EDUCATION OF BLOOD PRESSURE MEASUREMENT: A QUALITY IMPROVEMENT PROJECT

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Jessica Marie Ahumada, titled, Education of Blood Pressure Measurement: A Quality Improvement Project, and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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LAND ACKNOWLEDGEMENT

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

TABLE OF CONTENTS

LIST OF FIGURES 8

LIST OF TABLES 9

ABSTRACT 10

INTRODUCTION 12

Background Knowledge and Significance 13

Local Problem 14

Arizona Rates of Hypertension 14

Rates of Hypertension at the Project Site 14

Intended Improvement 16

Project Purpose 16

Project Question 16

Project Objectives 16

Theoretical Framework 16

Lewin's Theory of Planned Change 16

Unfreezing 17

Change 18

Refreezing 18

Literature Synthesis 19

Evidence Search 19

Comprehensive Appraisal of Evidence 20

Lack of Awareness 21

Continuing Education 22

Multi-modal Approach to Teaching BP 22

Strengths of Evidence 23

Weaknesses of Evidence 23

Gaps and Limitations 24

METHODS 25

Project Design 25

TABLE OF CONTENTS – Continued

Model for Implementation 25
Part 1 – IHI Model for Improvement 26
Part 2 – Plan-Do-Study-Act (PDSA) Cycle 26
Plan 26
Do 27
Study 27
Act 27
Setting and Stakeholders 28
Setting 28
Stakeholders 28
Planning the Intervention 29
Participants and Recruitment 30
Consent and Ethical Considerations 31
Data Collection 31
Data Analysis 32
RESULTS 32
Outcomes 33
Sample Size and Demographics 33
Data Analysis 34
Question Topics 34
Factors Affecting BP Measurement Accuracy 35
Body Position During BP Measurement 35
Cuff Size 36
Wait-Times During BP Measurement 36
Miscellaneous BP Measurement Topics 37
DISCUSSION 39
Summary 39
Interpretation 39

TABLE OF CONTENTS – Continued

Implications ... 42

Practice ... 42

Education ... 42

Research ... 43

Policy ... 43

Limitations ... 43

DNP Essentials Addressed ... 44

Conclusions ... 45

Plan for Sustainability ... 45

Plan for Dissemination ... 45

Funding ... 45

APPENDIX A SITE APPROVAL/AUTHORIZATION LETTER ... 47

APPENDIX B CONSENT DOCUMENT (DISCLOSURE AND CONSENT FORM) ... 51

APPENDIX C RECRUITMENT MATERIAL (RECRUITMENT EMAIL AND FLYER) ... 53

APPENDIX D EVALUATION INSTRUMENTS (PRE-POST-INTERVENTION SURVEYS) ... 56

APPENDIX E PARTICIPANT MATERIAL (EDUCATIONAL POWERPOINT PRESENTATION SLIDES) ... 61

APPENDIX F PROJECT TIMELINE ... 72

APPENDIX G LITERATURE REVIEW GRID ... 75

APPENDIX H OTHER DOCUMENTS AS APPLICABLE TO THE PROJECT (BUDGET) ... 81

REFERENCES ... 83

LIST OF FIGURES

Figure 1 *Flow Diagram for Literature Synthesis Article Selection*..20

LIST OF TABLES

Table 1 *Participant Demographics*....................33
Table 2 *Pre- and Post-Presentation Survey Scores*....................34
Table 3 *Survey Responses*....................38

ABSTRACT

Purpose

This project's purpose was to increase medical assistants' (MAs') knowledge and understanding of the recommended best practices for blood pressure (BP) measurement.

Background

Nearly half the population in the United States (US) has been diagnosed with hypertension, leading to a variety of complications including diabetes complications, cerebrovascular disease, ischemic heart disease, kidney disease, etc. Only 39.64% of patients diagnosed with hypertension have controlled hypertension. To complicate this issue, often inaccurate BP measurements are obtained leading to inappropriate medication prescribing and errors with staging and treating hypertension.

Methods

MA participants from TMC One Wyatt in Tucson, Arizona were invited to a presentation on best practices for BP measurement. Prior to the presentation, participants completed a pre-intervention survey with questions about best practices for BP measurement technique. Then the presentation was given covering best practices for BP measurement and the importance of adhering to the recommendations. Participants then took a post-intervention survey to assess learning.

Results

Nine MAs participated in the project. In the pre-intervention survey, participant scores ranged from 40% to 80% with a median score of 60% and an average score of 57.78%. In the post-presentation survey, participant scores ranged from 60% to 93.33% with a median score of

93.33% and an average score of 87.41%. The overall increase in average scores was 35.56%. Participants demonstrated strong prior knowledge of certain aspects of BP measurement such as positioning of the legs and feet and the effects of using the wrong cuff size. There were also aspects of BP measurement participants exhibited increased knowledge after the presentation such as factors affecting BP measurement or determining the correct cuff size. In addition, some topics showed little to no improvement of knowledge such as the effects of talking during the five-minute rest period or the wait time in between taking multiple BP measurements.

Conclusions

Based on the overall increase of knowledge, this project supports providing periodic refresher trainings on BP measurement to improve and maintain knowledge and understanding of best practices.

INTRODUCTION

In primary care practice, hypertension is one of the most frequently diagnosed conditions (Finley et al., 2018). In the United States (US), nearly half the population, 48.1%, has a hypertension diagnosis, necessitating lifestyle changes and medications for management (Centers for Disease Control and Prevention [CDC], 2023). One issue with this diagnosis, however, is blood pressure (BP) measurements taken in primary care offices can often be inaccurate due to different factors. According to Padwal et al. (2019) a 5-mmHg difference in systolic BP can lead to an incorrect classification of a patient's hypertension status. Furthermore, this can cause inappropriate hypertension medication prescribing and dosing in 20-45% of cases (Padwal et al., 2019).

Factors that cause inaccurate BP measurements can be patient-related, procedure-related, equipment-related, and observer-related. Patient-related factors include caffeine use, tobacco use, or bladder distension. Procedure-related factors include improper patient positioning, fast deflation rate, and insufficient rest before the BP is taken. Equipment-related factors involve using an improper BP cuff size and automated device variability. Lastly, observer-related factors consist of rounding the auscultatory measurements to zero as well as hearing deficits (Padwal et al., 2019). Most causes of inaccurate BP measurements can be remediated by incorporating proper BP techniques and training to healthcare professionals. Because of these outside causes of inaccurate BP measurements, healthcare professionals need to be trained in best practices for BP measurement and understand why accuracy is important. Therefore, the purpose of this quality improvement (QI) project was to increase knowledge of best practices for BP measurement to medical assistants (MAs) involved with performing vitals on patients. This intervention was conducted in a primary care clinic. MAs received not only training on best practices for BP measurement but also a review of the importance of accuracy in these measurements. The training was provided through a live presentation by the project lead, a Doctor of Nursing Practice (DNP) candidate, conducting the QI project. Assessment for learning was measured through pre- and post-intervention surveys.

Background Knowledge and Significance

In the US, nearly half the population has a diagnosis of hypertension, which can lead to a wide variety of complications as well as mortality. Some complications include cerebrovascular disease, ischemic heart disease, heart failure, and chronic kidney disease. Hypertension also contributes to complications associated with diabetes mellitus (Dunphy et al., 2023). Though almost half the population has been diagnosed with hypertension, it is uncontrolled in most patients. Chobufo et al. (2020) found in the US, only 39.64% of patients on BP medications have controlled hypertension. To further complicate this issue, healthcare professionals often obtain inaccurate BP measurements leading to inappropriate medication prescribing in 20-45% of patients (Padwal et al., 2019)

Inaccurate BP measurements can cause errors in staging patients' hypertension as well as treating it. As mentioned, an inaccurate systolic measurement even as small as 5 mmHg can affect the classification of a patient's hypertension, for example, speaking while the BP is being measured can increase it (Padwal et al., 2019). This small increase in systolic BP could cause a patient with a stage 1 hypertension diagnosis to become diagnosed with stage 2 hypertension, potentially leading to overdosing on hypertension medication. Another way BPs can be measured inaccurately is by using the wrong cuff size. For example, if a healthcare professional uses a cuff that is too large, this could produce a BP reading that is inaccurately lower, which could change the recommendations of the practitioner (Padwal et al., 2019). Using a cuff that is too small could also lead to an incorrectly higher BP measurement and over-prescribing hypertension medication due to pseudo-resistant hypertension (Bhatt et al., 2016). Whether the BP measurement inaccuracies cause under-prescribing or over-prescribing, both inaccurately contribute to the US percentages of controlled and uncontrolled hypertension. Furthermore, this demonstrates a need for increasing accurate BP measuring through proper technique performed by healthcare support staff.

Local Problem

Arizona Rates of Hypertension

In Arizona, 30.9% of the population has a reported hypertension diagnosis. The age ranges with the highest rates of hypertension are 55-64 years of age, and 65 years and older (Center for the Future of Arizona, n.d.). The group with the highest rates of hypertension is 65 years and older, with 56.8% reporting a hypertension diagnosis. The 56-64 years age range has the second highest rates with 42.9% having hypertension. The ethnicities with the highest rates of hypertension in Arizona are African Americans and whites. Of the African American population, 38.3% of this group has been diagnosed with hypertension, while 34.2% of whites have this diagnosis. There is a higher percentage of men diagnosed with hypertension, 34%, than women, 27.9% (Center for the Future of Arizona, n.d.).

Rates of Hypertension at the Project Site

Tucson Medical Center (TMC) Health is a local non-profit health system in Tucson, Arizona. It consists of multiple hospitals in Southern Arizona as well as clinics for primary care and specialty practices. This QI project took place at TMC One Wyatt, an outpatient clinic within the TMC Health system. At this time, there were five primary care providers working in the clinic. These providers treated and diagnosed hypertension according to the most current American College of Cardiology (ACC) and American Heart Association (AHA) recommendations, with a parameter of <130/80 mmHg being considered controlled hypertension. In addition, treatment also was guided by thresholds based on the atherosclerotic cardiovascular disease risk score. However, for insurance reimbursement and quality metrics, TMC One Wyatt classified controlled hypertension using an older parameter of <140/90 mmHg. Therefore, the following quality metrics for controlled hypertension were <140/90 mmHg. Before the intervention took place, the percentage of patients with controlled hypertension in this clinic varied between the five providers from 60-91% with an average of 75.98%. This meant 24.02% of the clinic patients had uncontrolled hypertension. As discussed, inappropriate hypertension medication prescribing occurs in 20-45% of patients (Padwal et al., 2019). With this in mind, it was possible there may have been inaccurate prescribing of hypertension medications due to inaccurate BP measurements at the clinic. According to Padwal et al. (2019), healthcare professional training and periodic re-training is critical for encouraging best practices for BP technique, therefore it was considered beneficial by the project lead to provide a presentation on best practices for BP measurement to the MAs of TMC One Wyatt clinic to promote BP measurement accuracy.

Intended Improvement

Project Purpose

The purpose of this project was to increase MAs' knowledge and understanding of best practices of BP measurement. This was accomplished through providing a presentation on best practices as recommended by the ACC and AHA. Participants were given a pre- and post-intervention survey containing the same questions to assess learning. The project lead thought providing a presentation on BP measurement techniques could potentially help promote BP measurement accuracy. Furthermore, this could help promote accurate diagnosis and treatment of hypertension in clinic patients.

Project Question

Will a refresher training on BP measurement, using ACC and AHA best practices, increase MAs' knowledge of proper BP measurement techniques?

Project Objectives

The proposed project objectives were the following:

1. Increasing MAs' knowledge of the ACC and AHA recommended best practices for BP measurement through a BP measurement refresher training.
2. Increasing understanding of the importance of following the ACC and AHA recommendations.

Theoretical Framework

Lewin's Theory of Planned Change

Kurt Lewin's theory of planned change provided the theoretical framework to guide this QI project. It asserts that change consists of driving forces, restraining forces, and equilibrium.

Driving forces are forces that push a change to occur, and restraining forces are counter-driving forces. When a system is in equilibrium, there are equal amounts of driving and restraining forces, and no change happens (Hawkes & Hendricks-Jackson, 2017). In this QI project, before the educational intervention had been given, the clinic could be considered in equilibrium as there had not been any recent changes to MAs' practices of taking BP measurements. The driving forces of Lewin's theory were considered best practices for BP measurement, while the restraining forces were the MAs' lack of complete adherence to the best practices for BP measurement.

Lewin's theory describes three steps to implementing change: unfreezing, change, and refreezing (Hawkes & Hendricks-Jackson, 2017). The following describes each stage and how it was implemented in this project.

Unfreezing

Unfreezing refers to the agitation of the equilibrium by increased forces of change (Hawkes & Hendricks-Jackson, 2017). In this project, the unfreezing stage involved providing the pre-intervention survey before the BP presentation. This survey contained multiple-choice questions asking about the different aspects of BP measurement. Example questions included, "How long must a patient remain seated before BP measurements are taken?" and "How much of the arm does the BP cuff bladder need to encircle?" The goal of the pre-intervention survey was to unfreeze equilibrium by requiring MAs to question whether they were performing BP measurements correctly.

Change

Change involves moving people to a new level of equilibrium by presenting the desired outcome and challenging their thoughts, feelings, and behaviors toward that outcome (Hawkes & Hendricks-Jackson, 2017). In this project, the goal of the presentation was to encourage the participating MAs to implement best practices around BP measurement. Because each MA had their own way of taking BPs, individual changes needed to meet best practice guidelines likely varied. For example, some MAs may have allowed patients to sit for five minutes before having their BPs taken. Some MAs might have used a cuff size based on the patient's arm size, while others might not have. Some MAs might or might not have asked patients if they consumed caffeine or tobacco before the appointment. Each MA needed to make changes based on their current individual practices.

It was also essential for participants of this project to understand the reasons why best practices of BP measurement needed to be implemented. Using evidence-based information, the project lead also explained in the presentation how implementing best practices positively influenced hypertension management. For example, MAs needed to be aware that an inaccurate BP measurement of as little as 5 mmHg could cause inaccurate dosing of BP medication. Having an understanding that how they took BP measurements had a large impact on BP treatment could help convince MAs to incorporate proper BP measurement techniques into their practices.

Refreezing

Refreezing in Lewin's theory of planned change can be described as achieving a new equilibrium that contains the adopted change (Hawkes & Hendricks-Jackson, 2017). In this QI project, refreezing would happen when participants decided to implement the needed changes for obtaining accurate BP measurements. These improvements in proper BP technique would be the new equilibrium. Due to time constraints, this project was not able to confirm if MAs made the necessary changes to implement ACC and AHA recommendations to their practices of BP measurement. Follow-up on post-intervention practice changes could be an idea for a future QI project.

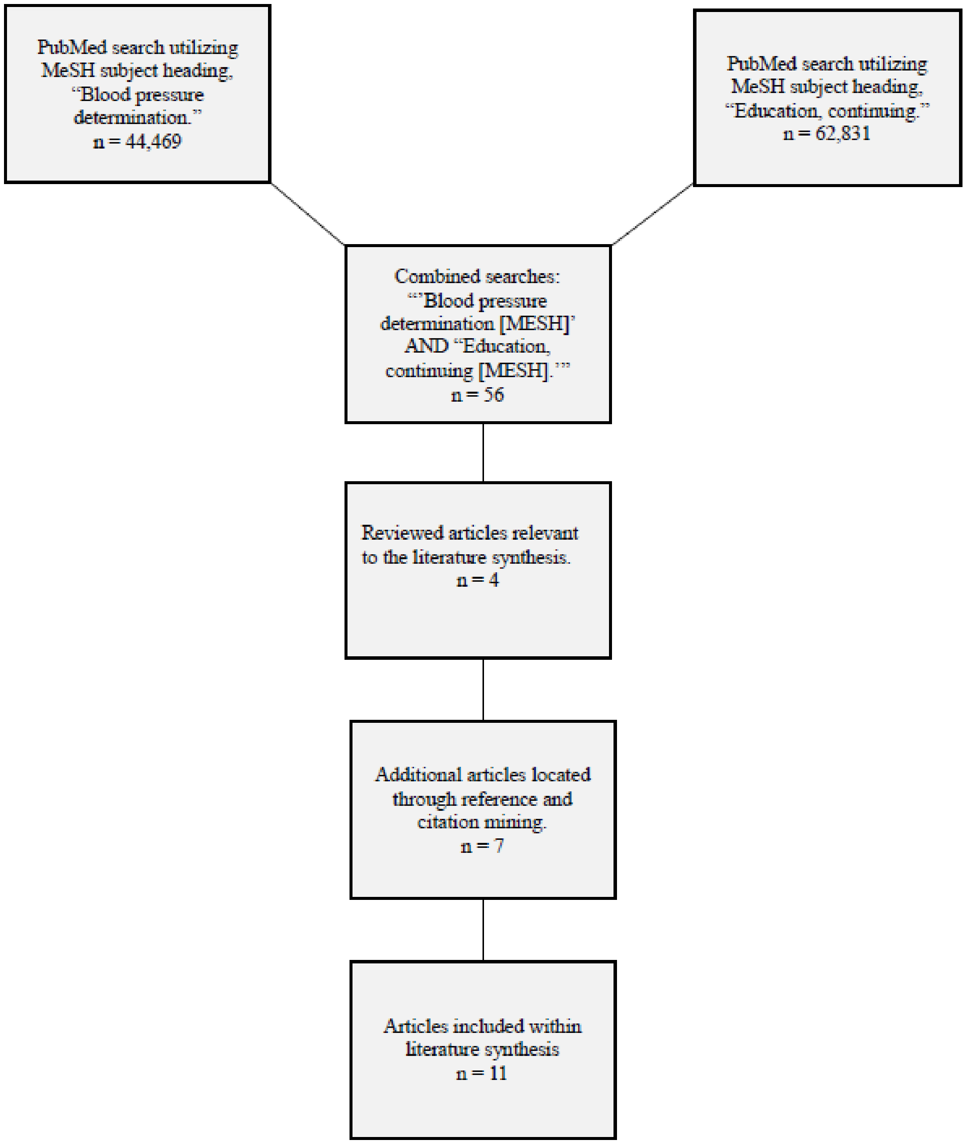
Literature Synthesis

Evidence Search

The database used for the literature synthesis was PubMed. The subject heading, “Blood pressure determination” was applied to Medical Subject Headings (MeSH), which produced 44,469 results. Another subject heading, “Education, continuing” was applied in a different MeSH search, which produced 62,831 search results. Both searches were combined: “(‘Education, continuing’ [MeSH]) AND (‘Blood pressure determination’ [MeSH]).” This narrowed the results to 56 articles. By combining the subject headings, the search results decreased significantly; there were no date limits used in the filters, nor were there any other filters applied. Of the 56 articles, many of them were about teaching providers about BP management, which was irrelevant to the synthesis. Only four were chosen as relevant because they involved teaching BP to healthcare professionals. An additional seven studies were located through reference and citation mining. This led to a total of 11 articles (Figure 1).

Figure 1

Flow Diagram for Literature Synthesis Article Selection



Comprehensive Appraisal of Evidence

The 11 articles chosen for review focused on teaching proper BP measurement techniques to healthcare workers or health sciences students. Common themes across studies were lack of awareness of proper BP technique, the need for continuing education on BP measurement, and the need for multi-modal teaching styles when demonstrating proper BP measurement techniques. These themes are expanded below.

Lack of Awareness

All the 11 selected studies addressed a lack of awareness of different aspects of BP measurement that were exposed through the pre-education intervention assessments. In the Elzeky and Shahine (2022) study, the pre-assessment total knowledge scores for BP measurement were only 54-55% in the intervention group and control group, respectively. Similarly, Altidor (2022) observed in clinic MAs limited awareness of correct patient positioning, proper sphygmomanometer technique, correct BP measurements, and reporting of BP readings to patients. Hull et al. (2013) found 10% of MAs did not perform BP measurements accurately in pre-intervention assessments, while Hayer et al., (2022b) found in pre-intervention assessments participants performed less than half the skills needed for proper BP technique. Also, in the Dickson and Hajjar (2007) study, there was one community health RN who did not know how to perform BP measurements.

The literature showed a lack of awareness in some aspects of BP measurements more than others. Block et al. (2018) and Brokalaki et al. (2008) noted participants were not aware of the waiting period between taking three BPs. Pre-education intervention assessments also noted use of incorrect BP cuff sizes to be common: 83% and 91% of study participants in Bachur et al. (2021) and Daniel et al. (2019), respectively. While the percentage was lower in Hayer et al.'s (2022a) study, 34% of participants still showed a lack of knowledge in choosing the right BP cuff size and positioning patients for accurate BP measurement. Eley et al. (2021) also identified choosing the wrong cuff size as common in medical staff working with obese patients and conducted an intervention focused solely on choosing correct cuff sizes when working with this patient population.

Continuing Education

Some of the studies addressed the need for continuing education on BP measurements. Altidor (2022) and Elzeky and Shahine (2021) found nearly half of the participants in their studies had not received BP measurement training in the last two years or five years, respectively.

In the Dickson and Hajjar (2007) study, a one-month post-intervention follow-up showed a decline in BP skills suggesting the need for regular continuing education on BP measurement. Block et al. (2018) also discussed in their study the need for regular continuing education as knowledge and skills decline over time in healthcare settings. All these studies suggest the need for healthcare facilities to provide continuing education at regular intervals to optimize the accuracy of BP measurements taken by their staff.

Multi-modal Approach to Teaching BP

A few of the studies addressed the need for the BP technique to be taught in a multi-modal approach to successfully improve knowledge and performance. Daniel et al. (2019) provided an expository/dialogue class as well as a board game to teach proper BP techniques to RN professionals in a hospital setting. Another unique method of teaching BP measurement techniques was that of Ezkely and Shahine (2022). They performed a randomized control trial in which the control group received routine hospital education, while the intervention group received routine hospital education as well as 24 educational sessions (one session a day) via video clips, audio clips, and text messages. The intervention group showed higher posttest scores than the control group, supporting the idea of multi-modal education. Hayer et al., 2022 also discussed the need for multi-modal education as their e-module on BP measurement improved knowledge in certain aspects of BP measurement, but not others, suggesting that in-person training is also necessary for teaching BP.

Strengths of Evidence

Two strengths in the literature are the large study populations as well as increased knowledge and performance improvement after the educational interventions. The range of participants in these studies were 30 to 478 participants (Bachur et al., 2021; Block et al., 2018; Brokalaki et al., 2008; Daniel et al., 2019; Eley et al., 2021; Elzeky & Shahine, 2022; Hayer et al., 2022a; Hayer et al., 2022b; Hull et al., 2013). Large sample sizes in research help provide a better representation of the overall population or population group (Andrade, 2020). Also, all the included studies showed either increased knowledge of BP measurement, improved performance, or both, after the educational interventions. Altidor (2022), Bachur et al. (2021), Hayer et al. (2022a), and Hull et al. (2013) all showed an increase of participant knowledge after receiving an educational session on proper BP measurement. Brokalaki et al. (2008) showed an increase in BP performance after a total of two educational sessions of BP measurement. The studies that showed both increased knowledge and performance were Block et al., (2018), Elzeky and Shahine (2022), Eley et al. (2021), Hayer et al. (2022b), Daniel et al., (2019), and Dickson and Hajjar (2007).

Weaknesses of Evidence

Weaknesses of the literature include lack of follow-up time or short follow-up time, and small population samples in some of the studies. Eight of the 11 studies had no follow-up after the educational intervention (Altidor, 2022; Block et al., 2018; Brokalaki et al., 2008; Daniel et al., 2019; Eley et al., 2021; Elzeky & Shahine, 2022; Hayer et al., 2022a; Hull et al., 2013). Three of the studies had a short follow-up time of one month (Dickson & Hajjar, 2007; Hayer et al., 2021; Bachur et al., 2021). Having a short follow-up time or no follow-up gives little to no information on how long the effects of the intervention last, therefore it could not be determined how long the improvements or knowledge were sustained in these studies. Another weakness to the literature, as mentioned, is three of the studies had small samples sizes ranging from 5-11 participants (Altidor, 2022; Dixon & Hajjar, 2007). Small sample sizes can lead to a type II error, or false rejecting or acceptance of a null hypothesis, (Nayak, 2010). Due to the small sample sizes, it cannot be generalized that the intervention of a BP refresher training would improve participants' knowledge and performance of BP measurement. However, taking into consideration that the other eight studies had similar outcomes with larger populations indicates that results and outcomes are likely to be credible in the studies with smaller population sizes.

Gaps and Limitations

A gap in the literature was that there were only two studies that focused specifically on education interventions with MAs (Altidor, 2022; Hull et al., 2013). The other eight studies had study populations of nurses, nursing students, or mixed groups of healthcare professionals (Bachur et al., 2021; Block et al., 2018; Brokalaki et al., 2008; Daniel et al., 2019; Dickson & Hajjar, 2007; Eley et al., 2021; Elzeky & Shahine, 2022; Hayer et al., 2022a; Hayer et al., 2022b). This gap in the literature suggests that more research is needed with the MA population. In addition, this gap in the literature reduces generalizability to MAs, which is a limitation. For example, Block et al. (2018) included nurses and MAs as study participants, and Hayer et al.

(2022b) included physicians, advanced practice providers, nurses, nursing students, and MAs as study participants. These two studies had participants with varying levels of knowledge and experience with taking BP measurements. This could have influenced the improvement of knowledge and performance in an unequal manner. Although gaps and limitations occur in the literature, the consistency across studies of increased knowledge and improved performance supporting conducting a similar intervention with MAs exclusively.

METHODS

Project Design

MA participants were given a presentation on best practices of BP measurement as recommended by the ACC and AHA. Their knowledge was measured through a pre- and post-intervention survey. Survey questions asked about different aspects of BP measurement such as how long patients should sit before BP measurement, choosing the correct cuff size, or if talking during a resting BP measurement could produce an inaccurate result. The pre- and post-intervention surveys made the project quantitative. All participants were in the intervention group.

Model for Implementation

Quality improvement uses various models borrowed from other industries to improve patient care and healthcare costs (Adams, 2018). The model guiding this project was the Model for Improvement created by the Institute for Healthcare Improvement (IHI), which has been widely adopted in healthcare (Adams, 2018). The two parts of this framework, as well as its application to this QI project, are described in more detail below.

Part 1 – IHI Model for Improvement

The first part of the IHI's Model for Improvement states three fundamental questions that drive the implementation and can be asked in any order: "What are we trying to accomplish? What change can we make that will result in improvement? How will we know that a change is an improvement?" (Adams, 2018; IHI, n.d.). In this QI project, what was attempted to be accomplished was improving BP measurement practices to obtain the most accurate resting BPs. The change being made was increasing MAs' knowledge and understanding of best practices for BP technique using the guidelines of the ACC and the AHA. Lastly, to ascertain the education intervention influenced an increase of knowledge and understanding of best practices for BP measurement technique, there was a pre- and post-intervention survey to assess learning.

Part 2 – Plan-Do-Study-Act (PDSA) Cycle

The second component of the Model is the Plan-Do-Study-Act (PDSA) cycle. This cycle allows small changes to be tested in a controlled manner (IHI, n.d.). The following describes how the PDSA cycle was applied to this QI project.

Plan

The planning phase of this project involved creating the presentation on BP measurement as well as the pre- and post-intervention surveys. Another part of this phase was obtaining multiple approvals from different stakeholders. The project lead consulted with and gained approval for the project idea from a family nurse practitioner (FNP) administrator at TMC One Wyatt. In addition, approvals to conduct the project were obtained from the University of Arizona (U of A) College of Nursing project committee members as well as the U of A institutional review board (IRB). Lastly, a presentation date was planned and email invitations were sent to the MAs at TMC One Wyatt clinic, along with a flyer invitation posted in the breakroom.

Do

In this phase of the Model, best practices of BP measurement were presented to the participants. Before the presentation, participants were given informed consent and completed the pre-intervention survey to assess prior knowledge. Then the presentation was given on proper BP technique using the ACC and AHA standards, as well as the importance of proper BP technique. After the presentation, participants completed a post-intervention survey to assess learning.

Study

The study phase consisted of analyzing the pre- and post-intervention surveys. This helped determine if the objectives and outcomes of the project were met. The survey results were entered into an Excel spreadsheet. The project lead analyzed the data comparing the pre- and post-intervention survey scores to determine if there was an increase in knowledge after the presentation was delivered.

Act

Lastly, the act phase of the Model happens after all the data has been collected and studied. The obtained data from the project provides conclusions on the effectiveness of the intervention which helps identify what went well and what needs improvement. This helps with developing small changes to improve the intervention and achieve more successful outcomes (IHI, n.d.). Due to time constraints, the act phase was not completed in this project. This phase could take place in a future project.

Setting and Stakeholders

Setting

The setting where this project was performed was TMC One Wyatt in Tucson, Arizona. At the time the project took place, this clinic consisted of five primary care providers, two general surgery providers, as well as a high-risk breast specialist. The support staff was comprised of 10 MAs, a registered nurse, a patient care coordinator, four front office staff, a clinical supervisor, and a senior manager. At the time of the project, the clinic saw about 100-110 patients on a typical day. The clinic was in central Tucson, where providers saw a variety of patients of different ages, ethnicities, educational backgrounds, and income classes. Most of the providers saw adult patients (18 years and older) exclusively, except for one provider who saw both adults and children for same-day appointments. At this clinic, one MA was assigned to each provider to perform vitals as well as other small procedures such as intramuscular injections, ear lavages, dressing changes, etc., on the patients. For BPs, MAs primarily performed auscultatory BP measurements on patients. It was required for MAs to complete a yearly skills competency training to demonstrate proficiency in skills related to their jobs which included performing BP measurements. This facility, however, did not have a protocol or standard operating procedure for BP measurements.

Stakeholders

There were multiple stakeholders in this QI project. Key stakeholders included the project lead, the MAs, the clinic FNP administrator, and the clinic manager. The project lead obtained project approvals from the IRB and committee chairs, presented the information to the MAs, and analyzed the project data. The MAs were project participants attending the presentation and completing the pre- and post-intervention surveys. The FNP administrator provided guidance with the project as well as approved the content of the presentation. Finally, the clinic manager also approved the project and helped with coordinating a meeting time for the presentation. Secondary stakeholders included the providers and patients, as MA improvements in BP measurement accuracy could influence diagnosis and prescribing.

Planning the Intervention

The project was implemented in the fall of 2024. Before implementation, the project lead consulted with the clinic manager to receive approval for the project and to reserve time for the presentation. MAs were emailed an invitation for the presentation, and a flyer invitation was posted in the break room. On the day of the presentation, all MAs were given informed consent in which the project lead discussed the purpose, proposed outcomes, and risks and benefits of participation. Participants were informed that the QI project's purpose and proposed outcomes were to teach proper BP techniques and the importance of adhering to proper BP technique. They were also given the benefits of the project which were increased knowledge and enhanced BP measurement accuracy. MAs were informed that there was no risk for participation. After informed consent, a pre-intervention survey was given on paper that asked questions about the proper BP technique and its importance. The pre-intervention survey also had questions regarding demographic data such as years of experience, certification, and the last time BP technique training was received. Following that, the presentation was given via PowerPoint. The presentation covered the ACC and AHA recommended best practices for taking BP measurements. It addressed recommendations such as asking patients about caffeine or tobacco consumption, having the patient sit for five minutes before BP measurement, using the propersized cuff, taking two to three BP measurements, etc. MAs were given the chance to ask any questions regarding best practices for BP measurement. In this clinic, MAs mainly used auscultatory BP cuffs, so there was an emphasis on technique for auscultatory BP measurements in the presentation. After the presentation, participants completed the post-intervention survey on paper containing the same BP technique questions as the pre-intervention survey. Completion of the post-intervention survey was the completion of MAs' participation in the project. To track individual improvement of knowledge, each MA received the pre-intervention survey and post-intervention survey together with a participant number written on them. Participants' names, or any other personal identifiers, were not used.

Participants and Recruitment

The participants in this project were the MAs of the TMC One Wyatt clinic. Three weeks prior to the presentation, they were invited via email, and a flyer was placed in the breakroom. The email gave information on the date and time of the lunch presentation, as well as the material that would be presented. A copy of the informed consent was attached to the email so participants could read it before attending the presentation. MAs were also notified they could be eligible to enter a drawing for one of two $25 restaurant gift cards with participation in the project. Any MA who wished to participate in the drawing wrote their name and email on a blank slip of paper (separate from the surveys) and dropped it into the drawing box. At the end of the presentation session, two winners were selected from the drawing box and the gift cards were emailed to them.

Consent and Ethical Considerations

Ethical principles must be considered whenever creating a quality improvement project involving human subjects. The four principles for ethics: beneficence, nonmaleficence, autonomy, and justice, were considered, and adhered to, when preparing for, and conducting this project. Beneficence, which is acting for the benefit of the participants (Varkey, 2020), was demonstrated through obtaining IRB approval of the project and not using identifying information of the participants. Also, providing an educational presentation would be of benefit to the participants as it could increase knowledge and understanding of BP measurement techniques. After obtaining IRB approval and de-identifying the participants, nonmaleficence, also known as "do no harm" (Varkey, 2020), was also followed. Autonomy, which is the ability to self-govern and make one's own decisions (Varkey, 2020), was adhered to by providing informed consent to the participants and emphasizing they had the autonomous choice to participate in the project. Lastly, the ethical principle of justice, which is the fair, equitable treatment of participants (Varkey, 2020), was followed through inviting all MAs to the presentation, providing informed consent to all the MAs who attended, and providing the same surveys and presentation information to all participants.

Data Collection

As mentioned, data was collected from the participants pre- and post-intervention surveys. With the pre-intervention survey, their prior knowledge was assessed. With the post-intervention survey, participants' learning from the presentation was assessed. Both surveys had the same questions. The results of the surveys provided information as to whether there was increased knowledge after the presentation was given.

Data Analysis

The data obtained from the surveys was entered into an Excel spreadsheet. Each survey question was marked as correct or incorrect for each participant, and their scores were entered into the spreadsheet. The increase in learning for each participant was determined by the difference in scores between the pre-intervention survey and the post-intervention survey. The average of the pre- and post-intervention surveys for all the participants was calculated and compared. In addition, demographic data collected such as the number of years working as an MA, whether participants were certified MAs, and where they received their last BP training was also collected and entered into Excel.

Data from this project will be stored on a secure computer only accessible by the project lead and kept on file per University of Arizona protocol for six years. Unidentified aggregate data was shared with the organization.

RESULTS

The intervention took place on September 26th, 2024, during lunch. As planned, the email invitation created by the project lead was sent out by the clinic manager on September 11th to notify the MAs of the project. On September 12th, 2024, a flyer was posted in the break room. The project lead also approached MAs during the clinic time between September 11th and September 26th to explain the project as well as answer questions they had regarding the project. The clinic manager who sent out the email invitation made this a mandatory education for the MAs. On the day of the intervention, the project lead emphasized that though this was a mandatory education, participation in the project was still voluntary. This meant if individuals did not want to participate, they did not need to complete the pre- and post-intervention surveys.

Outcomes

Sample Size and Demographics

On the day of the intervention, all 10 of the MAs in the clinic attended the presentation. Only one MA declined to participate in the project. As shown in Table 1, of the nine participants, three of them had less than one year of experience working as an MA, three of them had one to four years of experience, and two participants had five more years of experience. Regarding the last BP measurement training, seven of the participants had received BP measurement training within the last year, and one participant said their last training was more than one year ago. Five of the participants received their last BP training at TMC One Wyatt, while three of them received it at the MA school that they attended. When it came to certification, five of the participants were certified MAs, and four of them were not certified. There was one participant who only answered the question about certification and did not answer the other demographic questions.

Table 1

Participant Demographics

Demographics	Number of Participants
Participants with <1 year experience	3
Participants with 1-4 years of experience	3
Participants with ≥ 5 years of experience	2
Participants with MA certification	5
Participants who received BP training within the last year	6
Participants who received BP training > 1 year ago	2
Participants who received last training at TMC One Wyatt	5
Participants who received last training at MA school	3

Data Analysis

Overall, the data showed an increase in knowledge after the BP measurement presentation. In the pre-intervention survey, participant scores ranged from 40% to 80% of correctly answered questions with a median score of 60%, and an average score of 57.78%. After the presentation, the MAs completed the post-intervention survey with the same questions. In the post-intervention survey, participant scores ranged from 60% to 93.33% of correctly answered questions with a median score of 93.33%, and an average score of 87.41%. The overall increase in average scores was 35.56%. Table 2 highlights these results.

Table 2

Pre- and Post-Presentation Survey Scores

Participant	Pre-Presentation Survey Score (%)	Post-Presentation Survey Score (%)
1	60	93.33
2	60	93.33
3	40	86.67
4	60	80
5	73.33	93.33
6	53.33	60
7	46.67	93.33
8	46.67	93.33
9	80	93.33
Median	60	93.33
Average	57.78	87.41

Question Topics

The pre-intervention survey gave insight on participants' baseline knowledge while the post-intervention survey displayed what they learned from the presentation. There were some aspects of BP measurement participants demonstrated strong baseline knowledge of, while in other aspects they exhibited less knowledge. For some of the questions, they scored lower as a group in the pre-intervention survey but improved their scores in the post-intervention survey.

Below are pre- and post-intervention scores of the various BP measurement best practice topics. Table 3 also highlights these results.

Factors Affecting BP Measurement Accuracy

Question 1 was a multiple-choice, “circle all that apply” question that asked which factors could potentially cause an elevated resting BP. The group percentage of correct pre-intervention survey responses was 11.11%. After the presentation, 77.78% of the group answered the question correctly in the post-intervention survey. Another question addressing factors affecting BP measurement accuracy was question 3. It asked if talking during the five-minute rest period before the BP measurement could influence the reading. The pre-presentation and post-presentation surveys had the same score of 55.56%, showing no improvement.

Body Position During BP Measurement

The surveys contained four questions regarding body positioning during BP measurement that showed various results. Two of the questions, questions 5 and 7, demonstrated improvement of knowledge before and after the presentation. Question 5 was a true or false question asking if sitting on an exam table was proper body positioning. In the pre-intervention survey the percentage of correct responses was 22.22%, and in the post-intervention survey, 88.89% of the group answered it correctly. There was also an increase of knowledge on question 7 which asked about arm positioning during BP measurement. The number of correct responses increased from 77.78% to 88.89%. In question 6, which asked about the position of the legs and feet during BP measurement, participants displayed strong baseline knowledge as 100% of the group answered the question correctly on both surveys. Similarly, 100% of the group answered question 4 correctly in the pre-intervention survey which asked whether a patient should be sitting, standing, lying down, or squatting during BP measurement. In the post-intervention survey, however, one person answered it incorrectly reducing the group score to 88.89%.

Cuff Size

Like the body position questions, the group exhibited prior knowledge on some of the questions, while with others there was lower baseline knowledge that improved after the presentation. Questions 10 and 11 asked how a cuff size that was too large or too small could affect the BP reading. The entire group exposed awareness that a BP reading could be falsely lower with a cuff size that was too large and falsely higher with a cuff size that was too small. Pre- and post-intervention survey responses reflected this as 100% of the group answered the questions correctly in both surveys. Question 8 asked what percentage of the arm the cuff bladder needed to encircle, and 33.33% of the group answered this correctly in the pre-presentation survey. In the post-presentation survey, the average score increased to 100%

Similarly, question 9 asked what the best way was to determine the proper cuff size with two possible answers: measuring the arm or ensuring the index line fell within the index range. In the pre-presentation survey, 44.44% of the group responded correctly. The group score on this question increased to 88.89% in the post-presentation survey, revealing a 44.45% increase of knowledge.

Wait-Times During BP Measurement

There were two questions regarding wait times associated with BP measurements that participants demonstrated increased knowledge on in the pre- and post-presentation surveys.

Question 2 asked how long a patient needed to sit before their BP was taken. In the pre-intervention survey, only 33.33% of the group knew patients had to sit for five minutes before BP measurement. After the presentation, the score average increased to 100% showing increased knowledge of this best practice. Question 14 was also a question about wait times, asking how long one must wait in between taking multiple BP measurements. Only 11.11% of the group answered the question correctly in the pre-intervention survey. The post-intervention survey score was 44.44%, a slight increase in knowledge.

Miscellaneous BP Measurement Topics

Three questions that did not fall into the topics above also revealed improvement of knowledge in the pre- and post-intervention surveys. In question 12, the group was asked the rate of cuff deflation while taking auscultatory BP measurements. About 55.56% of the group answered this correctly in the pre-intervention survey, which increased to 88.89% in the post-presentation survey. There was also an increase of knowledge in question 13, in which participants were asked the recommended number of BP measurements that should be taken in the initial patient encounter. About 11.11% of the group answered this correctly in the pre-intervention survey, and 100% answered it correctly in the post-presentation survey. A question in which all participants were aware of the correct answer before and after the presentation was question 15, a true or false question asking whether inaccurate BP measurements influenced medication prescribing. All the MAs answered “true,” in both surveys demonstrating their awareness of the impact BP measurement accuracy could have on hypertension treatment.

Table 3

Survey Responses

Question #	Question Topic	Pre-Presentation Correct Responses (# correctly answered/#participants)	Post-Presentation Correct Responses (# correctly answered/#participants)	Improvement
1	Factors causing elevated BP	11.11%	77.78%	66.67%
2	How long patient needs to sit before BP is taken	33.33%	100%	66.67%
3	Influence of talking during BP measurement	55.56%	55.56%	0%
4	Body position during BP measurement (seated, standing, lying down, squatting)	100%	88.89%	-11-11%
5	Is sitting on an exam table proper body positioning	22.22%	88.89%	66.67%
6	Position of legs and feet during BP measurement	100%	100%	0%
7	Arm positioning during BP measurement	77.78%	88.89%	11.11%
8	Percentage of the arm the BP cuff bladder needs to encircle	33.33%	100%	66.67%
9	Best way to determine proper cuff size	44.44%	88.89%	44.44%
10	What happens when the cuff is too large	100%	100%	0%
11	What happens when the cuff is too small	100%	100%	0%
12	Rate of auscultatory cuff deflation	55.56%	88.89%	33.33%
13	Recommended number of BP measurements to take	11.11%	100%	88.89%
14	How long to wait in between multiple BP measurements	11.11%	44.44%	33.33%
15	Do inaccurate BP measurements affect prescribing of BP medications	100%	100%	0%

DISCUSSION

Summary

Hypertension is one of the most frequently diagnosed conditions in primary care requiring treatment and management by primary care providers. However, inappropriate hypertension management occurs in 20-45% of cases, and an inaccuracy as small as 5 mmHg can lead to inaccurate staging and treatment followed by inappropriate prescribing. To diagnose and treat hypertension, it is essential to obtain accurate BP readings using proper BP technique according to the ACC and AHA recommendations. All 11 studies in the literature synthesis showed increased knowledge after participants received a refresher training on BP measurement. This supported the intervention of providing a presentation on best practices for BP measurement to the MAs of TMC One Wyatt.

This QI project's objectives were to increase knowledge of the ACC and AHA recommended best practices for BP measurement and increase understanding of why the ACC and AHA recommendations were important. The presentation on best practices for BP measurement was designed to increase MA participants' knowledge and willingness to follow accurate BP measurement protocols. The pre- and post- comparisons demonstrated that this knowledge had increased among the participants. This result helps support the idea of providing periodic refresher trainings to improve and maintain best practices and therefore accuracy of BP measurement.

Interpretation

The pre- and post-intervention data comparisons showed that participants already had prior knowledge of some best practices for BP measurement, but that they lacked prior knowledge in other areas. In terms of body positioning, the entire group was aware that a patient should be seated with their legs uncrossed and feet flat on the floor, as was demonstrated in responses to questions 4 and 6 of the pre-intervention survey. In addition, all participants were aware that BP cuff sizes that were too large or too small would compromise accuracy of BP readings, as reflected in responses to questions 10 and 11 of the pre-intervention survey. Finally, the entire group correctly answered question 15 of the pre-intervention survey, which asked if inaccurate BP measurements influenced prescribing of BP medication. Since all participants answered these questions correctly in the pre-intervention survey, these results suggest their previous BP trainings emphasized these points for BP measurement.

There were aspects of best practices for BP measurement in which the group demonstrated lower baseline knowledge that improved after the presentation. For example, participants demonstrated lack of awareness of factors that could falsely elevate or drop the BP measurement in question 1. The pre-intervention survey average score was 11.11% which improved to 77.78% in the post-intervention survey. Another question the group showed less baseline knowledge was question 5, which asked if sitting on the exam table was proper body positioning for BP measurement. The percentage of correct responses for this question in the pre-intervention survey was 22.22%, which increased to 88.89% in the post-intervention survey. In question 2, participants were unaware of the recommended five-minute rest period before obtaining BP measurements as the pre-intervention survey revealed 33.33% of the group answered the question correctly. Knowledge on this topic improved after the presentation, however, as the group score increased to 100% in the post-intervention survey. The increases of knowledge in the survey questions discussed suggest the presentation was successful at teaching these recommended best practices for BP measurement.

There were three questions that showed little to no increase of knowledge. This could have been due to poor wording of the questions or poor articulation during the presentation. Question 3 was a true or false question that stated, “Talking during the rest period will not influence the BP measurement.” The pre- and post-intervention surveys had the same score of 55.56% showing no improvement of knowledge. Since the group score did not improve on this question, it is possible the topic was not articulated clearly, or the question was worded awkwardly. Another question that showed little improvement was Question 14, a multiple choice, fill-in-the-blank question that asked, “When taking multiple blood pressure measurements, the measurements should be taken at least _____ minutes apart on different arms (unless there is an arm restriction).” The scores on this question went from 11.11% in the pre-intervention survey to 44.44% in the post-intervention survey, with less than half of the group answering it correctly in both surveys. Once again, it may be possible the project lead did not articulate the wait time in between multiple BP measurements clearly, though it was stated the PowerPoint slides. Additionally, question 4, which asked whether the patient should be in a seated or unseated position during BP measurement, was a question in which everyone answered correctly in the pre-intervention survey and 11.11% answered wrong in the post-intervention survey. It is uncertain what may have caused one person to change their mind on the answer in the second survey. Selecting the wrong answer could have been a mistake, or perhaps there was a misunderstanding during the presentation.

Though there were some questions that had little or no increase of knowledge, overall, there was an increase of knowledge for the entire group. As discussed in the results section, the average pre-intervention survey score was 57.78%. After the presentation on best practices was given, the average score of the post-intervention survey increased to 87.41%. As was demonstrated in the literature review, this project supports the idea that periodic refresher trainings help increase knowledge of best practices of BP measurement technique as well as understanding of why the ACC and AHA recommendations are in place.

Implications

Practice

The results of this QI project showed increased knowledge after the intervention which could have helped participants improve their own practices of performing accurate BP measurements. As discussed in the theoretical framework section, each MA had their own practice for obtaining BP measurements, as well as individual strengths and weaknesses. The changes needed to perform BP measurements according to best practices likely varied with each participant, therefore each participant had their own improvements they needed to make.

With increased knowledge and understanding of best practices for BP measurement gained from the presentation, it is possible participants could have been influenced to improve their BP measurement technique afterwards. In addition, improving BP measurement technique would help promote appropriate diagnosis and treatment of hypertension.

Education

The findings of this project support the need for periodic refresher trainings to enhance and maintain knowledge and understanding of best practices for BP measurement as recommended by the ACC and AHA. The results of this QI project revealed participants had increased knowledge and understanding of the ACC and AHA recommendations for BP measurement after the educational intervention. Based on these findings, it is beneficial to provide periodic training so it can help promote BP measurement accuracy.

Research

Further research on this topic could include follow-up on retention of information as well as performance of BP measurement after the educational intervention. For example, a post-intervention follow-up survey could be conducted at one month and three months to assess how much of the information from the presentation was retained. This would provide insight into how often refresher trainings need to be provided to promote BP measurement accuracy. Also, for further research, MAs could be asked to perform BP measurements after the intervention to assess if they are incorporating proper BP measurement technique taught in the presentation.

Policy

While preparing for implementation of this QI project, it was discovered that TMC One Wyatt does not have a policy or standard operating procedure for performing BP measurements in the outpatient setting. Though MAs must perform and pass a yearly competency checklist which includes BP measurement, it would be of benefit to have a policy on the organization's intranet for employees to refer to at any time.

Limitations

Limitations to this QI project include possible flaws to the presentation content, poor wording of one of the survey questions, and a small participant population. As mentioned previously, questions 3 and 14 of the surveys showed little to no increase of knowledge after the presentation was given. This could have been due to poor articulation on those aspects of BP measurement during the presentation, or awkward wording of question 3, causing limitations to the project. Also, this project had a small population size of only nine participants. Small participant populations reduce generalizability to a larger population (Nayak, 2010), making this another limitation to the project.

DNP Essentials Addressed

This QI project incorporated three of the Level 2 competencies of the American Association of Colleges of Nursing (2021) *The Essentials: Core Competencies for Professional Nursing Education*. Essential IV (Scholarship for Nursing Discipline) was reflected in this project's literature synthesis as evidence-based literature was reviewed and discussed to support the project's purpose. Essential V (Quality and Safety) was also incorporated. The goal of the project was to increase knowledge and understanding of best practices of BP measurement which could increase accurate BP measurements and promote appropriate management of hypertension. Overall, this would improve quality of care as well as safety of prescribing BP medications. Promoting appropriate hypertension management and improving quality of care also reflects Essential III (Population Health). TMC One Wyatt sees a large variety of patients in the community of various ages, ethnicities, and social classes. Improving quality of care at this clinic helps contribute to positive public health outcomes (American Association of Colleges of Nursing [ACCN], 2021).

Conclusions

Plan for Sustainability

To ensure sustainability of this QI project, the PDSA cycle must be implemented to further improve it. A possible change that could be made to enhance learning of the material includes making the PowerPoint slides “less busy” to allow for absorption of the content. This could be accomplished by spreading out the content into additional slides. Another possible change that could be made is providing more explanation on topics the group did not perform well on in the surveys. For example, Question 3, which addressed the recommendation of no talking during the five-minute rest period, was a question that showed no improvement of scores. It was mentioned by the project lead and shown on the PowerPoint slides, but it may have required more discussion to enhance learning. If this QI project were performed again, the content on the PowerPoint presentation would be reduced to fewer bullets spread across more slides to allow more focus on the content. There would also be more discussion on aspects of BP measurement that showed lower scores on the post-intervention survey.

Plan for Dissemination

The clinic manager and NP preceptor were emailed the results of the QI project. Also, the project was presented in a final oral defense to the three committee members on November 5th, 2024.

Funding

Participants were offered a chance to enter a raffle for one of two $25 Chipotle gift cards with their participation in the project. The funding of $50 for the gift cards did not come from any outside sources; it was solely funded by the project lead to thank the participants for

participating (Appendix I). Two people were randomly chosen as winners of the raffle after the post-intervention survey. The gift cards were purchased online and emailed to the participants later that day.

APPENDIX A

SITE APPROVAL/AUTHORIZATION LETTER

TMC One
2424 N. Wyatt Dr. #100
Tucson, Arizona 85712

Date: 7/23/24

Human Subjects Protection Program
The University of Arizona
845 N Park Ave., Suite 537A
Tucson, AZ 85719

Please note that Jessica Ahumada, University of Arizona Doctor of Nursing Practice student, has permission of the TMC One Wyatt Clinic to conduct a quality improvement project at our facility for her project, "Education of Blood Pressure Measurement Technique: A Quality Improvement Project."

Ms. Ahumada will conduct a survey of medical assistants at TMC clinic. She will recruit medical assistants through email. The email will provide a description of the project, what they will be asked to do, the time involved, and a link to the online survey. Ms. Ahumada's activities will be completed by *11/18/2024.*

Ms. Ahumada has agreed to provide to my office a copy of the University of Arizona Determination before she recruits participants. She will also present aggregate results to the providers at their monthly staff meeting.

If there are any questions, please contact my office.

Signed,
Natalie Norem
Natalie Norem, FNP, NP Administrator

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University of Arizona IRB
845 N Park Ave., Suite 537A
Tucson, AZ 85719
Fax: 520-621-9810
VPR-IRB@arizona.edu

NOT HUMAN RESEARCH

September 18, 2024

Jessica Ahumada

Dear Jessica Ahumada:

On 9/18/2024, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	Education of Blood Pressure Measurement Technique: A Quality Improvement Project
Investigator:	Jessica Ahumada
IRB Submission ID:	STUDY00005303
Sponsor:	None
Prime Sponsor:	None
IND, IDE, or HDE:	None
Documents Reviewed:	• Advisor Attestation.pdf, Category: Other; • AhumadaJ.IRB-Protocol-for-Determination-of-Human-Research-v2023-12 (1).docx, Category: IRB Protocol; • Disclosure form.docx, Category: Consent Form; • Pre and Post Survey.docx, Category: Data Collection Tool; • Presentation BP.pdf, Category: Participant Material; • Recruitment Email.docx, Category: Recruitment Materials; • Recruitment Flyer.docx, Category: Recruitment Materials; • Site Auth PDF.pdf, Category: Institutional Approval;

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any

THE UNIVERSITY OF ARIZONA
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Tucson, AZ 85719
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changes be made. If changes are made and there are questions about whether these activities are research involving humans in which the organization is engaged, please submit a new request to the IRB for a determination.

All Covered Individuals must disclose all sponsored and non-sponsored Research Projects to the Office for Responsible Outside Interests (OROI) prior to Conducting Research if the individual is an Investigator. Please visit the OROI website for more information.

We value your feedback and would appreciate you taking the time to complete our survey about your experience with the IRB staff: https://uarizona.co1.qualtrics.com/jfe/form/SV_ehQ04WxNA06b42i.

If questions arise at any time during your study, please email the general IRB inbox at VPR-IRB@arizona.edu.

APPENDIX B

CONSENT DOCUMENT (DISCLOSURE AND CONSENT FORM)

Education of Blood Pressure Measurement Technique: A Quality Improvement Project

Project Lead: Jessica Ahumada, MS, RN, DNP Candidate

The purpose of this project is to increase knowledge and understanding of best practices of blood pressure (BP) measurement amongst the medical assistants at the Tucson Medical Center (TMC) One Wyatt outpatient clinic.

If you choose to take part in this project, you will be asked to:

1) Complete a short pre-intervention survey on BP measurement technique before the presentation.
2) Attend the presentation on best practices for BP measurement.
3) Complete a short post-intervention survey on BP measurement technique after the presentation.

It will take no longer than 30 minutes to attend the presentation and complete the surveys. Benefits of participation include increased knowledge of best practices of BP measurement and understanding why best practices of BP measurement need to be performed. There are no risks with participation. Since this project is not associated with TMC One, individual data from the surveys will not be shared with TMC One.

If you choose to participate in the project, participation is voluntary, and refusal to participate will not cause penalty to you. You may suspend your participation in this project at any time. By participating you do not give up any personal legal rights you may have as a participant in this project.

Your survey responses will be anonymous. Your name will not be collected or linked to your answers. Instead, you will be given a participant number that will be written on your paper surveys to track individual progress. Upon completion of the post-intervention survey, you may choose to provide your email address to be entered into a raffle to win one of two $25 gift cards to Chipotle. Your email address will only be used by the project lead to randomly select two winners and disperse the gift cards to the winners. It will not be linked to your survey responses, nor will it be distributed or used in any other manner. Participation in the raffle is optional.

For questions, concerns, or complaints about the project, you may call:

Jessica Ahumada, MS, RN, DNP Candidate
520-235-5979
Jma1@arizona.edu

You agree to have your responses used for this project.

APPENDIX C

RECRUITMENT MATERIAL (RECRUITMENT EMAIL AND FLYER)

Recruitment Email

Dear TMC MAs,

On September 26th, 2024 at 12 PM, I will be providing a presentation on proper technique for blood pressure measurement. This 30-minute presentation will cover the American College of Cardiology and American Heart Association guidelines for proper blood pressure measurement technique, and their importance for blood pressure management. This is a quality improvement project for partial fulfilment of my Doctor of Nursing Practice degree, and it has no affiliation with Tucson Medical Center. Attached to this email is the consent form explaining more details.

Participants will be eligible to enter a drawing for a $25 Chipotle gift card. Two people will be selected!

If you are interested in participating, please send RSVP to this email. Also, feel free to email me with any questions.

Sincerely,

Jessica Ahumada, MS, RN, DNP Candidate

Recruitment Flyer

Hello TMC MAs!

On September 26th, 2024 at 12 PM, I will be providing a presentation on proper technique for blood pressure measurement. This 30-minute presentation will cover the American College of Cardiology and American Heart Association guidelines for proper blood pressure measurement technique, and their importance for blood pressure management. This is a quality improvement project for partial fulfilment of my Doctor of Nursing Practice degree, and it has no affiliation with Tucson Medical Center.

Participants will be eligible to enter a drawing for a $25 Chipotle gift card. Two people will be selected!

If you are interested in participating, please email me at jma1@arizona.edu. Also, feel free to email me with any questions.

Sincerely,

Jessica Ahumada, MS, RN, DNP Candidate

APPENDIX D

EVALUATION INSTRUMENTS (PRE-POST-INTERVENTION SURVEYS)

Blood Pressure Pre-Intervention Survey

1) Which factors cause an elevated resting blood pressure? (Circle all that apply).
    a. Caffeine consumption within the last 30 minutes
    b. Exercise within the last 30 minutes
    c. Smoking within the last 30 minutes
    d. A full bladder
2) How long should the patient sit before their blood pressure is taken?
    a. At least 3 minutes
    b. At least 5 minutes
    c. At least 7 minutes
    d. At least 1 minute
3) Talking during the rest period will not influence the blood pressure measurement.
    a. True
    b. False
4) While taking a blood pressure, the patient should be
    a. Standing
    b. Lying down
    c. Sitting
    d. Squatting
5) Patients can sit on the exam table during a blood pressure measurement.
    a. True
    b. False
6) What is the proper leg positioning during a blood pressure measurement?
    a. Legs crossed, feet flat on the floor
    b. Legs uncrossed, feet in any position
    c. Legs crossed, feet in any position
    d. Legs uncrossed, feet flat on the floor
7) When taking a blood pressure, the arm in which the blood pressure is being taken should be positioned
    a. At heart level
    b. Above the head
    c. Hanging down to the side of the body
    d. Across the chest
8) What is the proper cuff size to use on a patient?
    a. A size with a cuff bladder that encircles 80% of the arm
    b. A size with a cuff bladder that encircles 100% of the arm
    c. A size with a cuff bladder that encircles 70% of the arm
    d. A size with a cuff bladder that encircles 90% of the arm
9) What is the most accurate way to determine the appropriate cuff size on a patient?

    ____

10) A blood pressure cuff that is too large for a patient will cause
    a. A blood pressure measurement to be falsely higher

   b. A blood pressure measurement to be falsely lower

11) A blood pressure cuff that is too small for a patient will cause
    a. A blood pressure measurement to be falsely higher
    b. A blood pressure measurement to be falsely lower
12) For auscultatory blood pressure measurements (manual blood pressure measurement), how fast should the cuff be deflated?
    a. Any rate as long as I can hear the Korotkoff sounds
    b. 2 mmHg per second
    c. 5 mmHg per second
    d. 10 mmHg per second
13) The American College of Cardiology, American Heart Association, as well as other professional organizations recommend taking at least ________ blood pressure measurements in an appointment.
    a. 1-2
    b. 2-3
    c. 3-4
    d. 4-5
14) When taking multiple blood pressure measurements, the measurements should be taken at least_____ minutes apart on different arms (unless there is an arm restriction).
    a. 5
    b. 3
    c. 2-3
    d. 1-2
15) Inaccurate blood pressure measurements can affect the prescribing of blood pressure medication.
    a. True
    b. False

Demographic Information

How many years have you worked as a medical assistant?

____

Are you a certified medical assistant?
- Yes
- No

When was the last time you received any kind of training on blood pressure measurement, and who provided this training?

____

____

Blood Pressure Post-Intervention Survey

1) Which factors cause an elevated resting blood pressure? (Circle all that apply).
   a. Caffeine consumption within the last 30 minutes
   b. Exercise within the last 30 minutes
   c. Smoking within the last 30 minutes
   d. A full bladder
2) How long should the patient sit before their blood pressure is taken?
   a. At least 3 minutes
   b. At least 5 minutes
   c. At least 7 minutes
   d. At least 1 minute
3) Talking during the rest period will not influence the blood pressure measurement.
   a. True
   b. False
4) While taking a blood pressure, the patient should be
   a. Standing
   b. Lying down
   c. Sitting
   d. Squatting
5) Patients can sit on the exam table during a blood pressure measurement.
   a. True
   b. False
6) What is the proper leg positioning during a blood pressure measurement?
   a. Legs crossed, feet flat on the floor
   b. Legs uncrossed, feet in any position
   c. Legs crossed, feet in any position
   d. Legs uncrossed, feet flat on the floor
7) When taking a blood pressure, the arm in which the blood pressure is being taken should be positioned
   a. At heart level
   b. Above the head
   c. Hanging down to the side of the body
   d. Across the chest
8) What is the proper cuff size to use on a patient?
   a. A size with a cuff bladder that encircles 80% of the arm
   b. A size with a cuff bladder that encircles 100% of the arm
   c. A size with a cuff bladder that encircles 70% of the arm
   d. A size with a cuff bladder that encircles 90% of the arm
9) What is the most accurate way to determine the appropriate cuff size on a patient?

   ____

10) A blood pressure cuff that is too large for a patient will cause
    a. A blood pressure measurement to be falsely higher

    b. A blood pressure measurement to be falsely lower

11) A blood pressure cuff that is too small for a patient will cause
    a. A blood pressure measurement to be falsely higher
    b. A blood pressure measurement to be falsely lower
12) For auscultatory blood pressure measurements (manual blood pressure measurement), how fast should the cuff be deflated?
    a. Any rate as long as I can hear the Korotkoff sounds
    b. 2 mmHg per second
    c. 5 mmHg per second
    d. 10 mmHg per second
13) The American College of Cardiology, American Heart Association, as well as other professional organizations recommend taking at least ________ blood pressure measurements in an appointment.
    a. 1-2
    b. 2-3
    c. 3-4
    d. 4-5
14) When taking multiple blood pressure measurements, the measurements should be taken at least______ minutes apart on different arms (unless there is an arm restriction).
    a. 5
    b. 3
    c. 2-3
    d. 1-2
15) Inaccurate blood pressure measurements can affect the prescribing of blood pressure medication.
    a. True
    b. False

APPENDIX E

PARTICIPANT MATERIAL (EDUCATIONAL POWERPOINT PRESENTATION SLIDES)

Proper Blood Pressure Technique

By Jessica Ahumada, MS, RN, DNP Candidate

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What is Blood Pressure?

- A measurement of the pressure in the arteries as the heart pumps blood throughout the body

- Systolic pressure: The pressure in the arteries as the heart contracts.
- Diastolic pressure: the pressure in the arteries as the heart relaxes.

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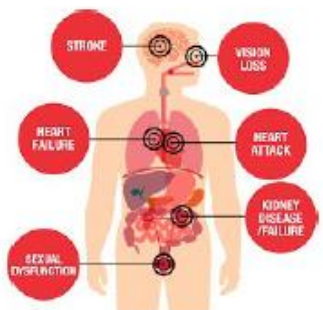
Complications of Hypertension

- Heart failure
- Coronary artery disease
- Heart attack
- Peripheral artery disease
- Stroke
- Eye damage
- Chronic kidney disease
- End stage renal disease
- Diabetes complications



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Blood Pressure Stats

- 48.1% of U.S. population diagnosed with hypertension (HTN)
- 39.64% patients with HTN have controlled HTN
- Inaccurate blood pressure (BP) measurements lead to inappropriate prescribing in 20-25% of HTN patients

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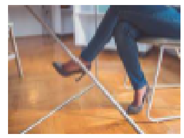
BP Errors

Common errors with BP measurement



- Wrong cuff size
- Inappropriate positioning
- Not sitting for at least 5 minutes prior to BP measurement
- Speaking during rest period or during BP measurement

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BP Errors

Common errors with BP measurement

- Patient exercised, had caffeine or smoked within 30 minutes of appointment
- Bladder distention during BP measurement
- Rounding of auscultatory BP measurement

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Effects of Inaccurate BPs

- This affects BP management
- A difference of 5mm Hg in systolic BP can lead to an incorrect classification of a patient's hypertension status

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7

Blood Pressure Categories

Table 6. Categories of BP in Adults*

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.

BP indicates blood pressure (based on an average of ≥2 careful readings obtained on ≥2 occasions, as detailed in Section 4); DBP, diastolic blood pressure; and SBP, systolic blood pressure.

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8

Inaccurate BP Measurements

Inaccurate BP measurements can lead to:

- Improper blood pressure management
  - Patients who need medication might not be receiving it
  - BP med doses that are too high or too low can lead to adverse events

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9

BP Measurement Guidelines

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: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

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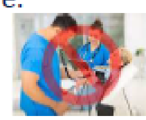
10

BP Measurement Guidelines

Step 1: Prepare the patient

- Sitting in a chair, feet on the floor, back supported for at least 5 minutes
- No talking during the 5-minute rest period
- No caffeine, smoking, or exercise at least 30 minutes before BP is taken
- Empty bladder
- Remove clothing where BP will be taken.
- No BP measurements while patient is sitting or lying on a table.



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11

BP Measurement Guidelines

Step 2: Use proper technique for BP measurements

- BP device must be validated.
- Either the bell or diaphragm of the stethoscope can be used
- Patient's arm should be supported on a surface
- Middle of the cuff should be positioned at the level of the right atrium (mid-sternum)
- Correct cuff size: Bladder encircles 80% of the arm

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12

BP Measurement Guidelines

Cuff sizes

Table 9. Selection Criteria for BP Cuff Size for Measurement of BP in Adults

Arm Circumference	Usual Cuff Size
22–26 cm	Small adult
27–34 cm	Adult
35–44 cm	Large adult
45–52 cm	Adult thigh

Adapted with permission from Pickering et al[S4.1-2] (American Heart Association, Inc.).

BP indicates blood pressure.

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13

BP Measurement Guidelines

Step 3: Taking proper blood pressure measurements

- Record BP in both arms (2-3 measurements)
- Separate measurements by 1-2 minutes.
- For auscultatory BP inflate 20-30 mm Hg above radial obliteration pressure
- Deflate cuff at a rate of 2 mm Hg per second

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14

BP Measurement Guidelines

Step 4: Properly document BP readings

- If performing an auscultatory BP
  - Systolic BP is the onset of the Korotkoff sound
  - Diastolic BP is the disappearance of the Korotkoff sound
  - Use the nearest even number 2
- Note the time when BP medication was taken

BP Measurement Guidelines

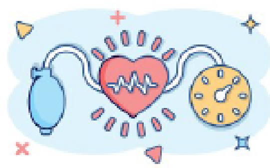
Step 5: Average the readings

- The average of the 2-3 BP readings should be obtained for BP level estimation.
- Refer to local policy on averaging BP measurements

BP Measurement Guidelines

Step 6: Provide BP readings to patient

- Patients should receive BP measurements both verbally and in writing



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17

Conclusion

- BP technique has a large impact on diagnosis and prescribing
- There is an evidence-based reason behind every aspect of proper BP technique
- It is important for us to adhere to the guidelines for proper technique as much as possible so providers can properly manage patients with HTN

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18

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19

APPENDIX F

PROJECT TIMELINE

Completion Date	Planning	Pre-implementation	Implementation	Evaluation
07/18/2024	Identify 3rd chair member			
07/23/2024		Obtained site authorization letter		
7/25/24	Scheduled project implementation date at site			
08/08/2024		Submit proposal to project chair		
08/30/24	Invitation sent for DNP project proposal			
9/11/24	Invitation for BP presentation sent to MAs at TMC One Wyatt			
9/12/24	Flyer invitation posted in TMC One Wyatt break room			
9/13/24		DNP project proposal presentation		
9/16/24		IRB form and DNP project document sent to Alice Vogel		
9/18/24		IRB approval request sent		
9/18/24		IRB approval received		
09/26/2024			Project implementation-Presented PowerPoint and collected data from surveys.	

Completion Date	Planning	Pre-implementation	Implementation	Evaluation
			Raffle winners drawn and gift cards emailed.	
09/27/2024-10/06/2024				Analyzed Data
10/22/2024				Set date for DNP final oral defense, DNP Project document emailed to Melinda Burns
11/05/2024				Presented DNP final oral defense
11/06/2024-11/07/24				Entered final edits to DNP Project document
11/07/2024				Executive summary shared with TMC One Wyatt clinic
11/07/2024				IRB Project Form Submitted

APPENDIX G

LITERATURE REVIEW GRID

Project Question: Will a refresher training on ACC and AHA best practices of BP measurements increase MAs' knowledge of proper techniques to take BP measurements?

Author's Last names, Pub. Year	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project	Strengths	Weaknesses
Altidor, 2022	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	Quasi-experimental study- DNP project	A DNP student gave a PowerPoint Presentation on the ACC and AHA guidelines for proper blood pressure measurement to 11 participating MAs. A pre-quiz and post quiz were performed to assess knowledge.	There was increased knowledge after the educational intervention.	• Increase of knowledge after the presentation • The sample was all MAs.	• Small sample size • Lack of follow-up
Bachur, Candido, Silveira, Oliveira, Neto, Veiga, 2021	Improvement in Semiconductivity on the Measurement of Blood Pressure After an Educational Intervention in Health Professionals	Quasi-experimental	An educational intervention in the form of a simulation was given to 30 health professionals (physicians, RNs, nursing technicians, first aid and medical regulation assistant technicians. from one healthcare organization. Knowledge was assessed before and 30 days after the intervention.	There was an increase in knowledge of blood pressure 30 days after the educational intervention.	• Increase of knowledge after the education intervention. • Large sample size of 30.	• Short follow-up time of 1 month. • Mixed sample.
Block, Flynn, Cooper, Lentz, Hull, Dietz, Boonyasai, 2018	Promoting sustainability in quality improvement: An evaluation of a	Quasi-experimental	Eighty-eight medical assistants and nurses working in six primary care clinics within a	Refresher courses increase knowledge and understanding as	• Improvement of knowledge and performance	• Lack of follow-up • Different levels of education and job

Author's Last names, Pub. Year	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project	Strengths	Weaknesses
	web-based continuing education program in blood pressure management		health system were enrolled in a web-based blood pressure measurement refresher course. There was improvement of knowledge and performance after the intervention.	well as practice of standard blood pressure measurement guidelines.	after the intervention. • Large sample size of 88.	experience; nurses and MAs. • Different observers conducted pre- and post-program observations which can cause measurement bias. • Lack of follow-up
Brokalaki, Matziou, Gymnopoulou, Brokalaki, Theodossiades, 2008	Modification of nursing students' performance in blood pressure measurement: An educational retraining programe	Quasi-experimental study	One hundred and fifty nursing students were taught blood pressure measurement in a basic education program in one semester and then a supplementary educational intervention the following semester. There was significant improvement in blood pressure performance after the second teaching.	A second teaching improved performance of blood pressure measurement.	• Improvement of blood pressure performance after second training. • Large sample size of 150 participants.	• Study sample included nursing students and no MAs. • Lack of follow-up
Daniel, Veiga, Machado, Mafra,Cloutier, 2019	Effect of an educational program for the knowledge and quality of blood pressure recording	Quasi-experimental study	101 nursing professionals' knowledge of blood pressure measuring was tested before and after an in person educational program. In addition, the quality of their blood pressure taking was recorded before and after the	Education on blood pressure helps increase knowledge and understanding as well as quality performance of taking proper blood pressure measurements.	• Increase in knowledge and performance after intervention. • Large sample size of 101.	• All participants were nurses from one hospital reducing generalizability. • No MAs included • Lack of follow-up.

Author's Last names, Pub. Year	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project	Strengths	Weaknesses
			educational program. Median test scores increased after the intervention. Performance quality also increased after the intervention.			
Dickson & Haajar, 2007	Blood pressure measurement education and evaluation program improves measurement accuracy in community-based nurses: A pilot study	Quasi-experimental study	Pilot study created to teach 5 community-based nurses blood pressure measurement guidelines and technique. Technique and knowledge improved after study.	Education on blood pressure helps increase knowledge and understanding as well as quality performance of taking proper blood pressure measurements.	• Increase in knowledge and performance after intervention.	• Study sample included only nurses, no MAs. • Small sample size of 5 participants. • Short follow-up of one month
Eley, Khoo, Woods, van Zundert, 2021	Improving accurate blood pressure cuff allocation in patients with obesity: A quality improvement initiative	Quasi-experimental study	Fifty-four Pre-op RNs and Post-operative anesthesia unit RNs from one hospital were given an in-person education on selecting appropriate cuff sizes based on arm circumference. Choice of cuff size was evaluated before the educational intervention and three months after. There was a significant improvement in cuff size accuracy after the intervention.	Educational interventions can help increase knowledge of proper blood pressure cuff allocation and increase accurate BP readings.	• Increased knowledge and performance regarding allocation of blood pressure cuff size. • Population of 54 participants	• Study sample included only RNs from one hospital. • No follow up

Author's Last names, Pub. Year	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project	Strengths	Weaknesses
Elzeky, & Shahine, 2022	Effects of an educational program using a virtual social network on nurses' knowledge and performance on blood pressure movement: A randomized controlled trial	Randomized control trial	Control group of cardiac nurses was given traditional routine training while the intervention group of cardiac nurses was given 24 consecutive days of web based trainings. The intervention group had higher post-intervention knowledge and performance scores than the control group.	Refresher trainings help increase knowledge of how to take blood pressures.	• Large sample size of 77 participants • Improvement of knowledge and performance after intervention.	• Participants did not include MAs, only cardiac nurses. • Lack of follow -up.
Hayer, Kirley, Tsipas, Allen, Hanson, Johnson, 2022a	Redesigning blood pressure measurement training in healthcare schools	Quasi-experimental	A pilot study for BP teaching was performed with mixed group of 77 medical students and nursing students . The students completed three web based modules regarding BP measurement. There was an increase of knowledge in the post education assessment.	A refresher training helps improve knowledge of blood pressure measurement.	• Post-intervention improvement of knowledge. • Large sample size of 77 participants	• No follow up • Mixed group of participants • No MAs included
Hayer, Kirley, Cohen, Tsipas, Sutherland, Oparil, Shay, Cohen, Kabir, Wozniak, 2022b	Using web-based training to improve accuracy of blood pressure measurement among health care professionals: A randomized trial	Randomized controlled trial	Sample included 177 MAs, RNs, advanced practice providers, and physicians. Control group and intervention group did a pretest of taking a blood pressure. Intervention	A refresher training helps improve the accuracy in blood pressure measurement as well as knowledge.	• Post-intervention improvement of knowledge and performance.	• Short follow up time- 1 month. • Mixed group of participants with varying levels of knowledge and training which included

Author's Last names, Pub. Year	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project	Strengths	Weaknesses
			group did an e-learning module and control group didn't. On repeat blood pressure test, the intervention group performed 3.4 more skills correctly than the control group. There was also an increase of knowledge of the intervention group. significant.		• Large sample size of 177 participants. • Diverse group of participants with different professional backgrounds from four different healthcare systems.	physicians, advanced practice nurses, nurses, nursing students, and MAs. • Lack of follow-up.
Hull, Taylor, Turo, Kramer, Crocetti, McGuire, 2013	Implementation of a Training and Structured Skills Assessment Program for Medical Assistants in a Primary Care Setting	Quasi-experimental	As an effort to improve quality of care, a competency training program was developed for MAs working in a healthcare organization. One of the skills included blood pressure. Knowledge was assessed with a pre- and post-quiz.	After ten years, this program has shown to increase knowledge of blood pressure measurement in 478 MAs.	• Increase of knowledge after the education program. • Large sample size of 478. • Sample size included all MAs.	• Lack of follow-up.

APPENDIX H

OTHER DOCUMENTS AS APPLICABLE TO THE PROJECT (BUDGET)

Budget	
In	Self-funded $50
Out	Two 25$ Chipotle gift Cards


CHIPOTLE MEXICAN GRILL

THANK YOU FOR YOUR PURCHASE

ORDER INFORMATION

Billing Information	Confirmation: A6Z8UBHVRQJB
Jessica Ahumada	Order Date: September 26, 2024
[redacted]	Payment Type: Visa
UNITED STATES	Subtotal: $50.00
[redacted]	Order Total: $50.00
	Amount Paid: **$50.00**

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