses identified age, family history, substance abuse, and current CD4 count as important to include. Additionally, they requested that HDL and LDL levels, the presence of an Abacavir regimen, BMI, current diabetes, and viral load should be added to the guideline (Appendix A).

Objective Three: Assessment of Guideline Usability and Provided Perception

Objective three included finalizing the Delphi questionnaire and designing the guideline. Round two of the Delphi survey revealed agreement among participants on the

items to be included in the guideline and addressed further testing to be completed on patients who were deemed “high risk” based on the standards of said guideline. All agreed that, at minimum, an EKG should be done and, if the patient was symptomatic or hypertensive, further testing such as an echocardiogram, blood work, and a stress test may be warranted. The treatment plan from this point forward would be based on provider preference and would be case dependent; therefore, this was only briefly addressed in the guideline. Upon in-depth review of the surveys, it was determined that the value of the guideline was in its ability to identify high risk patients who may have otherwise gone undetected rather than determine treatment regimens thereafter.

Therefore, the guideline created in partial completion of objective three included the items that the Delphi survey participants agreed upon, along with the addition of clinical parameters which determined if a patient should be classified as “high risk” or if they fell within defined parameters and could proceed with bi-annual monitoring for above mentioned risk factors. However, should the patient be outside of the parameters for three or more items within the guideline, they would be deemed high risk and should undergo further evaluation including an immediate EKG and additional follow-up care including nutrition counseling and possible cardiology referral.

Key Facilitators

Key facilitators for this project's success included the continual collection of literature. Committee members contributed greatly to the data collection process and provided key articles that assisted in the development of the guideline. Without the eager, thorough, and prompt responses from the panel of experts on the Delphi surveys, this guideline would not have been well-rounded or provider-centered. Finally, obtaining

Institutional Review Board approval was integral to the completion of this project (see Appendix B).

Key Barriers

Barriers arose during the process of creating the guideline for a specific clinic. Although this was preferred by the author and committee, complications began while trying to organize the logistics of a clinical rotation. Although seemingly detrimental, the guideline was designed in such a way to be applicable within a variety of patient settings.

The author also experienced difficulty with the time constraints relating to the turnover of round one and two of the Delphi survey and this nearly posed a substantial delay to the completion of the project. However, due to the prompt replies from the panel of experts, there was no disruption of the project timeline.

CHAPTER V
IMPLICATIONS FOR PRACTICE
Recommendation for Guideline
Implementation

As previously mentioned, this guideline would have a wide range of applicability due to its design. While appropriate to use at a family medicine clinic, it would be most useful at a specialty HIV/AIDS clinic where the patient was closely followed. The guideline was intended primarily for use at annual physical appointments or anytime when a full health assessment was being done. Ideally, this guideline would be re-assessed every 6 months as many of the risk factors could change rapidly but, at least, it should be assessed every 12 months.

Should a clinic choose to implement this guideline into practice, it would be recommended that they first use it alongside the guideline they were currently using. Not only would this make the provider's transition into switching guidelines more smooth, but it would shed light on the areas in which the guideline would still lacking, or perhaps its strengths, and may provide the author with suggestions for further improvement.

Finally, before introduction of the guideline to providers, it would be recommended that there be a staff in-service designed to educate and answer questions about the guideline implementation process. Ultimately this guideline has been designed as an assistive tool for providers; not a protocol mandating a treatment plan.

Ongoing Activities and Evaluations Outside the Scope of the Doctor of Nursing Practice Project

Based upon discrepancies in evidence, further research recommendations include: methods for safe statin therapy use in this population, the effects of hormone therapy (specifically estrogen) on atherosclerosis development, and finally the most indicative inflammatory marker to gauge atherosclerotic risk in HIV patients. Another suggestion for research would be to examine in detail the different ART regimens to determine if drugs other than protease inhibitors could improve patient outcomes with less metabolic effects. More research would be necessary to discover the risk-benefit relationship between ART used and statins in the elderly HIV patient, as quality of life usually becomes a higher priority than lifespan in this population. Additionally, there would be ongoing research to delineate between the various root causes of cardiovascular disease in these patients. Additionally, family medicine clinics should equip their providers with education regarding HIV and heart health. Providers should have heart health educational pamphlets readily available to give to patients.

Ideally, HIV patients would be followed by providers specializing in HIV or infectious disease because they require tailored care plans and close monitoring. Regular and consistent follow-up would be critical to health promotion and disease prevention in this population and, therefore, should be an integral part of their care plan.

It is recommended that at the conclusion of the five year trial period a retrospective chart review be conducted in order to collect data and record patient outcomes. Data obtained would include all patients flagged as high risk according to the guideline standards. Data obtained would answer the question: What interventions were

ordered for these patients and what was the clinical outcome? The result of those interventions would be important to include, as well as the current treatment plan as it pertains to cardiovascular health. This data could then be used to examine which areas of the guideline were still weak, as evidenced by the presence of risk factors that go undetected or by patients that incur a cardiovascular event but were not identified as high risk. A chart review and subsequent results comparison that reveals patients flagged as high risk who had risk factors that were previously unaddressed would demonstrate the usefulness of this guideline. Ongoing risk-factor analysis would be critical to the successful implementation and evaluation of this project.

Five Criteria for Executing a Successful Capstone Project

A Doctor of Nursing Practice Capstone project involves five essential criteria explained as the “acronym EC as PIE” (Waldrop, Caruso, Fuchs, & Hypes, 2014, p. 301). The first step is the enhancement of health or practice outcomes as well as health policy. Next is the culmination of practice inquiry, followed by the development of partnerships and the implementation or translation of research evidence into practice. Finally, the process is completed by the evaluation of healthcare, practice, or policy outcomes (Waldrop et al., 2014).

For the purposes of this project, the above criterion was met by first identifying the need for a concise, user-friendly guideline that could assist providers in treating and screening for atherosclerosis in HIV patients. Secondly, the author investigated commonly used guidelines in the practice setting, as well as utilizing the Delphi method to integrate provider preferences into the development of the guideline. Partnerships were formed with providers in the HIV and family medicine communities in order to better

understand the barriers and pitfalls of existing guidelines. Perhaps more importantly, the partnerships allowed for a deeper understanding of the intricate details of care as it pertains to the HIV population. Finally, the implementation and evaluation of this guideline as outlined above. This process would extend beyond the time constraints of this project but would be foundational to the improvement of the guideline.

Summary

The purpose of this guideline was to foremost increase the lifespan of HIV patients. By equipping providers with a guideline that was comprehensive and user-friendly, high risk patients would be readily identified and more closely monitored. Because of its simplicity and wide range of applicability, family medicine providers would hopefully be more comfortable with the complex and possibly daunting task of caring for HIV patients.

With additional time and feedback from those implementing this guideline, in the future it may be used as a stepping stone for further treatment initiatives or assistive tools. Providers should be encouraged to use this tool alongside their existing guideline(s) of choice and carefully consider all aspects of each individual patient condition prior to initiating treatment of any kind.

REFERENCES

- Beltran, L. M., Rubio-Navarro, A., Amaro-Villalobos, J. M., Egido, J., Garcia-Puig, J., & Moreno, J. A. (2015, January 6). Influence of immune activation and inflammatory response on cardiovascular risk associated with the human immunodeficiency virus. *Vascular Health and Risk Management*, *11*, 35-48.
- Cahill, S., & Valadez, R. (2013, March). Growing older with HIV/AIDS: New public health challenges. *American Journal of Public Health*, *103*(3), e7-e15.
doi:10.2015/AJPH. 2012.301161.
- Cheruvu, S., & Holloway, C. J. (2014). Cardiovascular disease in human immunodeficiency virus. *Internal Medicine Journal*, *44*, 315-324.
doi:10.1111/imj.12381
- De Lorenzo, F., Boffito, M., Collot-Teixeira, S., Gazzard, B., McGregor, J., Shotliff, K., & Xiao, H. (2009). Prevention of atherosclerosis in patients living with HIV. *Vascular Health & Risk Management*, *5*(1), 287-300.
- Depairon, M., Chessex, S., Sudre, P., Rodoni, N., Doser, N., Chave, J. P., . . . Mooser, V. (2001). Premature atherosclerosis in HIV-infected individuals-Focus on protease inhibitor use. *AIDS*, *15*, 329-334.
- Fitch, K., & Grinspoon, S. (2011). Nutritional and metabolic correlates of cardiovascular and bone disease in HIV-infected patients. *American Journal of Clinical Nutrition*, *94*, 1721S-1728S.

- Fitch, K. V., Srinivasa, S., Abbara, S., Burdo, T. H., Williams, K. C., Eneh, P., . . . Grinspoon, S. K. (2013). Noncalcified coronary atherosclerotic plaque and immune activation in HIV-infected women. *Journal of Infectious Diseases*, *208*, 1737-1746.
- Hulten, E., Mitchell, J., Scally, J., Gibbs, B., & Villines, T. C. (2009). HIV positivity, protease inhibitor exposure, and subclinical atherosclerosis. A systematic review and meta-analysis of observational studies. *Heart*, *95*, 1826-1835.
doi:10.1136/hrt.2009.17774
- Maggi, P., Quirino, T., Ricci, E., De Socio, G. V. L., Gadaleta, A., Ingrassia, F., . . . Bonfanti, P. (2009). Cardiovascular risk assessment in antiretroviral-naïve HIV patients. *AIDS Patient Care and STDS*, *23*(10), 809-813. doi:10.1089/apc.2009.0102
- Martin, L., Vandhuick, O., Guillo, P., Bellein, V., Bressollette, L., Roudaut, N., . . . Pasquier, E. (2005). Premature atherosclerosis in HIV positive patients and cumulated time of exposure to antiretroviral therapy (SHIVA study). *Atherosclerosis*, *185*(2006), 361-367. doi:10.1016/j.atherosclerosis.2005.06.049
- Masiá, M., Bernal, E., Padilla, S., García, N., Escribano, J., Martínez, E., & Gutiérrez, F. (2009). A pilot randomized trial comparing an intensive versus a standard intervention in stable HIV-infected patients with moderate-high cardiovascular risk. *Journal of Antimicrobial Chemotherapy (JAC)*, *64*(3), 589-598.
doi:10.1093/jac/dkp250

- Miedema, M. D., Lopez, F. L., Blaha, M. J., Virani, S. S., Coresh, J., Ballantyne, C. M., & Folsom, A. R. (2015). Eligibility for statin therapy according to new cholesterol guidelines and prevalent use of medication to lower lipid levels in an older U.S. cohort: The atherosclerosis risk in communities study cohort. *JAMA Internal Medicine, 175*(1), 138-140. doi:10.1001/jamainternmed.2014.6288
- Muhlestein, J. (2011). Chronic infection and coronary atherosclerosis: Will the hypothesis ever really pan out? *Journal of the American College of Cardiology, 58*(19), 2007-2009.
- Pearson, T. A., Mensah, G. A., Alexander, R. W., Anderson, J. L., Cannon, R. O., Criqui, M., . . . Vinicor, F. (2003). Markers of inflammation and cardiovascular disease: Application to clinical and public health practice. *Circulation, 107*, 499-511. doi:10.1161/01.CIR.0000052939.59093.45
- Terry, A. J. (2015). *Clinical research for the Doctor of Nursing Practice* (2nd ed.). Burlington, MA: Jones & Bartlett Learning.
- Waldrop, J., Caruso, D., Fuchs, M. A., & Hypes, K. (2014). EC as PIE: Five criteria for executing a successful DNP final project. *Journal of Professional Nursing, 30*(4), 300-306. Retrieved from <https://doi.org/10.1016/j.profnurs.2014.01.003>

APPENDIX A

**GUIDELINE FOR CARDIOVASCULAR RISK ASSESSMENT
IN HIV POSITIVE PATIENTS**

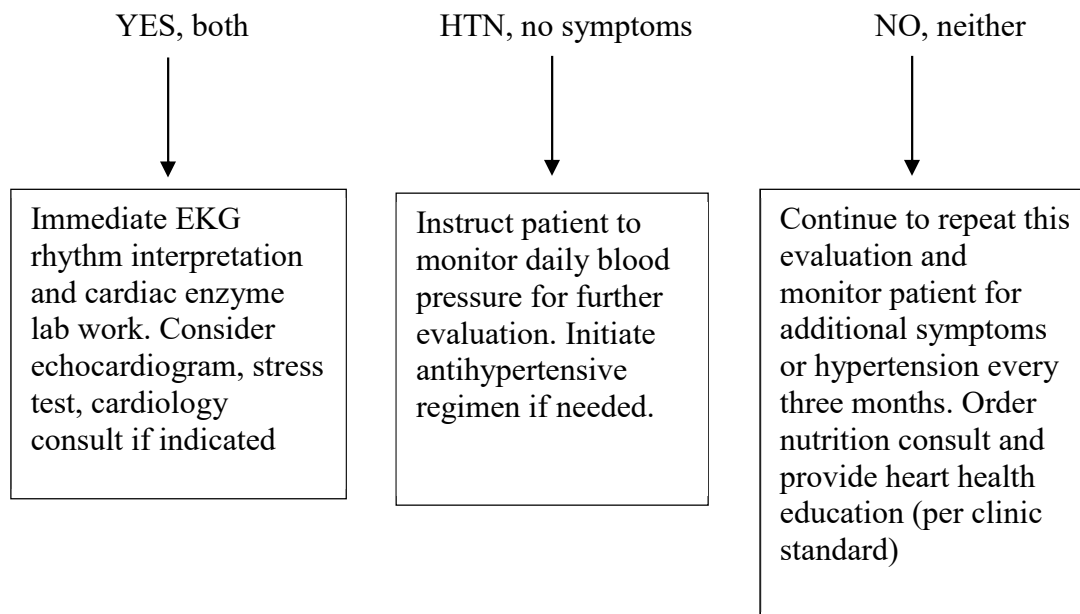
GUIDELINE FOR CARDIOVASCULAR RISK ASSESSMENT
IN HIV POSITIVE PATIENTS

Which of the following applies to the patient? (*Check all that apply*)

- 60 years or older
- Positive history of cardiac condition (MI, CHF, HTN)
- Length of time since HIV diagnosis is greater than 5 years
- First-degree relative with MI history before the age of 50
- Substance abuse or tobacco history of any duration
- HDL level less than 40mg/dl and LDL level greater than 160mg/dl
- Viral load that exceeds one million copies/ml within the last six months
- Not currently on Abacavir regimen
- BMI greater than 25
- Hemoglobin A1C greater than 7 OR diabetes diagnosis for ten years or longer

If the patient has three or more of the above risk factors, they are considered high risk. Proceed to the following algorithm:

Is the patient currently hypertensive or experiencing possible cardiac symptoms (dizziness, dyspnea, shortness of breath, chest pain)?



APPENDIX B
INSTITUTIONAL REVIEW BOARD APPROVAL



Institutional Review Board

DATE: September 15, 2017

TO: Maggie Heath
FROM: University of Northern Colorado (UNCO) IRB

PROJECT TITLE: [1126512-1] Atherosclerosis in HIV Positive Patients: A Clinical Practice Guideline for Cardiovascular Risk Assessment and Treatment

SUBMISSION TYPE: New Project

ACTION: APPROVAL/VERIFICATION OF EXEMPT STATUS

DECISION DATE: September 15, 2017

EXPIRATION DATE: September 15, 2021

Thank you for your submission of New Project materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

Maggie -

Thank you for submitting a clear and thorough IRB application for your capstone project. There are no requests for additional materials or amendments that need to be submitted for subsequent review.

Please be sure to add UNC letterhead to your consent form before use in your participant recruitment and data collection.

Best wishes with your research and don't hesitate to contact me with any IRB-related questions or concerns.

Sincerely,

Dr. Megan Stellino, UNC IRB Co-Chair

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Sherry May at 970-351-1910 or Sherry.May@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.