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Analysis Of Cholesterol Screening Practices

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ANALYSIS OF CHOLESTEROL SCREENING PRACTICES

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DEDICATION

The love and gratitude felt by the researchers toward our families for their understanding, patience, love, and support throughout the past year cannot be expressed in words. The commitment and devotion of our spouses, children, parents, siblings, and other loved ones were the support we needed to help us persevere. We will forever be grateful for your love and support through it all. We love you.

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ANALYSIS OF CHOLESTEROL SCREENING PRACTICES

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Abstract

Cardiovascular disease, which consists of hypertension, coronary heart disease, and cerebrovascular accidents, affects over 82 million American adults and is currently the leading cause of death in the United States. The Center for Disease Control and Prevention (CDC) identifies high-blood cholesterol as one of the main risk factors in the development of these diseases. Furthermore, 71 million Americans report having a high-blood cholesterol level, yet only about one third of those people have it under control (CDC, 2014c).

The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines recommend that adults 20 years or older be screened for high cholesterol once every 5 years. The purpose of the current research was to determine if primary care providers are screening adults between the ages of 20 and 40 years for high-blood cholesterol levels, according to recommendations stated in NCEP ATP III guidelines. The current research also identified the presence of cardiovascular disease risk factors in patients who were screened for cholesterol levels and who were not screened for cholesterol levels.

The questions asked by the current research included: Are primary care providers performing a fasting lipoprotein profile on patients between the ages of 20 and 40 years once every 5 years? Were risk factors present in the patients who had a fasting lipoprotein profile performed? Were risk factors present in the patients who did not have a fasting lipoprotein profile performed?

The current research utilized a quantitative, retrospective chart review of 500 patient charts from 5 participating clinics. All charts belonging to patients between the ages of 20 and 40 years were eligible. These charts were reviewed for adherence to the NCEP ATP III guidelines and were further reviewed for certain cardiovascular risk factors identified within the NCEP ATP III guidelines indicating the need for cholesterol screening.

Once data were compiled, it was analyzed by descriptive statistics. Based on the research data, primary care providers are not consistently following the NCEP ATP III guidelines for routinely performing cholesterol screening in adults between the ages of 20 and 40 years. The current research concluded that primary care providers need additional education regarding the NCEP ATP III guidelines for cholesterol screening.

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CHAPTER I

Dimensions of the Problem

Cardiovascular disease, which consists of hypertension, coronary heart disease, and cerebrovascular accidents, affects over 82 million American adults and is currently the leading cause of death in the United States (Centers for Disease Control and Prevention, 2014b). The Centers for Disease Control and Prevention (CDC) (2014a) identifies high-blood cholesterol as one of the main risk factors in the development of these diseases. Furthermore, 71 million Americans report having a high-blood cholesterol level, yet only about one third of those people have their blood cholesterol level under control (CDC, 2014c).

A large number of individuals living in the southeastern portion of the United States report having high-blood cholesterol levels—a factor contributing to the highest prevalence of cardiovascular disease mortality in the nation (CDC, 2015). A simple and effective way to prevent these diseases is to screen for high-blood cholesterol levels and introduce appropriate lifestyle modifications and treatment (CDC, 2014c). While the CDC (2012) reports screening rates have improved among primary care providers, only a handful of states meet the *Healthy People 2020* objective of an 82% screening rate.

Understanding cholesterol and its role in the development of cardiovascular disease is essential before one can understand why cholesterol screening and management are imperative. Cholesterol is a fatty substance found in many foods and is necessary for proper body function and metabolism. However, cholesterol, in particular low-density lipoprotein (LDL), can build up in the arteries. Too much cholesterol or an abnormal amount of certain cholesterols, known as *dyslipidemia*, can cause decreased ability of the vessels in the vascular system to dilate and can cause

hardening of the arterial walls, commonly known as *arteriosclerosis*. Cholesterol buildup and a loss of vasodilation result in a narrowed vessel, reducing the amount of blood that can pass through at any given time. Compromised vasculature causes a rise in peripheral vascular resistance and, in turn, causes a rise in a person's blood pressure. High blood pressure, a systolic reading > 140 and a diastolic reading > 90, causes further damage and hardening to the vessel walls. Cholesterol plaque buildup can eventually dislodge from the vessel walls, resulting in potentially devastating events, including a myocardial infarction (MI), also known as a heart attack, or cerebrovascular accident, also known as a stroke (National Health, Lung, and Blood Institute [NHLBI], 2012).

The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines recommend that adults 20 years or older be screened for high cholesterol once every 5 years (2002). A fasting lipoprotein panel is a simple blood test that can be performed in a primary care provider's office. The panel provides quantitative cholesterol levels, including total cholesterol, low-density lipoprotein, high-density lipoprotein, and triglycerides (James & Cleeman, 2001). The guidelines focus on monitoring and lowering abnormally high LDL levels because high LDL levels have been linked to an increased risk of developing cardiovascular disease (NCEP, 2002). Target LDL levels were defined by the NCEP ATP III guidelines as an LDL < 100 mg/dL (NCEP ATP III, 2002). A fasting lipoprotein profile requires that the patient abstain from food and drink for 8 to 12 hours before blood work is obtained (James & Cleeman, 2001).

High LDL levels can be easily detected and managed with increased adherence to NCEP ATP III guidelines by primary care providers. However, compliance of

screening by providers for high-blood cholesterol, namely among the young adult population, continues to be at a seemingly low rate (CDC, 2012). Failure to identify high LDL levels in adults between the ages of 20 and 40 years, especially those who have cardiovascular disease risk factors, increases his or her risk of developing cardiovascular disease earlier in life (James & Cleeman, 2001). Identifying cholesterol levels early allows the provider to identify at-risk patients and introduce interventions, such as preventative education, lifestyle modification, and medication therapy, to slow the development or progression of cardiovascular disease and reduce morbidity rates (James & Cleeman, 2001).

Purpose of Research

The purpose of the current research was to determine if primary care providers are screening adults between the ages of 20 and 40 years for high-blood cholesterol levels according to recommendations stated in the NCEP ATP III guidelines. The study also identified the presence of cardiovascular disease risk factors in patients who were screened for cholesterol levels and who were not screened.

Significance of Study

Nursing. Nurses and advanced practice nurses play an integral role in health promotion and disease prevention. Nurses, along with primary care providers, improve the health of patients using evidence-based recommendations, while also promoting healthy behaviors such as screenings to prevent disease processes from occurring. It is important for nurses, as well as advanced practice nurses in a primary care provider role, to be aware of populations at risk for developing cardiovascular diseases.

Advanced practice nurses must obtain a pertinent health history on each patient to include past medical history, family history, and social history. A thorough history

and physical performed by the advanced practice nurse or primary care provider is a key component when deciding which patients require particular screenings. In this case, the advanced practice nurse should be familiar with current guidelines and recommendations and promote cholesterol screening on all patients age 20 years or older.

The current research will aid advanced practice nurses in becoming familiar with current guidelines on cholesterol screening in young adults. The current research also brought to light the cholesterol screening practices, or lack thereof, of primary care providers. Increasing awareness and familiarity with current guidelines will allow advanced practice nurses to better promote healthy behaviors, properly screen patients for high cholesterol, and prevent or manage related diseases accordingly.

Education. Education is a key component in primary care practice. Healthcare professionals use education as a tool to convey pertinent information to patients in regard to their health and health maintenance. Studies suggest that thorough patient education by the primary care provider improves patients' self-efficacy when managing their own health (Bodenheimer, Lorig, Holman, & Grumbach, 2002). Patients and primary care providers alike are required to make educated decisions regarding healthy behaviors, such as screenings for disease prevention.

The current research will assist in the education of primary care providers, healthcare professionals, and the general public on the significance of cholesterol, cholesterol's effect on the development of cardiovascular disease, and the importance of cholesterol screenings to detect and treat high cholesterol levels. The current research will also educate primary care providers on the disparities of cholesterol screenings in

young adults, as well as raise awareness of populations at risk for developing cardiovascular disease.

Research. Research performed by, or in conjunction with, healthcare professionals' aids in education and quality improvement of primary care providers. A study by Nagykaldi and Mold (2006) showed how practice facilitators and practice-based research networks collaborate with primary care providers in performing research to improve quality of care delivered. Chart auditing is a method used by practice facilitators to gather and utilize data to aid primary care providers in targeting areas in need of improvement (Nagykaldi & Mold, 2006). Data collected in the current research will provide primary care providers and other healthcare professionals with data needed to improve cholesterol screening practices in the primary care setting.

Conceptual Framework

Nola Pender's Health Promotion Model (HPM) was used as the theoretical foundation for the current research. Pender's model of health promotion is one of the contemporary nursing models that predict health behavior (Vakili, Rahaei, Nadrian, & YarMohammadi, 2011). In the current research, the HPM was used as a guide to determine how healthcare providers emphasized the importance of cholesterol screening.

Nola Pender introduced the current HPM in 1996. The HPM is a nursing theory developed to understand and predict what factors, including biological, psychological and environmental, determine a person's health behaviors. Pender believed that for a person to be successful in health promotion a behavior must be perceived as beneficial and the person must believe they have the ability to achieve the behavior. For example, a person should not only be without a diseased heart, a person should actively engage in

behaviors to promote cardiovascular health because the person views a healthy heart as important. In contrast to other models, the HPM emphasizes health promotion and disease prevention using positive motivation. The model is used to predict health-promoting and health-protecting behaviors. The desired outcome of the HPM is a health-promoting behavior (George, 2011).

An assumption of the HPM states that patients will seek to actively regulate their own behavior (Pender, 1996). If a patient has made the effort to make an appointment with a primary care provider, the patient has taken the first step in regulating his or her health. Pender also assumed that a primary care provider is a part of the interpersonal environment and has the potential to make an impact on the individual's health throughout his or her lifetime (Pender, 1996). In the current research, the primary care provider had an opportunity to make an impact on the patient's life and health by performing a fasting lipoprotein panel. A primary care provider also had a chance to impact patients by informing them of the risk factors that may increase their cholesterol and by introducing interventions to improve their cardiovascular health. When a patient views cholesterol screening as important, he or she may be more likely to participate in a preventative treatment plan.

Self-efficacy was noted as an important factor of the HPM (Pender, 1996). Pender (1996) defined *self-efficacy* as the judgment of personal capability to organize and execute a particular health behavior and self-confidence in performing the health behavior successfully. The current research looks closely at a primary care provider's self-efficacy related to cholesterol screening practices. If the provider views cholesterol screening and management as important, there is a greater chance the patient will view screening and management as important to his or her overall health. Introducing and

educating young adults on the importance of cholesterol screenings can delay or even prevent the onset of cardiovascular disease. Therefore, the responsibility of education and screening in an effort to reduce cardiovascular disease falls heavily on the primary care provider.

Research Questions

The purpose of the current research was to identify cholesterol screening practices of primary care providers according to the NCEP ATP III guidelines. In addition, the current research sought to identify the cardiovascular disease risk factors present in patients who were screened and patients who were not screened using a fasting lipoprotein panel. The research questions were as follows:

1. Are primary care providers performing a fasting lipoprotein profile on patients between the ages of 20 and 40 years once every 5 years?
2. Were risk factors present in the patients who had a fasting lipoprotein profile performed?
3. Were risk factors present in the patients who did not have a fasting lipoprotein profile performed?

Definition of Terms

For the purpose of the current research, the researchers defined the following terms with both operational and theoretical definitions. The operational definitions specify the operations that the researchers performed in order to collect and measure the required information. The theoretical definition specifies the abstract meaning of the concepts studied by the current research.

Primary care providers

Theoretical: The healthcare provider, namely a physician, nurse practitioner, physician's assistant, or doctor of osteopathy, responsible for the healthcare and treatment of a person (Venes, 2009).

Operational: Physician or nurse practitioner providing care to the patients of the clinics included in the current research.

Fasting lipoprotein profile

Theoretical: A fasting lipoprotein panel that provides measurements of an individual's total cholesterol, high-density lipoprotein, low-density lipoprotein, and triglyceride levels present in the blood. The test is performed with the patient abstaining from all food and drink, excluding water, for 8-12 hours prior to blood draw (Venes, 2009).

Operational: A blood test performed on venous blood used to identify total cholesterol, high-density lipoprotein, low-density lipoprotein, and triglyceride levels present in the blood of a patient who has abstained from food and drink, excluding water, for at least 8-12 hours prior to blood draw.

Patients

Theoretical: An individual receiving medical care (Venes, 2009).

Operational: Persons between the ages of 20 and 40 years receiving care in the clinics included in the current research.

Risk factors

Theoretical: An environmental, chemical, psychological, physiological, or genetic element that predisposes an individual to the development of a disease (Venes, 2009).

Operational: Factors that increase a patient's risk of developing cardiovascular disease including tobacco use, hypertension, hyperlipidemia, obesity, and a family history of cardiovascular disease.

Assumptions

The assumptions presumed by the researchers during the current research are listed below:

1. Primary care providers are adhering to and familiar with current cholesterol screening guidelines presented in the NCEP ATP III guidelines regarding screening recommendations in adults between the ages of 20 and 40 years.
2. Primary care providers are identifying risk factors associated with cardiovascular disease in each patient including tobacco use, high blood pressure, obesity, and family history of cardiovascular disease.
3. Screening for cholesterol is a health-promoting behavior that is beneficial to the patient's cardiovascular health and overall wellness.
4. All data related to the patient, including age, sex, and payer information, are assumed to be true, accurate, and up-to-date.

CHAPTER II

Review of Literature

A comprehensive review of literature pertinent to the current research is presented in this chapter. The current research investigated the cholesterol screening practices of patients between the ages of 20 and 40 years in primary care. The purpose of the review of literature was to provide a background detailing how prior studies have influenced the current research. Several articles were included because they provide evidence of screening disparities between younger adults and older adults. Other articles are presented because they provided a background of cardiovascular disease risk factors, which are often present in patients with hyperlipidemia. These articles influenced the current study while the researchers developed the data collection tool utilized during chart reviews in the five respective clinics.

Conceptual Framework

When choosing a conceptual framework to guide research, it is logical to review past studies that have applied Nola Pender's Health Promotion Model to research. Alkhalaileh, Khaled, Baker, and Bond (2011) conducted a study in order to review how Nola Pender's Health Promotion Model (HPM) has been used in prior research studies. Pender's theory, developed in 1982, is centered on helping individuals gain higher levels of well-being. Health promotion is widely used by primary care providers via signs, posters, and ads encouraging the population to eat well, exercise, and use preventative measures, such as vaccinations. Nola Pender's HPM not only encourages illness prevention but also encourages individuals to seek ideal health-promoting behaviors. This theory is commonly used throughout the nursing world, especially in the primary care setting.

The intent of Alkhalaileh et al. (2011) was to evaluate how Nola Pender's HPM has been utilized in other research studies. The HPM is widely accepted in the nursing field. It is used in accordance with nursing care, research, and education. Alkhalaileh et al. (2011) measured the types of studies guided by the HPM, as well as the different populations and settings included in the studies reviewed.

The methodology of the study by Alkhalaileh et al. (2011) consisted of an electronic computer search for research studies guided by the HPM. The databases used for the search included Medline, CINAHL, PsychoINFO, and the British Nursing Index. The keywords *Pender's* and *Health Promotion Model* were used in the search. Alkhalaileh et al. (2011) reviewed the abstracts of 37 articles. Twenty-six of these articles were excluded as they were non-research-based or were not published in a peer-reviewed nursing journal. After reviewing the abstracts, 11 research studies were retrieved in order to review how the HPM guided the studies reviewed by Alkhalaileh et al. (2011). The research studies met the following criteria and were included in the study performed by Alkhalaileh et al. (2011):

1. The article was published in a peer-reviewed nursing journal.
2. The HPM was the conceptual framework or one of the conceptual frameworks that guided the study by Alkhalaileh et al. (2011).
3. The article was research-based; full text article was present; and article was published in English language.
4. The articles were published between 2002 and 2010.

Among the 11 research studies used, nine of the studies utilized quantitative research methodologies. One of the 11 studies used a qualitative methodology, and another study was secondary analysis. Alkhalaileh et al. (2011) found the purposes of

the reviewed studies had a wide variation. They divided the purposes of the reviewed studies into two categories. The first category included the studies that described aspects of the HPM in different populations, while the second category included the studies that tested relationships either among different variables of the HPM or between selected HPM variables and other variables (Alkhalaileh et al., 2011). A multitude of populations were included in the reviewed studies, such as workers, pregnant women, homeless women, adults with chronic diseases, and HIV/AIDS patients. The variables discussed in the reviewed studies included health-promoting behaviors, perceived benefits to action, self-efficacy, social support, and self-esteem. The reviewed studies discussed how the concepts of the HPM related to the variables discussed. In the reviewed studies, the self-report method was used as a data collection method. Self-administered questionnaires were used in the majority of the reviewed studies; however, some used interviews for data collection while others used techniques, including observation, lab tests, and blood pressure measurements. Measuring instruments used in the reviewed studies included Pender's Health-Promoting Behavior Scale, Pender's Commitment to a Plan of Action Scale, Pender's Perceived Barriers to Action Scale, and Pender's Preference Scale (Alkhalaileh et al., 2011).

Because the studies reviewed by Alkhalaileh et al. varied widely in the settings and populations, the results varied widely as well. However, the results of each reviewed study indicated improvement in overall compliance and health-promoting behaviors among the individuals involved. One study's results showed health-promoting behaviors and self-esteem had a direct effect on quality of life, while another study showed that the HPM influenced a group of Korean adults with cardiovascular disease (CVD) to commit to a plan of exercise. Alkhalaileh et al. (2011) revealed the

correlation between Pender's HPM and health-promoting behaviors. Alkhalaileh et al. (2011) also depicted how the HPM can be used in varying nursing situations and as a framework for research-based work.

Preventative screening is a key component to health-promoting behavior for providers and patients alike. Alkhalaileh et al. (2011) showed how Pender's model can be applied to research, such as the current research of cholesterol screening measures. As advanced practice nurses, it is important to understand how the HPM was utilized in the current research study and how it can be utilized in practice. Preventative practices, such as cholesterol screenings, are imperative in the primary care setting. Primary care providers perform cholesterol screenings to aid in the prevention of cardiovascular disease. Integrated reviews, such as the current research, are required in order to reveal how theories (e.g., the HPM) influence and benefit nursing policy and practice.

Pender's HPM was also used as the theoretical framework for Vakili, Rahaei, Nadrian, and YarMohammadi (2011), who conducted research on the predictors of oral health behaviors to identify variables that may be altered through intervention. Vakili et al. (2011) emphasized the importance of oral health by stating its importance to overall health and education. Children with poor dentition are more likely to underperform in school and accrue more absences. Gum disease is stated as more prevalent in older children, adolescents, and adults. This is of much concern since the Islamic Republic of Iran has a population of more than 70 million people. The dentist-to-citizen ratio is largely outnumbered, with one dentist to every 5,500 people. A complex mix of different influences determines the overall outcome of oral health behavior. These factors include biological, social, economic, cultural, and environmental factors, knowledge, and attitudes to health and learned behavior, as well as access to health

services. Vakili et al. (2011) stated that Pender's HPM is one of the explanatory nursing models that predict health behavior.

Vakili et al. (2011) attempted to answer the following four questions central to their research:

1. What is the pattern of performing oral health behaviors in the students in a developing country, like Iran?
2. In what aspects of oral health behaviors do students report having difficulties?
3. To what extent do the variables of the Health Promotion Model predict performing oral health behavior of the students?
4. May the Health Promotion Model be used in a developing country, like Iran, as a framework for planning intervention programs to improve the oral health behaviors of students?

Vakili et al. (2011) gathered information from 320 high school students from four high schools in Shahrekord City, Iran. The students were provided questionnaires that were kept confidential. Twenty students did not consent to the questionnaire; therefore, 300 students (140 males and 160 females) completed the questionnaires. Vakili et al. (2011) developed a system to measure the pattern of oral health. The two-scale plan, a commitment to a plan of oral health, assessed if the subjects had a regular plan to brush their teeth. A *yes* response was scored a one, and a *no* response was scored a zero. If the subject answered *yes* for the first question, they were asked how often they were committed to implement their plan of action. Vakili et al. (2011) used a 3-point Likert scale for the answer to the second question. A score of 0 was given for

not at all, a 1 for *somewhat*, and 2 for *completely*. Higher scores indicated a greater commitment to a plan of oral care.

The phrasing of the questions was considered important; therefore, a panel of seven experts which included a health behavior specialist, an educator, a dentist, and an oral healthcare provider reviewed the questions. The internal consistency of design was assessed using a pilot study of 30 students. Cronbach's coefficient alpha was used to estimate the internal consistency. The results were not published in the final sample. Vakili et al. (2011) also collected age, gender, and parents' education level as demographic data.

The statistical data were computed using the Statistical Package for the Social Sciences (SPSS). The HPM variables were calculated using *t* test and one-way ANOVA. The percentages of oral health behavior in high school students were as follows: tooth brushing (49.3%), using dental floss (15.3%), visiting a dentist twice a year (7%), and using a fluidized oral irrigator (5.3%). It was also found that the parents' education level coincided with the performance of oral health behaviors. The higher the parental education level, the more likely a child was to perform oral care. Pearson's analysis found a positive correlation between the HPM variables and oral health. The HPM variables had a positive correlation because the parents proved to be the most important influence in oral health behaviors of the students. The positive correlation of parental education and oral performance behavior suggested that the more educated parents were more involved and proved to be better interpersonal influences. Vakili et al. (2011) stated that oral health providers should consider this fact and focus on a design centered on interpersonal modeling.

Vakili et al. (2011) also found that females had a better performance of oral health than male subjects. Vakili et al. (2011) stated that one way to enhance oral care in the male population would be to use females as role models in oral health promotion. This design should include providing individual instruction practices and information through self-help groups. The students' self-efficacy should also be a main focus. By giving students adequate information and providing them with positive feedback, which may enhance their confidence in the given task, the students should exhibit better oral health behaviors. Other methods which may have a positive effect on oral health included guided exercise of a new skill, setting short-term goals, and combining feedback about accomplishments, modeling, and social support.

The study by Vakili et al. (2011) is appropriately similar to the current research. The study by Vakili et al. (2011) selected Pender's HPM to determine the oral health behaviors among high school students in Iran. The current research used the same model to determine the cholesterol screening practices of primary providers in a southeastern state. Though these two studies differ in population and variables, the current researchers were able to study these data and make similar assumptions based on a similar model. For example, the study by Vakili et al. (2011) determined that self-efficacy, an individual's belief in his or her capacity to execute certain behaviors, played a major part in the oral health behaviors in Iran. Therefore, an emphasis should be placed on the primary care provider's self-efficacy when determining which patients are being selected for cholesterol screenings.

Ronis, Hong, and Lusk (2006) conducted a quantitative study comparing the usefulness of Nola Pender's original HPM against her revised HPM. The HPM is a valuable and popular theoretical framework utilized in nursing research. Its foundation

draws from the expectancy value and the social cognitive theories. Following its initial publication in 1982, the Health Promotion Model has been used in countless studies. However, research found limitations to the model. Therefore, in 1996 Pender introduced a revised HPM model which dropped some variables, added others, and stressed new importance of some of the original model's variables. The revised HPM was identified as the theoretical framework in the study performed by Ronis et al. (2006).

The purpose of the study performed by Ronis et al. (2006) was to compare the ability of the original HPM model with the ability of the revised HPM model to predict a behavioral outcome. In addition, Ronis et al. (2006) sought to determine if placing importance on the variables of interpersonal and situational influences and behavior factors, according to the revised HPM, improves the revised model's ability to predict a health-promoting behavior.

Ronis et al. (2006) utilized data collected from an interventional study that sought to uncover whether a construction worker's use of ear protection in noisy areas would improve after being educated on the importance of ear protection. Ronis et al. (2006) performed secondary analyses of the data. The population included two groups: (a) one that represented only construction workers from the Midwest and (b) another that included workers from across the United States. The respective sample ($N = 703$) only consisted of construction workers in noisy areas of a construction site. The sample of workers included differing trades (e.g., carpenters, operating engineers, plumbers/pipefitters, and plumber/pipefitter trainers) (Ronis et al., 2006).

Ronis et al. (2006) distributed a posttest, self-reported questionnaire to the study participants. Multiple reliable scales in the questionnaire were utilized to quantify each

HPM's variable, including (a) demographic characteristics, (b) interpersonal influences, (c) situation factors/influences, (d) perceived control of health, (e) definition of health, (f) perceived hearing health status, (g) perceived self-efficacy, (h) perceived benefits, (i) perceived barriers, and (j) exposure to the intervention. Finally, the questionnaire asked the participant whether or not the educational series affected the likelihood of wearing ear protection (Ronis et al., 2006).

Results of the questionnaire were analyzed utilizing EQS matrix and Confirmatory Factor Analysis (CFA). The CFA measured whether or not the variables correlated to the behavioral outcome of wearing ear protection. Three separate CFA analyses were performed in an attempt to make data more usable.

Data collected offered valuable insight into the HPM. The revised HPM structure performed superiorly to the original model as evidenced by a 28% predictive variance rate by the revised HPM compared to only an 18% predictive variance rate by the original model. This finding can be attributed to the revised version placing greater importance on allowing behavior specific factors to have a direct and indirect path to a behavioral outcome. Factors that were dropped from the original HPM including perceived control of health proved to be a weaker factor in predicting health-promoting behavior. The findings of Ronis et al. (2006) supported the restructured HPM and the idea that it was more accurate in predicting health-promoting behaviors. Therefore, the revised HPM was utilized in the current research.

Review of Related Research

The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines, developed by the National Institutes of Health, recommend performing a fasting lipoprotein panel on all adults every 5 years, beginning at 20 years

of age. The following review of past research highlights disparities in the screening of young adults for dyslipidemia and other cardiovascular risk factors.

The leading cause of death in the United States is coronary heart disease (CHD). Dyslipidemia is a leading risk factor in the development of CHD and can begin to develop in early adulthood (CDC, 2014a). Barham et al. (2009) conducted a randomized practice-based trial to observe the frequency of lipid screenings and appropriate management in a sample of North Carolina primary care practices. Barham et al. (2009) stated that dyslipidemia is an important aspect to study due to its association with CHD, which is the leading cause of death in the United States (Barham et al., 2009). The appropriate treatment for dyslipidemia may also reduce the risk of CHD by 30% (Barham et al., 2009). Barham et al. also stated that CHD affects women and racial and ethnic minorities disproportionately. The study by Barham et al. (2009) set out to determine whether patient-level differences, such as sex, ethnicity, and cardiovascular disease, are associated with disparities in lipid screening.

Barham et al. (2009) gathered information from 61 community practices, teaching hospitals excluded, from June 1, 2001, through May 31, 2003. The practices were analyzed according to the NCEP ATP III along with demographics, cholesterol values, and comorbid conditions which were abstracted from the records. Eligible patients included those between the ages of 21 and 84 years who were not currently taking lipid-lowering therapy.

Barham et al. (2009) used a multivariable logistic regression model to determine if age, sex, race/ethnicity, diabetes, cardiovascular disease, NCEP ATP III risk category, or pretreatment of low-density lipoprotein had an effect on treatment. Since the research involved quality improvement, individual patient consents were not

required. Privacy was concealed under Health Insurance Portability and Accountability Act (HIPAA). Nurse abstractors collected data using a standardized data collection tool on a laptop computer on-site. Barham et al. (2009) then divided the patients into three categories: (a) patients taking lipid-lowering therapy prior to June 1, 2001, (b) patients not taking lipid-lowering therapy prior to and without lipid screening data during the data collection period, and (c) patients not taking therapy prior to June 1, 2001. The first category was eliminated because it focused more on therapy management than initial decision-making. The second and third categories were further subdivided into demographics and comorbidities. The demographics category consisted of age, sex, and race/ethnicity. The comorbidities category of CHD and diabetes. Evidence of attempts to correct their LDL with lifestyle changes was indicated also as a therapeutic lifestyle category (Barham et al. (2009).

Screened patients were then placed into categories determined by their NCEP ATP III risk category. A number from 1 to 4 was assigned and was based on the following guidelines: (a) low risk (0 or 1 risk factor for CHD), (b) intermediate low-risk ($\geq$ 2 risk factors) and Framingham risk score (FRS), a 10-year risk of having a heart attack < 10%), (c) intermediate high risk ($\geq$ 2 risk factors and FRS > 20%), and (d) high-risk (CHD risk equivalent and or $\geq$ 2 risk factors and FRS > 20%.

A total of 5,742 charts were examined from the 61 primary care practices. More than half of the patients had a pretreatment LDL < 130 mg/dl and only 5% had an LDL of at least 190 mg/dl. One third of the patients were placed into the low-risk category, and 25% was placed into the high-risk category. The total screening rate was 34.5%, which follows closely with the NCEP ATP III goal of 40%. Of the 1,711 patients, 1,310 were appropriately managed. Barham et al. (2009) concluded that

screening rates were higher at older ages, but the appropriateness of treatment was lower at older ages. There were no large discrepancies seen amongst the sexes and ethnicities. Patients with diabetes were more likely to be screened but less likely to receive appropriate treatment than patients without the disorder. The category which received the most appropriate treatment was the low-risk category with an LDL of $\leq$ 130 mg/dl.

In conclusion, the findings indicated that patients at high risk for CVD are at the greatest risk of being undertreated for dyslipidemia per NCEP ATP III guidelines. Also, older individuals are more likely to be screened but less likely to be appropriately treated. Barham et al. (2009) stated that their findings were consistent with an analysis of a Multi-Ethnic Study of Atherosclerosis, which states that higher risk individuals were more likely to be undertreated. Barham et al. also stated that screening by age seems to reflect a provider's belief that a younger, seemingly healthier individual may not necessitate screening due to their low risk of CVD. Efforts should be taken to improve the screening and management of intermediate to high-risk patients.

The study performed by Barham et al. (2009) was appropriately similar to the current research investigation into primary care lipid screenings and provided a strong foundation for the current research. The current research was obtained from a sample of 100 charts from five primary care facilities, much smaller than the sample compiled by Barham et al. which sampled 61 facilities and 5,742 charts. Yet, it still offers considerable insight into the statistics of screening patterns in a primary care setting. Also, the current research questions coincided with Barham et al. (2009) by analyzing if primary care facilities are abiding by guidelines when screening for cholesterol.

Kuklina, Yoon, and Keenan (2010) conducted a study in order to measure the compliance of cholesterol screening guidelines among the young adult population. High-cholesterol levels are one of the main risk factors for CHD, a leading cause of mortality in men and women in the United States (CDC, 2014a). Kuklina et al. (2010) utilized the measurements found in their study to determine if primary care providers are compliant in screening for high-cholesterol levels in young adults (men aged 20 to 35 years, women aged 20 to 45 years), as recommended by the NCEP ATP III guidelines. These guidelines are endorsed by the American Heart Association and the National Heart, Blood and Lung Institute, and recommend screening for high-cholesterol levels every 5 years in adults age 20 years and older.

The purpose of the study by Kuklina et al. (2010) was to determine whether or not young adults are being screened for high-cholesterol levels, as recommended by the NCEP-ATP III guidelines. Kuklina et al (2010) stated three objectives in their study: (a) the proportion of persons with CHD, CHD equivalents, or CHD risk factors; (b) rates of the self-reported screening for high cholesterol performed before the study; and (c) the prevalence of high low-density lipoprotein (LDL) levels that had been assessed by a fasting lipid test during the National Health and Nutrition Examination Survey (NHANES) (Kuklina et al., 2010). The CHD equivalents were defined as other forms of atherosclerotic vascular disease, diabetes, or risk of CHD > 20% within 10 years. Other CHD risk factors were defined as smoking, hypertension, familial history of early CHD, and obesity.

The study participants included those surveyed by NHANES. The NHANES uses a complex, multistage probability design to select participants in order to survey the health and nutritional status of the U.S. civilian, noninstitutionalized population

(Kuklina et al. 2010). Approximately 6,000 participants are selected each year to participate in the study. The data are released in 2-year increments. For the purposes of Kuklina et al.'s study, data were obtained from the four most recent cycles: 1999-2000, 2001-2002, 2003-2004, and 2005-2006. A group of 13,875 participants were randomly selected for fasting laboratory testing of cholesterol levels. After excluding those participants younger than 20 years of age, men older than 35 years of age, women older than 45 years of age, and women with a positive urine pregnancy test and/or reported pregnancy, Kuklina et al. (2010) was left with a sample size of 2,587 participants.

The participants were further subcategorized by sociodemographic characteristics (i.e., gender, race/ethnicity, education, and poverty index) and CHD risk factors (i.e., number of times the participant received healthcare in last the 12 months), history of CHD or CHD equivalent, positive for CHD risk factors (e.g., hypertension, smoking, obesity, family history of CHD), were taking lipid-lowering medication. Screening percentages were also obtained based on the number of risk factors for CHD among the participants and the prevalence of high LDL levels by the number of risk factors among participants.

The results of the study by Kuklina et al. (2010) showed that 63% of young adults (men aged 20 to 35 years, women aged 20 to 45 years) with CHD or CHD equivalent, 26% of young adults with two or more risk factors, 12% of young adults with one risk factor, and 7% with no risk factors had a high low-density lipoprotein (LDL) level (Kuklina et al., 2010). Except for persons with CHD or a CHD equivalent, screening was found to be low in young adults (about 50% for women and < 40% for men). Kuklina et al. (2010) found no significant difference in the screening rates between young adults with no risk factors and those with one or more risk factors, even

after adjusting for sociodemographic and healthcare factors. The low screening rates in the young adults with two or more risk factors were alarming, considering the risk for CHD rises with each occurring risk factor. Kuklina et al. (2010) recommended that future studies be done to identify how cholesterol screening among young adults could be improved in primary care settings. Their results also support the need to improve assessment and management of cardiovascular disease risk factors among young adults.

This study overall applies to the current research. Kuklina et al. (2010) focused on the compliance, or lack thereof, of high cholesterol screening in young adults, basing their participant groups on the NCEP ATP III guidelines, which are the same guidelines the current research has built a foundation upon. Kuklina et al. (2010) offered methodology variables for the current research, broadening the sociodemographic characteristics, and also assisted the current research in adjusting for variables such as CHD risk factors.

Cardiovascular disease has been found to be the third leading cause of death in women 18-44 years of age (Robbins et al., 2013). Robbins, Dietz, Cox, and Kuklina (2013) sought to identify the prevalence of risk factors in women of reproductive age according to the American Heart Association (AHA) at-risk definitions versus United States Preventative Serve Task Force (USPSTF) at-risk definitions. For women, risk factors, such as dyslipidemia, or abnormal cholesterol levels, precede cardiovascular diseases, such as heart attack and stroke. Dyslipidemia is also associated with polycystic ovarian syndrome, atherogenesis, and heart disease in women. With cardiovascular disease being a leading cause of mortality in adult women, it is important to identify women at risk by determining which risk factors, such as dyslipidemia, are present.

Robbins et al. (2013) utilized the AHA and USPSTF risk definitions to determine the proportions of women at risk according to each set of risk criteria.

Robbins et al. (2013) sought to compare at-risk definitions between the AHA versus the USPSTF. The population sample consisted of 1,781 women with data being drawn from the NHANES from the years 2007-2008. Physical examinations and labs were performed and questionnaires administered in mobile examination centers. Binary variables were created for CVD risk status, measures of dyslipidemia, and sociodemographic characteristics. USPSTF risk factors included diabetes, hypertension, tobacco use, obesity, and family history of CVD. AHA risk factors were defined as chronic kidney disease, pre-hypertension/hypertension, central obesity, poor diet, physical inactivity, history of gestational diabetes mellitus, rheumatoid arthritis, and Framingham 10-year CVD risk $\geq 10\%$. Sociodemographic characteristics were age, race/ethnicity, education, and annual family income.

The Stata Software Version 11 was used to conduct data analyses. Since the risk of developing dyslipidemia increases with age, differences in distributions of CVD risk factors by age were assessed using Pearson chi-square tests ($p < .05$) with Rao and Scott second-order corrections. The prevalence of dyslipidemia was calculated by risk category and stratified by risk and age category. Dyslipidemia prevalence and case-to-screening ratio were estimated by dyslipidemia type among women at-risk according to the AHA guidelines but not at-risk according to the USPSTF guidelines.

Robbins et al. (2013) found that nearly all women, whether of reproductive age or older, had at least one risk factor according to the AHA guidelines, with unhealthy diet being significant in the younger and older population. High prevalence of dyslipidemia was reported among women of reproductive age, and over half had not

had a cholesterol screening within the previous 5 years. Robbins et al. (2013) identified a much higher prevalence of CVD risk in the sample population when using the AHA guidelines set forth by the NCEP ATP III guidelines versus using the USPSTF guidelines. Robbins et al. (2013) also determined that future studies were needed to assess whether identification and treatment of all women with dyslipidemia will decrease CVD mortality later in life.

Robbins et al. was pertinent to the current research from different aspects. First, Robbins et al. (2013) utilized AHA at-risk definitions, which are based upon the NCEP ATP III guidelines that served as the foundation for the current research. Also, Robbins et al. (2013) magnified the prevalence of dyslipidemia and other CVD risk factors in women of reproductive age. In the research performed by Robbins et al. (2013), nearly 99% of the sample population was positive for at least one CVD risk factor according to the AHA at-risk definitions. Robbins et al. (2013), along with the current research, highlighted the importance of identifying risk factors of CVD, such as dyslipidemia, and treating each risk factor accordingly in hopes to prevent future disease.

It is important to recognize that the development of high-cholesterol levels and associated risk factors of cardiovascular disease may develop earlier than 20 years of age, which could contribute to cardiovascular disease in adulthood (CDC, 2012). May, Kuklina and Yoon (2012) conducted a study in order to measure recent trends in the prevalence of certain biological risk factors of cardiovascular disease in adolescents. Moreover, May et al. (2012) measured the prevalence of these risk factors in adolescents who were classified as either overweight or obese versus normal weight. CVD is a leading cause of mortality in the United States. Manifestations of CVD, such as heart attack or stroke, typically do not appear until adulthood. However, risk factors

for these diseases, such as elevated cholesterol, hypertension, and diabetes, can appear in childhood and adolescence. May et al. (2012) was conducted in order to determine the trend of rising numbers of adolescents with CVD risk factors, particularly those who are overweight or obese. Because these risk factors can transcend into adulthood, it is important to understand which adolescents are at risk for developing CVD and how to screen appropriately.

The purpose of the study by May et al. (2012) was to determine the prevalence of CVD risk factors to include prehypertension/hypertension, borderline-high/high low-density lipoprotein (LDL) levels, low high-density lipoprotein (HDL) levels, and prediabetes/diabetes by weight status and their trends among adolescents aged 12 to 19 years. May et al. objectively determined the trends of CVD risk factors among adolescents classified as normal weight, overweight, or obese.

The initial sample data were from NHANES, a nationally representative, continuous cross-sectional survey of the health and nutritional status of the U.S. civilian, noninstitutionalized population (May et al., 2012). Participants are selected annually to participate by using a complex, multi-stage probability design. The NHANES data are released in 2-year increments. The study by May et al. (20102) was conducted with data from 5 cycles: 1999-2000, 2001-2002, 2003-2004, 2005-2006, and 2007-2008. The initial combined sample from the five cycles included 10,397 adolescents. Of this group, 4,174 were randomly selected to provide fasting blood samples for lipid and glucose testing (May et al., 2012). Excluded were those who reported being pregnant or were missing data. The final sample included 3,383 adolescents. May et al. (2012) defined *overweight* and *obesity* according to the CDC age and gender-specific percentiles for body mass index (BMI). May et al. defined

overweight as having a BMI ≥ 85th percentile and < 95th percentile. Obesity was defined as having a BMI ≥ 95th percentile. Normal weight was defined as having a BMI ≥ 5th percentile and < 85th percentile. Adolescents measured as underweight were not included in the study. Prehypertension and hypertension were measured and defined according to the average of three blood pressures taken during the physical examination portion of the study. In order to define *prehypertension* and *hypertension* in adolescents aged 12 to 17 years, May et al. (2012) used the guidelines established by the NHLBI that were specific for age, gender, and height. For participants 12 to 17 years of age, prehypertension was defined as having a systolic blood pressure or diastolic blood pressure reading that was ≥ 90th percentile and < 95th percentile. *Hypertension* was defined as having a systolic blood pressure or diastolic blood pressure reading ≥ 95th percentile.

Prehypertension for study participants aged 18 to 19 years was defined as having a systolic blood pressure (SBP) of 120-139 mmHg or a diastolic blood pressure (DBP) of 80-89 mmHg. Hypertension for 18- to 19-year-olds was defined as having a SBP > 140 mmHg or a DBP > 90 mmHg. Abnormal lipid levels in the study participants included borderline high low-density lipoprotein (LDL), high LDL, and low high-density lipoprotein (HDL) levels. May et al. (2012) used guidelines set by the NCEP ATP III in order to determine these levels. Borderline high LDL levels were those ≥ 110 mg/dL to < 129 mg/dL. High LDL levels included ≥ 130 mg/dL. HDL levels < 35 mg/dL were considered low. Prediabetes and diabetes were defined using guidelines set by the American Diabetes Association. Prediabetes was defined as having a fasting plasma glucose level > 99 mg/dL to < 126 mg/dL. Those adolescents who had a fasting glucose ≥ 126 mg/dL were classified as having diabetes. Demographic characteristics

included gender, age, and race/ethnicity. These characteristics were self-reported during the home interview by NHANES. Ethnicity included non-Hispanic white, non-Hispanic black, Hispanic, and other. May et al. (2012) began data analysis by measuring each BMI category to include normal weight, overweight, and obese. Next, May et al. measured the proportion of adolescents with one of four CVD risk factors for the entire sample, followed by measuring based on BMI category. Next, May et al. (2012) measured the differences in prevalence of each of the four CVD risk factors, as well as of overweight and obesity, across the five-study cycles. Finally, May et al. (2012) measured combinations of two or more of the four CVD risk factors among overweight and obese adolescents and clustered their findings based on prevalence.

May et al. (2012) found that 34% of the study group was overweight or obese. The overall prevalence for each of the four risk factors was > 10% with the exception of low HDL (May et al., 2012). Borderline-high/high LDL was the most prevalent risk factor overall. A dose-response increase with weight category was observed for each of the four risk factors, with 49% of overweight and 61% of obese adolescents having at least one of the CVD risk factors. The most prevalent two-risk factor combination included prehypertension/hypertension and borderline-high/high LDL, which accounted for nearly one fourth of the study sample. No significant differences were noted among the different ethnicities; however, the increase of risk factor prevalence was substantially higher in those adolescents who were overweight or obese.

The basis of May et al.'s study was pertinent to the current research. The prevalence of CVD in the U.S. is ever-growing. While CVD and its manifestations, such as heart attack and stroke, are still most likely to present in adulthood, healthcare professionals should seriously consider the prevalence of CVD risk factors in youth.

The findings of May et al.'s study indicated that the adolescent youth of the country bear a significant burden of risk factors for CVD. These findings are also concerning due to the fact that these risk factors most likely will carry over into adulthood. Borderline-high and high LDL levels were the most significant CVD risk factors found by May et al. (2012). It is imperative that advanced practice nurses adhere to current guidelines and screen for high cholesterol appropriately. It is evident in the study conducted by May et al. that high cholesterol and other CVD risk factors do not limit themselves to adults only; therefore, providers should be vigilant in beginning cholesterol screenings at the recommended age of 20 years.

Risk factor identification is an important step in primary prevention of cardiovascular disease. Johansen, Green, Sen, Kircher, and Richardson (2014) investigated the relationship between certain cardiovascular disease risk factors and the use of statin drugs. It is well documented that statins can significantly reduce a person's risk of developing cardiovascular disease. However, past research has indicated statins are underutilized in patients with cardiovascular risk factors, diabetes, and cardiovascular disease.

The purpose of the study performed by Johansen et al. (2014) was to identify themes and correlations between the diagnosis of cardiovascular disease and various cardiovascular disease risk factors with the use of statin drugs. Additional research questions sought to identify each cardiovascular risk factor separately and its correlation to statin therapy utilization.

Johansen et al. (2014) utilized the 2010 Medical Expenditure Panel Survey (MEPS) to establish the respective sample for their study. Johnansen et al.'s population included all MEPS participants aged 30 to 79 years resulting in 16,712 individuals.

Any subject within the population who was deemed ineligible for statin therapy was eliminated from the sample. Next, two different analysis groups were formed. The first group contained each member of the sample. The second group contained only members of the sample with a history of diabetes mellitus or coronary artery disease. The independent variable was identified as a statin user (Johansen et al., 2014).

The dependent variables were identified as cardiovascular risk factors as follows: (a) hyperlipidemia, (b) coronary artery disease, (c) diabetes mellitus, (d) cerebrovascular disease, (e) peripheral artery disease, and (f) hypertension. A modified cardiovascular disease risk index was also utilized. The index was necessary for use in individuals who did not have a history of coronary artery disease or diabetes (Johansen et al., 2014).

In addition, sociodemographic covariates were identified. The covariates included the following: (a) age, (b) race, (c) poverty category, (d) tobacco use, and (e) insurance coverage. Age is an important factor in identifying cardiovascular risks because cardiovascular risk factors often increase with a person's age. Insurance and poverty categories could serve as important covariates because they may identify a population at risk for statin noncompliance secondary to an inability to access or afford necessary healthcare (Johansen et al., 2014).

The data collected by Johansen et al. (2014) revealed several significant findings. First, the presence of hyperlipidemia proved to be the most significant risk factor in predicting statin use. Individuals who were diagnosed with hyperlipidemia were more likely to be on a statin than those individuals with cardiovascular disease or diabetes who did not have hyperlipidemia. Furthermore, high-risk individuals diagnosed with hyperlipidemia that did not have a history of coronary artery disease or

diabetes were being managed on statins more often than high-risk individuals who were not diagnosed with hyperlipidemia (Johansen et. al, 2014).

The study by Johansen et al. (2014) was relevant to the current research because the findings supported the need for examining primary care providers' adherence to NCEP ATP III guidelines for cholesterol screening and management of patients. Johansen et al. (2014) found that many patients who were not diagnosed with hyperlipidemia were undermanaged. Under-management of such a significant risk factor puts patients at unnecessary risk for developing cardiovascular disease. This finding shows the importance of properly screening all patients for risk factors rather than hyperlipidemia alone.

The methodology utilized by Johansen et al. (2014) influenced the development of the data collection form for the current research. The current research also sought to identify whether the variations of age, payer source, or tobacco use correlated with cholesterol screening practices.

Research performed by Feinglass, Jean-Jacques, and Kenik (2014) investigated the relationship of racial and ethnic disparities in cholesterol screening practices. A quantitative, cross-sectional, and nonexperimental study was conducted to investigate whether racial and ethnic disparities in cholesterol screening persisted after making adjustments for socioeconomic status, access to care, and language barriers.

Feinglass et al. (2014) utilized the 2011 Behavioral Risk Factor Surveillance System (BRFSS), monitored by the CDC, to collect data. The BRFSS is the largest ongoing telephone survey and utilizes a weighted ranking system. The system allows more demographic variables, such as age, gender, race, marital status, education, or home ownership. Sample parameters included men over the age of 35 years and

women over the age of 45 years with increased risk for cardiovascular disease. Adjustments were made in the sample parameters to include all women over the age of 45 years. The survey, conducted in 2011, questioned respondents as to whether they had ever had a cholesterol screen. Demographic factors were already calculated from the respondents' information. Other categorizing factors included age, race, ethnicity, self-reported health status, household income, and personal doctor. Analysis of data also factored in additional differences by race, ethnicity, younger respondents, smokers, higher income, and health insurance.

Feinglass et al. (2014) identified socioeconomic status, healthcare access, and language barriers as the fundamental elements contributing to the racial and ethnic disparities associated with lack of cholesterol screening. Out of almost 13 million respondents, 9.1% reported never having a cholesterol screening performed (Feinglass et al., 2014). Additional findings revealed that the lack of health insurance and absence of a primary care provider also contributed to cholesterol screening disparities.

Feinglass et al. (2014) provided insight relevant to the current research because it defined and identified gaps in current cholesterol screening practices. Feinglass et al. (2014) identified socioeconomic status, healthcare access, and language barriers as the primary elements contributing to the racial and ethnic disparities associated with lack of cholesterol screening.

With the implementation of the Affordable Care Act, Feinglass et al. (2014) felt that these issues would be resolved. Language barriers were also considered as an interfering factor, indicating the need to increase the availability of bilingual primary care providers.

The Coronary Artery Risk Development Study performed by Pletcher et al. (2010) provided valuable results and data supporting the current research. The purpose of the study performed by Pletcher et al. (2010) was to determine if hyperlipidemia present in study participants between the ages of 18 and 30 years was positively associated with the development of CHD in the same participants 15 to 20 years later. Participants were represented from four cities across the United States. The participants were between the ages of 18 and 30 years at the time the study by Pletcher et al. (2010) took place.

The study by Pletcher et al. (2010) included 5,115 men and women. The participants were evaluated at years 2, 5, 7, 10, 15, and 20, respectively. At each visit, a fasting lipoprotein level was drawn. All labs were received and processed by one single laboratory located in Seattle, Washington. At year 15 or 20, a cardiac commuted tomography scan was performed to measure for the presence of coronary calcium.

In addition to drawing cholesterol levels, the variables of age, sex, ethnicity, premature coronary heart disease risk, blood pressure, and tobacco use were recorded. When participants presented for the cardiac commuted tomography scan at year 15 or 20, the variables of education, income, fasting glucose level, diabetic status, BMI, and waist circumference, alcohol use, and activity level were also recorded. During the study analyses, these variants were analyzed to determine which variant had a positive correlation to the development of coronary calcium. In addition, analyses were performed to include and then exclude participants who were prescribed statin therapy.

The methodology further divided participants into the categories of normal, borderline, or abnormal lipid levels during the time the participant was between 25 and 35 years of age. The categories were defined by the low-density lipoprotein (LDL),

high-density lipoprotein (HDL), and triglyceride cholesterol levels presented in the NCEP ATP III guidelines. These categories were used to calculate a correlation between abnormal cholesterol levels as a young adult to abnormal levels as a middle-aged adult and the presence of coronary calcium.

The data were analyzed using Spearman rank correlations and chi squares. At the time of analyses, 3,258 participants of the original 5,115 were included. To be included, the participants must have had the coronary heart disease risk factor measured and results of the cardiac commuted tomography (CT) scan. Pletcher et al. (2010) found that 47% of the participants were black, 42% were female, and an average of 42 years of age at the time of cardiac commuted tomography. Thirteen percent of participants were found to have an LDL < 100 mg/dL, considered the optimal LDL measurement by the NCEP ATP III guidelines, throughout young adulthood. Seventy-five percent of young adults were found to have non-optimal LDL levels.

The results of the study by Pletcher et al. (2010) found a positive, strong correlation with increased lipid levels, specifically a high LDL and a low HDL, in young adulthood and the presence of hyperlipidemia and coronary calcium 15 to 20 years later. Of the patients with an LDL of 160mg/dL or higher during young adulthood, 44% were found to have coronary calcium present at the time of cardiac CT. The presence of abnormal lipids was most commonly associated with the following demographics: white males, a higher than average income, a premature coronary heart disease risk, increased BMI and waist circumference measurements, diabetes, a sedentary lifestyle, and consumption of alcohol.

Even slight elevations in lipid levels showed an increased coronary calcium risk. Increased LDL and low HDL levels were the cholesterol measurements found to have

the greatest impact on participants' risk of developing coronary calcium. Patients who had a LDL level of 130-159mg/dL during young adulthood were 17% more likely to have coronary calcium on cardiac CT than those participants with optimal levels < 100mg/dL. Furthermore, participants with a low HDL level in young adulthood experienced a statistically significant increase in the presence of coronary calcium 15 to 20 years later.

The findings of Pletcher et al. (2010) supported the need for the current research. Young adults with even just a slight increase in LDL levels were at a higher risk for developing calcium in the vessels of the heart than those young adults who kept LDL levels within the NCEP ATP III optimal level. Pletcher et al. (2010) provided evidence that activity level, diet, and lipid levels will impact the health of young adults as they age. While heart disease is not considered a disease of the young, it begins to manifest itself silently in patients as young as 20 years of age. Analyzing cholesterol screening practices of primary care providers will shed light on how well young adults are being screened, managed, and educated on the importance of health-promoting behaviors that will leave a lasting impact on their lives as middle aged adults.

Parker et al. (2008) conducted a qualitative, ethnographic study investigating the perceived implementation barriers and facilitators felt by primary care providers toward the NCEP ATP III guidelines. When screening guidelines are introduced, the recommendations have been developed based on evidence and research to facilitate best practice. However, there tends to be an underwhelming compliance rate to screening guidelines in primary care. Parker et al. (2008) investigated what specific barriers primary care providers felt toward cholesterol screening and management guidelines introduced by NCEP ATP III guidelines.

The purpose of the study performed by Parker et al. (2008) was to identify barriers and facilitators primary care providers felt existed when implementing the NCEP ATP III guidelines. At the conclusion of their study, Parker et al (2008) hoped to gain insight into how their findings compared to previous research studies (Parker et al., 2008).

After obtaining ethical approval from the Memorial Hospital of Rhode Island Institutional Review Board, Parker et al. (2008) conducted nine separate focus groups. The focus groups were led and attended by a three-person research team who performed various roles. For example, an experienced primary care provider with a background in qualitative research guided the focus groups by utilizing prepared open-ended questions. The groups were conducted from October 2002 until February 2003 (Parker et al., 2008).

The population in the study performed by Parker et al. (2008) included 300 primary care providers from various areas of Rhode Island. A sample of 50 primary care providers participated in the focus groups. The characteristics of the physician sample group included 68% males and 32% females, 52% specialized in primary care, while 44% practiced internal medicine. Ninety-two percent of the sample had been in practice from 1 to 30 years. The focus groups were audio-recorded and performed until data saturation was achieved, which occurred during the seventh focus group. Redundancy was verified by performing the eighth and ninth focus group (Parker et al., 2008).

Data were analyzed using activities common to qualitative research. First, the verbal and nonverbal messages were recorded from the researchers' participation and observation immediately following each focus group. NVivo software and personal

self-reflection and immersion into data were utilized by the researchers to code and categorize data. Finally, Parker et al. took part in 10 separate interpretation immersion-crystallization sessions (2008).

Three common themes related to guideline implementation were interpreted by researchers from the focus group data: physician-related, patient-related, and external/environmental issues. Key facilitators in adoption of the cholesterol screening guidelines included the following: (a) strong guideline credibility, (b) an improved awareness of the importance of cholesterol management that providers felt patients were displaying, (c) technological advances, and (d) improved cost-effective screening tools. Barriers identified in implementing guidelines were as follows: (a) physician perceived guideline complexity. (b) lack of accessibility and guidance in guideline interpretation in rural practices, (c) patient noncompliance to provider recommendations and patient's inability to afford guideline related tests or drugs, and (d) time constraints during patient encounters (Parker et al., 2008).

While Parker et al. (2008) were the first to look specifically at guidelines related to cholesterol, their results supported findings in previous guideline implementation studies. The findings of Parker et al. (2008) supported the need for clinical prompting and decision-making software. The findings also verified that providers are willing to follow guidelines set forth by credible, evidence-based organizations. Furthermore, patient noncompliance or inability to follow doctor recommendations was identified in other studies.

Parker et al. (2008) was relevant to the current research. The research adequately identified barriers and facilitators of cholesterol guideline implementation, and its findings were congruent with prior research. The qualitative findings of Parker

et al. (2008) provided valuable background and credible insight into the stated problem of the current research.

Summary

Performing a lipoprotein every 5 years in accordance with the NCEP ATP III guidelines promotes wellness and disease prevention. The HPM was discussed at length in the literature review. The HPM identified that patient wellness and positive health outcomes are directly related to whether a patient views a behavior as beneficial to his or her health. Patient health is influenced by a provider perceiving a behavior as beneficial and educating patients on a health behavior. The desired health behavior in the current research was cholesterol screening.

Overall, the studies reviewed for this chapter were significant in many ways. For example, it was noted that barriers exist among providers when adopting guidelines (Parker et al., 2008). The literature review also revealed that 61% of young adults possess at least one risk factor, such as obesity and a positive cardiac disease family history, that have proven to contribute to the development of cardiovascular disease (May et al., 2012). Risk factors that were included in the research performed by Johansen et al. (2014) were included in the researcher-developed data worksheet compiled for the current research. The use of this data collection worksheet aided the researchers of the current study in identifying provider compliance to cholesterol screening guidelines. The results also identified possible risk factors and patient demographics, including age, sex, payer source, family history of cardiovascular disease, obesity, tobacco use, hypertension, or use of hypertensive medications, which may correlate with an increased or decreased chance of being screened. In addition, the

current research identified whether the number of risk factors present influenced the likelihood that a screening took place.

CHAPTER III

Design and Methodology

Heart disease and stroke are the two leading causes of death in the United States (Centers for Disease Control and Prevention [CDC], 2014a). High-blood cholesterol is one of the main risk factors for CVD and is a prevalent problem in the United States (CDC, 2013). The National Cholesterol Education Campaign recommends that patients 20 years of age and older be screened for high-blood cholesterol. The purpose of the current research was to determine whether or not primary care providers were adhering to the National Cholesterol Education Program ATP III (NCEP ATP IIII) guidelines for cholesterol screening of patients between the ages of 20 and 40 years. Research design, setting, population, and methods of data collection are described in this chapter.

Research Design

The current research consisted of a quantitative, descriptive, retrospective chart review to evaluate adherence to the NCEP ATP III guidelines by primary care providers. Data were obtained from a convenience sample of 500 charts from a retrospective chart review. The research design was appropriate to address the research questions for the current research and also allowed the researchers to review screening behaviors of practitioners without influencing them in order to yield results that were consistent with their normal practices.

Setting

The setting for the current research was five primary care clinics in the southeastern United States. Each of the selected clinics provides primary care serves a diverse population, primarily Caucasian, African Americans, Hispanic, and Native American races, with ages ranging from pediatrics to the older adult.

Clinic One is a federally funded rural community health center, staffed by one physician and three nurse practitioners who treat approximately 280 patients per week. A sliding fee schedule is provided for low-income and indigent patients. The clinic also accepts government program insurance and private commercial insurance.

Clinic Two is a hospital-owned internal medicine practice staffed with 11 physicians and four nurse practitioners. Two of the 11 physicians treat pediatrics. The patient population consists of pediatrics to geriatrics with the largest percentage of clients being the older adult. Approximately 200 patients are seen each day in this urban city clinic. Commercial private insurance and government program insurance are accepted. If a patient is self-pay, a charity program is available; a fee is set based on the client's income.

Clinic Three is an internal medicine practice. The practice is owned and operated by one medical doctor who has been in practice for nearly 40 years. The majority of the patient population ranges from adolescent to older adult. The practice is located in an urban city and serves over 1,500 patients. This practice serves the community following a unique model. The facility does not accept commercial insurance or government programs; instead, each patient pays a flat fee. The fee covers the doctor visits and any fees associated with certain labs or procedures commonly performed in an internal medicine practice.

Clinic Four is a large multispecialty clinic that houses physicians and nurse practitioners of specialties, such as family practice, pulmonology, nephrology, internal medicine, and gastroenterology. The patient sample was collected from the internal medicine physician's office records. This physician routinely treats 15 to 20 patients per day, ranging from 18 to 99 years of age. All insurance types are accepted, with the

main payer source being private insurance. An average of 80 patients are treated each week.

Clinic Five is a nurse-practitioner-owned clinic in a rural community. This clinic serves a range of patients from pediatrics to geriatrics and accepts all insurance types. The main payer source is comprised of self-pay and private insurance. An average of 30 patients are treated on a daily basis.

Population and Sample

The population in the current research included men and women 20 to 40 years of age with different ethnicities and payer sources. The current research included 100 charts randomly selected by each respective clinic's secretary for a total of 500 charts. The age selection was based on the recommendations within the NCEP ATP III guidelines for age-related screening. The charts selected included men and women between the ages of 20 and 40 years. These charts were reviewed for adherence to the NCEP ATP III guidelines. The 500 charts were further reviewed for certain cardiovascular risk factors identified within the NCEP ATP III guidelines, thereby indicating the need for cholesterol screening.

Methods of Data Collection

Prior to conducting the current research, approval was obtained from Mississippi University for Women's Institutional Review Board (IRB) (see Appendix A). After approval from the IRB, each research team member contacted the manager/provider of each clinic where he/she wished to review charts in order to obtain written consent (see Appendix B) to review charts. The members of the research group also met with each respective clinic manager to obtain permission to access electronic medical records and/or paper charts for the purpose of data collection. The office secretary or office-

delegated staff member performed a search of the respective clinic's electronic patient databases using the criteria of 20 to 40 years old, male or female, and provided the researchers with a list of patients meeting the age and gender criteria for cholesterol screening. One hundred charts were randomly selected from this list by selecting every 10^{th} medical record for review. All patients selected had been seen in the clinic within the last 5 years. One clinic included in the current research still utilized paper charts. In this clinic, the office manager manually pulled any chart and set aside those charts belonging to a patient between 20 and 40 years of age. The manager did this until 100 charts were pulled.

The medical records were reviewed in a secure area away from clinic traffic and patient care areas. Data were collected confidentially in the designated area approved by office management. Once data collection was completed, each researcher returned the charts to the medical records department or the pre-designated area for chart return. If electronic records were utilized, the research team member logged off the designated device and returned the device and/or user access code information to office management.

A data collection worksheet was utilized by each research team member to collect data (see Appendix C). The data collection worksheet did not contain any confidential, identifying information, such as the clinic name, patient name, medical record number, social security number, birthdate, or address. All data were entered into a word processing document and stored on a single-password-protected USB drive secured in a location accessible only to the researchers. Upon completion of the research, all media and paper data were appropriately destroyed.

Protection of Subjects

Prior to data collection, written approval for the current research was obtained from Mississippi University for Women's IRB. Data were collected by a retrospective chart review that did not involve any direct testing or human subjects. All charts remained in the medical clinic with patient confidentiality being maintained at all times in accordance with the Health Insurance Portability and Accountability Act (HIPAA). Access to patient information was limited to researchers during the review. The data collection worksheet did not contain any identifiable information pertaining to the clinics or patients. Information obtained from the data collection worksheet was saved on a secure universal serial bus (USB) flash drive.

Methods of Data Analysis

Data were collected on a researcher-designed worksheet and organized into a word processing document. Information captured on the data collection worksheet included age, gender, payer source, risk factors, type of healthcare provider, and whether or not a lipid panel was performed in the last 5 years. Data were then subjected to analysis using descriptive statistics including, but not limited to, frequency distributions and percentages. Data were analyzed for provider adherence to the NCEP ATP III guidelines and the incidence of a lipid profile being performed based on cardiovascular risk factors and demographic factors.

Summary

Research design, implementation, data collection, and data analysis were addressed in this chapter to determine if providers are compliant with the NCEP ATP III guidelines. A quantitative, descriptive, retrospective review of 500 charts was performed for the purposes of the current research. Data were collected systematically

and confidentially from a random convenience sample of medical records. Data analysis was performed to determine whether or not primary care providers in the southeastern United States were in compliance with the NCEP ATP III guidelines for screening individuals for hyperlipidemia.

CHAPTER IV

Research Findings

The Centers for Disease Control and Prevention (2013) cites dyslipidemia as a lead risk factor in the development of cardiovascular disease. Early identification of dyslipidemia by primary care providers allows for correction and management of cholesterol that may help prevent development of cardiovascular disease. Statistically, primary care providers are falling short in screening the general public for dyslipidemia. The purpose of the current research was to analyze the cholesterol screening practices of primary care providers. The current research sought to determine if patients between the ages of 20 and 40 years were being screened every 5 years with a fasting lipoprotein profile as recommended by the National Cholesterol Education Program guidelines (NCEP ATP III). This chapter describes the current research sample and answers the research questions by utilizing the current research. Statistical findings are also summarized in figures and tables.

Profile of Study Participants

Data for the current research were obtained by reviewing a convenience sample of 100 charts from 5 clinics in the southeastern United States. The sample included patients between the ages of 20 and 40 years. The selected charts represented patients that were treated in one of the five respective clinics between 2011 and 2015, reflecting provider adherence to NCEP ATP III guidelines during those years. The data were manually extracted and recorded on a data collection worksheet. Specific demographic information abstracted from each chart included the patient's age, gender, risk factors, provider type, and payer source. The researchers also recorded whether or not there was documentation of a fasting lipoprotein within the last 5 years.

Age. The sample of charts reviewed consisted of 500 patients ranging in age from 20 to 40 years with 20.4% (n = 102) between 20 and 25 years of age, 21% (n = 105) between 26 and 30 years of age, 30.2% (n = 151 between 31 and 35 years of age, and 28.4% (n = 142) between 36 and 40 years of age. The mean age was 31.35 years of age. Figure 1 illustrates the percentage of participants in each age group.

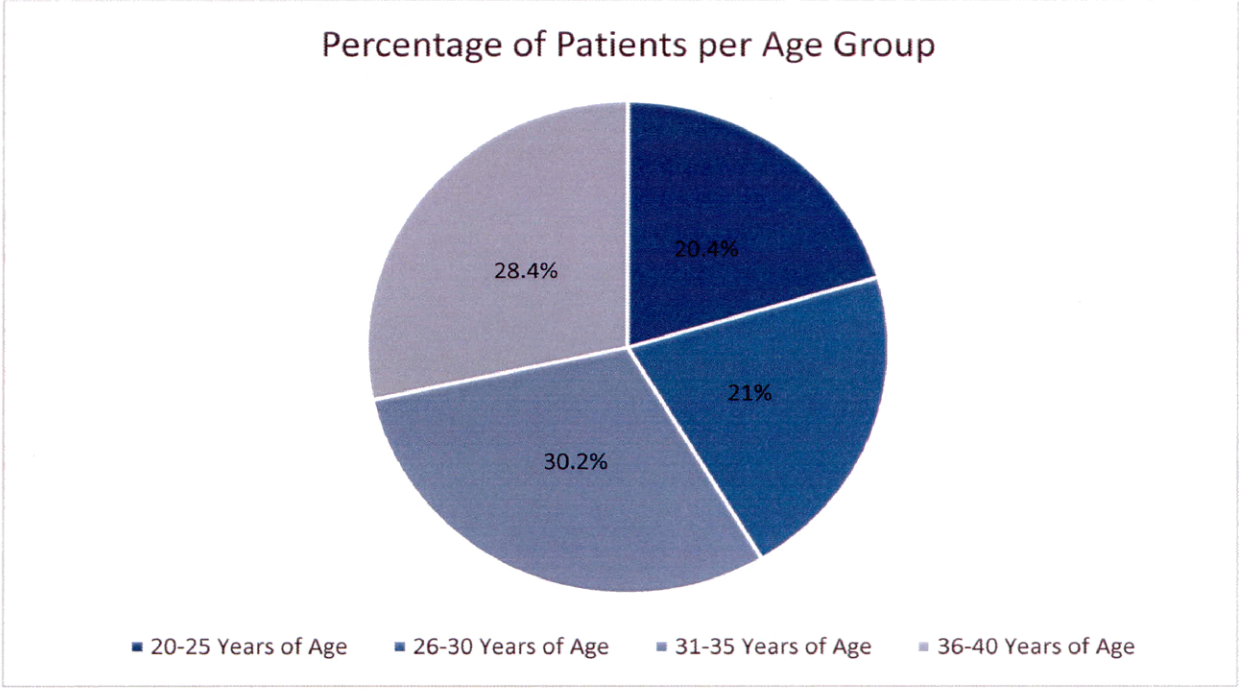

Figure 1. Percentage of participants in each age group.

Gender. The sample was comprised of more female than male participants. The sample included 40% males (n = 199) and 60% females (n = 301). Figure 2 depicts the percentage of the gender distribution in the sample population.

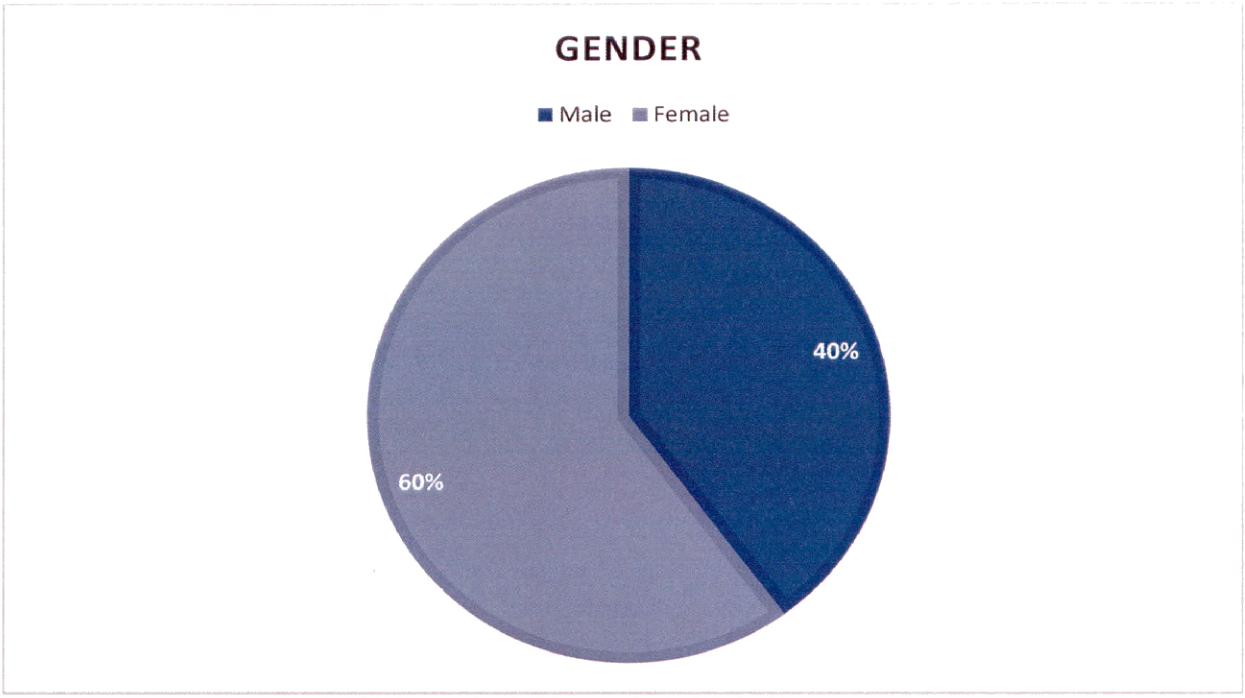

Figure 2. Percentage of gender distribution in the sample population.

Provider type. The researchers assessed which type of provider managed the participants' care. Of the 500 participants, 65% (n = 327) were treated by a nurse practitioner and 34.6% (n = 173) were treated by a physician. Figure 3 presents the percentage of the sample treated by each type of provider.

Payer source. Of the 500 patients, the most common payer source was private insurance at 49.6% (n = 248), followed by self-pay at 37.2% (n = 186), and 13.2% (n = 66) covered under a government program which includes the Medicare and Medicaid programs. Figure 4 presents the payer source of the participants.

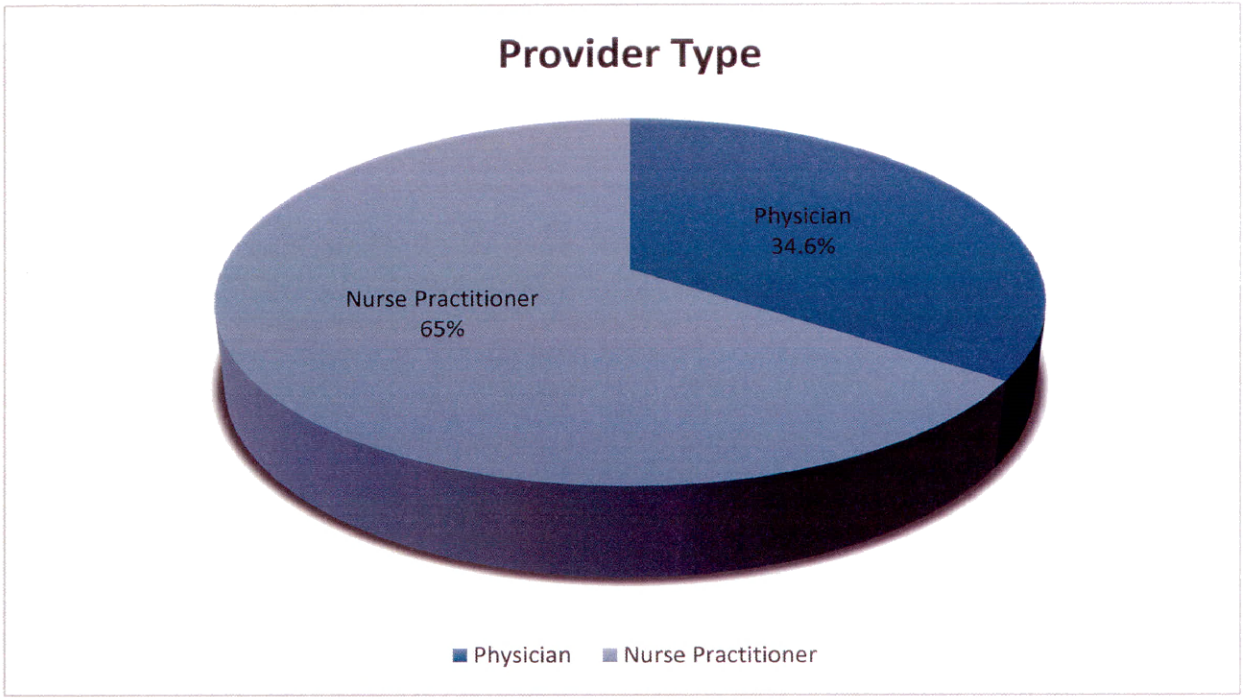

Figure 3. Percentage of the sample treated by each type of provider.

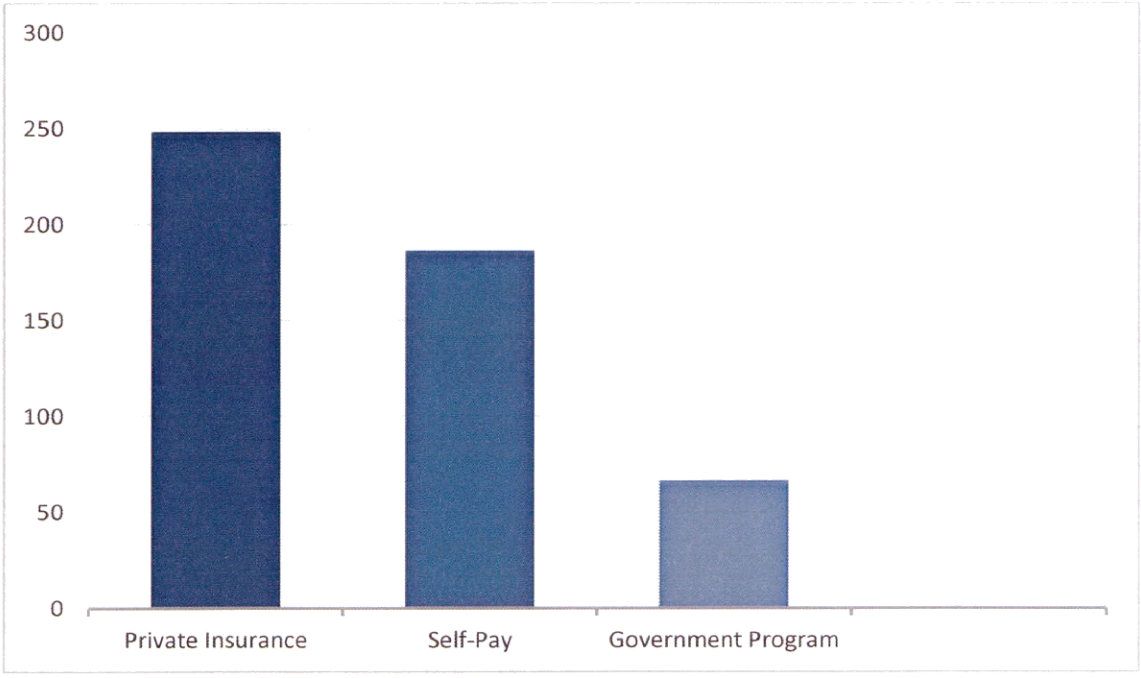

Figure 4. The payer source of the participants.

Statistical Results

A total of 500 charts were chosen at random to complete this retrospective chart review. The only requirement while randomly choosing charts was that the charts belonged to patients between the ages of 20 and 40 years. The current researchers collaborated with a professional statistician to organize the information from the data collection worksheets in a Microsoft Excel spreadsheet. Data were analyzed by the statistician using UMB SPSS statistical software, version 21. Analyses were performed to answer the three research questions presented in this study. Chi-square analyses were performed to determine if demographics affected the cholesterol screening practices of primary care providers. The researchers investigated the following research questions:

1. Are primary care providers performing a fasting lipoprotein profile on patients between the ages of 20 and 40 years once every 5 years?
2. Were risk factors present in the patients who had a fasting lipoprotein profile performed?
3. Were risk factors present in the patients who did not have a fasting lipoprotein profile performed?

Research question 1. Are primary care providers performing a fasting lipoprotein profile on patients between the ages of 20 and 40 years once every 5 years? Of the 500 charts reviewed, 211 patients (42.2%) had a fasting lipoprotein profile performed in the past 5 years. Providers failed to perform a fasting lipoprotein profile on 289 patients (57.8%). Figure 5 represents these findings.

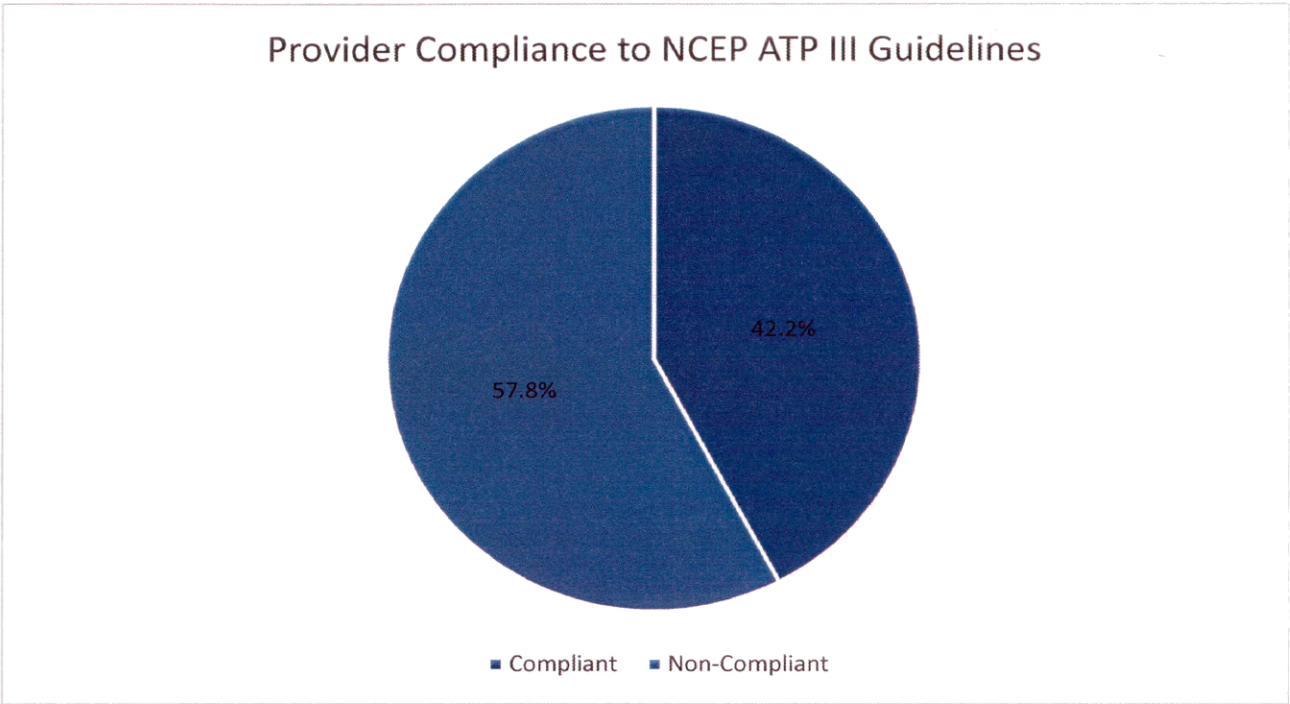

Figure 5. Provider compliance to NCEP ATP III guidelines.

Research question 2. Were risk factors present in the patients who had a fasting lipoprotein profile performed? Of the 500 patient charts reviewed, 42.2% (n = 211) of the participants had a fasting lipoprotein performed in the past 5 years. Analyses were performed to determine if any cardiovascular risk factors were present. Table 1 summarizes the percentage of patients who had each risk factor. The current research found that 50.2% (n = 106) of screened patients had the diagnosis of hypertension, and 43.1% (n = 91) of screened patients were taking hypertensive medications. These were the most common risk factors present in the patients that were screened by the primary care provider. Furthermore, 28.9% (n = 61) of the patients that were screened exhibited at least two of the risk factors on the data collection worksheet.

Figure 6 presents the number of risk factors present in the 211 patients in which a lipoprotein profile was performed.

Table 1

Presence of Risk Factors for Patients with Fasting Lipoprotein Profile Performed

	Present		Absent	
Risk Factor	*n*	%	*n*	%
Family history of cardiovascular disease	46	21.8	165	78.2
Tobacco use	39	18.5	172	81.5
Hypertension	106	50.2	105	49.8
Prescribed hypertension medication	91	43.1	120	56.9
Obesity	67	31.8	144	68.2

Note. $N = 211$.

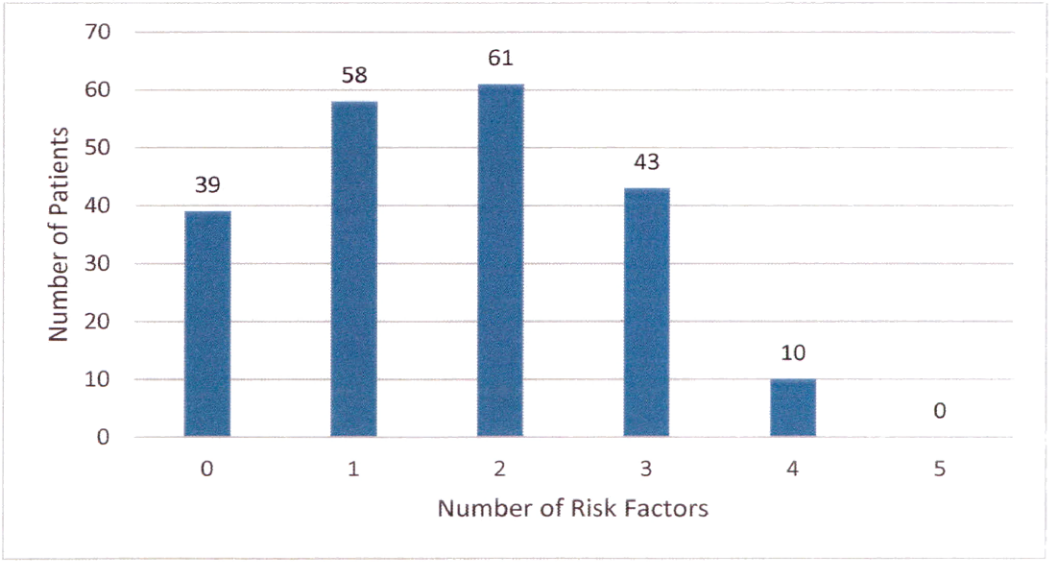

Figure 6. Frequency of risk factors in patients who were screened with a lipoprotein profile.

Research question 3. Were risk factors present in the patients who did not have a fasting lipoprotein profile performed? Of those patients who were not screened, 43.9% (n = 127) had zero risk factors present. Of the remaining 169 patients, obesity and tobacco use were the most common risk factors present. Table 2 presents the percentage of unscreened patients who had each or did not have a specific risk factor.

Table 2

Presence of Risk Factors for Patients Without Fasting Lipoprotein Profile Performed

	Present		Absent	
Risk Factor	*n*	%	*n*	%
Family history of cardiovascular disease	33	11.4	256	88.6
Tobacco use	59	20.4	230	79.6
Hypertension	47	16.3	242	83.7
Prescribed hypertension medication	43	14.9	246	85.1
Obesity	71	24.6	218	75.4

Note. n = 289.

The patients (n = 289) who were not screened were evaluated for the presence of cardiovascular risk factors. Figure 7 presents the number of risk factors present in the patients who were not screened.

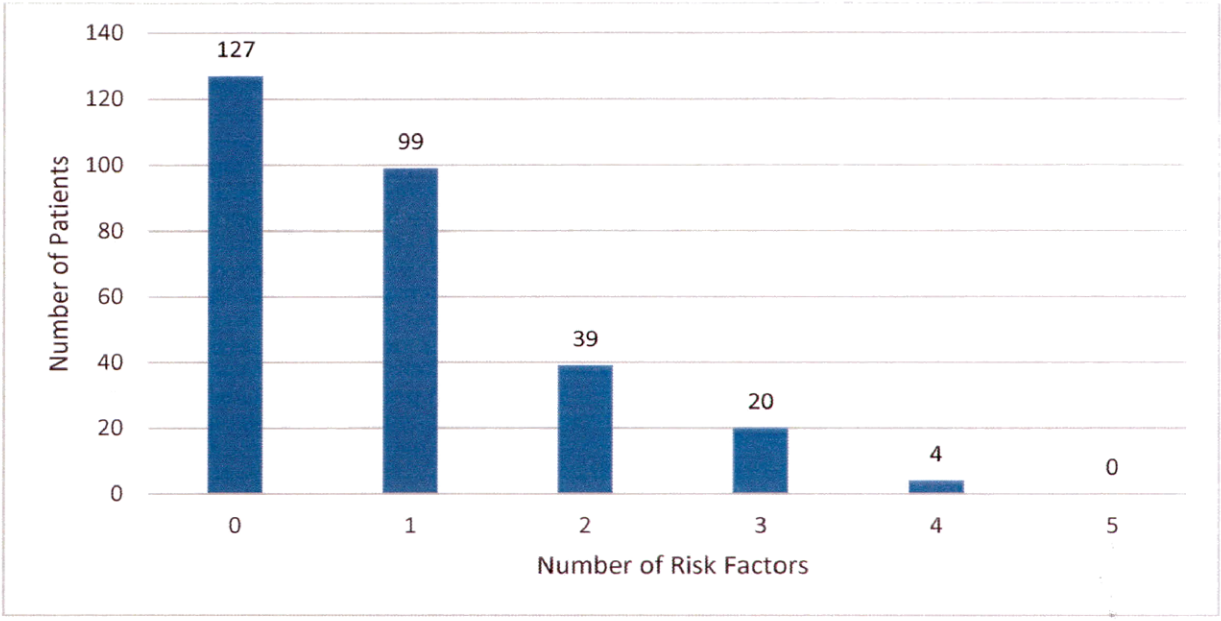

Figure 7. Frequency of risk factors in patients who were not screened with a lipoprotein profile.

Other results. In addition to answering the stated research questions, chi-square analyses were performed to determine if individual demographic factors influenced cholesterol screening practices of primary care providers. In relation to payer source, chi-square analyses revealed that 43.3% (n = 248) of insured patients, 38.2% (n = 186) of self-pay patients, and 53% (n = 66) of government assistance patients were screened. Therefore, the chi-square proved that there is no statistically significant effect on payer type and screening practices. Table 3 shows the chi-square analysis performed on payer source.

Table 3

Chi-square Analysis Performed on Payer Source

Payer source	*n*	% patients screened
Insurance	248	42.3
Self-pay	186	38.2
Government program	66	53.0
Chi-square analysis		$\chi^2(2, N = 500) = 4.413, p = .110$

Additionally, 43.2% of male patients and 41.5% of female patients were screened with a lipoprotein profile. This finding revealed that there is no statistical significance between gender and cholesterol screening practices. Table 4 shows the chi-square analysis performed on gender type.

Table 4

Chi-square Analysis Performed According to Gender

Gender	*n*	% patients screened
Male	199	43.2
Female	301	41.5
Chi-square analysis		$\chi^2(2, N = 500) = .140, p = .708$

Chi-square analysis revealed there was a statistically significant difference in provider type and clinic location. Physicians were significantly more likely to perform a cholesterol screening when compared to their nurse practitioner counterparts. These results are represented in Table 5.

Table 5

Chi-square Analysis of Provider Type

Provider type	*n*	% patients screened
MD	327	55.0
NP	173	17.9
Chi-square analysis		$\chi^2(1, N = 500) = 63.938, p = < .001$

Additionally, Clinics Two, Three, and Four were more likely to perform a lipoprotein profile than Clinics One and Five. Another important factor is that physicians were the providers who signed for the majority of the charts in Clinics Two, Three, and Four. Therefore, the clinic result is considered identical to the physician/nurse practitioner result. The results are displayed in Table 6.

Table 6

Chi-square Analysis of Clinic Sites

Clinic	*n*	% patients screened
One	100	25.0
Two	100	65.0
Three	100	57.0
Four	100	54.0
Five	100	10.0
Chi-square analysis		$\chi^2(4, N = 500) = 90.638, p = < .001$

Data Analyses

Data were collected from patient charts at 5 respective clinics located in the southeastern United States and entered on a researcher-developed data collection worksheet. Data were then entered into Microsoft Excel and sent to a professional statistician for analyses in an effort to accurately answer the three research questions.

Data analyses revealed primary care providers were compliant with only 42.2% of patients when performing cholesterol screenings. Data also revealed that physicians were more likely to perform a lipoprotein profile than nurse practitioners. No significance was noted in regard to payer source or gender. Hypertension and hypertensive medications were the diagnoses most likely to be seen in patients who were screened with a lipoprotein profile.

Summary of Findings

Chapter IV presented the researchers' findings from the current retrospective chart review of 500 patients from five clinics in the southeastern United States. Findings from the demographics and research questions were presented in figures and tables for comparison. The results of this analysis revealed overall noncompliance among primary care providers in regard to following the NCEP ATP III guidelines. These conclusions highlight the opportunity for improvement among primary care providers, especially nurse practitioners, in cholesterol screening practices.

CHAPTER V

Summary and Conclusions

According to the Centers for Disease Control and Prevention (2014b), cardiovascular disease affects over 82 million American adults and is currently the leading cause of death in the United States. High cholesterol is one of the main risk factors in the development of this disease process (CDC, 2014a). Hypercholesterolemia can result in the vascular system becoming unable to dilate, thus resulting in hardening of the arterial walls which is known as *atherosclerosis*. Atherosclerosis can lead to a compromised vasculature system. Cholesterol plaque buildup can dislodge from the vessels resulting in myocardial infarction or cerebrovascular accident (National Health, Lung, and Blood Institute [NHLBI], 2012). The purpose of the current research was to determine if primary care providers are screening adults between the ages of 20 and 40 years for high-blood cholesterol levels. The researchers used recommendations stated in the National Cholesterol Education Program, Adult Treatment Panel III guidelines (NCEP ATP III) (James & Cleeman, 2001).

Compliance was evaluated by three research questions:

1. Are primary care providers performing a fasting lipoprotein profile on patients between the ages of 20 and 40 years once every 5 years?
2. Were risk factors present in the patients who had a fasting lipoprotein profile performed?
3. Were risk factors present in the patients who did not have a fasting lipoprotein profile performed?

Nola J. Pender's Health Promotion Model was used as the theoretical framework to guide the current research. A summary of the findings, implications of the results, and recommendations for further research are presented in this chapter.

Summary of the Findings

The sample consisted of 500 participants. The participants received care at one of the five primary care clinics in the southeastern United States between 2011 and 2015. The sample consisted of 199 males and 301 females. The average age was *SD* = 31.35 years. The primary payer source was private insurance at 49.6% (n = 248), followed by self-pay at 37.2% (n = 186); and 13.2% (n = 66) were covered under a government program which includes the Medicare and Medicaid programs. Physicians were the primary care provider for 85.3% of the sample with nurse practitioners managing the care of 14.7% of the participants.

Discussion of the Findings

The researchers found that 289 patients or 57.8% did not have a fasting lipoprotein level checked every 5 years by a primary care provider. This equates to a compliance rate of only 42.2% by primary care providers. Hypertension was the most prevalent risk factor among those who were screened, followed by those on prescription hypertension medication and obesity. Of the patients who did not receive a fasting lipoprotein profile screening, obesity and tobacco use were the most common risk factors present, followed by hypertension and prescribed hypertension medication.

Chi-square analyses were performed to determine if individual demographic factors influenced cholesterol-screening practices. There was no statistical significance effect on payer type and screening practices. There was also no statistical significance between gender and cholesterol screening practices. There was, however, a statistical

difference in provider type and screening practices. Physicians were significantly more likely to perform a cholesterol screening when compared to nurse practitioners. Clinics Two, Three, and Four were more likely to perform lipoprotein profiles than Clinics One and Five. It is important to note that in Clinics Two, Three, and Four the charts were completed by physicians, and in Clinics One and Five the charts were completed by nurse practitioners.

The current researchers found that 289 patients or 57.8% did not have a fasting lipoprotein level checked every 5 years by a primary care provider. This leaves a compliance rate of only 42.2% by primary care providers. The reason for the noncompliance is unknown, as it was not documented in any medical records. Noncompliance could be attributed to lack of education on the part of the provider or lack of education on the part of the patient. It could also be associated with the patient seeing another provider for his or her wellness visits. Financial burdens could also be a factor; yet, there were no significant statistical differences in payer source.

In the study by Barham et al. (2009), a total of 5,031 patients between the ages of 20 and 84 years were examined from 61 community practices. The total screening rate was 34.5%, which is near the NCEP ATP III goal of 40% (Barham et al., 2009). This is in contrast to the current research, which yielded a total screening rate of 42.2%, which is above the NCEP ATP III goal. Barham et al. (2009) also found that older patients were more likely to be screened but less likely to be appropriately treated. The current research did not include such a broad age variation; therefore, it was unable to analyze the significance of age and screening practices.

Kuklina et al. (2010) conducted a study of cholesterol screening practices using the National Health and Nutrition Examination Survey (NHANES), a multistage

probability design to select participants to survey the nutritional status of the United States. Kuklina et al. analyzed a sample size of 2,587 patients. Of the 2,587, 50% of women between the ages of 20 and 45 years and 40% of men between the ages of 20 and 40 years were screened for high cholesterol (Kuklina et al., 2010). Even though these findings met the NCEP ATP III goals, Kuklina et al. (2010) still argued that young adults are not being screened as frequently as they should. Kuklina et al. (2010) used a sample size 5 times larger than the student research and were still able to receive a better screening outcome than the current research. Kuklina et al. (2010) offered no reasoning as to why the screening rates were low to average. Kuklina et al. suggested that future studies be conducted to improve cholesterol screenings in younger adults. The current research coincides with Kuklina et al.'s (2010) findings and also supports the fact that screening practices need improvement.

Research performed by Johansen et al. (2014) helped develop the current study's data collection form by emphasizing the importance of risk factors in preventing cardiovascular disease. Johansen et al. included individuals between the ages of 30 and 79 years. This resulted in the analysis of 16,712 individuals (Johansen et al., 2014). Johansen et al. (2014) found that many patients who were not diagnosed with hyperlipidemia were undermanaged. Undermanagement of this significant risk factor put them at an unnecessary risk for developing cardiovascular disease (Johansen et al., 2014). These findings support the current research by emphasizing the importance of screening all patients for risk factors.

Pletcher et al. (2010) studied 5,115 men and women in an attempt to determine if hyperlipidemia present in 18- to 30-year-olds was positively associated with the development of coronary heart disease 15 to 20 years later. The participants were

evaluated periodically through scheduled lipoprotein levels. Pletcher et al. (2010) found a positive correlation with increased lipid levels in young adulthood and the presence of hyperlipidemia and coronary calcium scores 15 to 20 years later. The presence of abnormal lipids was most commonly associated with white males, a premature coronary heart disease risk, increased BMI and waist circumference measurements, diabetes, a sedentary lifestyle, and consumption of alcohol (Pletcher et al., 2010). The risk factors for obesity and a premature heart disease risk coincided with the risk factors used in the student research. Pletcher et al. (2010) stated that young adults with even a slight increase in LDL were at a higher risk of developing cardiovascular disease later in life. This supports and emphasizes the importance of the current research and the need for proper cholesterol screening.

Parker et al. (2008) performed a study to identify barriers that primary care providers felt existed when implementing the NCEP ATP III guidelines. Nine separate focus groups were organized with a total of 300 primary care providers. Parker et al. concluded that the barriers physicians identified included the following: (a) physician perceived guideline complexity, (b) lack of accessibility and guidance in guideline interpretation in rural practices, (c) patient noncompliance with provider recommendations, (d) patients' inability to afford guideline-related test or drugs, and (e) time constraints during patient encounters. The study performed by Parker et al. (2008) related to the current research by providing insight as to why only 42.2% of the patients were screened for cholesterol.

Studies conducted by Barham et al. (2009), Johansen et al. (2014), Kuklina et al. (2010), Parker et al. (2008), and Pletcher et al. (2010 support the current research and emphasize the importance of cholesterol screenings. It is evident that there is a need to

abide by the NCEP ATP III guidelines for proper lipoprotein screenings. Emphasis should be placed on the importance of cholesterol screenings, and education should be provided to promote safer practices in primary care.

Limitations of the Research

Limitations were identified in the current research. Limitations included small sample size, limited data collection, and the use of convenience sampling. These limitations decreased the reliability of the findings, limited the representation of the sample studied, and misrepresented practice in other parts of the country.

The small sample size of only 500 charts decreased the reliability of screening practices by primary care providers. The small sample would likely not be of sufficient size to make any accurate assumptions of the screening practices of these clinics, other clinics in the area, or clinics in the remainder of the state. Using clinics in more areas of the state, as well as using clinics in various other states, would have increased the reliability of provider screening practices.

Data collection was limited to clinics located in one state located in the southeastern United States. Limitation to this geographic location may not be applicable to other geographic areas of the country. Therefore, the results may not appropriately represent the practices of other clinics across the United States. Again, expanding future research to other areas of the United States would give a better overall view of how primary care providers are screening patients for cholesterol levels.

The use of random, convenience sampling reduced the reliability of the current research. Convenience sampling represented the results of only the charts reviewed rather than the entire client population of each clinic, this may have caused the results to be limited and atypical of the population in the region being studied. This limitation

could be corrected by selecting subjects that were representative of the population as a whole.

Implications

Major implications can be made from the results of the current research. In the southeastern United States, the increased prevalence of cardiovascular disease remains high. Furthermore, high-blood cholesterol is a contributing factor. Approximately half of the primary care providers in the current research were not compliant with NCEP ATP III guidelines. The current research provided areas of focus for performance improvement in primary care clinics and increased positive outcomes among patients meeting criteria for cholesterol screening. An educational opportunity is identified for nursing schools, medical schools, and physician assistant programs potentially increasing compliance with guidelines by providing educational information while training new primary care providers. Additionally, future research and nursing theory may benefit from the implications drawn from the current research.

Clinical practice. Hyperlipidemia increases the risk of developing cardiovascular disease. The results of the current research indicated that primary care providers in the southeastern United States are noncompliant with the NCEP ATP III guidelines for routine cholesterol screening, thus increasing the risks of adverse outcomes related to elevated cholesterol. With poor compliance identified, primary care providers should increase efforts to maintain or obtain continuing education in regard to the evidence-based practice of cholesterol screening. Additionally, primary care providers must provide teaching to patients in regard to maintaining healthy cholesterol levels. By improving clinical practice standards, nurse practitioners and physicians can delay or prevent the onset of cardiovascular disease in adults between

the ages of 20 and 40 years. By increasing awareness of current cholesterol screening guidelines, the primary care provider will be in a position to promote healthy behaviors, properly screen patients for elevated cholesterol, and prevent or manage related diseases accordingly.

Education. The current research concludes that there is a need for further education of primary care providers, healthcare professionals, and the general public on the significance of cholesterol's effects on the development of cardiovascular disease and the importance of cholesterol screenings to detect and treat high-cholesterol levels. The current research may educate primary care providers on the disparities of cholesterol screenings in young adults and raise awareness of populations at risk of developing cardiovascular disease. The challenges of staying educated on current guidelines and standards of practice have been identified from the results of the current research. Primary care providers must realize the importance of continuing education and providing educational information to patients as a means of decreasing adverse outcomes in healthcare and increasing the quality of life for patients.

The clinics that participated in the current research will be provided a copy of the research findings. By utilizing the results of the current research, each individual clinic can develop a plan of action to increase compliance with the NCEP ATP III guidelines. Increasing the public's awareness of the importance of cholesterol screening through patient education can and will empower patients to take an active role in their healthcare, thereby resulting in the prevention of future complications from heart disease.

Research. Evidence-based practices originate with well-planned, designed, and orchestrated research. Implications for future research can be identified within the

conclusions of the current research. The first implication is that additional research should be performed investigating the low compliance rate to the current cholesterol guidelines, whether the reason is a lack of knowledge of the current guidelines or simply healthcare provider oversight when ordering tests. Future research is also needed to investigate compliance rates on a larger scale within the designated area to determine if the low compliance rate was only within the current resarch sample or if the problem of compliance is more widespread. Replication of the current research on a larger scale with a larger population and geographical area will determine if guideline compliance rates are similar across the country or a problem in an isolated geographical region.

As the use of electronic medical records increases, future research is needed to investigate different systems. Future research should evaluate if a system's built-in reminders for required labs, in particular diagnoses or age groups, increases compliance. Researching for increased compliance rates in systems containing alerts versus systems that do not have built-in reminders may indicate the need for improved electronic medical records.

Nursing theory. Nola Pender's Health Promotion Model (HPM) was selected by the researchers as the theoretical foundation for the current research. The HPM is a nursing theory developed to understand and predict what factors, including biological, psychological and environmental, determine a person's health behaviors. This theory emphasizes health promotion and disease prevention using positive motivation, and the desired outcome is a health-promoting behavior. In the current research, the HPM was used as a guide to determine how effectively healthcare providers emphasized the importance of cholesterol screening. Utilizing the concepts and assumptions identified

within the HPM, the primary care provider can impact the patient by educating patients on the risk factors that may increase their cholesterol and introduce interventions to improve the cardiovascular health of individuals. Additionally, compliance improvement could be accomplished through the education of primary care providers and the identification of potential obstacles in following NCEP ATP III guidelines. By utilizing the HPM, the development of strategies to overcome any apparent obstacles could improve compliance with NCEP ATP III guidelines for healthcare providers and patients.

Conclusions

The purpose of the current research was to determine whether or not primary care providers were screening adults between the ages of 20 and 40 years for high-blood cholesterol levels. The current research evaluated the cholesterol screening practices of primary care providers according to recommendations stated in the NCEP ATP III guidelines. The current research also identified the presence of cardiovascular disease risk factors in patients who were screened and who were not screened. Overall, 42.2% of the patients studied had a fasting lipid profile performed versus 57.8% of the patients studied who did not have a fasting lipid profile performed within the last 5 years. The current research concluded that physician providers were significantly more likely to perform fasting lipid screen than nurse practitioner providers. Physicians appropriately screened 55% of the 327 patients they treated. Nurse practitioners only screened 17.9% of the 173 patients they treated.

The 211 patients who received screening were further evaluated to determine the presence of risk factors. The most prevalent risk factor was hypertension in 50.2% of the screened patients, followed by patients receiving a prescription for hypertensive

medication at 43.1%. The family history of cardiovascular disease, tobacco use, and obesity were also included as risk factors. Of the patients who were screened with a fasting lipoprotein, 21.8% had a family history of cardiovascular disease, 39% had a history of tobacco use, and 31.8% had a history of obesity.

Conversely, the 289 patients who were not screened with a fasting lipoprotein were also evaluated to determine the presence of risk factors. The most prevalent risk factor in those who did not receive screening was obesity at 24.6%, followed by a history of tobacco use at 20.4%. Other risk factors included a history of hypertension at 16.3%, history of prescribed hypertensive medications at 14.9%, and family history of cardiovascular disease at 11.4%.

The current research concluded there were statistically significant differences in cholesterol screening based on a clinic. Clinics Two, Three, and Four were significantly more likely to perform cholesterol screening than Clinics One and Five. It is important to note that Clinics Two, Three, and Four were composed primarily of physician providers.

Additionally, the current research evaluated whether payer source affected cholesterol screening practices. The current research found that 53% of the 66 patients that were a government insurance program were screened, 42.3% of 248 privately insured patients were screened, and 38.2% of the 66 self-pay patients were screened. Therefore, payer source did not significantly affect cholesterol screening.

Based on the current research, primary care providers are not consistently following the NCEP ATP III guidelines when routinely performing cholesterol screening in adults between the ages of 20 and 40 years. The current research

concluded that primary care providers need additional education regarding the NCEP ATP III guidelines for cholesterol screening.

Recommendations

Based on the results of the current research, the following recommendations are made for primary care providers:

- Obtain and maintain continuing education in regard to the evidence-based practice of cholesterol screening.
- Increase the public's awareness of the importance of cholesterol screening at any age through patient education.
- Replicate the current research on a larger scale with a larger population and geographical area to determine if guideline compliance rates are similar across the country or a problem in an isolated geographical region.
- Include the subject's race within the demographics to identify any disparities involving cholesterol screening practices and ethnicity.
- Investigate the compliance rate among a variety of primary health providers, including physician's assistants and doctors of osteopathy.

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APPENDIX A

IRB Approval of Mississippi University for Women

Mississippi University
for Women
A Tradition of Excellence for Women and Men

Provost and Vice President for Academic Affairs
1100 College St. MUW-1603
Columbus, MS 39701-5800
(662) 329-7142
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February 24, 2015

Teresa Hamill, DNP
Mississippi University for Women
College of Nursing and Speech-Language Pathology
MUW-910
Columbus, Mississippi 39701-5800

Dear Dr. Hamill:

I am pleased to inform you that the members of the Institutional Review Board (IRB) have reviewed the following proposed research and have approved it as submitted:

Name of Study:	Analysis of Cholesterol Screening Practices
Investigator(s)	Connie Harthcock, Christina Jordan, Jan Mattina, Kristen McPherson and Bradley Myers
Research Faculty/Advisor:	Teresa Hamill

I wish you much success in your research.

Sincerely,

Thomas C. Richardson, Ph.D.
Provost and Vice President for Academic Affairs

TCR/jh

pc: Tammie McCoy, Institutional Review Board Chairman

APPENDIX B

Letter of Consent

DATE:

SUBJECT: Permission to Participate in a Quality Assurance Research Study

We are graduate students at Mississippi University for Women in the Family Nurse Practitioner program in Columbus, Mississippi. As a program requirement, we are conducting a retrospective chart review to assess provider compliance to the National Cholesterol Education Program's cholesterol screening protocol. We will be looking specifically for adherence to the national guidelines for cholesterol screening. The students that are participating in the current research are Constance Harthcock, Christina Jordan, Jane Mattina, Kristen McPherson, and Bradley Myers.

We are requesting your permission to utilize your clinic as one of the settings for our study. By providing us with permission, we will have access to your patients' medical records for a retrospective chart review. We recognize the essential need for confidentiality in regard to patient health information. Each student has completed a HIPAA training workshop through Mississippi University for Women. The students further agree to protect all information obtained, and no identifying information will be recorded. We will be utilizing a student-designed data collection worksheet to collect the required information. A copy of this tool is included with this letter. We will load all information to a computerized data sheet, which will be stored on a password-protected portable USB drive. Access to all data will be restricted to the primary researchers. All physical data will be destroyed at the completion of the study. No identifying personal, provider, or clinic information will be included in the final publication of our study. A complimentary copy of the study results will be provided to all participating clinics.

Your participation in this study is strictly voluntary. The amount of time required for us to review charts and collect data will be approximately one month.

If you have any questions concerning the current research, please call Connie Harthcock (601-506-5820), Christina Jordan (662-419-5008), Jane Mattina (228-860-1931), Kristen McPherson (601-917-5486), Bradley Myers (601-940-0570), or contact the chair of our research committee, Teresa Hamill, DNP, FNP-BC, at (662-312-7926. In

addition, you may withdraw your consent and participation in this study at any time by contacting one of us or the chair of our research committee.

Sincerely,

Connie Harthcock

Christina Jordan

Jane Mattina

Kristen McPherson

Bradley Myers

APPENDIX C

Analysis of Cholesterol Screening Practices Data Collection Worksheet

Clinic #	Chart #	1 Age	2 Gender	3 Provider Source	4 Was lipid panel performed in the last 5 years?	5 If *Yes* to #4, what cardio-vascular risk factors were present?	6 If *No* to #4, what cardio-vascular risk factors were present?	7 Was the provider a
			Male (0) Female (1)	Self-pay (0) Insurance (1) Govern-ment program (2) Not available (3)	No (0) Yes (1)	Fam Hx of CVD (0) Tobacco use (1) Hypertension (2) Prescribed hypertensive medication (3) Obesity (4)	Fam Hx of CVD (0) Tobacco use (1) Hypertension (2) Prescribed hypertensive medication (3) Obesity (4)	NP (0) PA (1) MD (2) D.O. (3)