INTEGRATION OF A PEDIATRIC CARDIOVASCULAR HEALTH MODEL WITHIN THE PRIMARY CARE SETTING

A Scholarly Project submitted to the

Faculty of Liberty University

In partial fulfillment of the requirements for

The degree of Doctor of Nursing Practice

By

Mary Carol LoGalbo

Liberty University

Lynchburg, VA

May, 2020

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ABSTRACT

Cardiovascular diseases are a chronic pandemic and leading cause of mortality globally. This pandemic has been studied thoroughly and it is well known that approximately 80% of cardiovascular diseases are preventable through maintenance of healthy lifestyles and early detection of risk beginning in childhood. Because the majority of children are born with healthy cardiovascular systems, the role of the pediatric primary care provider is to identify and manage such risk factors including obesity. There is extensive literature regarding barriers to obesity prevention and management including lack of clinician diagnosis of overweight or obesity, limited time for cardiovascular screening and education, low referral rates for obesity management, clinician knowledge deficits of current guidelines, and clinician challenges to discussing body mass index due to social stigma. The aim of this project was to address these barriers through implementation of a cardiovascular health model integrated within the electronic health record to streamline the process of risk assessment and management. The goal was to aid pediatric provider conversations regarding lifestyle behavior modifications and to translate research into practice through improved rates of overweight or obesity diagnosis, nutrition or weight management referrals, and lipid screening. The intervention improved lipid screening rates for both clinicians but obesity diagnosis and referrals were inconsistent. Data analysis indicates a key area for clinical improvement is focus on early childhood and pre-pubescent body mass index elevations as a predictor for adolescent obesity and to invest time in cardiovascular health maintenance education instead of managing efforts to reverse obesity.

Keywords: Cardiovascular health, child obesity, risk factors, primary care, lifestyle modification

Dedication

This project is dedicated to God and His Holy Spirit whose whispers of insight, inspiration, and encouragement have made this possible. Any good that results from this project is attributable to His grace and spirit of generosity.

Acknowledgments

I would like to acknowledge Dr. Goodrich, Dr. Kennedy, and Dr. Rothwell for their guidance, patience, and encouragement throughout the trials and tribulations of this educational journey and project completion. “Keep going” and “share your knowledge” are now permanently part of my personal and professional psyche.

I would like to thank my mother and sister for their prayers and loving words reminding me that God makes all things possible. “Surrender to His will” has become the cornerstone of perseverance and acceptance. Lastly but never least, I thank God for the gift of my four children. Their desire to do good in service of others has inspired me to do the same.

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List of Abbreviations

American Heart Association (AHA)

Body mass index (BMI)

Cardiovascular (CV)

Cardiovascular disease (CVD)

Centers for Disease Control and Prevention (CDC)

Coronary heart disease (CHD)

Electronic health record (EHR)

Institutional Review Board (IRB)

National Heart, Lung, and Blood Institute (NHLBI)

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

U.S. Preventative Services Task Force (USPSTF)

SECTION ONE: INTRODUCTION

The vast majority of children are born with healthy cardiovascular (CV) systems, but this is lost throughout the lifespan due to unhealthy behaviors and modifiable lifestyle patterns for sustained CV health (Steinberger et al., 2016). By the year 2030, it is estimated that approximately 44% of adults living in America will have at least one form of CV disease contributing to projected health care costs of over $900 billion (Benjamin et al., 2017). Pediatric primary care providers have the opportunity to implement evidence-based CV risk reduction guidelines in childhood to promote lifelong CV health through the identification and management of CV risk factors including obesity. Notable barriers to guideline implementation include the extent of the recommendations, clinicians' lack of agreement on implementation approach, time limitations at the point of care, and parental sensitivity to lifestyle change recommendations (Belay et al., 2019). Clinician involvement in the establishment of a guideline-based CV health protocol streamlined into an electronic health record (EHR) system may reduce barriers to implementation and increase practices for CV risk factor reduction and factors associated with obesity management.

Background

Cardiovascular disease (CVD) is a general term describing heart disease resulting from conditions that alter the structure and function of the heart. The four types are coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease, and aortic atherosclerosis. CVD is a global health issue and leading cause of adulthood death before age 60 with a 31% mortality rate globally. The predominant type of CVD is CHD which accounts for 30-50% of the incidence. Approximately 1.5 million people in the United States suffer from CHD sequalae including heart attacks and strokes resulting in 250,000 deaths yearly. Approximately 90% of

CHD complications are attributable to at least one risk factor including hypercholesterolemia, diabetes, hypertension, obesity, and smoking (Wilson, 2019). Modifiable risk factors for CV disease are detectable in childhood and have been linked to long-term adverse health outcomes that span into adulthood (Shrestha & Copenhaver, 2015).

Longitudinal studies have indicated that maintaining and improving CV health has an inverse relationship with CVD and mortality rates. Higher levels of adulthood CV health are associated with maintenance of CV health in youth (Sanchez, 2018). The risks to CV health decline in childhood are associated with the development of obesity. Childhood obesity in the United States is prevalent in 18.5% of children aged 2-19 years of age (Centers for Disease Control and Prevention [CDC], 2019) and 15% not meeting criteria for obesity are overweight with BMIs $\geq 85^{th}$ percentile (Steinberger et al., 2016). Epidemiological studies indicate high association with obesity comorbidities including elevated blood pressure, dyslipidemia, insulin resistance, and subclinical vascular changes indicating early atherosclerosis (U.S Department of Health and Human Services [HHS], National Heart Lung and Blood Institute [NHLBI], 2012).

The American Heart Association (AHA) has identified a constellation of factors associated with coronary artery wall changes that are influenced by modifiable risk factors. These risk factors can be used as a metric to quantify CV health which provides indicators for CV disease risk. These factors include tobacco exposures, dietary imbalances, sedentary activity patterns, elevated blood glucose levels, total cholesterol, blood pressure, and BMI. Elevated blood pressure, low levels of high-density lipoprotein with high levels of low-density lipoproteins, and elevated glucose levels or diabetes promote arterial plaque deposits obstructing blood flow and increasing the likelihood of heart attacks or strokes (Sanchez, 2018).

Despite the need for identifying and managing modifiable risk factors for CV health in the pediatric primary care setting, clinical providers are less likely to integrate clinical recommendations into practice specifically as it relates to counseling and management of nutrition, weight status, and physical activity levels (Belay et al., 2019). Quality improvement studies have indicated that obesity is underdiagnosed by approximately 20% of clinicians and there is lack of documentation of lifestyle behavior assessments including physical activity and nutrition. In these patients, screening for obesity comorbidities and referrals to nutritionists are less likely to be performed (Reed et al., 2016). This contradicts the U.S. Preventative Services Task Force recommendation that all children older than five years of age should be screened for obesity and referred for comprehensive management to improve weight status (U.S. Preventative Services Task Force [USPSTF], 2017).

Problem Statement

CV health promotion requires screening and management of modifiable risk factors and lifestyle behaviors including BMI, tobacco exposure, dietary patterns, blood pressure, physical activity level and cholesterol level (Sanchez, 2018). In the pediatric primary care setting, clinicians inconsistently assess and document modifiable CV risk factors, including BMI, which consequently leads to missed opportunities for healthy lifestyle education, metabolic management, and referral to specialty services including nutritionists. Notable barriers identified by clinicians include personal resistance to addressing weight and obesity, perception of parental motivation for lifestyle changes, clinician knowledge deficits regarding clinical recommendations, and limitations in environmental resources.

Purpose of the Project

The purpose of this project is to integrate an evidence-based pediatric CV health risk assessment and management protocol utilizing the EHR system to streamline processes that promote healthcare practices conducive to CV health promotion and disease prevention. The aims of this project are to improve adherence to CV health risk assessments including BMI classifications, physical activity level, heart healthy dietary habits, blood pressure, and tobacco exposures. Integral to this aim is improvement in clinician documentation of management strategies including hyperlipidemia and nutritionist referrals. The second aim is to establish a clinician-oriented CV health screening and risk management protocol within the EHR utilizing the AHA's health metrics associated with "Life's Simple 7" and guidelines for management.

Clinical Question

In pediatric patients aged three through 18 years of age, does a cardiovascular health risk assessment and management protocol integrated within an electronic health record system compared to no intervention improve CV screening and clinician management of obesity and CV risks?

Literature Review

The Doctor of Nursing Practice (DNP) student conducted a literature review with two separate searches. The first search identified evidence-based recommendations for the screening of CV health, identification of obesity and other CV risks, and management of obesity-associated CV risk factors. Compiling clinical evidence is essential for uniformity in clinical management in the pediatric primary care setting. The secondary search explored EHR clinical decision support impact on clinical provider performance of obesity and CV risk factor assessment and management.

Search Strategy

The DNP student used an EBSCO literature search including CINAHL Plus with Full Text, MEDLINE with Full Text databases, and Health Source: Nursing and Academic Edition. Search limiters included full text, online, in the English language, and peer reviewed from published dates of 2014 through 2019. Database search terms used for the subject field included "pediatric obesity or child obesity." Search results yielded 3,661 results and the addition of additional filters of "systematic review or meta-analysis" yielded 197 results with the addition of "prevention and management." Excluded studies contained "diabetes" or "school-based" in the subject title.

The DNP student used ProQuest for the second search which included CINAHL Plus with Full Text and MEDLINE with Full Text Search limiters including full text, online, in the English language, and peer reviewed from published dates of 2014 through 2019. Database search terms used for the subject field included "cardiovascular health" which yielded 1,210 results. The additional filters of "risk factors" or "contributing factors" yielded 413 results. The remaining 76 results were limited through the use of an additional filter of "children or adolescents or youth or child." Articles were individually reviewed for relevance to the subject matter and excluded if insignificant. Systematic reviews, randomized controlled trials, longitudinal and cohort studies were included. A hand search of clinical practice guidelines and expert panel recommendations was included using the American Heart Association, National Heart, Lung, and Blood Institute, Endocrine Society, American Academy of Pediatrics, and the U.S Department of Health and Human Services.

Critical Appraisal

Melnyk's Level of Evidence is utilized to critically appraise the strength, validity, and reliability of research to address a clinical question and determine the level of confidence that an intervention will produce a practice change (Melnyk, 2016). The literature review consists of five reports with Level of Evidence I ratings which include systematic reviews, meta-analysis, or clinical practice guidelines regarding dietary guidelines, physical activity guidelines, cardiovascular health risk reduction in the pediatric population, and assessment and management of obesity and obesity comorbidities. There is one Level II study consisting of a meta-analysis of randomized controlled trials (RCT) and non-randomized trials for brief primary care obesity interventions. Two Level 3 studies using RCTs without randomization examined primary care provider knowledge and practice patterns for obesity management and utility of electronic medical record systems for clinical decision support. One Level 4 longitudinal cohort study was included, which discussed early life predictors of adult adiposity. Five Level 5 systematic reviews of descriptive studies to determine impact of lifestyle modifications, education, and cardiometabolic screening on CV health were included. Two Level 6 studies examined EHR use for integration of clinical guidelines and screening tools impact on obesity. One Level 7 study consisting of expert opinion discussed integration of lipid screening as a proposed intervention to enhance CV health.

Synthesis

Obesity is recognized as a global health problem and there is growing evidence that indicates cardiometabolic risk is not isolated to the adult population. Several studies conducted by the AHA including children ages three through 19 years of age who were overweight or obese have shown that obesity severity magnitude is directly correlated to abnormal total cholesterol

levels, high-density lipoprotein, triglycerides, blood pressure, fasting glucose and glycosylated hemoglobin (Skinner, Perrin, Moss, & Skelton, 2015). This is in accordance with the literature review providing strong evidence for early identification of CV risk factors in childhood to preserve CV health into adulthood and to avoid early subclinical atherosclerosis (Steinberger et al., 2016).

Primary prevention of childhood obesity is identified as the promotion of a healthy diet of nutrient dense food including lean protein, fruits and vegetables, whole grain, and low saturated fats and sugars. Lifestyle behaviors for obesity prevention include decreasing sedentary behaviors such as screen time and increasing physical activity levels to one hour daily (HHS, 2015; Styne et al., 2017). The USPSTF recommends screening for obesity beginning at six years of age and to use BMI stratification according to Centers for Disease Control and Prevention growth charts where obesity is defined as BMI $\geq 95^{th}$ percentile, and overweight is defined as BMI in the 85^{th} to 94^{th} percentile. This slightly differs slightly from the recommendations of the Endocrine Society and the American Academy of Pediatrics (AAP), who recommend screening after two years of age (Magge, Goodman, & Armstrong, 2017; Styne et al., 2017). Evidence by the USPSTF and conclusive statements from medical societies' meta-analyses indicate that only comprehensive, intensive behavioral interventions have shown moderate improvements in weight status for up to 12 months; therefore, the clinical role is to diagnose obesity and refer for comprehensive treatment (Bahia et al., 2018; USPSTF, 2017).

The literature strongly supports obesity prevention as the first line of defense in cardiometabolic risk prevention which is accomplished through identification of CVD risk factor clustering. Prevention of CV risk factors include family history screening for CV disease, lifestyle screening for obesity risk factors and tobacco exposure, BMI screening, and blood

pressure and cholesterol screening (HHS, 2015; HHS & NHLBI, 2013; Magge et al., 2017; Styne et al., 2017). CV health metrics in the pediatric population may be used as a surveillance tool in the primary care setting which supports best evidence for CV health risk assessment and is a basis for lifestyle education and cardiometabolic screening. Metrics classify CV health according to tobacco exposures, BMI percentiles, physical activity level, healthy dietary habit scores, blood pressure percentiles, and when indicated, cholesterol and fasting glucose levels (Steinberger et al., 2016).

The USPSTF recommendations for assessment of certain CV risk factors both supports and deviates from clinical practice guidelines. The task force does not use an integrated approach for the constellation of factors that contribute to loss of CV health over time. The Task Force does not recommend blood pressure screening as a reliable tool for primary hypertension assessment. These USPSTF recommendation variations are also evidenced by the grading of insufficient evidence to support universal serum lipid screening in pediatric patients unless risk factors for dyslipidemia are present (HHS, 2016). Expert recommendations and systematic reviews argue that targeted hyperlipidemia screening fails to identify children with elevated low-density lipoprotein levels (Kelishadi et al., 2015).

The literature review supports challenges to integrating evidence-based practice into clinical settings due to the complex nature of provider adherence practices. A systematic review conducted by the NHLBI on implementation methods that improve provider adoption of cholesterol, blood pressure, and overweight and obesity screening indicated stakeholder involvement in intervention development, which improved guideline adherence and clinical outcomes. For clinicians to support guideline integration, guideline education and agreement on intervention effectiveness and efficiency must be established. The EHR is described as a

valuable tool for streamlining care and providing audits and feedback to enhance clinician efforts (Chan et al., 2016).

Conceptual Framework

The revised Iowa Model of Evidence-Based Practice is the conceptual framework used for this scholarly project which outlines a stepwise approach for evidence-based practice change. The theoretical underpinnings of this model are based on Roger's Diffusion of Innovations Theory for evidence translation and implementation (Iowa Model Collaborative, 2017). This theory states that perception of a need for change, change compatibility with group values, practice change ease of use, and evidence that change will produce positive outcomes are essential to promoting behavioral change and innovation adoption (Dearing & Cox, 2018).

The Iowa Model Revised expands on the initial Iowa Model established in 1994 outlining specific steps that guide each phase of the scholarly project. The first step is identification of a problem trigger for practice change within the organization. This has been determined to be clinicians' missed opportunities for diagnosis and management of patients at risk for cardiovascular and metabolic disease associated with obesity. Clinicians routinely avoid the topic of obesity and lifestyle behaviors due to time constraints, disagreement and non-acknowledgement of extensive clinical guidelines, and parental resistance to discussion of overweight and obesity due to social stigmas.

The second step guided by the framework is to formulate a clinical question or purpose of the evidence-based project. This step establishes a focus for gathering and synthesizing evidence (Iowa Model Collaborative, 2017). The clinical question uses a population, intervention, comparison, and outcome (PICO) format. The patient population and phenomenon of interest is pediatric patients between the ages of three through 18 years of age presenting for wellness

exams with a BMI between 85%-94% and 95% or greater who are not diagnosed as overweight or obese due to inconsistent provider practices, level of discomfort discussing obesity, and time limitations during office visits. The proposed intervention is integration of an evidence-based protocol for CV health assessment and management utilizing the EHR which addresses CVH, obesity, and obesity comorbidities. The comparison group consists of patient populations without exposure to the project intervention. The outcomes of interest which can explain whether the intervention made an impact on provider practice include diagnosis rates of overweight and obesity, laboratory screening for hyperlipidemia, and referrals to nutritionists.

The next step is to determine whether the topic is a priority to the organization. EBP projects that are identified as higher priority are characterized by alignment with the mission and vision of the organization and its stakeholders (Melnyk & Fineout-Overholt, 2015). To enhance clinician engagement in practice change that is determined to be a priority, the aims of the scholarly project de-emphasized focus on obesity and emphasized cardiovascular health. The clinicians supported this project purpose of integrating a CV health risk assessment and management protocol within the EHR to improve care efficiency and quality.

Once organizational support of topic priority was established, a team was formed to assist in the development and integration of the practice protocol within the EHR. The team members involved in this project included clinicians, nurses, medical assistants, the office manager, billing and referral coordinators. The clinicians also participated in the next step of the Iowa Model during the appraisal of relevant research and evidence that supported practice change. The research matrix consisting of level and strength of evidence grading and an educational session consisting of clinical practice guidelines was presented to clinician stakeholders. Once agreement was reached on the relevance of evidence, clinicians engaged in the design of the CV protocol

and EHR templates to enhance practice change adoption. The billing coordinator assisted in data collection used to analyze changes in outcome measures pre and post pilot intervention.

The next step in the Iowa Model is to pilot the practice change. The proposed practice change of a CV health protocol integrated within the EHR was piloted after Liberty University's Institutional Review Board (IRB) approved the project as being non-experimental and after pre pilot, baseline data collection (Iowa Model Collaborative, 2017). Data collection consisted of diagnosis code reporting of overweight and obesity procedural code reporting pertaining to laboratory testing and referral to specialty clinics three months prior to the intervention. The CV protocol was piloted by all staff members to determine efficiency of workflow patterns and adjustments to the assessment and management process were conducted throughout the pilot process. Post pilot data analysis was used to determine whether the CV health protocol led to performance improvement of obesity assessment and management. If data suggest improvement, the practice change may be adopted on a larger scale with ongoing monitoring of quality indicators and staff motivation for continued change (Iowa Model Collaborative 2017). Dissemination of results amongst the team through progress reports and team meeting feedback sessions were conducted bi-weekly to promote discussions for optimal process improvement.

Theoretical Framework

The Stakeholder Engagement Theory (SET) guided the establishment of a sustainable CV health model and a health information technology-assisted assessment and management protocol within the primary care setting. This theory addresses barriers to intervention adoption and dissemination by involving organizational stakeholders in research and project planning. Stakeholders are described as individuals or organizations with specific interests in the process and outcomes of a project. Engagement is the process of recruiting individuals' knowledge,

expertise, and values for purposes of creating shared decision-making and understanding (Boaz et al., 2018). Stakeholder engagement through open dialogue and ongoing interactions produces the creation of social values, information-sharing, trust and relationship-building, goal-formation, and strategies for change. The engagement process has a strong association with social responsibility which contributes to stakeholder adoption and promotion of organizational change (Freeman et al., 2017).

The CV protocol required EHR template and practice workflow modifications that deviated from practice norms. These changes were customized in collaboration with the clinician stakeholders who were the primary users of the project intervention. Implementation science studies support the SET and show that involving clinicians in evidence-based knowledge translation interventions increases provider adherence to clinical practice guidelines and improves patient outcomes (Chan et al., 2017).

Summary

Cited barriers to clinician promotion of obesity prevention and management include lack of knowledge, limitations in resources, and perception of parental motivation (Bahia et al., 2018; Belay et al., 2019). Focusing on CV health risks instead of a narrow focus on childhood weight without CV-associated impacts has been recommended to motivate lifestyle behavioral changes due to parental underestimation of childhood weight status (Wright et al., 2016). Due to these factors, a CV health protocol was integrated within the EHR utilizing the AHA criteria for assessment of CV health guided clinical provider assessment and management of CV risks including obesity.

SECTION THREE: METHODOLOGY

Design

This scholarly project is an evidence-based practice project utilizing a quasi-experimental design to collect and analyze data. It is guided by the Iowa Model for Evidence-Based Practice as a conceptual framework to integrate a CVH promotion model within the EHR system to enhance provider adherence to clinical guidelines. This entailed the use of a pilot study and comparing measurable outcomes before and after the implementation of the CVH protocol (Iowa Model Collaborative, 2017). The project design allowed for determination of protocol impact on clinician assessment and management practices relevant to the CVH protocol at preventative health care visits of all patients within the designated age range and study time period and compared this to pre-protocol practice patterns. Because evidence-based practice is an expectation in healthcare, patients were not randomized or assigned to control groups.

Measurable Outcomes

The measurable outcomes are documentation rates of BMI diagnostic classifications using categories of overweight for BMI $\geq$ 85th percentile through the 94th percentile or obese for BMI $\geq$ 95th percentile according to the Centers for Disease Control and Prevention, rates of baseline and targeted screening of hypercholesterolemia, and number of referrals to nutritionists or weight loss programs for patients with an obesity diagnosis.

Setting

The scholarly project setting is a privately owned, free-standing pediatric primary care clinic in the western suburbs of Chicago serving approximately 5,000 patients from newborn through age 22 years of age. According to the United States Census Bureau (2018), the ethnic and racial status in Kendall County is 80% Caucasian, approximately 15% Hispanic, and 5%

Black. Over 35% of parents have an education at or above a bachelor's degree. The primary language in approximately 80% of the homes is English and over 95% have access to the Internet.

The primary care clinic was established in 2005 and is in close vicinity to several hospital owned clinics and urgent care facilities. The mission of the organization is to spend ample time with patients and families to provide teaching and personalized care. To accomplish this and to maintain reimbursement rates to sustain the practice, the owner has contracted with private, third party payors which make up over 90% of the payer mix. This small business consists of two pediatricians, one who is the physician owner, a pediatric nurse practitioner, a business manager who serves as the financial and information technology expert, an on-site billing coordinator, a front office coordinator, two nurses, and three medical assistants. This small atmosphere attracts families who report a high level of expectations for efficient and individualized care that meets the time constraints of their family. The physician stakeholder supported integration of the most current evidence-based care within his practice but with the goal of maintaining high patient satisfaction ratings.

Population

The patient population included in the CVH protocol intervention was all patients ages three through 18 years of age presenting to the clinic for a wellness examination by the pediatricians. The recommended age to begin BMI screening is at two years of age although blood pressure screening is not recommended until three years of age (HHS & NHLBI, 2012). The sampling type is purposive due to pre-defined subject criteria for project inclusion (Alvi, 2016). Patients who presented to the clinic for appointment types other than preventative care or whom were outside of the designated age range were excluded from protocol data extraction.

The estimated number of preventative care visits per month for patients ages three through 18 years changes seasonally ranging from 250 monthly visits during June through August and decreasing to approximately 150 monthly visits during September through May. This practice had markedly reduced preventative visit volumes during the intervention time frame due to a rise in influenza-related illnesses as well as parental concerns about contracting Severe Acute Respiratory Syndrome (SARS) coronavirus disease 2019 (COVID-19).

Ethical Considerations

To ensure the protection of human subjects, a Collaborative Institutional Training Initiative (CITI) research ethics certificate was obtained. The project proposal application was submitted to the IRB for approval. Data confidentiality was maintained using assigned patient numbers as identifiers for diagnostic and procedural code reporting within the electronic health record system. No consent for treatment was required in accordance with evidence-based guideline integration.

Data Collection

This student used administrative access to organizational data through the cloud based EHR and collected data after IRB approval. Included software packages allowed for detailed clinical reporting using filters for patient encounter type classification, age range, clinical provider, diagnostic codes and date range. Pre pilot data consisted of the three months prior to the intervention and was categorized by the pediatrician rendering care. This student conducted a chart review, recorded data into an Excel spread sheet with patient identification number, BMI percentile, overweight diagnosis, obesity diagnosis, lipid panel order, and nutritionist referral column headers. CV health protocol outcome data collection followed the same process and occurred over a three-month time frame.

Tools

The CVH protocol utilizes a pediatric version of the AHA's cardiovascular risk prediction tool as a template for health history assessment and to guide diagnosis and management. The adult tool is valid and reliable in estimating 10-year CVD risks based on age, total cholesterol, high-density lipoprotein, systolic blood pressure, tobacco exposure, and diabetes status (Motamed et al., 2017). The pediatric tool identifies CV health risk by assessing nutritional patterns, physical activity level, tobacco exposure, blood pressure ranges, BMI percentiles, and blood lipid levels (HHS & NHLBI, 2012).

The CV health protocol contained dietary tools for clinician quick reference, dietary assessment, and patient education to aid in dietary guidance. Clinicians had dietary educational quick references for Dietary Guidelines for Americans in electronic and paper format. Elements of this tool were embedded within the CV health screening. The dietary guide is a reliable evidence-based resource developed by an advisory committee of medical researchers and clinical experts on nutrition science (Office of Disease Prevention and Health Promotion, 2019). A second dietary educational tool used for patient education is MyPlate.gov which is supported by and supplemental to the 2015-2020 Dietary Guidelines for Americans (United States Department of Agriculture, 2019).

The physical activity guideline reference tool for clinicians is an executive summary of physical activity recommendations compiled by the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA) from systematic reviews of evidence involving physical activity impacts on health (Office of Disease Prevention and Health Promotion, 2019). Elements of this tool were embedded within the CV health screening. A

second physical activity patient education tool is the “Move Your Way” patient quick reference supported by the HHS and USDA.

The clinician education tool consisted of a presentation compiling clinical guidelines regarding dietary and physical activity recommendations, laboratory screening for CV risk, and management of cardiometabolic risks.

Intervention

The DNP student integrated a model for CV health through integration of quick assessments embedded within the EHR, educational references uploaded for quick distribution, and referral resources available for clinician distribution. Clinician stakeholders gave verbal and written support for this project prior to the design of CV health templates and workflow protocols. Once the IRB approved the project, this student and the office technology manager conducted a phone meeting with the EHR representative to discuss software capabilities.

The DNP student collected pre protocol data utilizing EHR reporting tools and chart reviews. These data were transferred into an Excel spreadsheet. The de-identified data, including number of patients who met criteria for overweight or obese, the number diagnosed as overweight or obese, the number of nutritionist referrals, and the frequency of lipid or screening orders were tallied per clinician. These were presented during clinician education sessions.

The DNP student educated clinicians on clinical guidelines and CV health risk assessments using adult learning theory (Cooper & Richards, 2016). This entailed biweekly, 45-minute meetings for two weeks, each using a combination of discussion and presentation format. The student used an open discussion format for pre-and post-teaching knowledge assessment and for discussion of attitudes toward guideline-based, protocol integration. After a standard of care

was established, the clinician team collaborated on protocol design including documentation practices to evaluate outcomes.

The next step was EHR customization, including creation of a CV health history template, test patient additions for mock testing, and educational material uploads into the cloud-based system. This student conducted biweekly phone conferences with EHR representatives to assist in template customization. The technology manager modified the practice website with links to educational resources. The student and office technology manager met once to test function and accessibility of educational materials. The student met with clinicians one additional time to practice on mock patient templates.

Nursing and medical assistant training interventions with feedback sessions occurred during afternoon staffing overlap biweekly for two weeks. During the first meeting, the student presented the protocol outlining project goals, measurable outcomes, and staff member role involvement in the process that was necessary for success. The second and third meetings centered on nursing and medical assistant training of CV health history assessment using mock patients for interactive training purposes. During the fourth meeting, a staff feedback session addressed workflow patterns and potential barriers for seamless project integration.

After mock patient testing by all staff members, the CV health protocol was integrated into a live format for 12 weeks. Post intervention data were collected in four-week cycles, the process was monitored weekly to determine accurate use of the CV health history and EHR functions, and brief feedback sessions were conducted to determine if process modifications were necessary.

Feasibility Analysis

This scholarly project met feasibility criteria. There were no additional financial, technological, or personnel resources necessary to complete this project. The EHR was found to contain necessary software for data extraction, reporting, template and order group revisions. Personnel and clinicians training occurred during scheduled shift over-lap and did not increase payroll expenses. Staff educational materials are web-based, and patient educational materials are available as links on the organizational website.

Data Analysis

A Statistical Package for Social Sciences (SPSS) was used to describe the clinical significance of the CV health protocol on clinician assessment of CV risk through measurement of specific outcomes. Descriptive statistics were used to compare outcome means of the CV protocol intervention from pre-intervention to post-intervention. Coefficients of variance were used to describe the range of standard deviation to determine whether provider management was consistent (McDonald, 2014).

Measurable Outcome 1. The first outcome measured is the average number of patients with BMIs meeting criteria for overweight or obesity that have a diagnosis documented per clinician during the specified timeframe. Diagnosis is a nominal variable and diagnosis accuracy is a ratio.

Measurable Outcome 2. The second measurable outcome is the average number of patients who qualified for hyperlipidemia screening and the test was ordered by a particular clinician during the specified timeframe. Screening is a nominal variable and screening accuracy is a ratio.

Measurable Outcome 3. The third measurable outcome is the average number of patients with an obesity diagnosis who have a nutritionist, or a weight management referral

ordered by a particular clinician during the specified timeframe. Referral documentation is a nominal variable and referral accuracy is a ratio.

SECTION FOUR: RESULTS

Patient Demographics

The mean age of patients evaluated pre-intervention and during the intervention were similar. The pre intervention data consisted of patients ages three through 18 years old who were evaluated by one of two pediatricians, referred to as Doctor (Dr.) A and Dr. B, for preventative care visits during a three-month time frame before the project began. Dr. A evaluated 85 patients who met inclusion criteria during the three months prior to the intervention with a mean age of 10.6 years of whom approximately 40% were male and 60% were female. He evaluated 89 patients who met inclusion criteria during the intervention with a mean age of 9.5 years and a gender mix of 57% males and 43% females.

Dr. B evaluated 114 patients during the pre-intervention time period with a mean age of 10.6 years and a gender mix of 51.5% males and 48.5% females at 48.5%. He evaluated 99 patients who met inclusion criteria during the intervention with a mean age of 9.8 years and a gender mix of 63.3% males and 36.6% females.

Descriptive Statistics

Weekly chart audits showed 100% of patients eligible for the protocol had documentation of a CV health risk assessment obtained by ancillary staff during intake although this is not included as an outcome measure. The clinician documentation outcome measures of diagnosis, screening, and referral are described using percentages indicating accuracy based on evidence-based criteria. Calculation of percent means were used to describe changes from baseline and at three points in time at the end of consecutive calendar months per clinician. Mean change,

standard deviation, and coefficients of variance were calculated at three months post intervention.

Overweight or Obese Diagnoses

Table 1 shows that Dr. B did not make any diagnosis of overweight for patients who met BMI criteria either before or after the CV protocol intervention, totaling 19 missed opportunities. He diagnosed obesity with 23.3% accuracy pre intervention then declined to 0% accuracy throughout the intervention. Dr. B did not diagnose obesity in patients with BMIs between the 95th-98th percentile but diagnosed if BMI was at the 99th percentile during that time period. Missed diagnostic opportunities pre intervention occurred in patients ages 6-18 years and in those with height tracking greater than 80%. Missed obesity diagnoses during the intervention occurred in patients ages 7-10 years. Seventy-five percent of those patients had height tracking greater than 90%.

Table 1 also shows that Dr. A did not diagnose patients who met overweight criteria pre intervention or during month one but did diagnose during months two and three. There were 10 missed opportunities pre intervention and nine missed opportunities during the intervention. Dr. A diagnosed obesity with 25% accuracy pre intervention but missed diagnostic opportunities in patients with BMIs between 95%-98% during that three-month time frame. He diagnosed obesity in months two and three but missed two diagnostic opportunities in the first month. The first patient is five years old with a BMI at 99% and height tracking greater than 95%. The second patient is seven years old with BMI greater than 99% and height tracking greater than 95%.

Table 1

Percent of Overweight or Obese Diagnosis Accuracy by Clinical Provider

Clinical Provider	Baseline		1 month		2 months		3 months	
	N	%	N	%	N	%	N	%
Dr. A								
Overweight	10	0	2	0	4	25	6	33.3
Obese	12	25	2	0	2	100	6	50
Dr. B								
Overweight	13	0	4	0	2	0	0	N/A
Obese	13	23.1	2	0	0	N/A	1	0

Note. N denotes the total number of patients that meet diagnostic criteria for overweight or obesity during the specified time frame. Percent (%) denotes the number of patients accurately diagnosed divided by the total number of patients that meet BMI criteria for diagnosis.

Nutrition Referrals

Table 2 shows that Dr. A improved referral accuracy post-intervention at month three with a 50% referral rate but missed opportunities for referrals during months one and two. Missed referral opportunities occurred in patients age five through 16 years with BMIs ≥95%. During the pre-intervention time period, data showed that Dr. B referred one of 13 patients with

BMI > 99% for nutrition counseling. During the remainder of the intervention, Dr. B did not refer any other eligible patients.

Table 2

Percent of Weight Management Program or Nutritionist Referral Accuracy by Clinical Provider

Clinical Provider	Baseline		1 month		2 months		3 months	
	N	%	N	%	N	%	N	%
Dr. A	12	8.3	2	0	2	0	6	50
Dr. B	13	7.7	2	0	N/A	N/A	1	0

Note. N denotes the total number of patients that meet diagnostic criteria for obesity and eligibility for a weight loss program or nutritionist referral during the specified time frame. % denotes the number of patients referred divided by the total number of eligible patients.

Lipid Screening

Both clinical providers consistently performed lipid screening both pre-intervention and throughout the intervention. As shown in Table 3, both screened with similar rates of accuracy during the pre-protocol phase. Post intervention, both providers improved screening by 40-50%.

Table 3

Percent of Patients Who Meet Screening Criteria with a Lipid Test Ordered

Clinical Provider	Baseline		1 month		2 months		3 months	
	N	%	N	%	N	%	N	%
Dr. A	46	21.7	11	63.6	15	53.3	19	73.6
Dr. B	52	19.2	15	20	15	26.6	11	63.6

Note. N denotes the total number of patients that meet diagnostic criteria for obesity or universal lipid level screening eligibility during the specified time frame. % denotes the number of patients with a lipid panel laboratory order in their medical record divided by the total number of screening-eligible patients.

Change in Provider Practice

Table 4 illustrates the overall average change in provider practice from baseline to three months post protocol intervention. Both providers show positive mean changes in lipid screening at three months post protocol intervention. Dr. A shows positive mean change in overweight and obesity diagnosis as well as nutrition referral rates. Dr. B shows no change in overweight diagnosis and overall reduced rates of obesity diagnosis and nutrition referrals post protocol intervention.

Table 4

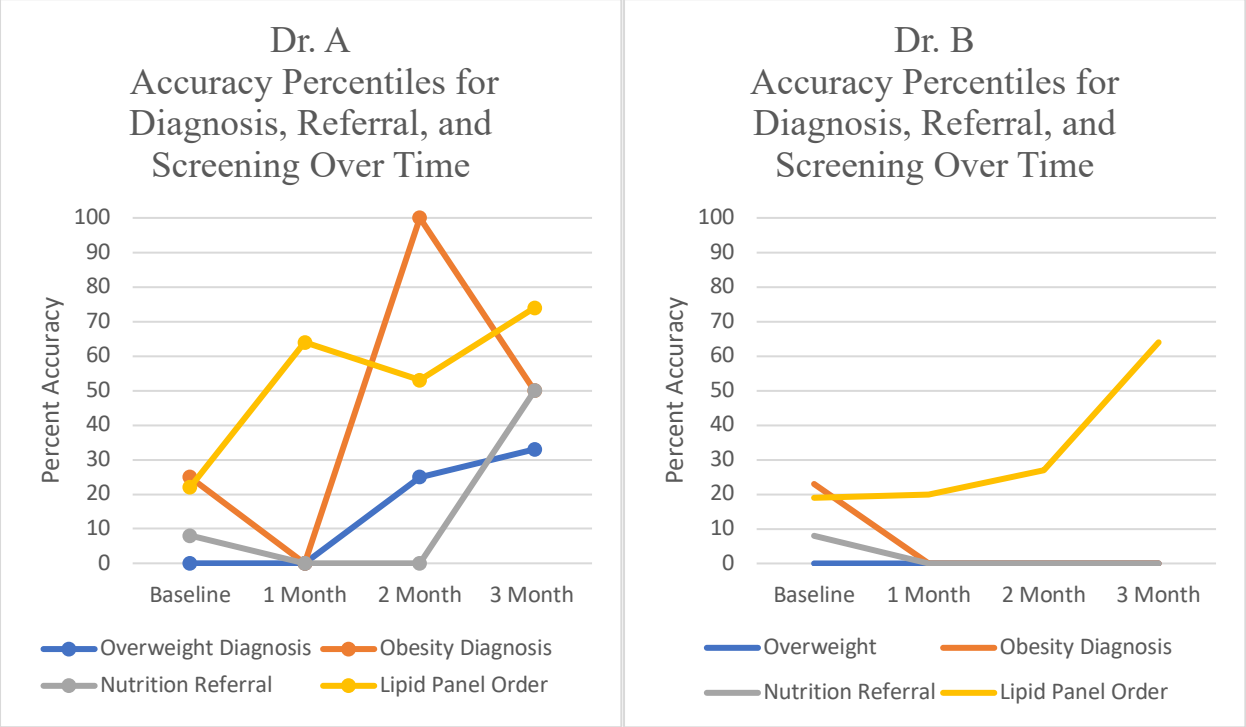
Mean Change in Diagnosis, Screening, and Referral by Provider Over Time

Clinical Provider	Baseline % accuracy	Mean % accuracy	Mean change	SD	CV
Dr. A					
Overweight	0	25	+25	17.1	1.17
Obese	25	50	+25	42.6	.975
Referral	8.3	16.7	+8.4	23.9	1.64
Lipid Screen	21.7	63.5	+41.8	22.4	.424
Dr. B					
Overweight	0	0	0	N/A	N/A
Obese	23.1	0	-23.7	11.5	N/A
Referral	7.7	0	-7.7	3.8	N/A
Lipid Screen	19.2	36.7	+17.5	23.9	.652

Note. SD is standard deviation. CV is coefficient of variation. Baseline numerator is number of patients the diagnosed, referred, or screened. Denominator is total eligible number of patients who meet criteria during the time frame. Mean accuracy is average rate of accuracy throughout the three-month intervention. Average change is overall mean difference in clinician practice from pre to post intervention. The CV illustrates variation of clinician practices from the mean.

Figure 1

Diagnosis, Referral, and Screening Accuracy Percentages Per Clinician Over Time



Note. This figure shows provider accuracy as a percentage per outcome measure over time. The lines that deviate from 100% accuracy illustrate provider practice variance from baseline and at the end of each calendar month of the intervention. Dr. A's graph shows that obesity diagnosis is consistently higher than nutrition or weight management referrals but lipid screen mirrors overweight diagnosis trends. Dr. B's graph shows lipid screening is independent of BMI.

SECTION FIVE: DISCUSSION

Implications for Practice

The goal of the CV Health Model integration is to address the problem of clinician inconsistencies in the assessment and management of CV health risk factors and to determine if

the protocol impacted CV health maintenance. The design of the project centered on assisting medical provider adherence to the vast clinical guidelines through use of a streamlined process protocol aided by the EHR. The model also addresses clinician barriers for discussion of modifiable lifestyle risk factors and resistance to addressing childhood weight and obesity.

The first aim of improving CV health risk assessment of modifiable risk factors is achieved through integration of a streamlined CV health risk protocol and EHR tools. Although CV health risk assessment is not included as an outcome measure, integration of the CV health history template into the EHR platform allows for a consistent and efficient process for modifiable risk factor and lifestyle behavior screening for patients presenting for preventative health visits.

The second aim of improving clinician documentation of BMI-based diagnoses, nutrition referrals, and lipid screening was consistently achieved with one of two clinicians. This project protocol addressed the most commonly cited barriers of clinician adherence to obesity prevention and management guidelines (Rhee et al., 2018) but these implementation efforts did not improve provider consistency in evidence-based practices. Despite controls for variation and successful integration of an evidence-based assessment tool, process flow algorithms, updated nutrition and pediatric weight management referral lists, a communication platform for focus on CV health versus solely weight status, and educational resource links available for printing and quick reference, the pediatricians' practice patterns remained inconsistent. This is evidenced in Tables 1-3, which showed large mean deviations from baseline data and at the end of each calendar month per clinician. Table 4 summarizes standard deviations and coefficients of variation, which supports variability of practice patterns. The spikes in practice variation are visualized in Figure 1. If the physicians' practice patterns were consistent, these would be mirror images.

While Dr. A diagnosed obesity with 50% accuracy during the intervention, he referred to nutrition with 30 % accuracy. Dr. B did not accurately diagnose obesity or refer to nutrition during the intervention. This supports literature that pediatric primary care providers have low rates of obesity diagnosis documentation (Rhee et al., 2018) and low nutrition referral rates for patients with obesity despite quality improvement interventions (Belay et al., 2019).

Project data also show low rates of overweight diagnosis for both providers. Each provider missed 19 opportunities for overweight identification. Low rates of overweight diagnosis in pediatric primary care clinics are also supported in the literature with coding rates as low as 10% (Rhee et al., 2018). Patient chart review indicates that 68% of the patients with missed overweight diagnoses included in the project intervention are in the early childhood and prepubescent age group.

Underdiagnosis of overweight in young childhood and in the prepubescent age group has clinical significance, as it pertains to obesity primary prevention efforts. Longitudinal studies of a population sample of over 50,000 patients indicate risk for adolescent obesity may be predicted by BMI rates of increase from 0.2-2.0 standard deviations evident in children ages 2-6 years (Geserick et al., 2018). This is the first talking point for clinicians who meet parental resistance in BMI discussions during toddler and preschool years.

Project data analysis also illustrates that both providers diagnose obesity at a greater frequency when BMI is 99% or greater. Research indicates there is a greater than 80% probability that early childhood obesity will continue into adolescence (Geserick et al., 2018). This refutes assumptions that children with obesity will “outgrow” this during adolescent growth spurts. This information may serve as another talking point for clinicians when addressing parent assumptions that their child will grow into their weight during puberty (Wake et al., 2018).

The literature and project data support the need for a strategic change in clinical focus away from obesity diagnosis to obesity probability and focus on prevention in the early childhood and pre-pubescent population. Studies indicate reversing obesity trends is difficult and the primary clinical approach is early identification of risk (Geserick et al., 2018). Further studies indicate that children with obesity even without comorbidities have shown early signs of arterial wall stiffness (Gourgari et al., 2017). Elevated BMI trajectories should be identified at preventative care visits in primary years before age six.

Delays in identification of overweight and obesity in pre-pubescent pediatric patients even without other comorbidities puts them at risk for development of subclinical arterial wall changes that begin as early as age three (Gourgari et al., 2017) and may progress into adulthood. This is an essential talking point for clinical providers when addressing parental resistance. Explaining to parents the reason screening is performed is to eliminate this risk and maintain health into adulthood.

Post intervention audit and feedback with pediatricians provide insight into further barriers for overweight and obesity diagnosis. Both providers indicate need for scripting to address parental resistance regarding validity of BMI as a reliable tool. The BMI as a tool for identifying obesity has 74% sensitivity and 95% specificity in childhood. Childhood BMI is a predictor of high adolescent BMI. High BMI in adolescence is a predictor of obesity in adulthood (Simmonds et al., 2015).

The literature suggests that motivational interviewing may improve clinical provider level of comfort in addressing lifestyle modification and assist in identifying parental motivation for change (Desai, 2019); however, this method does not address clinician motivation to motivate parents (Rhee et al., 2018). There are gaps in the literature indicating whether clinician lifestyle

behaviors impact lifestyle behavioral screening and counseling practices (Busch et al., 2018). More specifically, further research is needed to determine if there are correlations between clinical providers' CV health scores or BMI status and their performance of CV health risk assessment and obesity prevention practices.

There are several limitations to this project including the timing of the study. Pre-intervention data collection occurred during peak school physical season and before influenza season. Protocol intervention occurred during sick season which could have impacted provider time and ability to address preventative care issues while also treating a concurrent illness. The timing also impacted the protocol sample size. The number of preventative care visits declined by approximately 65% from previous years due to parental concerns about contracting a virus while in the office setting prior to and shortly after the announcement of COVID-19 being declared a Public Health Emergency.

Another limitation to the study is related to provider type. Both providers are pediatricians and comparison of nurse practitioner (NP) diagnosis and management practices under the same controlled processes may have given insight into whether differing professional roles produce different outcomes. It is also uncertain whether the CV health screening conducted by ancillary staff provided a significant aid to the providers' documentation practices.

Sustainability

The CV Health Model is integrated into practice workflow, but components of this project limit the sustainability. Factors that enhance continued use of this project are that it is an integral part of the EHR platform. There are no additional costs and staff does not require additional training to use the CV health history template and clinical providers are knowledgeable about clinical guidelines. It continues to have primary stakeholder support and

documentation practices have improved. Barriers to sustainability are continued clinical provider practice variability and Dr. B motivation.

Future discussions are needed to determine how the clinicians will address the topic of overweight or obesity and whether the CV template is viewed as a reliable fit for lifestyle behavioral modification discussions. A valuable lesson learned is to pay attention to implementers' values and attitudes toward the interventions for practice change both before and during practice change (Shelton et al., 2018). Dr. B shared concerns over his own poor CV health score due to several risk factors, which may impact his motivation or feelings of credibility to educate on healthy lifestyle modifications or BMI fluctuations.

Dissemination Plan

Dissemination of knowledge in the form of publication is a scholarly expectation of the Doctor of Nursing Practice. Evidence-based practice projects are undertaken with the goal of addressing a clinical problem, critiquing evidence, translating research into practice, and producing outcomes that inform a process of care that ultimately improves the healthcare system (Becker et al., 2017). This project did not produce the anticipated outcomes, but the results where shared with the providers and staff, as the implications have clinical significance.

The purpose of this evidence-based project is to improve the process of care as it relates to addressing the sensitive issues of life-style behaviors and body mass index elevations which may impact CV health. It is also a comprehensive and efficient CV health package that integrates clinical practice guideline and educational materials into workflow. The basis of this project is to focus on CV health instead of body weight. While the outcome measures do not support use of the CV health history assessment as a tool aiding clinician diagnosis of overweight or obesity, analysis of data and clinical provider feedback post intervention inform the topic of clinical

providers' personal attributes and feelings regarding their own CV health status and their performance of CV health assessments. Clinical providers may improve evidence-based intervention integration by assessing implementors' values, beliefs, and health-related lifestyle behaviors before and during project adoption so that interventions may be modified, and practice change is a fit for sustainability.

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