An Educational Intervention to Improve Knowledge and Understanding of Correct Blood Pressure Measurement Procedures Among Medical Assistants in A Medical Clinic: A Quality Improvement Project

A Scholarly Project Presented to the Faculty of the Nicole Wertheim College of Nursing and Health Sciences

Florida International University

In partial fulfillment of the requirements

For the Degree of Doctor of Nursing Practice

By

Samuel Altidor

Supervised By

Derrick C. Glymph, Ph. D, DNAP, CRNA, APRN, COL., USAR, FAANA, FAAN

Approval Acknowledged: DocuSigned by: Dr. Charles Buscemi 5D65DFEB12C74F7... , DNP Program Director

Date: 7/31/2022

Table of Contents

Abstract

Blood pressure (BP) measurement is one of the most common procedures performed in the medical office. BP measurements are used to screen, diagnose, and treat clients suffering from hypertension (HTN). However, BP measurement errors are so prevalent that the reliability of those measurements has been questioned recently. Lack of supervised training and understanding of the appropriate practice guidelines are cited in the literature as contributing factors. To gain a greater understanding of the clinical problem, a literature review was conducted. In addition, the literature review results were used to design an educational intervention to improve knowledge and understanding of the correct BP measurement procedures among medical assistants (MAs) in a medical office.

Participants were recruited via secure email from multiple local Health Centers. Data were collected by pretest & posttest questionnaires via Qualtrics. Pretest and Posttest questions addressed different aspects of the BP measurement process. There was an overall knowledge improvement of 42.2%. Also, a paired t-test for dependent samples showed that the difference between pretest and posttest means was statistically significant. The result of this QI project demonstrated the effectiveness of the educational intervention. Advanced Practice Nurses can be essential in improving knowledge and understanding of appropriate clinical practice guidelines regarding BP measurements. Ultimately, education is essential to enhance MAs knowledge, confidence, and awareness and should be ongoing to ensure long-term sustainability.

I. Introduction/Problem Statement/Significance

Medical assistants (MAs) are one of the nation's fastest growing and the most often encountered non-physician staff workers in medical offices. In the United States, around 720,900 MAs employed as of 2020, and the Bureau of Labor Statistics (2021a) projected that the MA workforce will grow by 18% (roughly 132,000 new MAs) between 2020 and 2030. As of May 2020, around 56,010 MAs were practicing in medical facilities across the state of Florida (U.S. Bureau of Labor Statistics, 2021b). When MAs are trained properly, they become integral members of the health care team and essential contributors to improved patient care and outcomes. MAs have increased their participation in multidisciplinary health care teams in recent years, and their vital role in care coordination, chronic care management, and health promotion has been recognized (Chapman, Marks, & Dower, 2015). Nevertheless, there is so much variability in the duration and quality of their education that many MAs are not ready for practice. Some cannot perform even the most basic of procedures, including accurate blood pressure (BP) measurements (Fraher et al., 2021; Hull et al., 2013).

Background

There is considerable variation in the duration and quality of MA training programs and curricula. For example, MA educational programs range from six months to two years. Most MA graduates' complete non-degree certificate programs lasting less than a year (Chapman et al., 2015). It is difficult to determine the total number of medical assisting educational programs available in the private and public sectors. They may not be accredited nor disclose statistical data to the United States Department of Education (Department of Education National Center for Education Statistics, 2021). Despite the continuous evolution of MA duties and responsibilities, their training is inconsistent and frequently insufficient to equip them for new roles and responsibilities (Chapman et al., 2015).

In Florida, MA practice is governed by the Florida Board of Medicine. According to Florida statute 458.3485, licensure for MAs is not required (The Florida Senate, 2011). However, they may choose to become certified medical assistants (CMAs) by the American Association of Medical Assistants (AAMA) or as Registered Medical Assistants (RMAs) by the American Medical Technologists (AMT). Additionally, the lack of established educational requirements significantly contribute to the heterogeneity in the quality and degree of job preparedness among MAs. Clinical competence for even the most basic procedures, including blood pressure (BP) measurements, cannot be guaranteed (Fraher et al., 2021).

BP measurement is the most frequently performed procedure by MAs in the clinical setting. Nonetheless, the accuracy of these measurements is commonly taken for granted, and even in the scientific literature, the methodology for measuring BP is sometimes detailed insufficiently or not at all. (O'Brien et al., 2018; Sheppard et al., 2018; Stergiou et al., 2020). For example, in the medical office, BP measurement accuracy varies significantly (Stergiou et al., 2016). SBP measurements differed by greater than five mmHg in either direction for 68% of patients, whereas DBP readings varied by greater than two mmHg in either direction for 78% of patients. Also, 93% of patients from another study had a difference in BP of either 5-mmHg systolic or two mmHg diastolic (Ray, 2012).

Even with good staff training programs, knowledge and skills deteriorate over time, highlighting the importance of lifelong employee training (Block et al., 2018). Besides, MAs often fail to adhere to the American Heart Association (AHA) blood pressure measurement guidelines (Levy et al., 2016). Lack of supervised training and understanding of the proper techniques and the deterioration of knowledge and abilities over time have been highlighted as contributory factors (Eyikara et al., 2018). Staff training programs have been shown to reduce measurement error, particularly when combined with the use of automated blood pressure equipment as part of comprehensive quality improvement "bundles" (Cooper et al., 2013).

Scope of the clinical problem

With more than a billion people globally suffering from hypertension (HTN), there is a growing concern that the measurements healthcare providers rely on so much are sometimes erroneous and misleading. Inaccurate BP measurements may lead to errors in HTN diagnosis, overtreatment, or undertreatment of patients suffering from high BP (O'Brien et al., 2018; Sebo et al., 2014). As a result, the consequences of erroneous BP measurements, a persistent and ubiquitous problem worldwide, are substantial (Olsen et al., 2016). Because HTN rarely manifests any symptoms in its early stages, it is a silent killer, producing accelerated atherosclerosis, organ damage, disability, and death from cardiovascular disease (Forouzanfar et al., 2017). Assuming a global prevalence of hypertension of 1.4 billion, a five-mmHg inaccuracy in BP measurement has been projected to result in the inaccurate diagnosis of at least 84 million individuals globally as having HTN (Padwal et al., 2019).

Consequences of not Addressing the Problem

The 2017 American College of Cardiology/American Heart Association (ACC/AHA) guidelines for HTN management, which recommend lowering the blood pressure level at which HTN is diagnosed, will result in the conversion of millions of "healthy" people worldwide to "hypertensive patients" (Whelton et al., 2018). In comparison to the Joint national committee 7 (JNC7) guidelines, the 2017 ACC/AHA guideline results in a significant increase in the prevalence of HTN, a slight increase in the percentage of adults in the United States recommended for antihypertensive medication, and more intensive BP lowering for many adults on antihypertensive medication. According to the 2017 ACC/AHA and JNC7 guidelines, HTN prevalence was 45.6% and 31.9%, respectively. Within all age, sex, race/ethnicity, and CVD risk category subgroups, the prevalence of HTN was higher when classified by the 2017 ACC/AHA guideline compared to the JNC7 guideline. According to the 2017 ACC/AHA recommendations, antihypertensive medication was recommended for 36.2 % of US adults with HTN, compared to 34.3% of adults with HTN according to the JNC7 guideline (Muntner et al., 2018). As the diagnostic threshold for HTN is lowered, and more aggressive BP control is advocated, accuracy in estimating BP becomes even more critical to avoid the consequences of overestimating BP and recommending excessive medication (Muntner et al., 2019). In addition, undertreatment of HTN may lead to uncontrolled BP, which is responsible for significant morbidity and mortality around the globe (Padwal et al., 2019). Therefore, it is vital and timely to reassess the methodology of BP measurement and educate those who measure BP, including MAs, on the proper knowledge, skills, and techniques to ensure accuracy (O'Brien et al., 2018).

II. Summary of the literature/Evidence related to the clinical question

BP measurements in the medical office

In the medical office, BP can be assessed using two distinct methods: auscultatory and oscillatory. The auscultatory or classic method involves using a stethoscope to listen for the appearance and muffling or disappearance of the Korotkoff sounds, which represent SBP and DBP, respectively. However, the oscillometric approach has been developed and improved during the last two to three decades. In this method, embedded software evaluates oscillometric waveforms, most frequently produced during BP cuff deflation, and uses algorithms to estimate BP (Forouzanfar et al., 2015). Regardless of who takes the BP readings, or the method utilized, the accuracy of the readings is contingent upon standardization of procedures and proper observer training.

AHA 2017 guidelines for accurate BP measurements

The AHA guidelines for accurate BP measurements provide a six-step procedure to accurately conduct seated BP measurements in the office setting.

Step one

In the first step, the MA prepares the client for the procedure. Interventions include allowing the patient to rest in a chair with their feet flat on the floor, their back supported, and their legs uncrossed. SBP and DBP may rise by 5–15 mmHg and 6 mm Hg, respectively, when a patient's back is not supported (Pan et al., 2014). Leg crossing during BP measurement may increase 5–8 mm Hg in SBP and 3–5 mm Hg in DBP (Liu et al., 2016). Before taking the initial blood pressure reading, the client should remain seated for three to five minutes without moving or speaking. The client may experience significantly higher BP without adequate rest (Nikolic et al., 2014; Kallioinen et al., 2016). For at least 30 minutes before measurement, the patient should abstain from caffeine, exercise, and smoking. Consumption of caffeinated beverages (Grasser et al., 2014; Arciero & Ormsbee, 2009), exercising, and smoking (Farsalinos et al., 2014; Seek et al., 2012; Shaik et al., 2012) before BP measurements leads to an elevation in both SBP and DBP measurements. The MA should Ascertain those patients have entirely emptied their bladder. The evidence suggests that holding urine before BP measurement increases SBP and DBP (Kallioinen et al., 2016). Neither the patient nor the MA should speak during the rest interval or the measurement. Talking and small movements during BP measurement may negatively impact the accuracy of BP measurements (Zheng et al., 2012; Kallioinen et al., 2016). Finally, the MA should remove any clothing covering the cuff placement area.

Step two

In the second step, the MA performs the BP measurements using the correct techniques. This step includes utilizing a validated upper-arm cuff BP measurement device and ensuring that the device is calibrated regularly. To begin, the MA must palpate the brachial artery in the antecubital fossa and set the cuff's center of bladder length (typically marked on the cuff by the manufacturer) over the client's bare upper arm arterial pulse. The bottom of the cuff should be roughly two to three centimeters above the antecubital fossa. This creates enough space to place the stethoscope if the observer uses the manual method. However, suppose the bladder is long enough to completely encircle the arm (75–100% for auscultatory measurements). A larger cuff should be used in this case, keeping in mind if the bell of the stethoscope makes any contact with the cuff, this will produce artifactual noise (Stergiou, 2018). The MA should provide support for the patient's arm. Clients should not hold their arms against gravity since isometric exercise influences BP measurements. If patients hold their arm up, the BP will be artificially elevated (Kallioinen et al., 2016; Muntner et al., 2019). The MA should place the cuff's center at the level of the right atrium on the patient's upper arm (midpoint of the sternum). If the upper arm is below the right atrium level (for example, if the arm is hanging down when seated), the readings will be very high. Also, the MA should support the cuffed arm or place it on a table at heart level. The bladder should encircle 75%–100% of the arm (Muntner et al., 2019). Using a too-small cuff may result in an artificially elevated BP reading, whereas using a too-large cuff may result in an artificially low blood pressure reading (Kallioinen et al., 2016). Auscultatory readings can be taken using either the stethoscope diaphragm or the bell.

Step three

In the third step, the MA obtains the necessary readings for diagnosing and treating HTN. The interventions in this step include recording blood pressure in both arms during the initial visit. Subsequent readings should be taken with the arm that generates the higher reading. Repeated measurements should be separated by 1–2 minutes. The evidence suggests that a rest period shorter than one minute between measurements may negatively impact BP accuracy (Kallioinen, 2016). For auscultatory readings, the SBP is estimated using a palpated estimate of radial pulse obliteration pressure. The MA inflates the cuff 20–30 mm Hg above this level to obtain an auscultatory BP reading. For auscultatory measurements, deflate the cuff pressure by 2 mm Hg/s and listen for Korotkoff sounds. This is critical, even more so if the client's heart rate is lower than 60 beats per minute (bpm). Rapid deflation of the BP cuff may result in inaccurate BP readings. (Munter et al., 2019).

Step four

The fourth step requires the MA to document the BP reading accurately. Interventions in this step include recording SBP and DBP. SBP and DBP should be recorded as the start of at least two consecutive beats and the final audible beat, respectively, if utilizing the auscultatory method. SBP and DBP should be rounded to the nearest even number. Finally, the MA should ask the client when the most recent BP medication was taken before the measurements (Muntner et al., 2019).

Step five

In the fifth step, the MA uses the average of at least two consecutive BP readings to estimate the client's BP. For many individuals, the initial BP reading obtained during an office visit is usually higher than subsequent ones. For example, when three readings were averaged, a study of American adults indicated that 35% of patients with a starting SBP/DBP of 140-159/90-99 mm Hg had an SBP/DBP of less than 140/90 mm Hg (Handler et al., 2012). Some automated office BP (AOBP) devices used in medical offices automatically average a set of BP measurements taken within a predetermined period (ten minutes, for example), rendering the task of correctly estimating the client's BP more manageable for the MA. AOBP monitors can record repeated BP readings following a rest interval with a single activation. Current AOBP devices provide an average of these readings and do not need to discard the original reading. AOBP readings can be conducted in the presence or absence of the MA and are referred to as attended or unattended AOBP. With the patient comfortably seated in an examination room or waiting area, reliable unattended AOBP readings can be obtained. (Armstrong et al., 2015). Besides, any elevated BP readings should be reported immediately to the physician or advanced practice provider for further consideration.

Step six

Finally, the MA furnishes the clients with a verbal and written readout of their SBP/DBP. Additionally, a physician or advanced practice provider should assist the client in interpreting the findings (Muntner et al., 2019).

Barriers to accurate BP measurements

A variety of factors might complicate accurate BP measurements in the medical office. For example, according to Hwang et al. (2018), four key factors can compromise the accuracy of BP measurements. These are the following: employee knowledge and attitude, workflow, equipment and layout, and client characteristics and attitude.

Employee knowledge and attitude

Clinical staff knowledge, particularly MAs, is one of the most crucial elements affecting BP measurements' accuracy. Clinical staff members would feel competent in their knowledge and skills to perform accurate BP measurements after passing the initial skills assessment during orientation. However, once they begin working independently in the clinic, there are typically no systematic mechanisms to evaluate and provide feedback on their BP measurement proficiency. As a result, their abilities and knowledge diminish with time. Additionally, they struggle to implement concepts taught during training in a busy clinic's "real-world" environment. While they agree that patients should remain silent during BP measurements, many indicated that enforcing silence during encounters is often challenging (Hwang et al., 2018).

Workflow-related factors

Workflow-related issues also play a significant role in reducing the accuracy of blood pressure measurements. For example, accurate blood pressure measurement might be complicated by issues that arise during the check-in process at the front desk and continue throughout the actual BP measurement. A key concern raised by practice managers and the clinical staff was a perceived shortage of time, which interferes with the recommended 5-minute rest interval preceding the initial BP measurement and the observer's ability to focus on proper BP measurement techniques. Clinic staff members express a sense of pressure from physicians to register patients to sustain the clinic's patient flow quickly. Additionally, they face time constraints if a patient arrives late for an appointment, most commonly due to incomplete insurance verification and routine paperwork.

Additionally, multitasking was associated with the issue of time constraints. As a result, they feel overburdened by the responsibility of completing various tasks in a short period to prepare the patient for the medical visit. While the device reads the client's BP, they may have to discuss chief complaints and past medical history, update pharmacy information in the electronic health record (EHR) or take the client's temperature. (Hwang et al., 2018). This may negatively impact BP readings (Kallioinen, 2016).

Equipment and layout

Correct BP measurement requires using appropriate BP devices and seats with arm support. While BP equipment mounted on rolling stands speeds up BP measurement and makes it easier for clinic staff to adhere to established blood pressure practices, delays may occur when devices are not immediately available due to battery issues or a high volume of patients. If there is a limited supply of BP equipment, personnel may feel the need to rush through the measurement to avoid delaying other patients. The location of the BP measurement within the clinic also influences the quality of the measurement. For example, suppose BP is taken in a packed triage area or a bustling hallway. In that situation, the chaotic environment may influence the patient (for example, elevated stress levels) or clinic staff (for example, making them feel rushed) during the measuring procedure (Hwang, 2018). In some clinics, patients are frequently required to walk along long corridors before taking their BP, prompting worries about whether physical exertion can cause BP levels to rise. Patients may be required to sit on an exam table rather than a chair, depending on the clinic's layout and patient volume. This constitutes an inherent problem due to the patient's arm, foot, and back being unsupported. As previously stated, these factors may have a detrimental effect on the accuracy of blood pressure readings (Kallioinen, 2016).

Patient characteristics and attitude

BP measurements may be altered by the patients' inherent characteristics and specific behaviors. For example, some clinic personnel asserts that it is difficult to effectively measure BP in patients who use wheelchairs due to the difficulty of positioning them in cramped quarters. Individuals who are elderly or frail often complain of pain during cuff inflation (Hwang, 2018). While these activities are unlikely to be interpreted as conscious attempts to disrupt BP, they may have a detrimental effect on BP accuracy. For example, patients may experience nervousness, fidget, cross their legs, or converse with clinic personnel or on the phone, all of which can have a negative impact on the accuracy of BP measurements (Kallioinen, 2016). Sometimes patients may bring their young children into the examination area, which could be a distraction during the BP assessment. In the winter or cold clinic setting, patients may wear multiple layers of long-sleeved clothing, making it more difficult and time-consuming to bare their upper arms for the BP cuff placement. Clinic personnel is not usually authorized or have the time necessary to make necessary adjustments. (Hwang et al., 2018).

Web-based educational intervention: a viable solution

A possible solution to the clinical problem is designing, implementing, and evaluating a web-based education program to teach clinical staff, including MAs, the proper techniques to measure BP accurately, following AHA guidelines for BP measurement. Also, the education program would reinforce evidence-based knowledge, skills and attitude recommended to ensure accurate BP measurements. Web-based learning is a validated tool to distribute and deliver customized and up-to-date trainings aligned with organizational goals throughout several care facilities (Lau et al., 2017; Liaw et al., 2017; Bylow et al., 2019; Barisone et al., 2019; Vaona et al., 2018) efficiently and effectively.

III. PICO Clinical Questions

Can an educational intervention improve knowledge and understanding of correct BP measurement procedures among MAs in a medical office?

- **Population:** medical assistants in a medical office
- **Intervention:** educational intervention
- **Comparison:** none
- **Outcome:** improved knowledge and understanding of correct BP measurement procedures.

IV. Purpose/Objectives

DNP project Purpose

The purpose of the DNP project is to create, implement, and evaluate a quality improvement (QI) project to improve knowledge and understanding of the correct BP measurement procedures among MAs in a medical office. This QI project was based on the American Heart Association (AHA) guidelines for accurate seated BP measurements in the medical office. The AHA guidelines provide a six-step process to standardize the BP measurement process, reduce observer errors, and improve accuracy (Muntner et al., 2019). The AHA guidelines have been validated to reduce the variability in BP readings taken in the medical office (Ray, 2012; Iyengar, 2021)

The AHA guidelines for accurate BP measurements were not followed at the immersion site. Consequently, several shortcomings were identified after weeks of direct observations of the current workflow. For instance, the AHA guidelines recommend that clients should sit quietly for a period of three to five minutes with the BP arm back resting at the level of the right atrium (midpoint of the sternum), feet uncrossed and flat on the ground before BP readings (Muntner et al., 2019). Nonetheless, at the immersion site, BP readings usually occur right after clients walk into the exam room. Clients' BP arms are often unsupported, and MAs usually perform other tasks such as temperature readings and ask clients questions regarding chief complaints. Besides, the AHA guidelines recommend abnormal BP measurements be repeated after a one-to-two-minute rest period (Muntner et al., 2019). However, this recommendation is often not followed. MAs retake these repeat measurements within seconds. Also, the AHA guidelines recommend that the bottom of the BP cuff be placed about two to three centimeters above the antecubital (AC) fossa (Muntner et al., 2019). Nevertheless, in several instances, MAs at the immersion site were overserved to place the bottom of the BP cuff right over the antecubital fossa and sometimes below.

Goals and outcomes

Pretest and posttest quizzes were used to assess MAs knowledge and understanding of appropriate BP measurement guidelines. The pre-and post-implementation assessments included a 20-question knowledge quiz assessing MAs knowledge regarding the proper procedures to measure BP In the medical office accurately. The knowledge tests explored the importance of BP measurements, patient position, relaxation periods, and the appropriate usage of BP measurement devices.

Project structure

The QI project was a PowerPoint presentation regarding the correct techniques to measure blood pressure delivered virtually via zoom accurately. It consisted of a 20-question pretest, a 30-minute PowerPoint presentation, and a 20-question posttest. The education program covered the justification for accurate BP measurement, proper client position, the essential nature of rest period and multiple readings, the critical aspects of the semiautomated or automated BP device, troubleshooting device errors, and measuring BP in special populations such as physically disabled and obese clients.

V. Definition of Terms

Medical assistants: also known as healthcare assistants, medical assistants, or medical technicians, they are medical professionals who work in hospitals, physician offices, and other healthcare institutions, doing administrative and clinical tasks. Traditionally, their function has been limited to bringing patients to an exam room, collecting vital signs, writing the chief complaint in the patient record, and then exiting the exam room unless aid with a procedure is required(Chapman and Blash 2017).

Auscultatory BP: also referred to as the Korotkoff or manual method for blood pressure monitoring, involves a qualified healthcare provider utilizing a sphygmomanometer and a stethoscope to listen for the Korotkoff sounds in the brachial artery two to three centimeters above the antecubital fossa (Muntner et al., 2019).

Oscillometric BP: is used to determine the pressure differences in the BP cuff generated by blood flow oscillations in the brachial artery. An algorithm derived empirically is used to calculate the blood pressure results. Many automated blood pressure monitors use the oscillometric approach because it is less vulnerable to artifactual noises (Forouzanfar et al., 2015).

Automated office BP (AOBP): an oscillometric BP measurement method involving a BP device capable of autonomously taking several BP readings with one actuation without the presence of the observer in the exam room (Roerecke et al., 2019; Muntner et al., 2019).

Attended BP: BP readings taken in the presence of the observer in the exam room.

Unattended BP: BP readings taken without the observer's presence in the room.

VI. Conceptual Underpinning and Theoretical Framework of the Project

Kurt Lewin's (1951) change management model was used to guide the implementation and evaluation of this QI project. Lewin proposed a three-stage change model (unfreezing-change-refreezing) for identifying and examining the elements and factors that may influence a particular situation (Wagner, 2018). According to Lewin, for any individual or organization, change is a complicated journey that is rarely straightforward and frequently comprises various transitional or misunderstood periods before achieving equilibrium or stability. He considers behavior to be a dynamic balance of opposing forces. "Driving forces" promote change by directing employees in the desired direction and "restraining forces" pushing employees in the other direction. Consequently, these forces must be evaluated, and Lewin's change management model can assist in establishing a new equilibrium. (Burnes, 2017).

According to Lewin, the three stages of change are as follows:

- **Unfreezing:** this initial stage entails identifying ways of assisting individuals in letting go of ingrained behavioral patterns and aiding them in overcoming resistance and collective conformity. Disequilibrium occurs at this stage, disrupting the system and allowing for the recognition of "driving forces" for change and anticipated "restraining forces" against it. A successful transition from this stage ultimately means the reinforcement of the motivating forces and the debilitation of restraining forces (Shirey, 2013). This can be accomplished in three ways: by increasing the driving forces that direct behavior away from its current state of equilibrium; by diminishing the restraining forces that hinder movement away from the current equilibrium; or by integrating the preceding two approaches.

- **Moving or change:** this stage includes the process of adjusting one's feelings, beliefs, and behaviors. Lewin (1951) identified three interventions that can facilitate change: persuading individuals that the status quo is unsustainable and, urging them to approach the issue from a fresh perspective; engaging with others to unearth new and relevant facts that can aid in enacting the desired change; establishing relationships with influential leaders who support the initiative for the desired change. This stage is typically the most challenging, as change entails an element of uncertainty and dread for many (Shirey, 2013). Consequently, having a supportive team and open communication is crucial for effecting change (Wagner et al., 2018).
- **Refreezing:** this stage entails enacting the new behavior into practice as the new path forward. It is essential to ensure that the improvements implemented in the moving stage are sustained continually. A new equilibrium state is established if this stage is successful, referred to as the new baseline or the expected higher performance standard. (Shirey, 2013).

While Lewin's change model is well-known and widely accepted in healthcare settings, it is usually criticized for being oversimplistic and linear. However, due to the unexpected and complex nature of change, an effective leader must be knowledgeable regarding several change models. (Wagner et al., 2018).

VII. Methodology

QI method: the PDSA cycle

The Plan-Do-Study-Act (PDSA) cycle is a methodical series of steps for acquiring useful insights and knowledge to improve a product or process continually. The PDSA cycle assumes that microsystems and systems are composed of interdependent, interacting parts whose operation is unexpected and nonlinear. Consequently, modest modifications might have significant consequences on the system (AHRQ, 2020). The PDSA cycle has four parts: plan, do, study, and act.

Plan

This step entails determining a goal or purpose, developing an intervention or theory of change, defining success measures, and implementing a plan (AHRQ, 2020). BP measurement was identified as a clinical problem at the immersion site. The DNP student conducted a need assessment to determine what needs to be accomplished and a literature review to better understand the clinical problem. Also, the literature review results were used to design an educational intervention to improve knowledge and understanding of the appropriate BP measurement procedures among MAs at the immersion site. Additionally, the DNP student obtained a letter of support from the medical director, who approved the QI project. Additionally, the DNP students received internal review board (IRB) approval from Florida International University (FIU) before implementing the QI project. Finally, the DNP recruited MAs to participate in the QI project via secure email.

Do

This is the phase in which the plan's components are implemented. MAs participated in a 30-minute presentation addressing several aspects of the BP measurement process. Also, the MAs completed a 20-question pretest and posttest knowledge questionnaire before and after the presentation to assess their knowledge and understanding of the proper BP measurement techniques and procedures. Finally, demographic data, pretest and posttest scores were collected for analysis.

Study

This step entails monitoring outcomes to test the plan's validity for indicators of progress and success, as well as issues and opportunities for improvement (AHRQ, 2020). In this phase, participant demographic data, pretest and posttest scores were analyzed. Also, a paired t-test was conducted, using an online statistic calculator called Data Tab, to evaluate differences in responses to pretest and posttest knowledge questions.

Act

This step completes the cycle by integrating the knowledge gained during the entire process, which can be utilized to modify the objective, alter the techniques, or even restructure an intervention or improvement program entirely (AHRQ, 2020). Results tabulated from the QI project presented to interested stakeholders. In addition, planning was made to adopt the educational program as an annual or biannual continuing education (CE) for MAs at the clinical sites. In addition, future DNP students can build upon and modify the program based on lessons learned from prior implementations.

Setting

This QI project was carried out at Caremax, a group of primary care centers in Miami-Dade County, Florida. Caremax encompasses 13 surrounding area clinics open from 8:00 AM to 5:00 PM and provides pediatric, woman's health, and geriatric care. The company's medical director approved the idea and believes it will enhance MA's BP measurement knowledge and skills. The organization consists of a Chief Executive Officer (CEO), a Chief Medical Officer, a general Medical Director, and several local Medical Directors. One medical doctor (MD), three medical assistants (MA), and two advanced registered nurse practitioners (ARNP) work at the primary clinical site. The primary immersion site serves an average of 80 Medicare and

Medicaid patients aged 65 or older per week. Those patients are primarily of Hispanic, African American, and Haitian descent. According to Miami-Dade Media Matters (2019), people of black/African American, non-Hispanic, and Hispanic descent made up 59.3% of those who suffer from HTN in Miami-Dade County between 2017 and 2019, which made that location the ideal setting to implement the QI project.

Participants

The participants were MAs from several Caremax centers in Miami-Dade and Broward Counties. They received training on the correct procedures to accurately measure BP in the medical office. The educational intervention included information regarding the current epidemiology of hypertension (HTN) in the United States, the significance of accurate BP measurements, the different categories of HTN, BP measurement errors, device validation and calibration, six key actions to accurate BP measurements, different types of BP measurement devices, and some evidence-based practice (EBP) recommendations for accurate BP measurements.

SWOT analysis of immersion site

Strengths

Influential leadership is one of the greatest strengths regarding BP measurement at the immersion site. According to Lewin (1951), one of the best interventions to foster change is establishing relationships with influential leaders who support the initiative for the desired change. Implementing this QI project is possible because the medical director at Caremax has identified accurate BP measurement as an issue to be addressed at the immersion site. The medical director's leadership was one of the driving forces pushing for a change in how BP is measured at Caremax.

Weaknesses

The DNP student identified several weaknesses regarding BP measurements at the immersion site. First, MAs working at the immersion site lack proper BP measurement knowledge and skills. The MAs do not follow the AHA guidelines for accurate BP measurements in the medical office. From direct observations, the MAs do not seem to know the six key interventions to accurate BP measurements i.e., properly prepare and position the client, use the proper technique for BP measurements, take the correct number and type of measurements, adequately document BP measurements, and provide the BP reading to the client both verbally and in writing (Muntner et al., 2019). Second, there is no established protocol for BP measurements at the immersion site. BP measurement protocols would standardize BP measurements, thereby reducing the variability in BP measurements at the immersion site. Finally, there is no BP measurement continuing education (CE) for MAs at the emersion site. Consequently, any knowledge and skills they may have had at the beginning of their employment may have eroded over time.

Opportunities

Several opportunities have emerged based on the identified weaknesses at the immersion site. First, there is an opportunity to establish BP measurement policy and procedures at the immersion site. BP measurement policy and procedures will standardize how BP is measured at the immersion site. Second, there is an opportunity to create an annual or biannual BP measurement CE at the immersion site. Third, a BP measurement CE program will ensure that MAs knowledge and skill do not diminish with time. Finally, there is an opportunity to use AOBP measurements at the immersion site. AOBP measurement is the gold standard for consistent and accurate BP measurements in the medical office (Muntner et al., 2019). One of the greatest strengths of the AOBP method is the ability to take multiple measurements with one actuation without needing the MA to be present. These devices include a built-in delay that permits MAs to start the readings and leave the patient alone before the first reading begins. Also, the automated BP measurement device can automatically average those measurements, removing the need for the MAs to do the calculations (Roerecke et al., 2019).

Threats

The DNP student identified several threats to fully adopting the AHA's guidelines for accurate BP measurements at the immersion site. One of the most significant threats to accurate BP measurements at the immersion site will be the willingness of MAs to adopt the newly gained BP measurement knowledge into their everyday practice. MAs may find it challenging to apply all the principles addressed during training in the "real-world" situation of a busy clinic like the immersion site. For instance, they may find it difficult to keep clients quiet while BP measurements are in progress.

Another threat involves the current workflow at the immersion site. MAs at the immersion site may find it challenging to observe the three-to-five-minute rest period before BP measurements. In addition, the frantic environment at the immersion site may not allow adequate time for clients to rest peacefully before having their BP measured. Furthermore, if a client arrives late for an appointment, MAs may face additional obstacles due to time limits, especially if insurance verification and standard paperwork have not been completed.

VII. Timeline

The DNP student acquired a letter of support (see Appendix A) outlining the quality improvement doctoral project from the medical director of the hospital organization. **T**he medical director viewed the planned educational intervention favorably and gave his approval.

This project has also obtained IRB approval (see Appendix B) and was ready for implementation.

The DNP candidate received the names and email addresses of 14 MAs from several local Caremax medical directors. Pretest (see Appendix C) and demographic surveys (See appendix D) were emailed out on June 8th, 2022. The email included information about the project's date and time and a recruitment/consent letter (see Appendix E) that describes the study's methodology in depth. On June 13th, 2022, a zoom invitation was emailed to the center medical directors and participating MAs. On June 15th, 2022, the DNP student conducted the PowerPoint presentation on the correct procedure to accurately measure BP in the medical office. Shortly after the presentation, the posttest survey links were emailed to all participating MAs. The project was initiated in one medical center but was extended to other centers. The MAs were notified by work email and provided information about the QI project. The entire project was completed online and digitally utilizing Zoom and Qualtrics. There was no direct interaction.

Protection of human subjects

Before beginning the project, the DNP student obtained IRB approval from Florida International University (FIU). The DNP student receives the written approval of the medical director of Caremax. The participants represented a convenience sample of MAs from multiple Caremax centers. In addition, they participated voluntarily, and their consent was acquired.

Data management and analysis plan

The DNP student was the only individual managing the data. All data were stored on a password-protected computer. Data was collected according to the goals and objectives of the project. The data was analyzed to answer this DNP project's PICO question: can a brief educational intervention improve knowledge and understanding of the appropriate BP measure procedures among MAs in a medical office?

VIII. Results

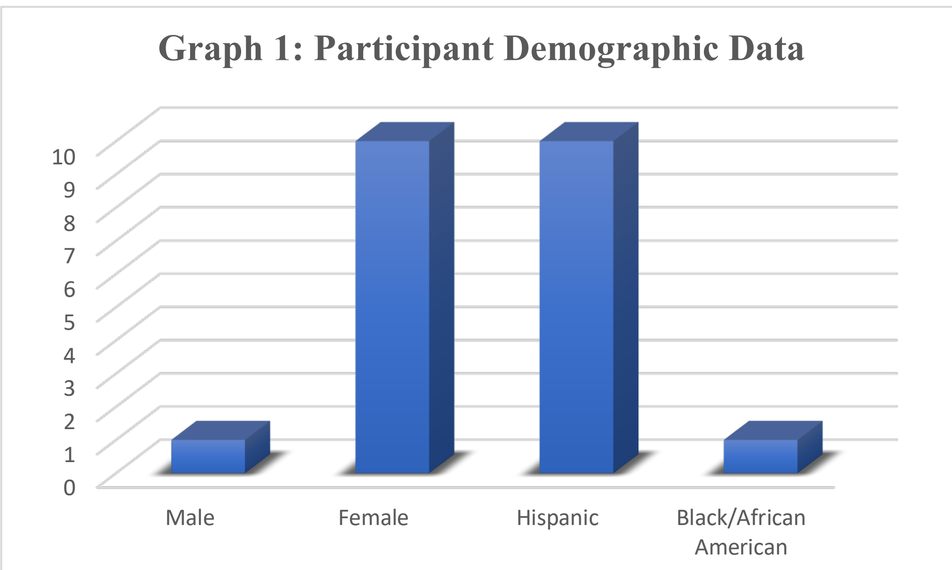
Participant demographic data

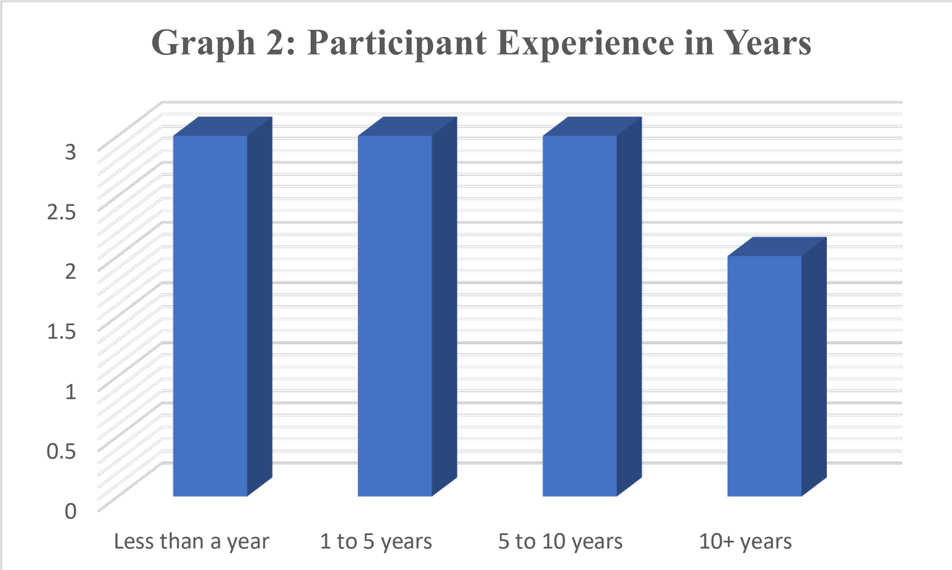
Eleven participants consented to complete this QI project. All 11 participants completed the project in its entirety, which included a pre-and posttest questionnaire and a 30-minute instructional session, voluntarily. Consequently, the pre-intervention and post-intervention samples were identical. Ten (90.9%) participants identified as female, and one identified as male (9.1%). Also, ten participants identified as Hispanic (90.9%) and only one (9.1%) African American (see graph 1). In addition, three participants (27.3%) reported less than a year of experience, three (27.3%) reported one to five years of experience, three (27.7%) reported six to ten years of experience, and two participants (18.2%) reported five to ten years of experience as MAs (see graph 2). Ten participants (90.9%) reported completing any recent BP measurement training. Of those who reported any recent BP measurement training, one (10%) completed that training in the last six months, four (40%) in the past year, and five (50%) over two years ago (see graph 3).

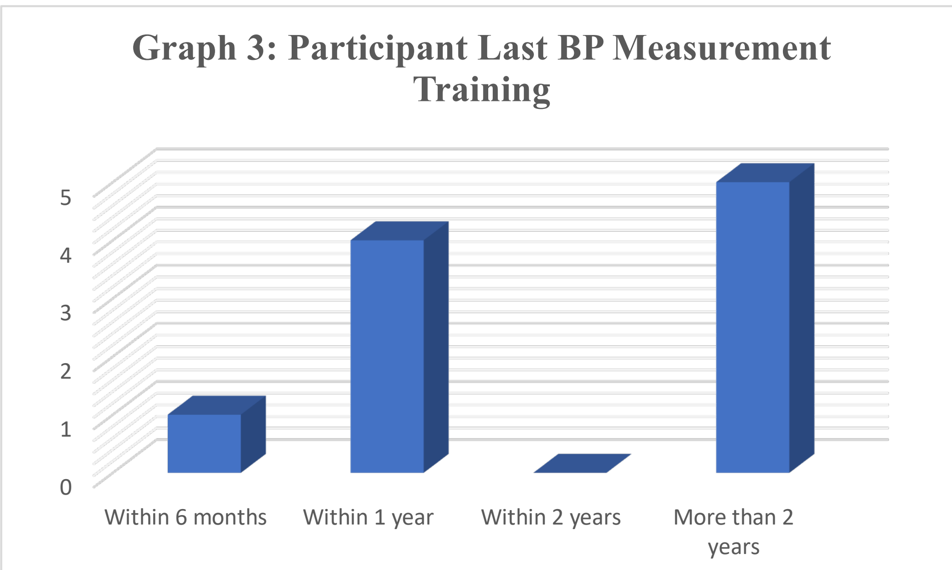
Pretest and posttest score analysis

The pretest scores ranged from 25% to 75% and averaged 58.7%. The posttest scores ranged from 80% to 90% and averaged 85.9% (see graph 4). The overall improvement percentage from pretest to posttest was 44.2% (see table 1 and graph 5). The Pretest Score group had lower values (M = 58.86, SD = 15.58) than the post-test score group (M = 84.89, SD = 4.49) (see table 1 A paired-samples t-test was conducted using Data Tab, an online statistic calculator, to determine any significant statistical difference between the means from the pretest and posttest survey.). The t-test for dependent samples showed that this difference was statistically significant. This results in a p-value of <.001, below the specified significance level of 0.05. The t-test result is therefore significant for the present data, and the null hypothesis was rejected. In other words, the educational intervention resulted in a statistically significant increase in the overall BP measurement knowledge and understanding among the participating MAs after the program's implementation.

XIII. Graphs and Tables




Graph 2: Participant Experience in Years
3
2.5
2
1.5
1
0.5
0
Less than a year
1 to 5 years
5 to 10 years
10+ years


Graph 3: Participant Last BP Measurement Training
5
4
3
2
1
0
Within 6 months
Within 1 year
Within 2 years
More than 2 years

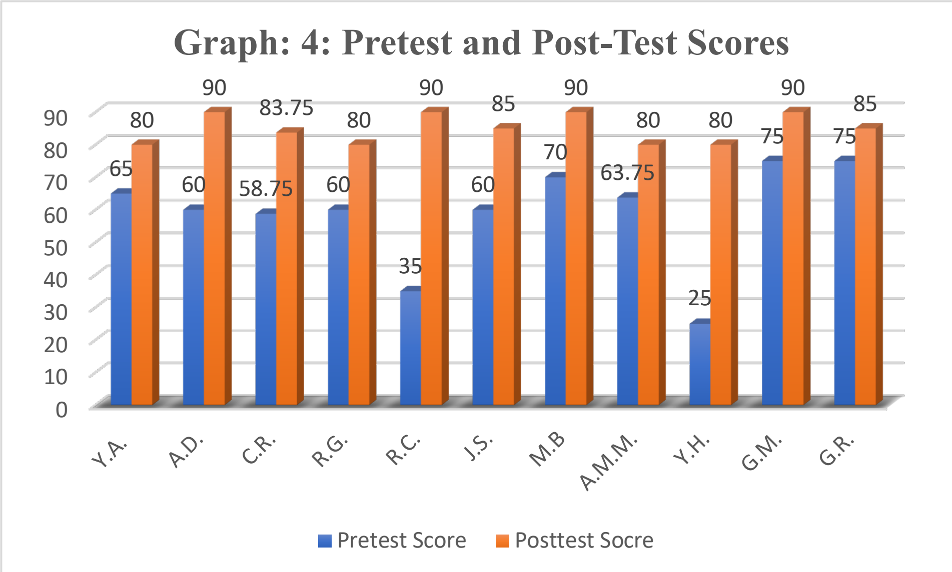
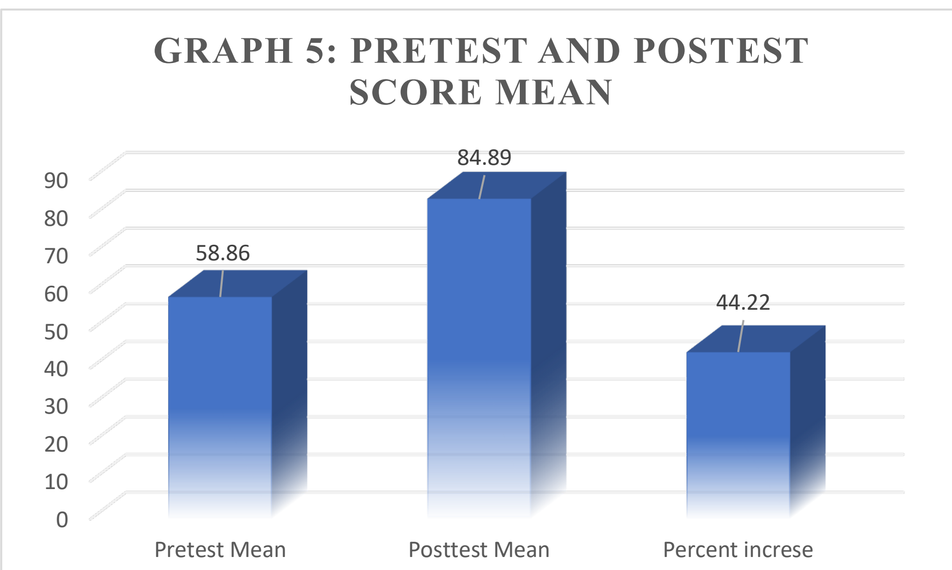


Table 1: descriptive statistics

	N	Mean	Std. Deviation	Std. Error Mean
Pretest Score	11	58.86	15.58	4.7
Posttest Score	11	84.89	4.49	1.35



XIV. Discussion

A virtual educational intervention is an effective way to improve knowledge and understanding of the proper BP measurements techniques and procedures among MAs in a medical office. It is suggested in the literature that clinicians and staff be provided continuing education either annually or biannually to prevent any deterioration of knowledge and skills over time (Block et al., 2018). Nonetheless, 45.4% of this project's participants have not received adequate BP measurement training in over two years, which can partly explain the lack of knowledge and skills directly observed in implementing this QI project. Health system leaders must successfully convey information regarding new initiatives, protocols, and techniques to ensure that clinicians and staff provide standardized care across sites. However, the logistical challenges and costs associated with maintaining an adequate pool of educators, organizing training sessions with providers' clinical schedules, standardizing training across sites, and providing ongoing staff training are significant obstacles to effective training (Block et al., 2018). This QI project highlighted the fundamental characteristics of virtual education intervention through the lens of a program aimed at improving BP measurement. After the implementation of a virtual education program, MAs and at several health centers have significantly improved their knowledge of the proper BP measurement guidelines. Also, it suggested that similar programs could be seamlessly integrated with the current training framework at the time of hiring and continuing education and incorporated into a rapid dissemination platform without straining available resources.

Limitations

The small sample size was one of the critical drawbacks of this QI project. Only eleven MAs participated in the project. Which means the results from the QI project could not be generalized. However, because the participants are affiliated with medical centers, they are typical of the company's MAs. Besides, language barrier may have been a limiting factor since several center medical directors requested that their MAs take the pretest and posttest in Spanish. In addition, it is worth considering the participants' honesty when completing the questionnaire. Since the participants were not supervised, they may have sought assistance or solutions to the questions online; nevertheless, this seems improbable given that they were not offered an incentive to participate.

Even though the score improvement was satisfactory, time may have limited the project's overall success. The optimal time to have the greatest number of MAs was about 90 minutes before the end of their work shift. Also, some of the MAs did not complete the pretest until minutes before implementing the QI project. As a result, they may have hurried to answer the questions, resulting in some of the lowest scores observed in the pretest knowledge questionnaire.

Another limitation of this QI project is the short follow-up period to evaluate knowledge and use of a single health system in a single specialty. We do not know if the findings apply to other specialties or practices, nor if staff knowledge gains were sustained. Since this training program was purely educational and did not address other potential barriers to blood pressure control, such as knowledge of guidelines and clinical inertia, it is unknown if knowledge improvements will result in better blood pressure control.

Implication for practice

Training is essential to improve primary care medical professionals' knowledge, confidence, and awareness and should be ongoing to ensure long-term sustainability (Islam et al. 2020). Nevertheless, to ensure longevity in the long run, BP measurement education should be part of a quality improvement plan (QIP). A QIP is a comprehensive and detailed organizational work plan for the health care organization's clinical and service quality improvement operations. In most organizations, the QI Plan is developed by executive and clinical leadership and must be authorized by the organization's governing body, such as the Board of Directors. The QIP acts as a road map for all operational and clinical quality actions. A QI project or initiative would fall under the QIP's scope. (AHRQ, 2020).

According to the Health and Human Services Health Resources and Services Administration (HRSA) (2011), to be effective, a QIP should have the following attributes:

- Use a methodical approach with clearly defined leadership, accountability, and allocated resources.
- Utilize data and measurable results to assess progress towards appropriate, evidence-based benchmarks.
- To improve outcomes, the focus should be on relationships, efficiency, and provider and client expectations.
- Be a continuous process that is adaptable to change and integrates with other programmatic quality assurance and QI initiatives.
- The acquired data is fed back into the process to ensure that objectives are met and that improved outcomes are concurrent.

According to the American Association of Colleges of Nursing (AACN) essentials of doctoral education for advanced nursing practice (AACN, 2006), graduates of a Doctor of Nursing Practice program should possess a vast array of scientific knowledge and the ability to apply it swiftly and effectively to the benefit of patients in the daily demands of practice environments. Consequently, the DNP-prepared advanced practice registered nurse (APRNs) can play a crucial role in every step of the process of creating and implementing a sustainable QI plan. For instance, they can write policy and procedures at the organization level to ensure accurate BP measurements. In addition, they can be key contributors to implementing the QIP in that they can implement QI projects to address other barriers to accurate BP measurements in the medical office. For example, one of the limitations of this QI project was the langue barrier experienced by some of the participating MAs. Future DNP students can implement the QI project in Spanish. Additionally, they can participate in the annual evaluation and work plan development. In other words, they can participate in continuously monitoring the QI plan. This includes identifying problems that may arise throughout the implementation phase, collecting and reviewing performance data (e.g., annual skills checks and direct observations), setting continuous improvement targets, and developing specific work plans to improve performance and outcomes (AHRQ, 2020).

Conclusions

In conclusion, a virtual educational intervention can be highly effective way to enhance BP measurement knowledge among MAs in the medical office. BP measurements in one of the most common procedures performed in the medical office. However, measurement errors are so prevalent that their reliability has recently been questioned in recent years. Inaccurate BP measurement may lead to the improper diagnosis, undertreatment, or overtreatment of HTN. Consequently, they may also increase health complications associated with uncontrolled HTN, including heart disease, cerebrovascular accidents (CVAs), kidney failure, vision changes, and sexual dysfunction. A contributing factor is the lack of ongoing training among clinical staff, including MAs, regarding the proper procedures for accurate BP measurement which may lead to a deterioration of knowledge and skills over time. This QI project demonstrated that a virtual education intervention may enhance MAs knowledge and understanding of the correct procedures to achieve accurate BP measurements in the medical office. In addition, it can potentially be seamlessly integrated into the current educational framework at the organization level without any additional strains on existing resources. However, to be sustainable in the long term, BP measurement education should be part of a QIP. The APRN can play a crucial role in the development and implementation of the QIP.

References

Agency for Healthcare Research and Quality (AHRQ). (2020, January). Section 4: Ways to approach the quality improvement process. AHRQ. Retrieved July 12, 2022, from https://www.ahrq.gov/cahps/quality-improvement/improvement-guide/4-approach-qi-process/index.html

American Association of Colleges of Nursing. (2006, October). *The Essentials of Doctoral Education for Advanced Nursing Practice*. Retrieved July 3, 2022, from https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf

Arciero, P. J., & Ormsbee, M. J. (2009). Relationship of blood pressure, behavioral mood state, and physical activity following caffeine ingestion in younger and older women. *Applied physiology, nutrition, and metabolism = Physiologie appliquee, nutrition et metabolisme*, *34*(4), 754–762. https://doi.org/10.1139/H09-068

Armstrong, D., Matangi, M., Brouillard, D., & Myers, M. G. (2015). Automated office blood pressure - being alone and not location is what matters most. *Blood pressure monitoring*, *20*(4), 204–208. https://doi.org/10.1097/MBP.0000000000000133

Barisone, M., Bagnasco, A., Aleo, G., Catania, G., Bona, M., Gabriele Scaglia, S., Zanini, M., Timmins, F., & Sasso, L. (2019). The effectiveness of web-based learning in supporting the development of nursing students' practical skills during clinical placements: A qualitative study. *Nurse Education in Practice*, *37*, 56–61. https://doi.org/10.1016/j.nepr.2019.02.009

Block, L., Flynn, S. J., Cooper, L. A., Lentz, C., Hull, T., Dietz, K. B., & Boonyasai, R. T. (2018). Promoting sustainability in quality improvement: an evaluation of a web-based continuing education program in blood pressure measurement. *BMC Family Practice*, *19*, 1–N.PAG. https://doi.org/10.1186/s12875-017-0682-5

Boonyasai. (2018). A bundled quality improvement program to standardize clinical blood pressure measurement in primary care. The Journal of Clinical Hypertension., 20(2), 324–333. https://doi.org/10.1111/jch.13166

Burnes, B. 2017. Kurt Lewin: 1890–1947. In The Palgrave Handbook of Organizational Change Thinkers, eds. D. B. Szabla, W. A. Pasmore, M. A. Barnes & A. N. Gipson, 1-15. Cham: Springer International Publishing.

Bylow, H., Karlsson, T., Lepp, M., Claesson, A., Lindqvist, J., & Herlitz, J. (2019). Effectiveness of web-based education in addition to basic life support learning activities: A cluster randomized controlled trial. PloS One, 14(7), e0219341–e0219341. https://doi.org/10.1371/journal.pone.0219341

Chapman, S. A. & L. K. Blash (2017) New Roles for Medical Assistants in Innovative Primary Care Practices. Health services research: HSR., 52, 383-406.

Chapman, S. A., Marks, A., & Dower, C. (2015). Positioning Medical Assistants for a Greater Role in the Era of Health Reform. *Academic Medicine*, *90*(10), 1347–1352. https://doi.org/10.1097/ACM.0000000000000775

Choi, E. J., Jeong, D. W., Lee, J. G., Lee, S., Kim, Y. J., Yi, Y. H., Cho, Y. H., Im, S. J., & Bae, M. J. (2011). The impact of bladder distension on blood pressure in middle aged women. *Korean journal of family medicine*, *32*(5), 306–310. https://doi.org/10.4082/kjfm.2011.32.5.306

Cooper, L. A., Marsteller, J. A., Noronha, G. J., Flynn, S. J., Carson, K. A., Boonyasai, R. T., Anderson, C. A., Aboumatar, H. J., Roter, D. L., Dietz, K. B., Miller, E. R., 3rd, Prokopowicz, G. P., Dalcin, A. T., Charleston, J. B., Simmons, M., & Huizinga, M. M. (2013). A multi-level system quality improvement intervention to reduce racial disparities in hypertension care and control: study protocol. *Implementation science: IS*, *8*, 60. https://doi.org/10.1186/1748-5908-8-60

Department of Education, National Center for Education Statistics (2021). Integrated postsecondary education data system. http://nces.ed.gov/ipeds/. Accessed November 4th, 2021).

Eyikara, E., & Baykara, Z. G. (2018). Effect of simulation on the ability of first-year nursing students to learn vital signs. *Nurse Education Today*, *60*, 101–106. https://doi.org/10.1016/j.nedt.2017.09.023

Farsalinos, K. E., Tsiapras, D., Kyrzopoulos, S., Savvopoulou, M., & Voudris, V. (2014). Acute effects of using an electronic nicotine-delivery device (electronic cigarette) on myocardial function: comparison with the effects of regular cigarettes. *BMC cardiovascular disorders*, *14*, 78. https://doi.org/10.1186/1471-2261-14-78

Flack, J. M., & Adekola, B. (2020). Blood pressure and the new ACC/AHA hypertension guidelines. *Trends in cardiovascular medicine*, *30*(3), 160–164. https://doi.org/10.1016/j.tcm.2019.05.003

Forouzanfar, M. H., P. Liu, G. A. Roth, M. Ng, S. Biryukov, L. Marczak, L. Alexander, K. Estep, K. Hassen Abate, T. F. Akinyemiju, R. Ali, N. Alvis-Guzman, P. Azzopardi, A. Banerjee, T. Bärnighausen, A. Basu, T. Bekele, D. A. Bennett, S. Biadgilign, F. Catalá-López, V. L. Feigin, J. C. Fernandes, F. Fischer, A. A. Gebru, P. Gona, R. Gupta, G. J. Hankey, J. B. Jonas, S. E. Judd, Y.-H. Khang, A. Khosravi, Y. J. Kim, R. W. Kimokoti, Y. Kokubo, D. Kolte, A. Lopez, P. A. Lotufo, R. Malekzadeh, Y. A. Melaku, G. A.

Mensah, A. Misganaw, A. H. Mokdad, A. E. Moran, H. Nawaz, B. Neal, F. N. Ngalesoni, T. Ohkubo, F. Pourmalek, A. Rafay, R. K. Rai, D. Rojas-Rueda, U. K. Sampson, I. S. Santos, M. Sawhney, A. E. Schutte, S. G. Sepanlou, G. T. Shifa, I. Shiue, B. A. Tedla, A. G. Thrift, M. Tonelli, T. Truelsen, N. Tsilimparis, K. N. Ukwaja, O. A. Uthman, T. Vasankari, N. Venketasubramanian, V. V. Vlassov, T. Vos, R. Westerman, L. L. Yan, Y. Yano, N. Yonemoto, M. E. S. Zaki & C. J. L. Murray (2017) Global Burden of Hypertension and Systolic Blood Pressure of at Least 110 to 115 mm Hg, 1990-2015. JAMA, 317, 165-182.

Forouzanfar, M., Dajani, H. R., Groza, V. Z., Bolic, M., Rajan, S., & Batkin, I. (2015). Oscillometric Blood Pressure Estimation: Past, Present, and Future. *IEEE reviews in biomedical engineering*, *8*, 44–63. https://doi.org/10.1109/RBME.2015.2434215

Fraher, E. P., Cummings, A., & Neutze, D. (2021). The Evolving Role of Medical Assistants in Primary Care Practice: Divergent and Concordant Perspectives from MAs and Family Physicians. *Medical Care Research and Review*, *78*(1_suppl), 7S-17S. https://doi.org/10.1177/1077558720966148

Goudreau, K. A., & Smolenski, M. C. (Eds.). (2022). *Health policy and advanced practice nursing: Impact and implications*. Springer Publishing Company.

Grasser, E. K., Yepuri, G., Dulloo, A. G., & Montani, J. P. (2014). Cardio- and cerebrovascular responses to the energy drink Red Bull in young adults: a randomized cross-over study. *European journal of nutrition*, *53*(7), 1561–1571. https://doi.org/10.1007/s00394-014-0661-8

Handler J. (2009). The importance of accurate blood pressure measurement. *The Permanente journal*, *13*(3), 51–54. https://doi.org/10.7812/TPP/09-054

Handler, J., Zhao, Y., & Egan, B. M. (2012). Impact of the number of blood pressure measurements on blood pressure classification in US adults: NHANES 1999-2008. *Journal of clinical hypertension (Greenwich, Conn.)*, *14*(11), 751–759. https://doi.org/10.1111/jch.12009

https://www.who.int/cardiovascular_diseases/publications/global_brief_hypertension/en/.

Hull, T., Taylor, P., Turo, E., Kramer, J., Crocetti, S., & McGuire, M. (2013). Implementation of a training and structured skills assessment program for medical assistants in a primary care setting. Journal for healthcare quality: official publication of the National Association for Healthcare Quality, 35(4), 50–60. https://doi.org/10.1111/jhq.12022

Hwang, Aigbe, A., Ju, H.-H., Jackson, V. C., & Sedlock, E. W. (2018). Barriers to Accurate Blood Pressure Measurement in the Medical Office. *Journal of Primary Care & Community Health*, *9*, 2150132718816929–2150132718816929. https://doi.org/10.1177/2150132718816929

Islam, M. M., Parkinson, A., Burns, K., Woods, M. &Yenb, L. (2020). A training program for primary health care nurses on timely diagnosis and management of dementia in general practice: An evaluation study. *International Journal of Nursing Studies, 105,* 103550. https://doi.org/10.1016/j.ijnurstu.2020.103550

Iyengar, Johnson, M., Khairi, S., Fennelly, J. E., & Wyckoff, J. (2021). Improving the quality of blood pressure measurements in an outpatient diabetes clinic. BMJ Open Quality, 10(1), e000917–. https://doi.org/10.1136/bmjoq-2020-000917

Juraschek, Ishak, A. M., Mukamal, K. J., Wood, J. M., Anderson, T. S., Cohen, M. L., Li, J. X., & Cluett, J. L. (2021). Impact of 30- Versus 60-Second Time Intervals Between Automated Office Blood Pressure Measurements on Measured Blood

Pressure. *Hypertension (Dallas, Tex. 1979)*, *78*(5), 1502–1510. https://doi.org/10.1161/HYPERTENSIONAHA.121.17876

Kallioinen, Hill, A., Horswill, M. S., Ward, H. E., & Watson, M. O. (2016). Sources of inaccuracy in the measurement of adult patients' resting blood pressure in clinical settings: a systematic review. Journal of Hypertension, 35(3), 421–441. https://doi.org/10.1097/HJH.0000000000001197

Krishnan G, V. (2021). Impact of Staff Development Programme Importance in Nursing among Female Staff Nurses Working in Tertiary Care Centre, Chennai 40. *International Journal of Nursing Education*, *13*(4), 83–86. https://doi.org/10.37506/ijone.v13i4.16592

Kulkarni, S. S., Joshi, B. P., Nayak, P. P., & Kelkar, V. P. (2022). Effectiveness of posters in enhancement of knowledge about cancer among outpatients and caregivers: A quasi-experimental study. *Oncology Journal of India*, *6*(1), 20.

Lau, B. D., Shaffer, D. L., Hobson, D. B., Yenokyan, G., Wang, J., Sugar, E. A., Canner, J. K., Bongiovanni, D., Kraus, P. S., Popoola, V. O., Shihab, H. M., Farrow, N. E., Aboagye, J. K., Pronovost, P. J., Streiff, M. B., & Haut, E. R. (2017). Effectiveness of two distinct web-based education tools for bedside nurses on medication administration practice for venous thromboembolism prevention: A randomized clinical trial. *PloS One*, *12*(8), e0181664–e0181664. https://doi.org/10.1371/journal.pone.0181664

Levy, J., Gerber, L. M., Wu, X., & Mann, S. J. (2016). Nonadherence to recommended guidelines for blood pressure measurement. *The Journal of Clinical Hypertension*, *18*(11), 1157–1161. https://doi.org/10.1111/jch.12846

Liaw, Chng, D. Y. J., Wong, L. F., Ho, J. T. Y., Mordiffi, S. Z., Cooper, S., Chua, W. L., & Ang, E. N. K. (2017). The impact of a Web-based educational program on the recognition and management of deteriorating patients. Journal of Clinical Nursing, 26(23-24), 4848–4856. https://doi.org/10.1111/jocn.13955

Liu, C., Griffiths, C., Murray, A., & Zheng, D. (2016). Comparison of stethoscope bell and diaphragm, and of stethoscope tube length, for clinical blood pressure measurement. *Blood pressure monitoring*, *21*(3), 178–183. https://doi.org/10.1097/MBP.0000000000000175

Media Matters. (2019). High blood pressure prevalence. Media Matters. Retrieved June 16, 2022, from https://www.miamidadematters.org/indicators/index/view?indicatorId=253&localeId=414&localeChartIdxs=1%7C2%7C3%7C4

Muntner, P., Carey, R. M., Gidding, S., Jones, D. W., Taler, S. J., Wright, J. T., & Whelton, P. K. (2018). Potential U.S. population impact of the 2017 ACC/AHA high blood pressure guideline. *Journal of the American College of Cardiology*, *71*(2), 109–118. https://doi.org/10.1016/j.jacc.2017.10.073

Muntner, Shimbo, D., Carey, R. M., Charleston, J. B., Gaillard, T., Misra, S., Myers, M. G., Ogedegbe, G., Schwartz, J. E., Townsend, R. R., Urbina, E. M., Viera, A. J., White, W. B., & Wright, J. T. (2019). Measurement of Blood Pressure in Humans: A Scientific Statement from the American Heart Association. *Hypertension (Dallas, Tex. 1979)*, *73*(5), e35–e66. https://doi.org/10.1161/HYP.0000000000000087

Nikolic, S. B., Abhayaratna, W. P., Leano, R., Stowasser, M., & Sharman, J. E. (2014). Waiting a few extra minutes before measuring blood pressure has potentially important clinical and research ramifications. *Journal of human hypertension*, *28*(1), 56–61. https://doi.org/10.1038/jhh.2013.38

O'Brien, E., Dolan, E., Stergiou, G. S., & O'Brien, E. (2018). Achieving reliable blood pressure measurements in clinical practice: It's time to meet the challenge. *Journal of Clinical Hypertension*, *20*(7), 1084–1088. https://doi.org/10.1111/jch.13323

O'Brien, E., Stergiou, G. S., & Turner, M. J. (2018). The quest for accuracy of blood pressure measuring devices. *The Journal of Clinical Hypertension (Greenwich, Conn.)*, *20*(7), 1092–1095. https://doi.org/10.1111/jch.13279

Olsen, M. H., Angell, S. Y., Asma, S., Boutouyrie, P., Burger, D., Chirinos, J. A., Damasceno, A., Delles, C., Gimenez-Roqueplo, A., Hering, D., López-Jaramillo, P., Martinez, F., Perkovic, V., Rietzschel, E. R., Schillaci, G., Schutte, A. E., Scuteri, A., Sharman, J. E., Wachtell, K., & Wang, J. G. (2016). A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: The lancet commission on hypertension. *The Lancet, 388*(10060), 2665-2712. http://dx.doi.org/10.1016/S0140-6736(16)31134-5

Padwal, R., Campbell, N. R. ., Schutte, A. E., Olsen, M. H., Delles, C., Etyang, A., Cruickshank, J. K., Stergiou, G., Rakotz, M. K., Wozniak, G., Jaffe, M. G., Benjamin, I., Parati, G., & Sharman, J. E. (2019). Optimizing observer performance of clinic blood pressure measurement: a position statement from the Lancet Commission on Hypertension Group. Journal of Hypertension, 37(9), 1737–1745. https://doi.org/10.1097/HJH.0000000000002112

Pan, F., Zheng, D., He, P., & Murray, A. (2014). Does the position or contact pressure of the stethoscope make any difference to clinical blood pressure measurements: an observational study. *Medicine*, *93*(29), e301. https://doi.org/10.1097/MD.0000000000000301

Pickering, T. G., Hall, J. E., Appel, L. J., Falkner, B. E., Graves, J., Hill, M. N., Jones, D. W., Kurtz, T., Sheps, S. G., & Roccella, E. J. (2005). Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Circulation*, *111*(5), 697–716. https://doi.org/10.1161/01.CIR.0000154900.76284.F6

Ray, G. M., Nawarskas, J. J., & Anderson, J. R. (2012). Blood pressure monitoring technique impacts hypertension treatment. *Journal of General Internal Medicine: JGIM.*, *27*(6), 623–629. https://doi.org/10.1007/s11606-011-1937-9

Roerecke, M., J. Kaczorowski & M. G. Myers (2019) Comparing Automated Office Blood Pressure Readings With Other Methods of Blood Pressure Measurement for Identifying Patients With Possible Hypertension: A Systematic Review and Meta-analysis. *JAMA Internal Medicine,* 179**,** 351-362.

Sebo, P., Pechère-Bertschi, A., Herrmann, F. R., Haller, D. M., & Bovier, P. (2014). Blood pressure measurements are unreliable to diagnose hypertension in primary care. *Journal of hypertension*, *32*(3), 509–517. https://doi.org/10.1097/HJH.0000000000000058

Seet, R. C., Loke, W. M., Khoo, C. M., Chew, S. E., Chong, W. L., Quek, A. M., Lim, E. C., & Halliwell, B. (2012). Acute effects of cigarette smoking on insulin resistance and arterial stiffness in young adults. *Atherosclerosis*, *224*(1), 195–200. https://doi.org/10.1016/j.atherosclerosis.2012.06.060

Shaikh, R. B., Abdul Haque, N. M., Abdul Hadi Khalil Al Mohsen, H., Abdul Hadi Khalil Al Mohsen, A., Haitham Khalaf Humadi, M., Zaki Al Mubarak, Z., Mathew, E., & Al Sharbatti, S. (2012). Acute effects of dokha smoking on the cardiovascular and respiratory systems among UAE male university students. *Asian Pacific journal of cancer prevention: APJCP*, *13*(5), 1819–1822. https://doi.org/10.7314/apjcp.2012.13.5.1819

Sheppard, J., Stevens, R., Martin, U., Mant, J., Hobbs, F. D. R., & McManus, R. J. (2018). Prospective external validation of the predicting out-of-office blood pressure (proof-BP) algorithm. *Journal of Hypertension*, *36*(Supplement 1). https://doi.org/10.1097/01.hjh.0000539619.46006.a6

Stergiou, G. S., G. Parati, C. Vlachopoulos, A. Achimastos, E. Andreadis, R. Asmar, A. Avolio, A. Benetos, G. Bilo, N. Boubouchairopoulou, P. Boutouyrie, P. Castiglioni, A. de la Sierra, E. Dolan, G. Head, Y. Imai, K. Kario, A. Kollias, V. Kotsis, E. Manios, R. McManus, T. Mengden, A. Mihailidou, M. Myers, T. Niiranen, J. E. Ochoa, T. Ohkubo, S. Omboni, P. Padfield, P. Palatini, T. Papaioannou, A. Protogerou, J. Redon, P. Verdecchia, J. Wang, A. Zanchetti, G. Mancia & E. O'Brien (2016) Methodology and technology for peripheral and central blood pressure and blood pressure variability measurement: current status and future directions – Position statement of the European Society of Hypertension Working Group on blood pressure monitoring and cardiovascular variability. Journal of Hypertension, 34, 1665-1677.

Stergiou, G. S., O'Brien, E., Myers, M., Palatini, P., & Parati, G. (2020). STRIDE BP: An international initiative for Accurate Blood Pressure Measurement. *Journal of Hypertension*, *38*(3), 395–399. https://doi.org/10.1097/hjh.0000000000002289

Stergiou. (2018). A Universal Standard for the Validation of Blood Pressure Measuring Devices. *Hypertension.*, *71*(3), 368–374. https://doi.org/10.1161/HYPERTENSIONAHA.117.10237

U.S. Bureau of Labor Statistics. (2021a, September 13). *Medical assistants: Occupational outlook handbook*. U.S. Bureau of Labor Statistics. Retrieved November 4, 2021, from https://www.bls.gov/ooh/healthcare/medical-assistants.htm.

U.S. Bureau of Labor Statistics. (2021a, September 13). *Medical assistants: Occupational outlook handbook*. U.S. Bureau of Labor Statistics. Retrieved November 4, 2021, from https://www.bls.gov/ooh/healthcare/medical-assistants.htm.

U.S. Bureau of Labor Statistics. (2021b, March 31). *31-9092 medical assistants*. U.S. Bureau of Labor Statistics. Retrieved November 4, 2021, from https://www.bls.gov/oes/current/oes319092.htm#st.

U.S. Bureau of Labor Statistics. (2021b, March 31). *31-9092 medical assistants*. U.S. Bureau of Labor Statistics. Retrieved November 4, 2021, from https://www.bls.gov/oes/current/oes319092.htm#st.

U. S. Department of Health and Human Services Health Resources and Services Administration. (2011, April). U. S. department of health and human services health resources and ... U. S. Department of Health and Human Services Health Resources and Services Administration. Retrieved July 14, 2022, from https://www.hrsa.gov/sites/default/files/quality/toolbox/508pdfs/developingqiplan.pdf

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, J., Collins, K. J., Dennison Himmelfarb, C., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P., Ovbiagele, B., Smith, J., Spencer, C. C., Stafford, R. S., Taler, S. J., Thomas, R. J., Williams, S., … Wright, J. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Journal of the American College*

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, J., Collins, K. J., Dennison Himmelfarb, C., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P., Ovbiagele, B., Smith, J., Spencer, C. C., Stafford, R. S., Taler, S. J., Thomas, R. J., Williams, S., … Wright, J. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Journal of the American College of Cardiology*, *71*(19), 2199–2269. https://doi.org/10.1016/j.jacc.2017.11.005

Appendix A: Letter of Support

Derrick C. Glymph, DNAP, CRNA, APRN, COL., USAR, FAANA, FAAN Enrollment and Global Initiatives Coordinator
Clinical Associate Professor, Graduate Nursing Department
Nicole Wertheim College of Nursing and Health Sciences

Florida International University Dear Doctor Glymph,

Thank you for inviting Caremax to participate in the DNP Project to be conducted by Samuel Altidor. I understand that this student will be conducting this project as part of the requirements for the Doctor of Nursing Practice program at Florida International University (FIU). After reviewing the project's proposal titled "*Educational intervention to improve blood pressure measurement knowledge and skills among medical assistants: A quality improvement project*." I have warranted him permission to conduct the project in this company.

We understand that the project will be developed in our setting and will occur in one session and will be considered for subsequent implementation. We are also aware of our staffs' participation in supporting the student to complete this project, this will include granting the student access to our facilities, provide consent, deliver the pretest questionnaire, provide the educational intervention and the posttest questionnaire to the recruited participants. We will provide a peaceful and safe environment to safeguard our participants' privacy and adequate area to conduct the educational activity.

This project intends to evaluate if a structured educational program targeting medical assistants will increase blood pressure measurement knowledge and skills. Before implementing this project, the Florida International University Institutional Review Board will evaluate and approve the procedures to conduct this project. Evidence suggests that continued education and training is of essence to ensure strengthening of clinical knowledge and skills. Successful annual or biannual training on knowledge, skills, and proper techniques to accurately measure blood pressure will improve accuracy, diagnosis, and treatment of patients with hypertension.

The educational intervention will be conducted via zoom or Microsoft team for 40-60 minutes. The students will provide the educational materials to each participant. Any data collected by Samuel Altidor will be kept confidential and stored in a password-protected electronic file.

I support our medical assistants' participation in this project and look forward to working with you.

Sincerely,

Pablo Alonso, MD
CareMax Market Medical Director for South Florida

Appendix B: IRB Approval Letter

FLORIDA INTERNATIONAL UNIVERSITY

Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To: Dr. Derrick Glymph
CC: Samuel Altidor

From: Maria Melendez-Vargas, MIBA, IRB Coordinator

Date: April 8, 2022
Protocol Title: "Educational intervention to improve blood pressure measurement knowledge and skills among medical assistants: A quality improvement project."

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #: IRB-22-0144 **IRB Exemption Date:** 04/08/22
TOPAZ Reference #: 111575

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

MMV/em

Appendix C: Pretest and Posttest Questionnaire

FLORIDA INTERNATIONAL UNIVERSITY

Achieving Accurate BP Measurements: Pre and Posttest Questionnaire

Q1. Which of the following characterizes accurate blood pressure measurement?

- Having the patient stand for blood pressure measurement
- Asking patients to let their arms rest quietly on their lap
- Recording the exact blood pressure instead of rounding to the nearest 10
- Measuring blood pressure without a rest period

Q2. Taking multiple blood pressure readings in one visit leads to a more reliable reading than a single reading. Why is this true?

- Taking multiple readings increases the patient's heart rate
- Taking multiple readings ensures that subsequent readings are higher than the first reading, which is usually low
- Taking multiple readings allows you to round the blood pressure to the nearest 5
- Taking multiple readings increases the likelihood that the measured value is close to the true value

Q3. **Which of the following statements regarding patient positioning for blood pressure measurement is correct?**

- The patient's legs should hang freely from the edge of the examining tale during blood pressure measurement
- The cuffed arm should be able the level of the heart during blood pressure measurement

- The patient should hold his/her arm away from the body during blood pressure measurement
- The patient's back should be supported during blood pressure measurement

Q4. Which of the following statements about placement of an automated blood pressure cuff is correct?

- Placing the blood pressure cuff over a thin shirt sleeve is acceptable
- The blood pressure cuff should be centered over the radial artery
- It is acceptable to use a cuff that is too large for the patient's arm, but not too small
- Placement of the cuff on the forearm is recommended in obese patients

Q5. The use of a regular adult cuff when a larger one is required would

- Give a falsely high blood pressure reading
- Give a falsely low blood pressure reading
- Have no impact on blood pressure reading
- Be more comfortable for the patient

Q6. The use of a large adult cuff when a regular one is required would

- Give a falsely low blood pressure reading
- Give a falsely high blood pressure reading
- Be more comfortable for the patient
- Have no impact on blood pressure reading

. **Which of the following statements regarding blood pressure measuring equipment is correct?**

- Automated blood pressure devices should be calibrated daily Blood pressure cuffs should be inspected regularly for leaks

- Automated blood pressure cuffs should be cleaned with soap and water after each use
- Most home blood pressure monitors require the use of a stethoscope

Q7. An obese patient comes for a blood pressure measurement. The extra-large (XL) cuff that comes with the blood pressure measurement device is too small for the patient. How should the medical assistant proceed?

- Use the cuff as is

  Wrap the cuff around the patient's forearm to measure blood pressure
- Obtain a manual blood pressure using the thigh cuff instead of the automated or semiautomated measuring device
- Inform your provider that it is not possible to obtain blood pressure measurement on this patient

Q9. An automated blood pressure device displays an error code. What should the medical assistant do next?

- Call the manufacturer of the device
- Stop taking blood pressure on that patient and record "error" in the EMR
- Look at the device and the patient and think stepwise about what might have happened
- Try retaking the blood pressure using the other arm

Q10. How can the medical assistant position the patient's arm at the correct level during blood pressure measurement?

- Have the patients hold their arm above heart level
- Have the patients hold their arm below heart level
- Support the patient's arm on a flat surface at heart level during the measurement
- Move the patient's arm higher for each subsequent reading

Q11. A 22-year-old female with no history of hypertension is seeing her doctor for a routine physical. According to correct protocol, how should the medical assistant measure her blood pressure?

- Take a single manual reading using the wall-mounted cuff
- Take multiple readings using the wall-mounted cuff and record the average
- Take a single reading using reading using the automated or semiautomated device
- Take an average reading using the automated or semiautomated device

Q12. Which one of the options is *not* one of the five critical actions that can help you take accurate blood pressure readings every time? Choose the best answer and select Submit.

- Provide BP reading to the patient both verbally and in writing
- Correctly document BP readings
- Properly prepare and position the patient
- Talk with patients to put them at ease
- Use proper technique to measure BP

  Take the proper number and type of BP measurements

Q13. What is the correct way to position a patient for blood pressure measurement? Select all that apply.

- The patient should not be talking while you take a blood pressure reading.
- The patient's arm should be supported while taking a blood pressure reading.
- The patient's legs should be uncrossed while you take a blood
- The patient should be sitting on the exam table while you take a blood pressure reading.
- Those patients should be seated with their backs supported.

Q14. How quickly should the MA deflate the cuff when taking a manual blood pressure measurement?

- 2mm Hg per second
- 4mm Hg per second
- 6mm Hg per second.
- 8mm Hg per second

Q15. True or false: ideally, preparation for blood pressure measurements start before patients present to the medical clinic.

- True
- False

Q16. **True or false: it is acceptable to ask to take the patient's temperature or medical history while the blood pressure measurement is in progress.**

- True
- False

Q17. True or false: the width of the cuff should be at least 40% to 50% of the patient's upper-arm circumference.

- True
- False

Q18. True or false: for a proper fit, the BP cuff's air bladder should encircle 75% to 100% of the patient's upper-arm.

- True
- False

Q19. True or false: it is acceptable for the BP cuff's bladder to overlap on itself after being wrapped around the patient's arm.

- True
- False

Q20. True or false: the "gold standard" for consistently accurate BP measurements is the manual device.

- True
- False

Appendix D: Demographics Questionnaire

FLORIDA INTERNATIONAL UNIVERSITY

Achieving Accurate BP Measurements: Demographics Questionnaire

What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

What is your ethnicity?

- White/Caucasian
- Black/African American - non-Hispanic
- Hispanic
- Other

How many years of experience do you have?

- 0-5 year
- 5 to 10 years
- 10+ years

Have you ever received any training on blood pressure measurements?

- Yes
- No

If so, how long ago?

- Within the past six months

- Within the past year
- Within the past two years

  More than two years ago

  I did not have any blood pressure measurement training

Powered by Qualtrics

Appendix E: Recruitment Letter

FLORIDA INTERNATIONAL UNIVERSITY

INFORMATIONAL LETTER

Educational intervention to improve blood pressure measurement knowledge and skills among medical assistants: A quality improvement project.

Hello, my name is Samuel ALTIDOR, MSN, APRN, FNP-BC. I am a Doctor of Nursing Practice (DNP) candidate at Florida International University (FIU). You have been selected to participate in a quality improvement project about enhancing blood pressure measurements. This study aims to develop an educational program to improve medical assistants' knowledge and skills regarding accurate blood pressure measurements in the medical office. If you decide to be in this project, you will be one of ten people in this research study. Participation in this study will span one day. If you agree to be in the study, I will ask you to do the following things:

1. Complete a 20-question pretest.

2. Participate in a 40–60-minute presentation about correctly measuring blood pressure in the medical office.

3. Complete a 20-question posttest.

There are no foreseeable risks or discomfort to you for participating in this study. Potential benefits of your participation include improved knowledge of the proper techniques for accurate blood pressure measurements in the medical office. This project is expected to benefit society by accurately measuring blood pressure and reducing the misdiagnosis, overtreatment, or undertreatment of patients suffering from hypertension.

There is no cost or payment to you; if you have questions while taking part, please stop me and ask.

You will remain anonymous. The records of this project will be kept private and protected to the fullest extent provided by law. In any sort of report, we might publish, we will not include any information that will make it possible to identify you. Project records will be stored securely, and only the researcher team will have access to the records. However, your records may be inspected by authorized University agents or other agents who will also keep the information confidential.

If you have questions for one of the researchers conducting this study, you may contact Samuel ALTIDOR at (9540 701-3789 or salti008@fiu.edu.

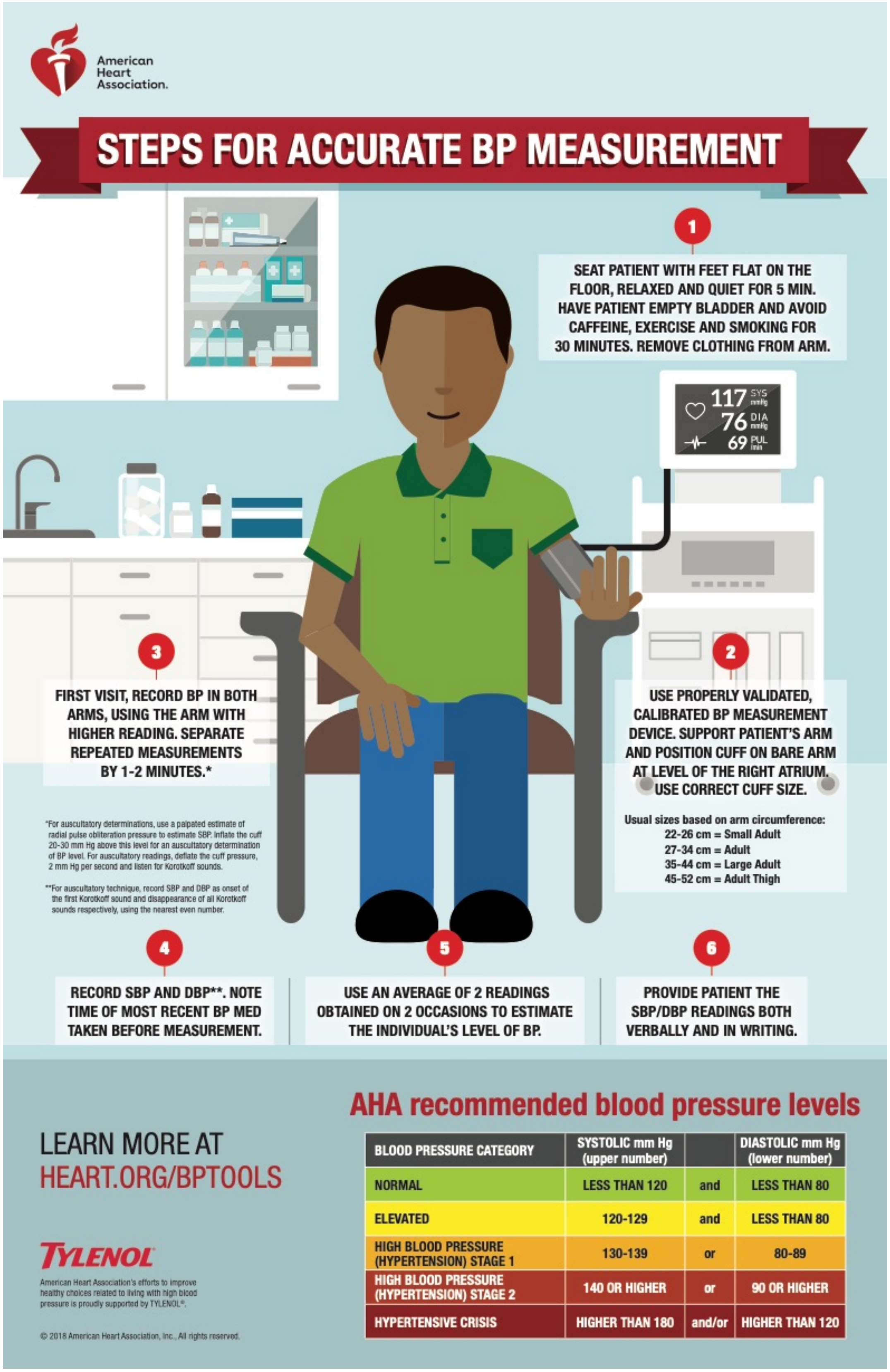
If you would like to talk with someone about your rights of being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

Participation in this project is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop. You may keep a copy of this form for your records.

Sincerely,

Samuel ALTIDOR, MSN, APRN, FNP-BC

Appendix F: AHA BP Measurement Poster



Appendix G: Technique Quick-Check

TARGET:BP | American Heart Association | AMA

Technique quick-check

Excellent measurement technique requires training and skill building, but a few common problems related to patient preparation and positioning often account for unreliable readings.[1, 2]

Use this tool to **verify** everyone in your practice or health center obtains blood pressure readings the right way and the same way every time. **Complete** four observations for each team member (e.g., medical assistant, nursing staff and physicians) who regularly takes blood pressure measurements, using one sheet for each person. **Repeat** on a quarterly or monthly basis or as needed.

General information		
Site name:	Date:	
Observer name(s):	Observation location (clinic, unit, etc.):	

	Patient #1			Patient #2			Patient #3			Patient #4		
Device used	Yes	No	Comments	Yes	No	Comments	Yes	No	Comments	Yes	No	Comments
1. Used a manual device	☐	☐		☐	☐		☐	☐		☐	☐	
2. Used an automated device	☐	☐		☐	☐		☐	☐		☐	☐	
Additional notes on availability, accessibility, quality and/or use patterns of blood pressure measurement devices in the practice (optional):												
Patient preparation and positioning	Yes	No	If no, why not?	Yes	No	If no, why not?	Yes	No	If no, why not?	Yes	No	If no, why not?
1. Patient in the correct position ...												
1.1. Seated with back supported	☐	☐		☐	☐		☐	☐		☐	☐	
1.2. Feet flat on the floor or footstool	☐	☐		☐	☐		☐	☐		☐	☐	
1.3. Legs uncrossed	☐	☐		☐	☐		☐	☐		☐	☐	
1.4. Arm bare	☐	☐		☐	☐		☐	☐		☐	☐	
1.5. Arm supported	☐	☐		☐	☐		☐	☐		☐	☐	
1.6. Arm at heart level	☐	☐		☐	☐		☐	☐		☐	☐	
2. Cuff used is correct size*	☐	☐		☐	☐		☐	☐		☐	☐	
If this is a confirmatory measurement (that is, a repeat measurement), then also check the following...												
3. Was the patient asked to empty his/her bladder prior to the repeat measurements?	☐	☐		☐	☐		☐	☐		☐	☐	
4. Did the patient rest quietly for at least five minutes (no speaking or texting) before the repeat measurement?	☐	☐		☐	☐		☐	☐		☐	☐	
5. Were at least three more measurements obtained?	☐	☐		☐	☐		☐	☐		☐	☐	
Additional notes on issues related to patient preparation, positioning and cooperation with use of technique (optional):												