

PROVIDER KNOWLEDGE OF HYPERTENSIVE URGENCY IN AN
OUTPATIENT SETTING

by

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A DNP Project Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF NURSING PRACTICE

In the Graduate College

THE UNIVERSITY OF ARIZONA

2020

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Erica Tran, titled Knowledge of Hypertensive Urgency in an Outpatient Setting and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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ACKNOWLEDGMENTS

I want to acknowledge my God. May His name receive all the glory and honor He deserves. He alone has provided me with the strength and wisdom to reach this milestone.

I would like to thank my committee members and my writing coach, Dr. Flamm, Dr. Shurson, Dr. Williams, Dr. Martin-Plank, and Dr. Dupont for their continuous guidance, support, and encouragement they provided to help me reach my goals. This project would have never seen its culmination without the hearts and minds of these amazing individuals.

I would also like to express my gratitude to my boyfriend, Gabriel for his patience, love, and support throughout my graduate studies.

DEDICATION

I would like to dedicate this to my parents, for their continuous support in my education. They have sacrificed beyond measures to allow me to pursue my goals and dreams.

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ABSTRACT

Purpose. The purpose of this quality improvement project is to 1) assess current providers' knowledge on care provided during hypertensive urgency crisis, 2) introduce an evidence-based hypertensive urgency algorithm, and 3) evaluate perceived usefulness and intent to use of hypertensive urgency algorithm for future practice.

Background. Hypertension is a common chronic condition that can lead to serious adverse events when it is not controlled. A hypertensive urgency crisis occurs when blood pressure is greater than 180 systolic and/or 110 diastolic without signs of acute organ injury. Referral to the emergency department has caused increased burden as these individuals can be safely managed within an outpatient setting.

Methods. A pre- and post-intervention survey design was used to evaluate providers' current knowledge and perceived usefulness of, and intent to use, a hypertensive urgency algorithm. A pre-recorded PowerPoint presentation (the intervention) will educate providers on hypertensive urgency and introduce the hypertensive urgency algorithm to primary care providers for future practice.

Results. The results from the pre- and post-intervention survey were collected and compared from primary care providers (n=9). Prior to the intervention, 33% answered three or more knowledge questions correctly. Despite the low percentage of knowledge questions answered correctly, 88% of primary care providers felt confident in their ability to manage hypertensive urgency. After the intervention, 66% answered more than five of the knowledge questions correctly, and 100% of providers felt confident in their ability to manage hypertensive urgency.

One hundred percent of the providers perceived usefulness of the algorithm, however, only 66% of the providers demonstrated their intent to use the algorithm in their future practice.

Conclusions. Assessing primary care providers' knowledge and introduction of a hypertensive urgency algorithm provided insight into the needed next steps in addressing hypertensive urgency management within an outpatient setting. The obtained data serves as an initial step to inform future efforts of guiding an implementation strategy to better manage hypertensive urgency in an outpatient setting.

INTRODUCTION

An estimated 65 million adults within the United States (U.S.) have hypertension, and approximately 1% will experience a hypertensive crisis during their lifetime (Centers for Disease Control and Prevention [CDC], 2020). Data showcases that 3.2% of these individuals will present to the emergency department when symptoms of a hypertensive crisis occur (CDC, 2020). Hypertensive crises are characterized by severely elevated blood pressure levels with systolic being greater than 180 and/or diastolic greater than 110 (Breu & Axon, 2018). During a hypertensive crisis, individuals may experience no symptoms, mild symptoms (e.g., headache, nausea, shortness of breath), or acute symptoms that may require immediate medical attention (e.g., chest pain, seizures, hematuria) (Gauer, 2017). Hypertensive crises are associated with a higher incidence of adverse cardiovascular events long-term and, therefore, warrant a nuanced approach to ensure better blood pressure control.

Background Knowledge

Hypertension is considered a “silent killer” as it often does not produce warning signs or symptoms prior to negatively affecting one’s health (CDC, 2020). According to the JNC-8 guidelines developed by the Institute of Medicine, uncontrolled hypertension is defined as blood pressure $\geq 140/90$ (Kovell et al., 2015). Roughly 1 in 3 adults or 75 million Americans in the U.S. are diagnosed with hypertension each year, and only half of these individuals have their blood pressure under control (CDC, 2020). Individuals who do not gain control of their blood pressure can eventually succumb to the life-threatening complication known as hypertensive crisis.

Hypertensive crisis is categorized into two levels: hypertensive urgency and hypertensive emergency. Hypertensive urgency occurs with a systolic blood pressure greater than 180 mmHg

and/or diastolic greater than 110 mmHg with no signs or symptoms of acute end-organ damage such as cardiac ischemia, pulmonary edema, neurologic deficits, or acute renal failure (Alley & Copelin, 2019). Organs commonly affected by severe hypertension are the brain, heart, large blood vessels, and kidneys (Breu & Axon, 2018). Hypertensive emergency is characterized by similar blood pressure elevations but also by evidence of new or worsening end-organ failure (Breu & Axon, 2018). Many factors can lead to a hypertensive crisis: obesity, gender, history of cardiovascular disease, diabetes, smoking are all high-risk factors, and (most commonly) medication noncompliance (Alley & Copelin, 2019). Gaining control of hypertension will reduce the risk of heart disease and stroke, which are two of the leading causes of death among Americans (CDC, 2020).

Hypertension can be controlled through nonpharmacologic or pharmacologic interventions. Nonpharmacologic interventions involve lifestyle modifications such as weight reduction, increased physical activity, and diet modifications. The American Heart Association (AHA) and the American College of Cardiology (ACC) recommend a diet high in vegetables, fruits, and whole grains; limiting sodium intake to less than 2,400 milligrams per day; and exercising three to four times per week for an average of 40 minutes per session (Oza & Garcellano, 2015). Additional nonpharmacologic strategies include tobacco cessation, meditation, acupuncture, biofeedback, self-monitoring of blood pressure, and dietary supplements that improve blood pressure levels (Oza & Garcellano, 2015). If blood pressure levels cannot be controlled through nonpharmacologic interventions, antihypertensive medications may be required.

The key to managing hypertensive crises is to determine the distinction between hypertensive urgency and hypertensive emergency. The introduction of an evidence-based hypertensive urgency algorithm can aid providers in determining the next step when patients presents with a hypertensive crisis. Often times, patients seek emergency department (ED) care as their first line of care during a hypertensive crisis, however, studies have shown that a rapid lowering of blood pressure, as generally performed in an ED, can create an unnecessary and harmful effect to patients who are asymptomatic (Kessler & Joudeh, 2010). Severely elevated blood pressure does not develop abruptly but is likely to develop over days, weeks, or months. Aggressive treatment to decrease blood pressure levels too quickly can result in markedly decrease cerebral perfusion leading to ischemia or infarction (Kessler & Joudeh, 2010). Therefore, outpatient treatment for hypertensive urgency is generally acceptable, with the appropriate follow-up. These individuals will need adjustments in their long-term oral antihypertensive therapy, particularly the use of combination medications or the reinstatement of medications if they have been nonadherent (Kessler & Joudeh, 2010). Studies demonstrate that greater than 50% of individuals sent to the emergency department for hypertensive urgency get discharged without any adjustment of medications (Heath, 2016; Patel et al., 2016). In fact, a Cleveland Clinic study found more than 80% of individuals had blood pressure greater than 140/90 mmHg 1 month after diagnosis of hypertensive urgency, and more than 60% 6 months after (Patel et al., 2016). Additionally, a systematic review reported 51% to 72% of inpatients have elevated blood pressures, with an estimated range of 37% to 77% who continue to have elevated blood pressures at the time of discharge (Stanistreet et al., 2020). Assessment and observation become essential in determining acute target organ damage. Unless there are clinical

findings of end organ damage or if symptomatic patients have persistent systolic blood pressure greater than 240 mmHg and/or diastolic blood pressure greater than 130 mmHg, hypertensive urgency can be successfully managed within an outpatient setting (Heath, 2016; Patel et al., 2016).

Current practices indicate that individuals who present to outpatient clinics with severely elevated blood pressure are directly admitted to the hospital or sent to the emergency department (Heath, 2016; Patel et al., 2016; Stanistreet et al., 2020). A study found that individuals who were referred to the emergency department for management of hypertensive urgency received no intervention for their blood pressure, were discharged home, and did not have their antihypertensive regimen adjusted upon discharge (Heath, 2016; Patel et al., 2016). Referrals to the hospital were associated with increased hospitalizations, but not with better health outcomes, and individuals with hypertensive urgency continued to have uncontrolled hypertension six months later (Heath, 2016; Ipek et al., 2017; Patel et al., 2016). Hypertensive urgency is common within the outpatient setting, and most individuals can be safely treated as complications are rare in short-term situations (Patel et al., 2016). Therefore, without signs of acute organ damage, there is no indication for referral to the emergency department.

Advanced practice nurses are in a unique position to educate and promote prevention of hypertensive crises. The role of nurses has grown considerably in which evidence-based protocols are able to guide advanced practice nurses to assess patients' health status, adjust medications, and address barriers to hypertension care and control, thus becoming more involved in the assessment and management of hypertension (Himmelfarb et al., 2016). The tools and

resources available such as treatment algorithms are part of a multi-faceted approach to enhance clinical decision making, communication, and patient self-management of their hypertension.

Local Problem

Within the state of Oregon, 1 in 5 individuals has reported being diagnosed with hypertension, accounting for 20% of the state population (Healthy Columbia Willamette Collaborative, 2019). Hypertension is highest among ethnicities who receive services through Medicaid, including Asians at 17-18%, African Americans at 17%, and Caucasians at 13-14% (Healthy Columbia Willamette Collaborative, 2019). In 2017, 353,446 individuals sought treatment in the ED, with 10% of those visits accounting for hypertensive crises (Oregon Health Authority, 2018). That same year, statistics have shown that the number of ED visits for hypertensive crises have risen 2.2% (Oregon Health Authority, 2018). The rise in ED visits for hypertensive crises follows the nationwide trend that Janke et al. (2016) found in which each year there was a 5.2% increase in ED visits for hypertension-related conditions. The use of EDs for non-urgent issues leads to unnecessary testing and treatment, excessive healthcare spending, and a missed opportunity for primary care providers to promote long-term relationships with their patients (Heath, 2016; Patel et al., 2016; Stanistreet et al., 2020; Uscher-Pines et al., 2013). This trend suggests that primary care providers might need more extensive training in controlling high blood pressure within an outpatient setting. This training, in alignment with best evidence-based practice, not only could reduce ED visits but also promote better management of their patients' hypertensive urgency among providers.

Intended Improvement

Project Purpose

The purpose of this quality improvement (QI) project is to provide an algorithm for primary care providers to utilize if an individual presents to the office with hypertensive urgency. The goal of the algorithm is to create a standardized protocol, within outpatient settings, for any individual experiencing hypertensive urgency. The new guidelines will provide consistency in patient care as hypertensive urgency can be managed within an outpatient setting.

Project Question

In outpatient primary care providers, does knowledge and perceived usefulness of and the intent to use a hypertensive urgency algorithm change after an educational session on hypertensive urgency?

Project Objectives

The aim of this QI project is to provide a hypertensive urgency algorithm for providers within an outpatient setting. This hypertensive urgency algorithm can guide primary care providers in gradually reducing blood pressure levels over a period of 24 to 48 hours and prevent overaggressive treatment (Gauer, 2017). The algorithm can further guide the management of hypertensive urgency and potentially decrease the number of hospitalizations for severely elevated blood pressure.

Aim 1: Introduce to clinic providers an evidence-based hypertensive urgency algorithm.

Aim 2: Educate primary care providers on how the algorithm can be used to identify individuals presenting with hypertensive urgency.

Aim 3: Offer an executive summary to clinic providers regarding their perceived usefulness and intent to use of the algorithm.

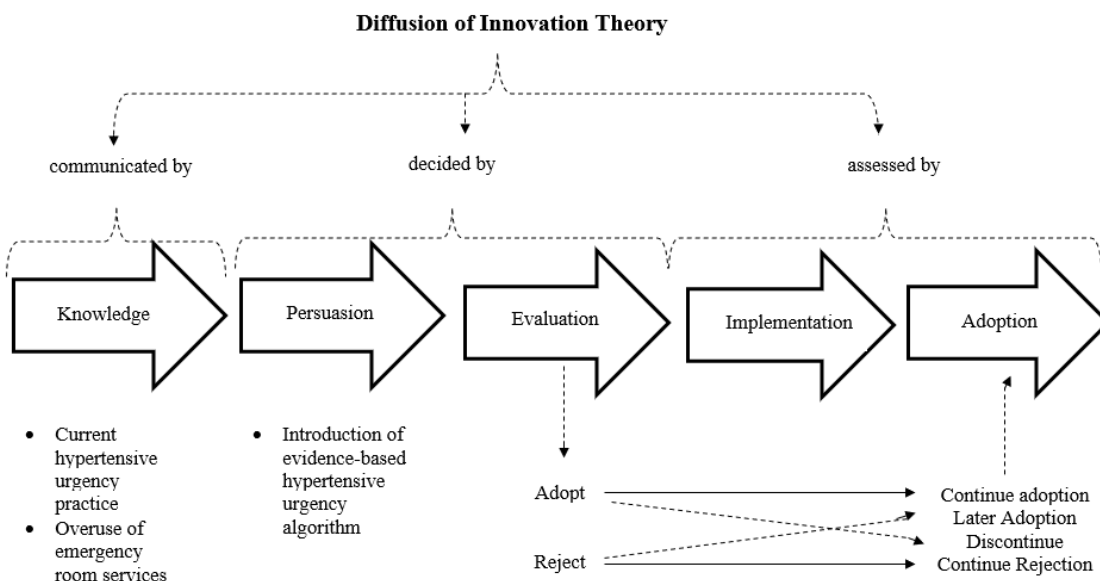
Theoretical Framework

The Diffusion of Innovation Theory is a communications model developed by E.M. Rogers in 1962 (Rogers, 2003). This model is one of the oldest social science theories originating in communications to explain how an idea or product gains momentum. It discusses how an innovation—a new idea or process—can diffuse through a specific population or within the social system. Diffusion occurs when information about the innovation flows from one person to another over time within the social system. As this project aims to implement an evidence-based algorithm and educate providers on best practices during a hypertensive urgency crisis, Roger’s Diffusion of Innovation Theory will act as a practical and relevant framework.

Roger’s Diffusion of Innovation Theory consists of four main determinants that guide the success of the new innovation: communication channels, attributes of the innovation, characteristics of adopters, and the social system (Rogers, 2003). The communication channel refers to the medium in which people obtain information about the innovation and perceive its usefulness. This involves both interpersonal communication and mass media. The attributes of the innovation include five user-friendly perceived qualities: relative advantage, compatibility, complexity, trialability, and observability. The potential adopters are characterized into five groups based on their attitudes towards the innovation: innovators, early adopters, early majority, late majority, and laggards. Roger’s theory referred to the social system as “a set of interrelated units engaged in joint problem solving to accomplish a common goal” (p. 56). He suggested that the social system structure affects individuals’ attitude toward the innovation, and consequently,

the rate of adoption of innovation. These four main determinants will determine the success of the adoption process. Furthermore, the adoption process is comprised of five components that will aid in the adoption process for this project: knowledge, persuasion, evaluation, implementation, and adoption. Knowledge relates to the amount of awareness individuals are exposed to relative to the innovation; persuasion is the extent to which individuals will be interested in the new innovation; evaluation will help determine whether the new innovation will be successful; implementation occurs when the innovation is trialed; and adoption occurs when the individual uses the innovation to its fullest extent.

Diffusion of Innovation Theory allows individuals working closely on this QI project the opportunity to gather feedback from stakeholders about whether the proposed protocol will benefit the clinic as well as patient outcomes. Open communication, support, and continual modifications will ensure the ultimate integration and compatibility of the new process. The success of this innovation will be passed through the social system, allowing other units and organizations to adopt the new practice as desired.

Figure 1*Diffusion of Innovation Theory for a Hypertensive Urgency Algorithm*

Note. Adapted from A Model of Five Stages in the Innovation-Decision process, by E.M. Rogers, 2003 (Source: Diffusion of Innovations, Fifth Edition by Everett M. Rogers. Copyright (c) 2003 by The Free Press. Reprinted with permission of the Free Press: A Division of Simon & Schuster.)

Application of Diffusion of Innovation Theory

Knowledge

The knowledge stage refers to the extent to which the innovation is exposed to potential adopters (Kaminski, 2011). In this phase, the project investigator (PI) performed a literature review and identified the overuse of emergency room services for individuals with severely elevated blood pressure levels. The PI evaluated the hypertensive crisis protocol and culture at the primary care practice, where the intervention will be implemented. Potential adopters will be made aware of this new intervention and how it can benefit current practice protocol.

Persuasion

The persuasion stage refers to the extent to which the individual becomes interested in the new innovation and seeks additional information (Kaminski, 2011). Upon completion of the literature review and assessment of clinician knowledge at the site, the PI will provide research on how an evidence-based hypertensive urgency algorithm can be beneficial in practice. The algorithm will be used to guide the clinicians' decision-making process for assessing patients' needs.

Evaluation

The evaluation stage refers to the extent to which the individual mentally applies the innovation to their present or anticipated future practice (Kaminski, 2011). In this stage, the potential adopter will determine whether they will utilize the evidence-based algorithm in clinical practice. The algorithm will be provided within a primary care setting for providers to use when a hypertensive urgency crisis occurs. Potential adopters will determine the usability of the algorithm and whether it will benefit the clinic site.

Implementation

The implementation stage refers to the extent to which the innovation can be experienced within a limited timeframe (e.g., during a trial) (Kaminski, 2011). The PI will begin the trial at the local primary care clinic, providing the hypertensive urgency algorithm to each clinician. Patients who arrive at the clinic with blood pressure levels greater than 180 systolic and/or 110 diastolic will be assessed based on symptoms. The algorithm will guide the clinician's decision-making process as to whether to adjust antihypertensive medications or send the patient to the emergency department.

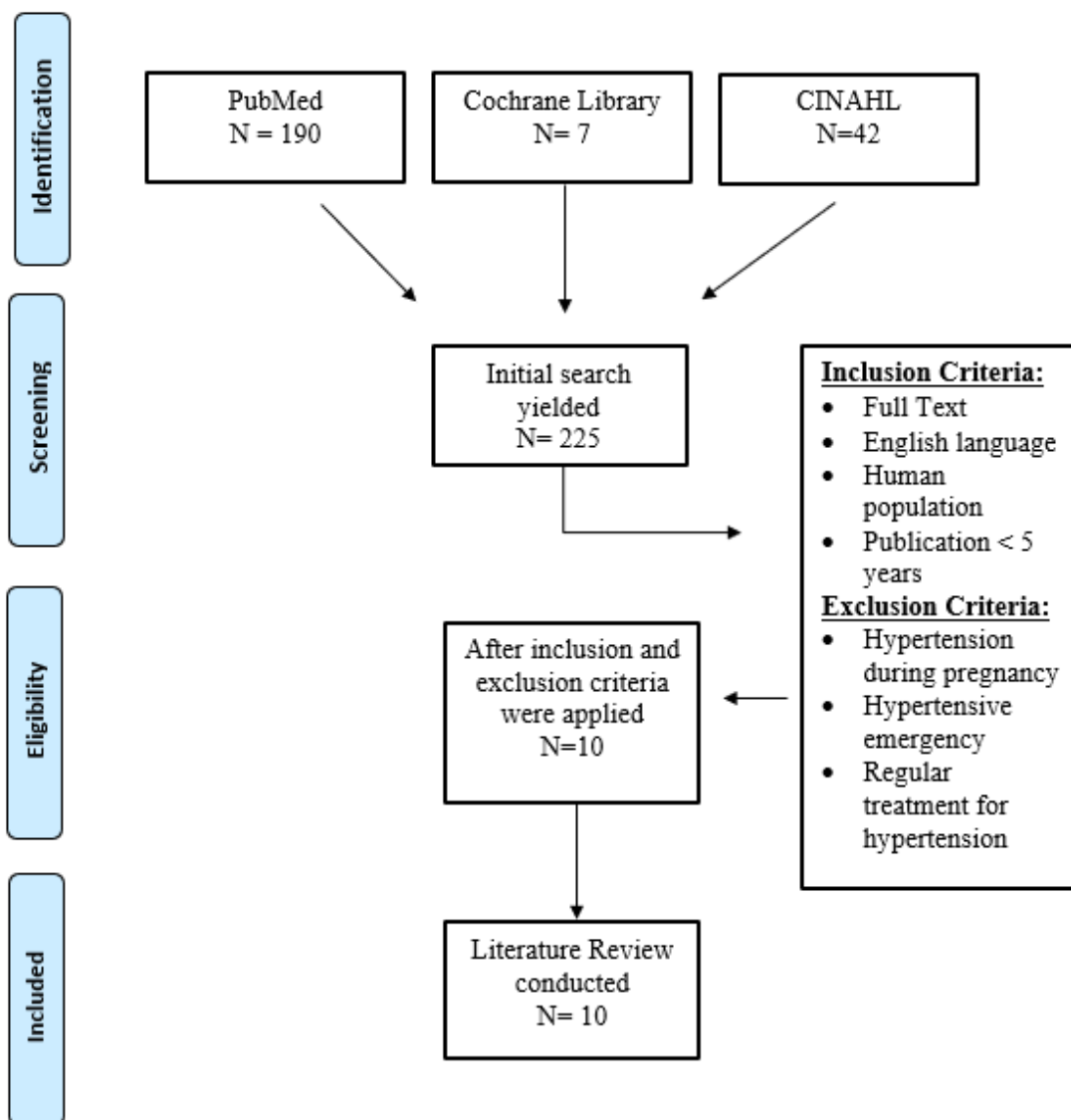
Adoption

The adoption stage refers to the extent to which the individual will continue to fully use the innovation (Kaminski, 2011). During this phase, potential adopters at the project site will determine whether to continue using this algorithm in their clinical practice. They will decide whether the algorithm benefits their patients and improves their practice.

Literature Synthesis

Evidence Search

A literature search on the efficacy of outpatient treatment for patients with hypertensive urgency was conducted using the PubMed, Cochrane Library, and CINAHL databases. A combination of keywords and Boolean search phrases included: “hypertensive urgency,” “severely elevated blood pressure,” “asymptomatic hypertension,” “hypertensive crisis,” “treatment plan,” “management,” “clinic setting” or “outpatient setting.” The initial search yielded a total of 225 articles. The search was further refined by setting the following limitations: full text availability, English language, human population, and publication within the last 5 years. Studies were included if the primary or secondary outcome included treatment plan for patients within the inpatient or outpatient clinical setting. Articles were excluded if they focused on hypertension during pregnancy, hypertensive emergency, and regular treatment for essential hypertension. After exclusion, a total of 10 articles were selected for critical appraisal (Appendix G). The following themes were identified: the reasons for elevated blood pressure, the relationship between hospital referrals and diagnostic testing, and the potential dangers of intravenous antihypertensive treatment from emergency department visits.

Figure 2*Flow Diagram of Literature Search*

Note. Adapted from Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement.* PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

Reasons for Elevated Blood Pressure

Hypertensive crisis is often caused by the individual not following an antihypertensive home regimen or running out of medication (Dowd et al., 2018; Ipek et al., 2017; Patel et al.,

2016). Elevated blood pressure can also be triggered by poor sleep, anxiety, pain, medication or nicotine withdrawal, and visits to providers (Stanistreet et al., 2020). In addition to being used to assess potential causes of asymptomatic hypertension, blood pressure checks should be repeated to ensure that proper technique is used. Five of the 10 studies have found benefit for individuals presenting with asymptomatic hypertension to have their blood pressure levels rechecked 30 minutes after initial check in order to determine if the elevated blood pressure is consistent (Breu & Axon, 2018; Campos et al., 2018; Dowd et al., 2018; Srumasiri et al., 2014; Stanistreet et al., 2020). Another study found that, out of 549 individuals presenting to the emergency department with elevated blood pressure, 32% showed a 20-mmHg reduction in baseline systolic BP and/or 10-mmHg reduction in diastolic BP 30 minutes later without antihypertensive treatment (Breu & Axon, 2018). A proper assessment should be made to determine medication compliance in individuals (Breu & Axon, 2018; Campos et al., 2018; Patel et al., 2016). Re-initiation and adjustment of oral antihypertensive therapy should occur for individuals with preexisting hypertension (Patel et al., 2016). In individuals without histories of hypertension but whose blood pressure remains elevated 30 minutes after initial check, oral antihypertensive therapy should be initiated with close outpatient follow-up (Breu & Axon, 2018; Patel et al., 2016; Stanistreet et al., 2020).

Hospital Referrals and Diagnostic Testing

Research has compared the impact of outpatient vs. hospital management of asymptomatic individuals with severely elevated blood pressure levels. Hospital referrals were associated with significant increases in hospitalization but no marked improvement in either adverse events or symptoms at follow-up (Heath, 2016; Ipek et al., 2017; Patel et al., 2016). In

addition, the number of diagnostic evaluations performed during hospitalization in individuals without symptoms of acute organ injury was not statistically significant (Dowd et al., 2018; Pak et al., 2014; Patel et al., 2016; Srurmasiri et al., 2014). A study demonstrated that hospital referrals increased the likelihood of diagnostic evaluation, in which 80% of patients had their basic metabolic panel drawn, 38% had their cardiac enzymes drawn, and 41% had a urinalysis collected (Dowd et al., 2018). Among these individuals, there were no causes of acute kidney injury, one patient had an elevated cardiac enzyme unrelated to acute coronary syndrome, and 12 were positive for hematuria and 18 were positive for proteinuria; which does not necessarily indicate acute organ injury (Dowd et al., 2018). Similarly, the Cleveland Clinic study demonstrated that 426 individuals who presented with hypertensive urgency underwent 748 diagnostic tests, with only 41 (5.5%) of those tests having abnormal results (Patel et al., 2016). Furthermore, 60 computed tomographic scans were ordered, in which all had normal findings (Patel et al., 2016). Conducting diagnostic evaluations on individuals presenting with asymptomatic hypertension is not only causing unnecessary exposure to radiation but also incurs higher healthcare costs with no difference in health outcomes. Therefore, hospital referrals should only be considered if the individual is symptomatic and/or exhibiting acute organ damage.

Potential Danger of Intravenous Antihypertensive Medications

Several studies compared the impact of rapid blood pressure reduction and outpatient blood pressure management strategies in individuals who presented to the ED with hypertensive urgency. They found that approximately 25% present with hypertensive emergency, while asymptomatic individuals are more likely to present with a “pseudohypertensive emergency”

(McNaughton et al., 2015; Pak et al., 2014). There are currently no studies that demonstrate the progression of hypertensive urgency to hypertensive emergency without antihypertensive medications, however, many ED physicians are reluctant to discharge individuals with severely elevated blood pressure levels resulting in administration of rapid antihypertensive medications (Stanistreet et al., 2020). This decision can cause potential danger in decreasing cerebral and renal perfusion when intravenous antihypertensive treatments are administered (Ipek et al., 2017; Levy et al., 2015). The use of intravenous antihypertensive medications within ED can lead to increase in length of hospital stays, iatrogenic hypotension after discharge, and even medication noncompliance (Ipek et al., 2017; Pak et al., 2014; Stanistreet et al., 2020). Instead, individuals with hypertensive urgency should have their blood pressure gradually lowered during a period of hours to days to minimize risks associated with rapid blood pressure reduction, cardiovascular sequelae, and impairment of autoregulatory mechanism that maintains tissue perfusion (Ipek et al., 2017; Levy et al., 2015; Pak et al., 2014; Stanistreet et al., 2020). Oral antihypertensive medications are the preferred method for gradual reduction in blood pressure levels. A systematic review examined the different types of oral antihypertensives such as captopril, labetalol, clonidine, hydralazine, and nitroglycerin and found no particular blood pressure medication used to lower blood pressure, but instead all of these medications have shown to be effective within 12 hours (Campos et al., 2018; Sruamsiri et al., 2014). The types of medication prescribed for individuals depends on their clinical picture and side effects of each medication. Therefore, unless clinically indicated, asymptomatic patients should be observed and discharged with adjustment of oral antihypertensive therapy without additional administration of intravenous antihypertensive medication in the emergency department.

Strengths and Weaknesses of Evidence

Six of the 10 appraised articles consisted of systematic reviews, all of which were at level III and above in terms of evidence quality. The four remaining articles were retrospective cohort studies, the strengths of which included being able to follow individuals' health information over a more extended period of time. All 10 articles demonstrated consistent results in that individuals with hypertensive urgency should not be seen in the emergency department unless they are symptomatic or have signs of acute organ damage.

Levy et al. (2015) and Patel et al. (2016) were both large retrospective cohort studies, each conducted within a single, large healthcare system. Both studies examined the short-term outcomes of asymptomatic hypertensive individuals treated within the emergency department. They concluded that treatment of these individuals would have been appropriate within an outpatient setting. The only difference found was Patel et al. (2016) encompassed a diverse population while Levy et al. (2015) had a skewed representation of African Americans, many of whom used the ED for chronic management of their hypertension. The findings in this study, therefore, can only be used to represent other large, urban emergency departments that predominantly treat underserved, African American patient populations (Levy et al., 2015). Patel et al. (2016) may be generalizable to large cities but not to small communities.

Several retrospective cohort studies did not follow-up with individuals who presented to the ED with asymptomatic hypertension and were discharged without any treatment (Dowd et al., 2018; Levy et al., 2015; Patel et al. 2016). In addition, events that may have occurred in other healthcare systems or adverse events resulting in death at home may not have been documented (Patel et al., 2016). Similar to Dowd et al. (2018), Levy et al. (2015) did not follow up with

individuals who were discharged from the emergency department without antihypertensive treatment, however, they utilized the Social Security Death Index, and found that their approach to management was relatively safe. The Social Security Death Index is shown to be approximately 95% accurate (Levy et al., 2015). Furthermore, the prescribing patterns of providers were also not tracked and may have differed in the selection of laboratory ordering, diagnostic tests, and route of antihypertensive medication administration (Dowd et al., 2018).

Gaps and Limitations

Majority of the studies examined management of hypertensive urgency in the ED (Breu & Axon, 2018; Dowd et al., 2018; Ipek et al., 2017; Levy et al., 2015; McNaughton et al., 2016; Srurmasiri et al., 2014). Patel et al. (2016) was one of the first studies to compare the prevalence, characteristics, and outcomes of asymptomatic hypertensive individuals treated within the emergency department vs. within an outpatient setting. Limited research on hypertensive urgency has been conducted within the outpatient setting, further requiring the need for future exploration in this area of practice.

The literature reflected the following limitations: in their systematic review, Campos et al. (2018) used only articles written in English, which would have excluded any studies published in non-English languages. In addition, many of the study designs limited data collection to the first few hours of presentation, which would not provide sufficient evidence to support mortality or morbidity outcomes (Campos et al., 2018). Several studies excluded individuals with acute pain and significant comorbidities such as chronic kidney impairment, in which hypertensive urgency is a frequent complication (Campos et al., 2018; Dowd et al., 2018).

Finally, Levy et al.'s (2015) sensitivity analysis excluded individuals who returned to the emergency department within 24 hours of discharge.

Summary of Evidence

All studies demonstrated how hypertensive urgency can be safely managed within the outpatient setting through adjustment of medications, whether it is initiating or re-initiating antihypertensive medications, increasing the dosage of an existing medication, or adding a new antihypertensive medication to current regimen. Currently, there is no supporting evidence that indicates the need for ED visits in individuals with asymptomatic hypertension (Heath, 2016; Ipek et al., 2017; Pak et al., 2014; Patel et al., 2016). Instead, individuals with asymptomatic hypertension should be allowed a thirty-minute rest period before rechecking of blood pressure (Breu & Axon, 2018; Campos et al., 2018; Dowd et al., 2018; Ssurmasiri et al., 2014; Stanistreet et al., 2020). If the blood pressure remains elevated thirty-minutes later, the introduction, the re-initiation, or the addition of oral antihypertensive medications is appropriate. The blood pressure should be gradually lowered during a period of hours to days to minimize the risk of hypotension-related complications. Any changes to antihypertensive medication regimen should be closely monitored during a 1-week follow-up visit (Breu & Axon, 2018; Patel et al., 2016; Stanistreet et al., 2020).

METHODS

Project Design

The purpose of this QI project is to assess knowledge and encourage adoption of an evidence-based hypertensive urgency algorithm among primary care providers. A pre- and post-survey in conjunction with an education session was implemented at an outpatient primary care

setting in Portland, Oregon. The algorithm was introduced to the providers asynchronously online via a PowerPoint presentation completed by the project investigator (PI). The initial and post-presentation surveys via Qualtrics will be used to determine changes in provider knowledge, perceived usefulness, and intent to use of the hypertensive urgency algorithm.

Model for Implementation

This QI project will utilize The Model for Improvement framework developed by Associates in Process Improvement, and utilized by the Institute of Healthcare Improvement (IHI; 2020). This model is comprised of two parts: three fundamental questions and the plan-do-study-act (PDSA) cycle. The first part of the model guides the PI in setting aims, establishing measures, and selecting changes by asking three questions: 1) “What are we trying to accomplish?” 2) “How will we know that a change is an improvement?” and 3) “What change can we make that will result in improvement?” (IHI, 2020, n.p.). The second part of the model will assist in testing the change, implementing the change, and spreading the change within the outpatient clinic setting. The three questions will influence the PDSA cycle in supporting the need for improvement.

Plan-Do-Study-Act (PDSA) Model

Plan. “Plan” in this context, refers to a strategy created to test for change in a clinical environment (IHI, 2020). The plan for this QI project has two parts: 1) to design a process for piloting a hypertensive urgency algorithm to improve workflow within a clinic setting and 2) to evaluate knowledge retention, perceived usefulness, and intent to use of this algorithm among providers.

Do. “Do” refers to carrying out the QI design developed in the planning stage (IHI, 2020). Provider participation will be voluntary. Materials for conducting the intervention will be readily accessible online.

Study. “Study” refers to the ability to utilize feedback on the intervention as a tool to improve the project (IHI, 2020). Survey responses will provide data for analysis and interpretation. The data will be analyzed by the PI to assess if ongoing use of the algorithm will potentially be successful.

Act. “Act” refers to the decision to make modifications based on information gained during analysis in the study phase (IHI, 2020). These modifications will enable stakeholders to create a sustainable plan for using the algorithm.

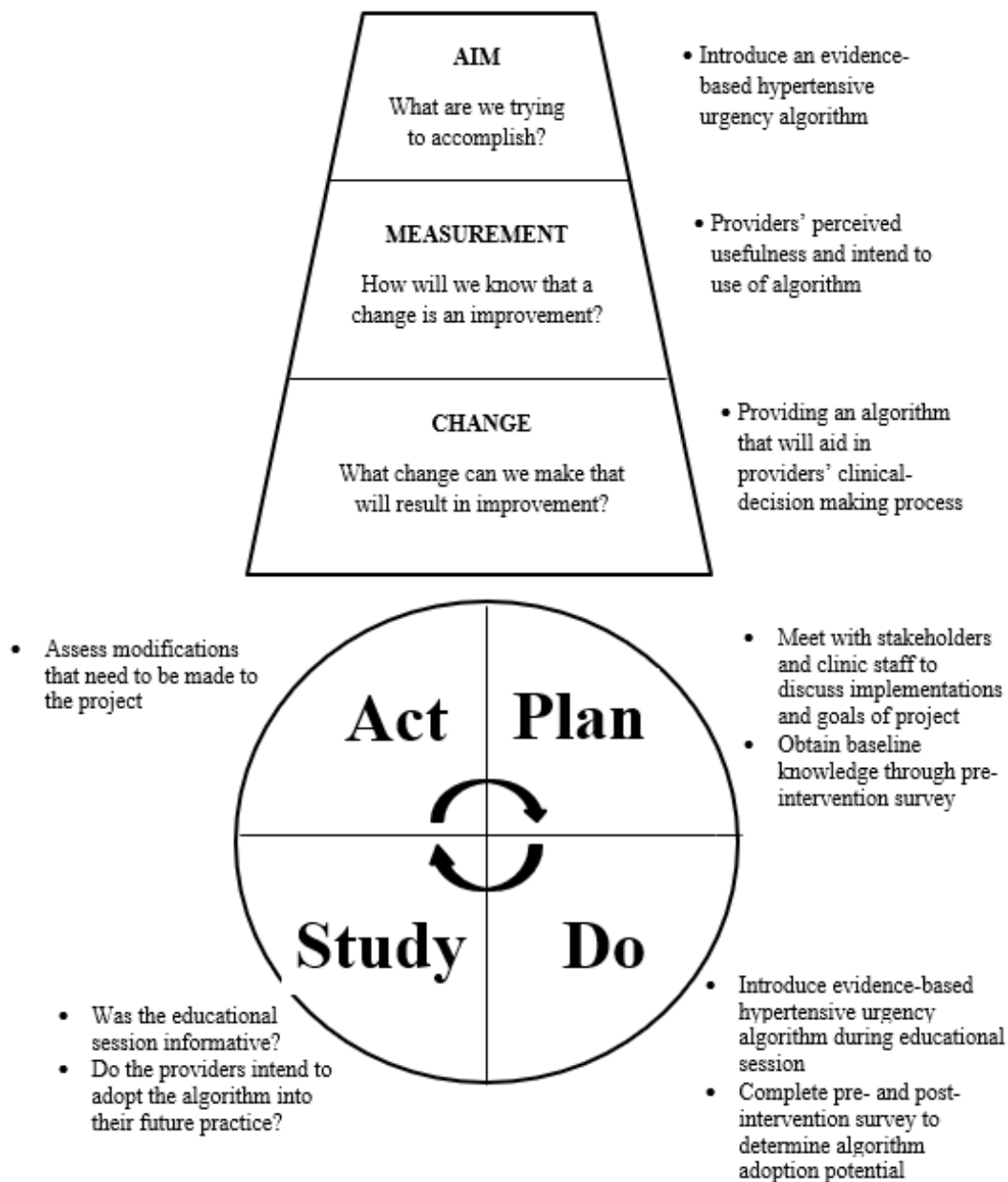
Setting and Stakeholders

This PI introduced the hypertensive urgency algorithm in a Portland, Oregon, primary care clinic. This multi-specialty practice clinic is part of the Providence Health & Services organization, a non-profit Catholic organization. It serves residents of all ages with Medicare, Medicaid, or private insurance. The facility consists of several departments, including urgent care, family practice, internal medicine, pediatrics, psychology, and physical therapy. The patient population seen at the clinic is 81% Caucasian, 1.3% African American, 0.4% American Indian, 7.2% Asian, and 10.7% Hispanic (United States Census Bureau, n.d.). Study participants were providers from family practice and internal medicine. The family practice department consisted of four providers – two nurse practitioners (NP), one physician assistant (PA), and one medical doctor (MD). The internal medicine department consisted of nine providers – two PAs, four MDs, one NP, and two doctor of osteopathic medicine (DO). Inclusion criteria comprise MDs,

PAs, and NPs, all of whom participated voluntarily and have the ability to prescribe. Exclusion criteria comprise medical assistants (MAs), registered nurses (RNs), laboratory assistants, care coordinators, case managers, nursing assistants (NAs) and those primary care providers (PCPs) without prescriptive authority.

Planning the Intervention

After obtaining permission from the clinic manager and preceptor to implement a 30-minute educational session online (Appendix A), the PI recruited the study participants. The education regarding the hypertensive algorithm intervention took place asynchronously online, with links provided for the pre- and post-intervention survey along with a pre-recorded PowerPoint presentation using the Zoom platform. An email was sent to all study participants with the participant disclaimer (Appendix B) and a link to start the pre-intervention survey. The pre-intervention survey evaluated providers' knowledge of care provided during a hypertensive urgency crisis. Next, the PI developed and pre-recorded a 5-10-minute evidence-based PowerPoint presentation (Appendix E). The pre-recorded PowerPoint presentation addressed the purpose of the QI project, educated on current best practices, and discussed potential benefits and outcomes of utilization of hypertensive urgency algorithm (Appendix E). After the educational session, a link to the post-intervention survey was available to assess provider knowledge and perception of the algorithm and intent for use in the future. Providers had two weeks to complete both surveys. A follow-up email was sent to providers one week after start of pre-intervention survey.

Figure 3*Model for Improvement for a Hypertensive Urgency Algorithm*

Note. Adapted from the Model for Improvement, PDSA Cycle, by the Institute for Healthcare Improvement, 2020, (<http://www.ihl.org/resources/Pages/HowtoImprove/default.aspx>).

Participants and Recruitment

This PI completed a clinical rotation at the study site and is acquainted with the family practice and internal medicine providers. The preceptor and clinic manager assisted the PI in recruiting participants by sending a recruitment flyer via email (Appendix C) to be disbursed at the family medicine and internal medicine clinic weekly provider meetings. The clinic manager provided a list of email addresses from clinic providers who verbally consented and showed interest in the study. Providers who were willing to participate in the QI project were emailed a written disclaimer (Appendix B) along with links to the surveys and the educational intervention. The goal was for seven of the 13 potential clinic providers to participate in this study.

Consent and Ethical Considerations

This QI project complied with guidelines and required approval from the University of Arizona Institutional Review Board (IRB). Participation in this project was voluntary, and each participant provided implied consent, after reading the participation disclaimer, by starting the pre-intervention survey. This project follows the ethical principles of research addressed in the Belmont report – respect for persons, beneficence, and justice (Office for Human Research Protections, 2018). The summarization of ethical principles and guidelines should aid in resolving ethical problems that surround research with human subjects.

Respect for Persons

Respect for persons is the ethical principle that requires individuals to either have complete autonomy or be protected if they have diminished autonomy (Office of Human Research Protections, 2018). This principle demands that study subjects be able to participate voluntarily, be provided adequate information, and be able to stop participating at any time.

Participants will be informed of the study's aims and the participation tasks. They will be asked to answer pre- and post-intervention surveys and to watch an educational PowerPoint presentation. All answers to the surveys will be kept anonymous on a password-protected computer that only the PI has access to.

Beneficence

Beneficence is the ethical principle of respecting study participants' decisions and protecting them from harm, making all efforts to secure their well-being (Office of Human Research Protections, 2018). There are no foreseeable risks or threats to participants' safety. The pre- and post-intervention design is likely to accomplish the project objectives by enhancing participant awareness of practice culture within the clinic and encouraging optimization of patient care.

Justice

Justice is the ethical principle that establishes the right to be treated equally (Office of Human Research Protections, 2018). In this QI project, there will be no biased targeting of specific or vulnerable populations. All clinic providers meeting the inclusion criteria and; regardless of age, race, gender, and years of experience, will be given the opportunity to participate in the project and be presented relevant information.

Data Collection

Data was collected from the online surveys using the Qualtrics platform before and after the educational session. Qualtrics is a simple, web-based survey tool that can be used for survey research and evaluation. Study participants were asked to provide a 4-digit personal identifier

that will be used on both surveys for the purpose of matching surveys. The 4-digit identifier was only be known to the study participant and PI.

Survey questions were derived from the literature review conducted earlier (Appendix G). Responses from the pre-intervention survey enabled the PI to determine in the participants' knowledge gaps related to hypertensive urgency. The pre-intervention survey contained questions regarding demographic information: age, gender, education, specialty, professional title, and years in practice. Fourteen Likert scale questions addressed clinical expertise in hypertensive urgency, including whether providers used the JNC-8 hypertension guidelines, had awareness and knowledge of hypertensive urgency, and saw any patients with hypertension (Appendix D). Next, an educational session provided the participants with insight into current clinical practices and potentially reinforced in participants the need to conduct hypertensive urgency interventions (Appendix F). Immediately following the educational session, participants completed a post-intervention survey that includes eight Likert scale questions designed to evaluate knowledge and perceived usefulness of the algorithm itself and intent to use the algorithm in their practice (Appendix E).

Data Analysis

The pre- and post-intervention survey responses served as quantitative data expressed as means using descriptive statistics and as percentages using graphs and charts. Specifically, the demographic questions collected were used to determine the prevalence of hypertension versus incidence of hypertensive urgency within that primary care setting. Ordinal data collected from the Likert scale questions in the pre- and post- responses will determine the providers' knowledge of and confidence in hypertensive urgency management practices. In addition, results

from the post-intervention survey will determine whether providers knowledge changed and if they found the algorithm beneficial and intend to utilize it in the future. All answers to the surveys were kept anonymous on a password-protected computer that only the PI has access to. The project findings were shared with providers through email for the purposes of credibility and transparency.

RESULTS

Outcomes

The purpose of this QI project was to objectively evaluate providers' knowledge and perceived usefulness of and intent to use an evidence-based hypertensive urgency algorithm.

Participants

Based on the inclusion and exclusion criteria, internal medicine and family medicine providers were invited to participate in this 2-week QI project that ran from September 17, 2020, through October 1, 2020. Thirteen providers were invited to participate in the QI project. Among these providers, 11 participated in the pre-intervention survey (Appendix D) taken online via the Qualtrics platform. Of the 11 participants, nine completed the QI project, resulting in a response rate of 69%. These primary care providers comprised three MDs, one DO, two NPs, and three PAs.

Of the nine respondents (n=9), 55% were female, 55% had fewer than five years of practice, and 55% were under age 35 (Table 1). The participants consisted of three male, five female, and one undisclosed gender identity. These participants were mixed in terms of age and years of practice in their specified specialties: four were over age 35, and four had more than six

years of experience in practice. More than half of these participants specialized in internal medicine.

Table 1

Participant Demographic Characteristics

Demographic Characteristic	Category	Number (n=9)
<i>Gender</i>	Male	3
	Female	5
	Prefer not to identify	1
<i>Specialty</i>	Family Medicine	3
	Internal Medicine	6
<i>Age Range (years)</i>	< 35 years	5
	36-45 years	1
	46-55 years	0
	55-65 years	3
	> 66 years	0
<i>Professional Role</i>	MD	3
	DO	1
	NP	2
	PA	3
<i>Years of Practice</i>	< 1 year	0
	1-5 years	5
	6-10 years	1
	11-15 years	1
	> 15 years	2

Providers' Knowledge, Perception, and Barriers

Providers participating in this QI project answered questions surrounding their knowledge of hypertensive urgency and management of patients during a hypertensive urgency crisis. The providers also reported perceived usefulness, intent to use, and potential barriers of the hypertensive urgency algorithm in future clinical practice.

Current Clinical Practice and Knowledge of Hypertensive Urgency

Prior to the educational PowerPoint presentation, the participants answered questions about their knowledge and current practice with hypertensive urgency. Figure 4 demonstrates the number of knowledge questions answered correctly prior to and after the intervention. Prior to the intervention, more than half of the primary care providers answered five of the six knowledge questions incorrectly. After the intervention, all six knowledge questions were answered correctly by at least six participants.

Figure 4

Hypertensive Urgency Knowledge Questions

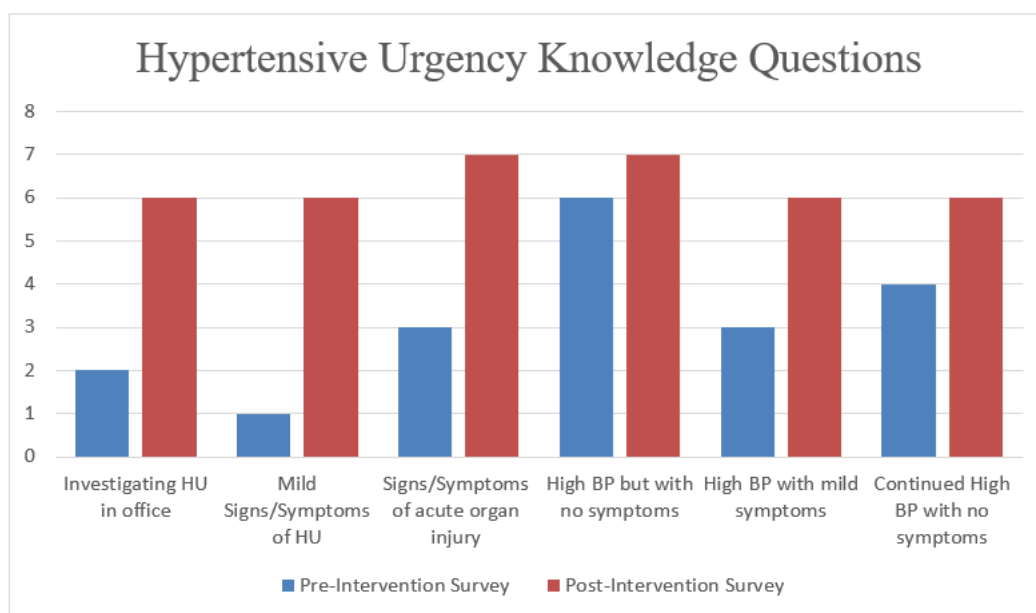


Figure 5 demonstrates participants' responses to the following statement: "I am confident in my ability to effectively manage a hypertensive urgency crisis" prior to the intervention. Two participants chose "Strongly Agree," six chose "Agree," and one chose "Neither Agree nor Disagree." After the intervention, participants answered the same question in the post-

intervention survey. Three providers chose “Strongly Agree” and six chose “Agree” in their ability to manage a hypertensive urgency crisis using the hypertensive urgency algorithm (Figure 6).

Figure 5

Confidence in Managing Hypertensive Urgency Before Intervention

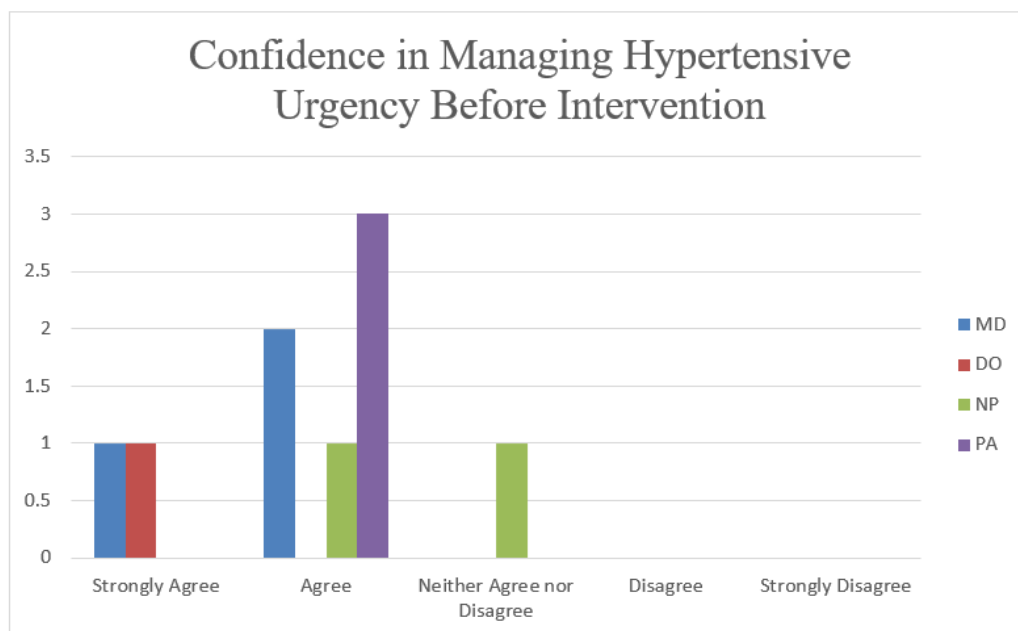
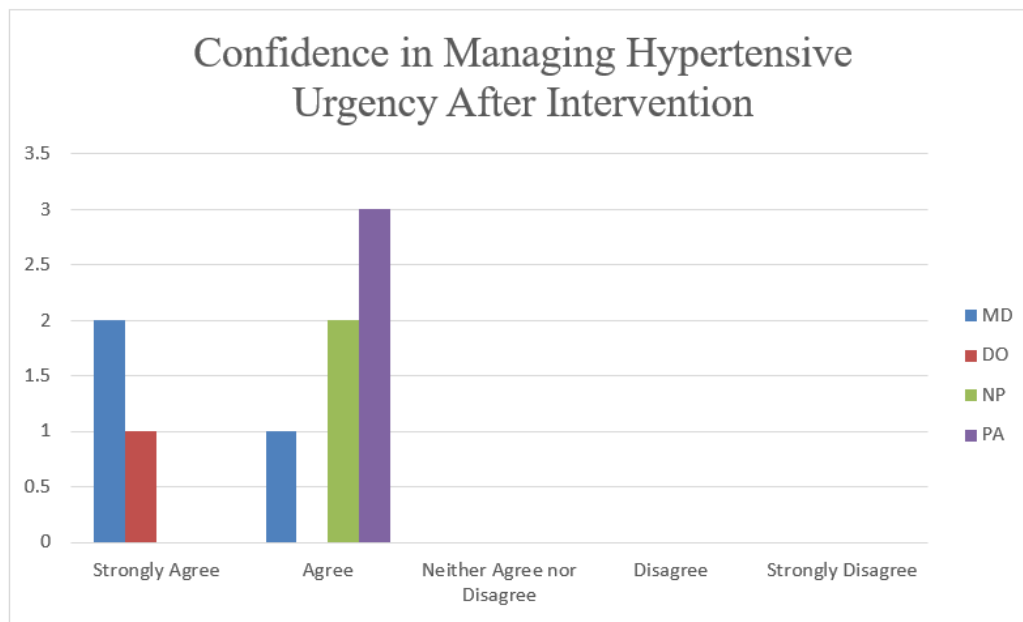


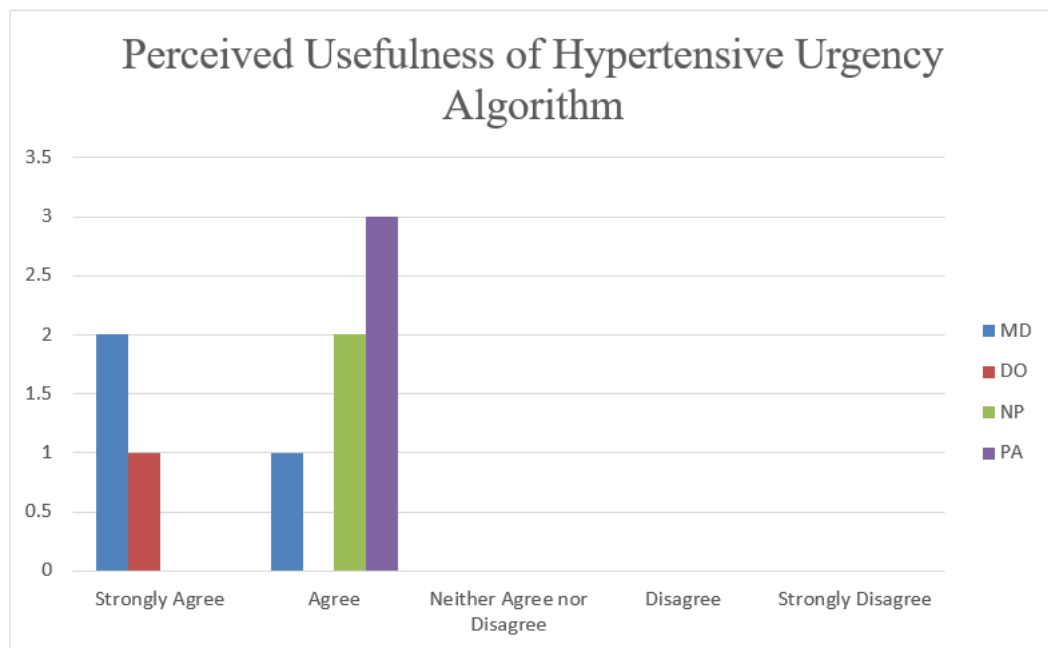
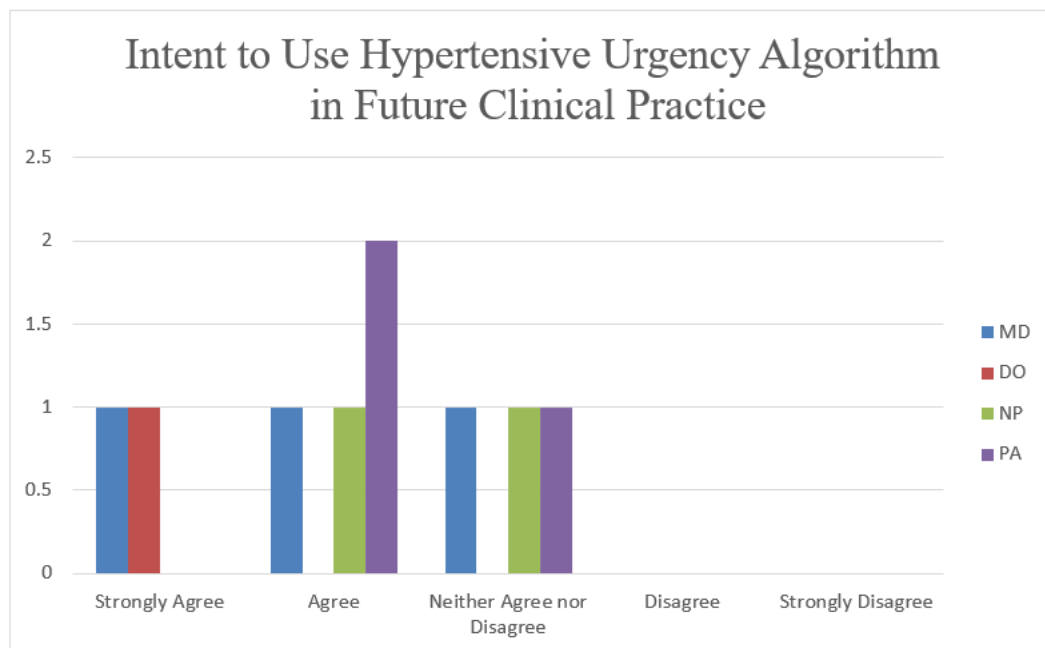
Figure 6

Confidence in Managing Hypertensive Urgency After Intervention



Perceived Usefulness and Intent to Use of Hypertensive Urgency Algorithm

Eight of the nine participants chose “Agree” to the following statement: “The educational session and hypertensive urgency algorithm has enhanced my knowledge.” Of these nine participants, Figure 7 illustrates that eight providers chose “Agree” or “Strongly Agree” to the use of the hypertensive urgency algorithm can encourage primary care providers to effectively manage hypertensive urgency within an outpatient setting. Furthermore, six of the participants in Figure 8 chose “Agree” or “Strongly Agree” to the following statement: “I intend to use this algorithm to help guide my clinical practice in the future.” However, three providers chose “Neither Agree nor Disagree” on whether they intend to the hypertensive urgency algorithm in their future practice.

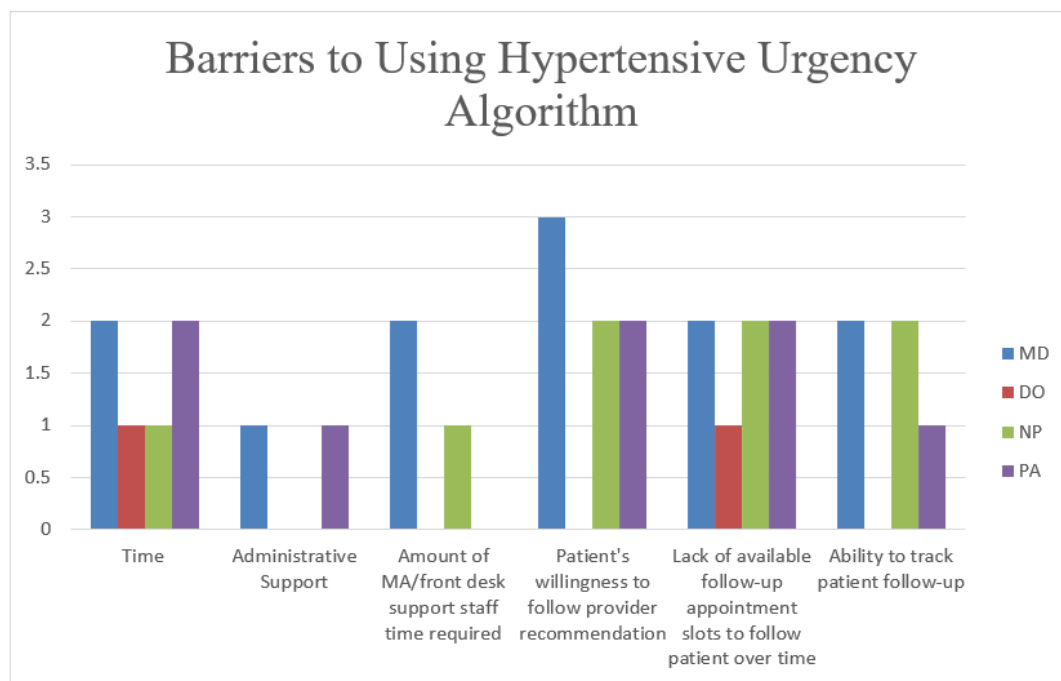
Figure 7*Perceived Usefulness of Hypertensive Urgency Algorithm***Figure 8***Intent to Use Hypertensive Urgency Algorithm in Future Clinical Practice*

Barriers to Utilizing Hypertensive Urgency Algorithm in Clinical Practice

A survey question was asked to determine potential barriers to implementation of the hypertensive urgency algorithm in future clinical practice. When asked of potential barriers to implementation, 66% of participants reported time as a barrier, while 77% participants reported patient's willingness to follow their recommendation as a barrier, and 77% participants reported the lack of available follow-up appointment slots as a barrier to utilize the hypertensive urgency algorithm within their future clinical practice (Figure 8). Some 55% reported lack of ability to track patient follow-up as a barrier to using the algorithm. Less than 35% of the participants did not think that administrative support was a barrier to implementing the hypertensive urgency algorithm.

Figure 9

Barriers to Using Hypertensive Urgency Algorithm



DISCUSSION

Summary

This project aimed to explore primary care providers' knowledge and perceived usefulness of, and intent to use, a hypertensive urgency algorithm. This section provides an explanation of the project's findings, discusses limitations of the project, and offers implications for future research and change in practice.

Interpretation

The purpose of this QI project was to assess providers' knowledge of hypertensive urgency and introduce the use of a hypertensive urgency algorithm in future clinical practice. In assessing providers' knowledge of hypertensive urgency, 33% of participants answered three or more questions correctly prior to the intervention. Despite the low percentage of knowledge questions answered correctly, 88% of primary care providers felt confident in their ability to manage hypertensive urgency prior to the intervention. Only one provider showed lack of confidence in their ability to manage hypertensive urgency. After the introduction of the hypertensive urgency algorithm, 66% of participants answered more than five of the six knowledge questions correctly and 100% of primary care providers either chose "Strongly Agree" or "Agree" in their ability to manage hypertensive urgency.

Following the introduction of the hypertensive urgency algorithm, 100% of primary care providers perceived usefulness of the algorithm, however, only 66% of the primary care providers demonstrated the intent to use the algorithm in their future practice. Each of the nine providers reported at least two barriers to implementation of the hypertensive urgency algorithm within their practice. The challenge remains to determine ways to overcome these barriers so that

primary care providers can utilize the hypertensive urgency algorithm to better manage hypertensive urgency.

Implications (Practice, Education, Research and Policy)

One percent of individuals with a medical history of hypertension have reported to have experienced a hypertensive crisis during their lifetime (CDC, 2020). Current practices show that these individuals have either been sent to or directly sought treatment in the emergency department for severely elevated blood pressure levels when they were asymptomatic. Studies have shown that individuals who have severely elevated blood pressure levels without any symptoms can be safely managed in an outpatient clinical setting (Heath, 2016; Patel et al., 2016). In order to provide optimal care for individuals with hypertensive urgency, providers must use validated evidence as their basis for treatment. Improved patient outcomes may be achieved with implementation of evidence-based practices such as a hypertensive urgency algorithm.

This project explored providers' knowledge of and perceived usefulness of this evidence-based hypertensive urgency algorithm, and identified barriers to integrating the hypertensive urgency algorithm into future clinical practice. An in-person hypertensive crisis educational program for providers may be effective in increasing knowledge, awareness, and intent to use of the hypertensive urgency algorithm. This planned education program should incorporate active learning, assessment, and evaluation. An investigation into the possibilities for integration of the hypertensive urgency algorithm into the EHR system may be performed with input received from primary care providers, information technology specialist, and administration.

Limitations

The most significant limitation to this project was the current COVID-19 pandemic that occurred in year 2020. The pandemic altered plans for implementation such that the entire project was not able to be conducted in-person at the clinical site but was instead implemented online via the Qualtrics and Zoom platform. Since the entire quality improvement project was implemented online, the PI was not able to physically remind primary care providers about the project implementation other than through email.

Another limitation was the inability to confirm participants' active engagement with the PowerPoint presentation prior to completing the post-intervention survey. Without confirmation that participants completed the intervention, the PI cannot rely on the credibility of the results. Furthermore, two participants who completed the pre-intervention survey did not complete the post-intervention survey. It is unclear whether these two providers participated in the pre-recorded PowerPoint intervention. The pre- and post-intervention surveys consisted of self-reporting answers which may have over- or underrepresented the skills and knowledge gained from the intervention. The pre- and post-intervention tools were adapted by the PI and were not tested for validity and reliability, which may have skewed the results.

The participant sample size was small as it was restricted to only MDs, DOs, NPs, and PAs within two practices in a local clinic. Within this group, only nine out of the 13 providers meeting inclusion criteria participated, which was also a limiting factor. The small number of participants and limited study setting did not provide enough data to make the findings from this QI project generalizable. However, the results can be used by providers at this clinic to improve best practices and patient outcomes during hypertensive urgency crises.

DNP Essentials Addressed

This QI project met the Doctor of Nursing Practice (DNP) essentials outlined by the American Association of Colleges of Nursing (ACCN, 2006). These DNP essentials articulate the curricular elements and competencies for advanced nursing practice (ACCN, 2006).

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

This DNP Essential utilizes scholarship and research in the discovery of new knowledge, assuring accountability of quality care and patient safety as well as critically examining ethical dilemmas inherent in patient care, healthcare organizations, and scientific research (ACCN, 2006). This QI project assessed the knowledge and perceived usefulness of, and the intent to use a hypertensive urgency algorithm among primary care providers within the outpatient setting.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health

This DNP Essential emphasizes the evaluation and interpretation of biostatistical, epidemiological, occupational, and environmental information that is imperative to improving the health of both the individuals and their communities (ACCN, 2006). This QI project assessed the prevalence of hypertensive urgency and proposed an evidence-based algorithm to assist providers in hypertensive urgency management within their clinical practice.

Essential VIII: Advanced Nursing Practice

This DNP Essential focuses on the goal of improving patient outcomes using advanced levels of clinical judgement, systems thinking, and delivery of evidence-based care (ACCN, 2006). This QI project focused on the introduction of an evidence-based algorithm for primary care providers to improve quality of care in individuals with hypertensive urgency.

Conclusions

The aim of this QI project was to assess providers' knowledge and perceived usefulness of, and intent to use, a hypertensive urgency algorithm. Assessing PCPs' knowledge and the introduction of such an algorithm provided insight into the needed next steps for addressing hypertensive urgency management within an outpatient setting. Just as the literature review identified deficiencies in current practice knowledge in hypertensive urgency, this project's pre-test had similar findings. Therefore, the use of a hypertensive urgency algorithm would provide an evidence-based guideline for providers to use in their clinical practice. The results of the DNP project clearly showed that PCPs found the introduction of the hypertensive urgency algorithm applicable. However, their intent to use the algorithm depended on the barriers they identified. The obtained data serves as an initial step to inform future efforts guiding an implementation strategy to better manage hypertensive urgency in an outpatient clinical setting.

Plan for Sustainability

An effective plan for sustainability must address perceived barriers among participants about using a hypertensive urgency algorithm. These barriers reflect inconsistent administrative and front-desk support, concerns about patient compliance, limited follow-up availability, and inadequate time. Therefore, consistent support in the form of in-person education on using the algorithm and integration of the algorithm into the EHR system will be required for achieving sustained behavior changes that lead to positive patient outcomes.

Plan for Dissemination

The purpose of disseminating the QI project findings is to help improve knowledge and practice about hypertensive urgency within the local community. The PI will provide an

executive summary and deliver a PowerPoint presentation of the aggregate findings of this QI project to the clinic manager of the local primary care clinic. The executive summary and PowerPoint presentation will explain the purpose of the project, results, and recommendations for practice.

Funding

The projected budget for this project is relatively minimal. Due to the COVID-19 pandemic, the entire QI project was delivered online. The anticipated costs of the project will include laminated printed copies of the algorithm for provider use in patient rooms, and study participants will be entered in a raffle to win \$25 Amazon gift card.

APPENDIX A:

PROVIDENCE SCHOLLS FAMILY MEDICINE CLINIC SITE APPROVAL

PROVIDENCE SCHOLLS FAMILY MEDICINE CLINIC
12442 SW Scholls Ferry Rd, Suite 206
Tigard, OR 97223

June 26, 2020

University of Arizona Institutional Review Board
c/o Office of Human Subjects
1618 E Helen St
Tucson, AZ 85721

Please note that Ms. Erica Tran, UA Doctor of Nursing Practice student, has permission of the Providence Scholls Family Medicine Clinic to conduct a quality improvement project at our facility for her project, "Provider Knowledge of Hypertensive Urgency".

Ms. Erica Tran will conduct a survey of health care providers at Providence Scholls Family Medicine Clinic. She will recruit providers 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 an online survey. Ms. Tran's activities will be completed by *September 2020*.

Ms. Tran has agreed to provide my office a copy of the University of Arizona Determination before she recruits participants. She will also present aggregate results to the providers via email after the completion of the study.

If there are any questions, please contact my office.

Signed,

A handwritten signature in blue ink that reads "Candice Eide RN". The signature is written in a cursive style.

Candice Eide, RN
Clinic Manager
PMG Scholls Internal and Family Medicine

APPENDIX B:
CONSENT DOCUMENT (DISCLOSURE AND CONSENT FORM)

Participation Disclosure

My name is Erica Tran and I am a Doctor of Nursing Practice (DNP) student at the University of Arizona. As a primary care provider, you have the opportunity to participate in a quality improvement project using a pre- and post-intervention study design with an evidence-based educational intervention to evaluate the perceived usefulness and intent to use of a hypertensive urgency algorithm. The purpose of this quality improvement project is to provide an algorithm for primary care providers to utilize if a patient presents to the office with hypertensive urgency.

If you choose to partake in this project, you will be asked to complete a survey prior to and after the educational session. It will take approximately 5-10 minutes to complete each survey. The educational session will take place online via a pre-recorded PowerPoint presentation. This presentation will take approximately 5-10 minutes. There are no foreseeable risks associated with participating in this quality improvement project. Survey responses will be kept anonymous. You will be asked to provide a 4-digit personal identifier that will be used on both surveys for the purpose of matching surveys. Your 4-digit identifier will only be known to you.

Participation is voluntary, you can withdraw at any time. Refusal to participate will involve no penalty or forfeiture of benefits to which you are otherwise entitled. All de-identified information gathered are for the purposes of completing the project. The information will be kept in a password-protected computer system and only the project investigator has access to it. By participating, you are agreeing to answer the pre- and post-intervention surveys and attend the PowerPoint presentation. You do not give up any personal legal rights you may have as a participant in this project.

This project has been reviewed by the University of Arizona Institutional Review Board. Thank you for your consideration in participating in this project. If you would like to proceed with participating in this project, start the pre-intervention survey by using the link below.

For any questions, concerns, or complaints about this quality improvement project, you can reach me by email at etran@email.arizona.edu, or by phone at (626) 201-8160.

Thank you for your time and consideration.

Respectfully,

Erica Tran, BSN, CMSRN, DNP-FNP candidate

APPENDIX C:
RECRUITMENT MATERIAL (RECRUITMENT FLYER)

Do you send patients with hypertensive urgency to the Emergency Department?



If you are a prescribing provider, this study may be for you.

Study for prescribing providers in assessing hypertensive urgency knowledge

We're looking for primary care providers to participate in a quality improvement project assessing providers knowledge of hypertensive urgency.

Participants will be sent links via email and asked to participate in:

- Pre-intervention Survey
- PowerPoint Presentation
- Post-intervention Survey

Participants will receive:

- Laminated copy of evidence-based hypertensive urgency algorithm
- Entry into raffle for \$25 Amazon Gift Card



THE UNIVERSITY OF ARIZONA
College of Nursing

Location

- All sessions will be delivered online through Providence Scholls Family Medicine in Tigard, Oregon

Are you eligible?

- Prescribing Provider
- Family Medicine or Internal Medicine speciality
- Provide care for adults 18 or older

If you're unsure if you meet the requirements, call or email the project investigator:

- Erica Tran, BSN, CMSRN, DNP-FNP candidate
- etran@email.arizona.edu
- (626) 201-8160

APPENDIX D:
EVALUATION INSTRUMENTS (PROVIDER PRE-INTERVENTION SURVEY /
PROVIDER POST-INTERVENTION SURVEY)

Provider Pre-Intervention Survey

1. What is your medical specialty?
 - a. Family Medicine
 - b. Internal Medicine

2. What is your professional title?
 - a. Doctor of Medicine (M.D.)
 - b. Doctor of Osteopathic Medicine (D.O.)
 - c. Nurse Practitioner (N.P.)
 - d. Physician Assistant (P.A.)

3. How many years have you been practicing for?
 - a. Less than 1 year
 - b. 1-5 years
 - c. 6-10 years
 - d. 11-15 years
 - e. More than 15 years

4. What is your age?
 - a. 35 and under
 - b. 36-45
 - c. 46-55
 - d. 56-65
 - e. 66 or older

5. What is your gender?
 - a. Male
 - b. Female
 - c. Prefer not to answer

6. I routinely manage patients with hypertension.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

7. I am confident in my ability to effectively manage hypertension.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

8. My knowledge and understanding of JNC-8 hypertension guidelines are:
 - a. Below Average
 - b. Average
 - c. Above Average
 - d. Expert

9. I routinely manage antihypertensive therapy in accordance to JNC-8 hypertension guidelines.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

10. I am confident in my ability to effectively manage a hypertensive urgency crisis.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

11. I would investigate causes for hypertensive urgency by ordering:
 - a. EKG
 - b. Lab work (i.e. CBC, CMP, urinalysis)
 - c. Imaging
 - d. I would not investigate in the office
 - e. A, B, & C

12. The following are mild symptoms of hypertensive urgency:
 - a. Shortness of breath
 - b. Epistaxis
 - c. Headache
 - d. Nausea
 - e. All the above

13. The follow symptoms are signs of acute organ injury:
 - a. Chest pain
 - b. Vision changes
 - c. Weak distal pulses
 - d. Hematuria
 - e. All the above

14. If a patient presents with BP ≥ 180 systolic and/or ≥ 110 diastolic without symptoms I would:
- Recheck BP
 - Obtain focused physical exam
 - Give oral antihypertensive medication
 - Send to the Emergency Department
15. If a patient presents with BP ≥ 180 systolic and/or ≥ 110 diastolic with mild symptoms I would:
- Recheck BP
 - Obtain focused physical exam
 - Give oral antihypertensive medication
 - Send to the Emergency Department
16. If BP is rechecked and BP is still ≥ 180 systolic and/or ≥ 110 diastolic without symptoms, I would:
- Recheck BP
 - Obtain focused physical exam
 - Give oral antihypertensive medication
 - Send to the Emergency Department
17. My goal is for patients to leave the office with a BP $< 140/90$.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree

Provider Post-Intervention Survey

1. The educational session and hypertensive urgency algorithm have enhanced my knowledge.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

2. I believe the algorithm can encourage providers to manage hypertensive urgency crisis effectively.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

3. I intend to use this algorithm to help guide my clinical practice in the future.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

4. Select all that apply. Some barriers that would prevent me from using this algorithm in my clinical practice include:
 - Time
 - Administrative support
 - Amount of MA/front desk support staff
 - Patient's willingness to follow provider recommendation
 - Lack of available follow-up appointment slots to follow patient overtime
 - Ability track patient follow-up

5. I would investigate causes for hypertensive urgency by ordering:
 - a. EKG
 - b. Lab work (i.e. CBC, CMP, urinalysis)
 - c. Imaging
 - d. I would not investigate in the office
 - e. A, B & C

6. The following are mild symptoms of hypertensive urgency:
 - f. Shortness of breath
 - g. Epistaxis
 - h. Headache
 - i. Nausea
 - j. All the above

7. The following symptoms are signs of acute organ injury:
 - f. Chest pain
 - g. Vision changes
 - h. Weak distal pulses
 - i. Hematuria
 - j. All the above

8. If a patient presents with BP ≥ 180 systolic and/or ≥ 110 diastolic without symptoms I would:
 - e. Recheck BP
 - f. Obtain focused physical exam
 - g. Give oral antihypertensive medication
 - h. Send to the Emergency Department

9. If a patient presents with BP ≥ 180 systolic and/or ≥ 110 diastolic with mild symptoms I would:
 - e. Recheck BP
 - f. Obtain focused physical exam
 - g. Give oral antihypertensive medication
 - h. Send to the Emergency Department

10. If BP is rechecked and BP is still ≥ 180 systolic and/or ≥ 110 diastolic without symptoms, I would:
 - e. Recheck BP
 - f. Obtain focused physical exam
 - g. Give oral antihypertensive medication
 - h. Send to the Emergency Department

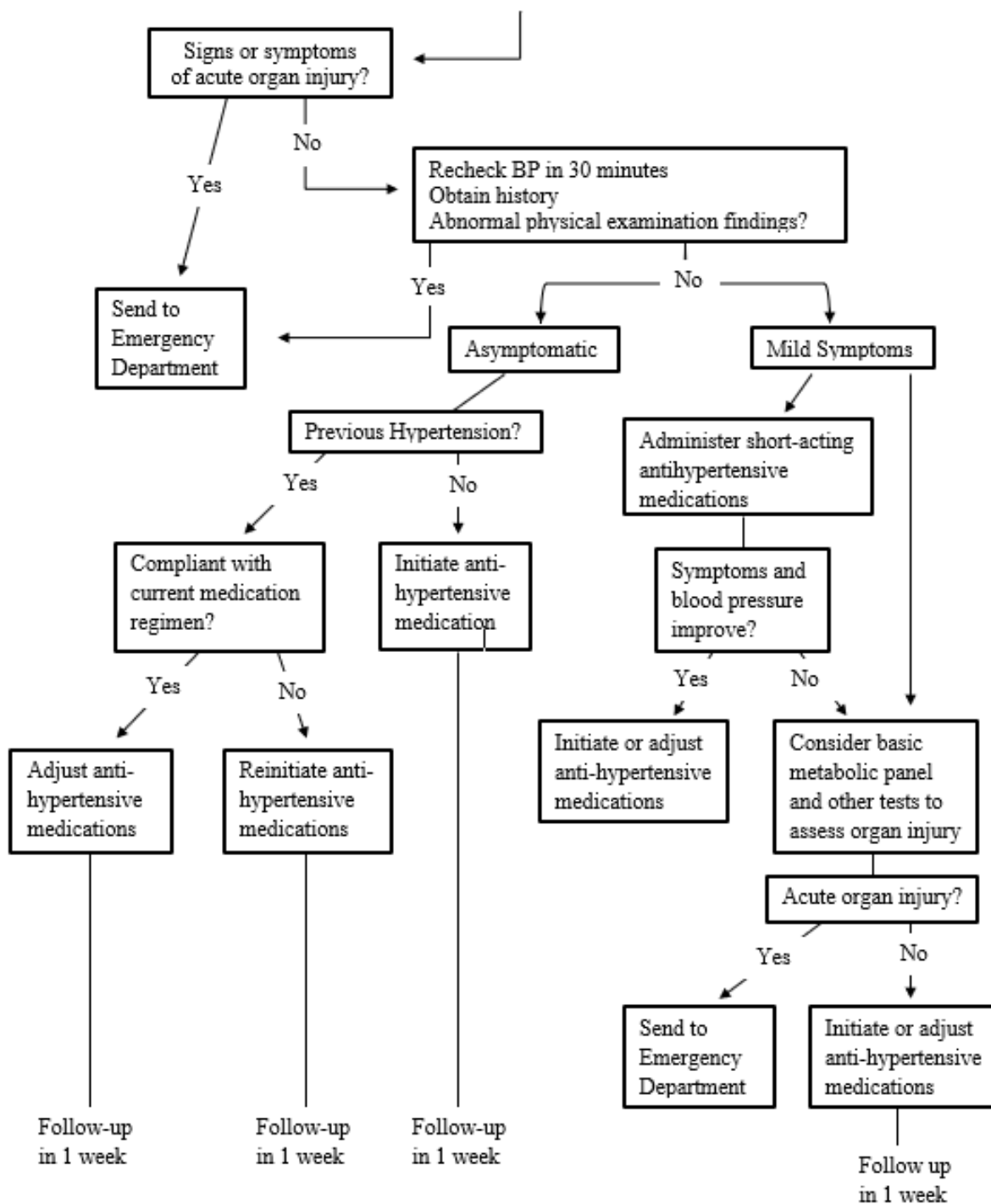
11. My goal is for patients to leave the office with a BP $< 140/90$.
 - a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

12. I am confident in my ability to effectively manage a hypertensive urgency crisis.
- a. Strongly Agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly Disagree

APPENDIX E:
PARTICIPANT MATERIAL (HYPERTENSIVE URGENCY ALGORITHM / POWERPOINT
PRESENTATION)


Hypertensive Urgency Algorithm

Patient presents with severely elevated BP
(≥ 180 systolic and/or ≥ 110 diastolic)



PROVIDERS' KNOWLEDGE OF
HYPERTENSIVE URGENCY ALGORITHM

BRUCA TRAN, BSN, CDEP, ONP-RP CANDIDATE



1

BACKGROUND

2

LOCAL PROBLEM

3

LITERATURE REVIEW

4

HYPERTENSIVE URGENCY ALGORITHM

5

REFERENCES

6

APPENDIX F:
PROJECT TIMELINE

Project Timeline				
Completion Date	Planning	Pre-Implementation	Implementation	Evaluation
07/10/20	Receive authorization from clinic site			
07/14/20	Project Proposal Defense			
07/21/20	IRB form submission/approval			
08/15/20	Confirm implementation date at clinic site			
09/10/20		Finalize PowerPoint presentation		
09/15/20			Implementation of Project at clinic site on agreed date	
10/12/20				Data Analysis
11/15/20				Project Final Defense
11/30/20				Recommendations and Handoff to future cohorts

APPENDIX G:
LITERATURE REVIEW GRID

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
Breu & Axon, 2018	Acute treatment of Hypertensive Urgency	Systematic Review	<ul style="list-style-type: none"> -426 patients were referred to the hospital and only 100 (0.17%) were admitted -Potential issue is that blood pressure obtained in hospital setting are often inaccurate -549 patients in the ER had elevated BP, after 30 minutes, 32% responded with at least 20 mmHg reduction in baseline SBP and/or a 10 mmHg reduction in DBP -Adjust home regimen if blood pressure remains elevated -Make sure accurate technique is used to take blood pressure 	<ul style="list-style-type: none"> -Unless there are signs of organ damage, patients should be given 30-minute rest before rechecking BP -If BP continues to be high, consider adjusting home medications
Campos et al., 2018	Pharmacologic Treatment of Hypertensive Urgency in the Outpatient Setting: A Systematic Review	Systematic Review	<ul style="list-style-type: none"> -Thirty-minute rest period can significantly decrease blood pressure -Captopril doses ranging from 6.25mg to 25 mg reduced SBP from 244-198 to 177-144 at 0.17-12 hours -Labetalol mean dose of 221 mg reduced SBP from 195 to 154 at 4 hours -Clonidine range dose from 0.1-0.6 mg reduced SBP from 204-196 to 165-155 at 2 hours -Hydralazine reduced MAP from 244 to 126 in 0.5 hours -Nitroglycerin reduced SBP from 190 to 150 in 1 hour 	<ul style="list-style-type: none"> -There is no particular BP medication that is used to lower blood pressure, multiple medications have shown to be effective within 12 hours -Rx of medication is dependent on patient profile and side effects of medication Limitations: <ul style="list-style-type: none"> -Only included English language studies

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
				-Did not address comorbidities and their potential contribution to long-term treatment
Dowd, Ballagher, Kessler, & Svingos, 2018	Asymptomatic hypertensive urgency at a VA emergency department	Retrospective Observational Study	<ul style="list-style-type: none"> -Reasonable to recheck BP in 30 minutes if asymptomatic -1/3 of patients presented to ED on their own volition, with more than 1/2 referred by PCP -Treatment in ED resulted in average BP reduction of 27/20 mmHg and HR reduction of 5 beats per minute -1/3 of patients received intravenous antihypertensives, but rapid reduction in BP can precipitate hypoperfusion inadvertently -80% had their BMP drawn with no cases of AKI noted -38% had cardiac enzymes collected, with only 1 patient had a positive result, unrelated to ACS -41% had a urinalysis, 12 were positive for hematuria, and 18 revealed proteinuria -ED made changes to 54% of outpatient antihypertensive regimen – 68% added a new medication, 24% increased dosage of existing medication, and 8% had multiple changes 	<ul style="list-style-type: none"> -Routine lab results collected does not indicate an increase in better outcomes -ED made changes to antihypertensive regimen in 50% of patients, in which it can be done outpatient -Safer, more convenient, and cost savings associated with oral administration of antihypertensive medications compared to intravenous route -Average cost of single ED visit -- \$740 to \$3,437 compared to ambulatory care clinic \$442 per adult Limitations: <ul style="list-style-type: none"> -Did not study ED encounters for non-treatment groups

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
				<ul style="list-style-type: none"> -Prescribing patterns of physicians were not tracked -Did not include patients with BP <180/110
Ipek, Oktay, & Krim, 2017	Hypertensive crisis: An update on clinical approach and management	Systematic Review	<ul style="list-style-type: none"> -Medication nonadherence is the main factor for hypertensive crises -In-hospital mortality rate 2.6% among those with hypertensive crisis -Treatment and non-treatment groups in the ED had good prognosis (0.2% mortality) and similar 30-day readmission rates -Hospital referrals are associated with 75% increase rate of hospitalization with no significant improvement in major cardiovascular events or controlled BP at 6 months follow up -Initial evaluation: make sure BP cuff is correct size, use lower extremity if significant difference in both arms -In symptomatic patients, diagnostic work up (i.e. CBC, troponin, BNP, UA) is appropriate 	<ul style="list-style-type: none"> -No significant difference in overall outcome of treatment and non-treatment groups seen in ED -Hospital referrals are associated with an increased rate of hospitalization -Diagnostic work-up is appropriate for symptomatic patients
Levy et al., 2015	Blood pressure treatment and outcomes in	Retrospective Cohort Study	-1016 patients in the ED, 436 (42.8%) received antihypertensive therapy, primarily oral clonidine	-Those who received antihypertensive medications in the ED

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
	hypertensive patients without acute target organ damage: A retrospective cohort		<ul style="list-style-type: none"> -Treated patient more often had a history of hypertension (93.1% vs. 84.3%) -Similar emergency department revisits between treated and non-treated groups at 24 hours (4.4% vs 2.4%), at 30 days (18.9% vs 15.2%) -No difference in all-cause mortality at 30 days (0.2% vs 0.2%) and 1 year (2.1% vs 1.6%) -Revisits to the ED and mortality rates were similar for patients with no acute organ damage -Treatment can lead to potential danger in autoregulation of cerebral and renal perfusion 	<p>had higher rates of ED return visits</p> <ul style="list-style-type: none"> -Treated and non-treated groups showed no difference in mortality rate at 30 days and 1 year <p>Limitation:</p> <ul style="list-style-type: none"> -Treatment among the African American community -Recall and misclassification bias as patients may not recognize subtle symptoms of hypertension-related complications -Potential adverse effects related to treatment or nontreatment were not performed
McNaughton et al., 2015	Incidence of hypertension-related emergency department visits in	Observational Study	<ul style="list-style-type: none"> -5.2% yearly increase in ED visits for hypertension-related visits -4.4% yearly increase for ED visits had a primary diagnosis of hypertension 	-Despite increase in ED visits for hypertension, >70% of Ed visits did not need to be admitted

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
	the United States, 2006-2012		<ul style="list-style-type: none"> -Over 7-year period, hypertension-related ED visits rose 26.2% -Proportion of ED visits occurred in patients who were younger, healthier, more likely to be uninsured, lower income, and less likely to be hospitalized after ED visit -Greater than 70% of hypertension-related ED visits were discharged home -Approximately 20% of hypertension-related ED visits were admitted 	Limitation: inability to determine whether the rise in ED visits was due to true increase in disease burden vs. increased awareness and changes in practice
Pak et al., 2014	Acute Hypertension: A Systematic Review and Appraisal of Guidelines	Systematic Review	<ul style="list-style-type: none"> -In asymptomatic patients, general suggestion is to gradually lower BP during a period of hours to days to (1) minimize risk associated with rapid BP reduction (e.g. MI or stroke) or impairment of autoregulatory mechanisms that maintain tissue perfusion (2) prevent deleterious cardiovascular sequelae that result from insufficient or too slow BP reduction -Symptoms of hypertensive urgency vs hypertensive emergency -A study tried to improve clinical conditions of acute severe hypertension in ICU and treated with IV antihypertensive drugs – 4% had iatrogenic hypotension and 29% had recurrent, severe 	<ul style="list-style-type: none"> -Safer to gradually lower BP from hours to days -Increase in adverse events when BP is lowered rapidly with intravenous antihypertensives

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			hypertension necessitation reinstatement of parenteral therapy	
Patel et al., 2016	Characteristics and Outcomes of Patients Presenting with Hypertensive Urgency in the Office Setting	Retrospective Study	<ul style="list-style-type: none"> -Rate of MACE (major adverse cardiovascular event) within 7 days, 8-30 days, and 6 months was low (<1%) in both groups -Patients sent home were more likely to have uncontrolled hypertension at 1 month, but not at 6 months, and also had lower hospital admission rates at 7 days -Among 310 patients discharged from ED, a new antihypertensive was added to home regimen for 26%, home dose of antihypertensives was increased for 7.4% and no change was made for 82.9% 	-Referral to the hospital was associated with increased hospitalizations, but not with better outcomes
Srumasiri, Chenthanakij, & Wittayachamnankul, 2014	Management of patients with Severe Hypertension in Emergency Department, Maharaj Nakorn Chiang Mai Hospital	Retrospective Study	<ul style="list-style-type: none"> -Electrocardiograms, chest radiography, and urine analysis were used to determine target organ damage – none detected, saw inconsistencies in physician ordering these tests -Some patients reading of BP was lower in subsequent readings -Amlodipine, captopril, hydralazine, and nifedipine were used in this study, in which there was no significant difference between each medication, p=0.513) -However, medication with highest rate of needing second dose was Captopril 	<ul style="list-style-type: none"> - No correlation in ordering diagnostic testing with better outcomes -Elevated blood pressure should be checked more than once – allow time for BP to lower -Oral antihypertensive medications are effective in lowering blood pressure

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			6.25mg (50%), Hydralazine 25mg (47.4%), Amlodipine 10mg (38.9%), and no further use of second dose needed for Nifedipine 10mg	
Stanistreet, Nicholas, & Bisognano, 2020	An evidence-based review of elevated blood pressure for the inpatient	Systematic Review	<ul style="list-style-type: none"> -Elevated blood pressure is common among individuals who are hospitalized -Determine cause of elevated BP and proper BP technique -No studies demonstrate progression from hypertensive urgency to hypertensive emergency or that treatment lowers morbidity and mortality - 4% of patient treated for hypertensive urgency developed hypotension -Lowering diastolic BP <65-70 mmHg lead to increased cardiovascular events - Admission to hospital for hypertension urgency resulted in 2-3 days longer stays when treated with intravenous antihypertensives compared to those that were not -No difference in repeated ED visit or mortality in those who received treatment 	<ul style="list-style-type: none"> -Recheck blood pressure -Intravenous BP treatment and in-hospital treatment resulted in longer hospital stays - Possible harm and little to no benefit when treating asymptomatic hypertension – potential for iatrogenic harms

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