

A DNP PROJECT

**THE EFFECT OF A HYPERTENSIVE TOOLKIT AT
DISCHARGE FROM THE EMERGENCY
DEPARTMENT ON 30-DAY REVISIT RATES FOR
HYPERTENSION-RELATED COMPLAINTS: A
PILOT PROJECT**

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Running head: HYPERTENSIVE TOOLKIT

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Revisit Rates for Hypertension-Related Complaints: A Pilot Project

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Abstract

Elevated blood pressure, or as it is known in the medical field; hypertension, is the number one cause of mortality both globally and domestically with heart disease now the leading cause of death in the United States above cancer (Centers for Disease Control and Prevention, [CDC], 2017). The most common and largest patient care setting in which patients are evaluated and found to be hypertensive is the emergency department (ED) (Niska, Bhuiya, & Xu, 2010). The costs associated with the treatment of hypertension and its sequelae are staggering and continue to increase exponentially, reaching an estimated \$109 billion in 2013 (Zhang, Wang, Zhang, Fang, & Ayala, 2017). Despite the significant impact that hypertension has on national health, there are currently no standards of care for patients being discharged from the emergency department.

This project sought to address this gap in care with the implementation of a hypertension education toolkit at the time of discharge for patients going back into the community. Patients were selected to receive the toolkit based on criteria of two or more blood pressure (BP) readings $\geq 145/95$ mmHg, ages 21-90, who were being discharged to home, and had no diagnosed cognitive delays. At the completion of the two-month implementation period, 11 patients received the toolkit and only two (18%) of them returned to the ED within 30 days. This patient cohort was compared to a convenience sample of 11 patients from the month of June 2018 from which only one patient (9%) returned within 30 days. A Fischer's Exact test was run to determine if there was any statistical significance between the two patient cohorts and resulted with a p value > 0.999 which was not statistically significant. Limitations and barriers encountered included time constraints, some resistance from ED staff, and some patients that were missed due to the fast-paced ED environment. Despite the results of this project, there is a

large amount of evidence supporting hypertensive education at discharge from the emergency department and clinicians can significantly improve the quality of care given to these patients with the use of this toolkit or similar education interventions.

The Effect of a Hypertensive Toolkit at Discharge from the Emergency Department on 30-Day
Revisit Rates for Hypertension-Related Complaints: A Pilot Project

Elevated blood pressure, or as it is known in the medical field, hypertension, is the number one cause of mortality both globally and domestically with heart disease now the leading cause of death in the United States above cancer (Centers for Disease Control and Prevention, [CDC], 2017b). It is the most common chronic condition diagnosed and evaluated by primary care providers affecting approximately 1 in 3 American adults but only about half of this population has their blood pressure under control (Griffin & Schinstock, 2015). The largest patient care setting in which hypertensive patients are evaluated and found to have uncontrolled blood pressure is the emergency department (ED) (Niska, Bhuiya, & Xu, 2010). Despite clinician knowledge of the morbidity and mortality associated with this chronic condition, current guidelines for treatment of hypertension in the ED do not exist. With strong supporting evidence that even the simplest of education interventions can have a tremendous impact on hypertensive patients, this project sought to implement a hypertensive toolkit at the time of discharge from the ED and to evaluate the toolkit's impact on 30-day revisit rates for hypertension-related complaints.

Background and Significance

Each year, EDs across the United States (U.S.) receive a combined 141.4 million visits for a wide variety of complaints (Centers for Disease Control and Prevention, 2017a). Although it is not often a chief complaint, approximately 27 million of these visits have a primary or secondary diagnosis of hypertension (Niska, et al., 2010). Known as “the silent killer”, hypertension is a precursor to coronary artery disease, congestive heart failure, stroke, end-stage renal disease, and peripheral vascular disease. Hypertension is the most common chronic

condition seen by health care providers in the U.S., affecting approximately 78 million people of which only about 50% have their blood pressure (BP) under control (Griffin & Schinstock, 2015). The costs associated with the treatment of hypertension and its sequelae are staggering. Data collected from 2000-2013 shows that the national annual cost has almost doubled from \$58.7 billion in 2000 to \$109.1 billion in 2013 (Zhang, Wang, Zhang, Fang, & Ayala, 2017). It is estimated that the number of patients with hypertension that are uninsured is approximately 12% and even more are underinsured at about 26% (Fang, Zhao, Wang, Ayala, & Loustalot, 2016).

The overseeing body guiding the treatment of hypertension is the Joint National Committee (JNC), who in 2014 released their eighth update to their treatment guidelines (Griffin & Schinstock, 2015). Known as the JNC-8 guidelines, several significant recommendation changes were made from the previous, JNC-7, guidelines. These changes included a new target blood pressure (BP) for the older adult population over age 60 with a goal of less than 150/90 mmHg up from 140/90 mmHg suggested by the JNC-7 guidelines and in diabetic patients a goal of less than 140/90 mmHg which was also up from 130/80 mmHg (Griffin & Schinstock, 2015). Some controversy is present surrounding the JNC-8 guidelines because the committee decided to publish their work in *JAMA* rather than involving major organizations in the field of hypertension including the American Heart Association and the American College of Cardiology but these guidelines were developed with strict adherence to the Institute of Medicine (IOM) standards (Griffin & Schinstock, 2015). The IOM's most recent standards in regards to clinical practice guidelines were released in 2011 (Griffin & Schinstock, 2015). These updated standards are intended to enhance the transparency and objectivity of guidelines being produced and to standardize the format by which they are developed (Kung, Miller, & Mackowiak, 2012).

Although the JNC-8 guidelines are comprehensive and address all patient populations and comorbidities, they do not address the treatment of hypertensive patients in the ED setting.

In response to the JNC's lack of ED recommendations, the American College of Emergency Physicians (ACEP) created two different clinical policies to address identification and referral of patients with elevated BP readings (Brody et al., 2016). The first policy recommends that patients with at least two BP measurements above 140/90 mmHg be referred to primary care for confirmation of diagnosis and treatment as needed (Decker, Godman, Hess, Lenamond, & Jagoda, 2006). The second recommends that in patients with asymptomatic elevated blood pressure readings, ED medical intervention and acute screening for target organ injury is not required but may be considered in select populations (Decker et al., 2006). In 2012, ACEP formed a subcommittee to update the 2006 policy and addressed two questions: 1) In patients with asymptomatic elevated BP, does screening for end-organ damage reduce poor outcomes? 2) Does treating asymptomatic patients with mildly elevated blood pressures in the ED significantly improve outcomes? (Wolf, Lo, Shih, Smith, & Fesmire, 2013). After extensive review of literature and evidence, it was found that 1) the only screening test that may prove beneficial to the patient in identifying end-organ involvement would be a serum creatinine level but only for patients who are admitted to the hospital or who are identified as at-risk for poor follow-up care and 2) for patients with asymptomatic elevated BP treatment should only be initiated for specific populations such as those with poor follow-up, limited access to care, the elderly, or black patients (Wolf et al., 2013).

Despite clinicians being aware of the numerous sequelae of hypertension, there appears to be a significant lack of structure when it comes to providing care and/or education aimed at addressing hypertension in the ED. Brody et al. (2016) identified several barriers to the

recognition and treatment of hypertension by ED physicians including a lack of familiarity with the JNC guidelines, time and resource constraints, perception that the ED blood pressure readings are not reliable, concern over lack of access to follow-up, and perception of care as outside the scope of ED practice. However, evidence has shown that the emergency department has a critical role to play in the diagnosis and treatment of chronic conditions such as hypertension. About 51% of patients with two or more elevated BP readings in the ED and no history of hypertension had continued elevation of their BP at home the week following discharge (Pirotte, Buckley, Lerhmann, & Tanabe, 2014). It was also reported that about 58% of men and 78% of women were found to have continued elevation in their blood pressure readings at outpatient follow-up visits (Pirotte et al., 2014). With a greater number of uninsured and underinsured individuals using the ED as their primary care setting, it is vital that clinicians become well-versed in hypertension guidelines and the significance of their role in identifying patients in need of treatment and education. The goal of this project was to address this provider knowledge gap while ensuring that hypertensive patients that are discharged from the ED receive proper referral for follow-up care to achieve improved control of their hypertension.

Needs Assessment

Hypertension affects approximately 1 in every 3 Americans and the number continues to climb every day (Pirotte et al., 2014). Emergency departments see about one-third of these individuals every year and yet no nation-wide protocol is in effect to address the need for ED providers to give proper education and follow-up instructions at discharge. ACEP simply recommends that patients with two or more consecutive BP readings of 140/90 mmHg or greater be referred for outpatient follow-up (Decker et al., 2006). Several studies have sought to identify

and address provider-reported barriers but a significant gap in knowledge, and therefore care, still exists.

Having explored this issue on a national scale, attention can be scaled down to the community level. There are approximately 95,000 annual visits to the ED of interest in Morris County, NJ (Data on file, 2016). It is a large, academic hospital that is classified as a Level II trauma center and a primary stroke care center and is the largest hospital in its five-hospital health system. In the ED, there is currently no protocol for the treatment, education, or follow-up referral of hypertensive patients that are being discharged. Retrospective chart reviews completed by one of the attending physicians revealed that a marginal number of the ED providers are including any type of hypertensive education at the time of discharge.

Problem Statement

Uncontrolled and undiagnosed hypertension is not only a matter of public health concern but also has evolved into a matter of debate among clinicians. Currently, treatment guidelines from the JNC-8 are being put into practice but there is a great variety of discrepancy between how providers interpret and use these guidelines, specifically in the setting of the ED. EDs are in need of a clinical toolkit/guideline to use when planning to discharge patients who are hypertensive.

Clinical Question

The clinical question guiding this project is: “In adult patients over age 21 who are seen in the emergency department and are found to be hypertensive, how will the implementation of a hypertensive toolkit at discharge for one month affect 30-day revisit rates for hypertension-related complaints?”.

Aim and Objectives

The broad goal of this project was to improve the quality of care for patients who are being released from the ED with a BP that is considered hypertensive according to the JNC-8 treatment guidelines by the implementation of a hypertensive toolkit at discharge.

Specific objectives of this project were:

- Educate nursing and medical staff on the importance and use of the proposed hypertensive toolkit at discharge
- Collect pre-data on the number of hypertensive patients discharged from the ED monthly who do not receive education
- Implement the hypertensive education toolkit for one month
- Compare three months of pre-data to three months of post-data to determine if there is a statistical difference in 30-day revisit rates for hypertension-related complaints

Review of Literature

A comprehensive search of the current literature was conducted, with the help of a medical librarian, via CINAHL and PubMed beginning with the search terms: *hypertensive education, hypertension in the emergency department, patient education for hypertension at discharge from the emergency department, and hypertension treatment guidelines*. Initial searching with these terms yielded a total of 24 articles. Of those 24 articles, 7 were initially selected based on inclusion criteria which were original research studies or systematic reviews from peer-reviewed journals only, dated within the last five years (2012-present), and that examined any aspect of the phenomena to be included in the project. These phenomena included

the treatment of hypertension using professional guidelines, providing hypertensive education to patients in the emergency department setting, evaluating and treating patients who are found to be hypertensive in the emergency department, and follow-up evaluation of patients who are discharged from the ED with an elevated blood pressure reading.

A second search was conducted using the Rutgers University library's databases. The search terms included were hypertension treatment guidelines or hypertension in the emergency department. There was a total of 6,154 articles initially and the search was narrowed down to include articles that shared the search terms hypertension guidelines and hypertension in the emergency department which reduced the articles to 1,118. Once the above-mentioned inclusion criteria were applied, only 8 articles remained for further appraisal. This brought the total number of collected articles to 15 with 11 experimental studies and 4 non-experimental that included 2 clinical practice guidelines and 2 systematic reviews. Three of these studies were ultimately excluded due to their lack of applicability to the proposed clinical question, leaving the final count at 11. A PRISMA diagram can be found in Appendix A and a Table of Evidence in Appendix B which summarizes the selected publications.

Hypertension Guidelines

There are several governing bodies in medicine that each have their own individual sets of treatment recommendations regarding hypertension (Griffin & Schinstock, 2015). However, the guidelines that are recommended and followed by primary care physicians, cardiologists, and hypertension specialists nationally are the JNC-8 guidelines that were published in 2014 (Griffin & Schinstock, 2015). The JNC is a group of clinicians who are periodically tasked with reviewing the most current evidence and updating hypertension treatment guidelines based on evaluation of the literature. The JNC-8 guidelines were approached in a different manor than the

seven prior publications because stricter criteria were applied when reviewing the literature (Davis, 2015; Griffin & Schinstock, 2015). The evidence used to develop the guidelines only included data from randomized control trials of adults with hypertension that studied at least 100 subjects and reported outcomes for at least one year of follow up (Davis, 2015).

The JNC-8 members selected three of the highest-ranking critical questions to answer in the new guideline which were as follows: (1) What is the right time to start a medication in order to improve outcomes?, (2) How low do you set BP for treatment goals to improve outcomes?, and (3) Which specific drug classes should be used to improve outcomes without undue harmful outcomes? (Davis, 2015). This ultimately led to the panel members developing a total of nine recommendations to answer these three questions. The most significant updates made from the JNC-7 guidelines addressed new target blood pressures for those over the age of 60, diabetic patients, and for those with chronic kidney disease (CKD). For patients over 60, the new recommended target BP is 150/90 mmHg or less as compared to 140/90 mmHg from JNC-7 (James, et al., 2014). For diabetic patients, the suggested treatment goal is now 140/90 mmHg up from 130/80 mmHg and for patients with CKD of all ages the goal is less than 140/90 mmHg (James, et al., 2014).

Some controversy does exist surrounding these new guidelines because, as previously discussed, important stakeholders such as the American College of Cardiology and the American Heart Association were not involved but only the strongest of evidence-based recommendations were ultimately included strictly following the IOM's standards. Across all literature, the general consensus is that although these guidelines were developed stringently, there is no replacement for good clinical judgement (Davis, 2015; Griffin & Schinstock, 2015). The long-term

implication of these guidelines is yet to be seen as we are just approaching the four-year anniversary of their release.

Diagnosis and Treatment of Hypertension in the Emergency Department Setting

A limited amount of literature exists exploring the best practice recommendations for the treatment of hypertension in the ED. Many ED clinicians do not feel that the diagnosis and treatment of hypertension falls into their scope of practice and therefore often do not address it further than instructing the patient to see their primary physician (Brody et al., 2016; Souffront, Chyun, & Kovner, 2015; Wolf et al., 2012). Due to this existing school of thought, there are many barriers that exist to implementing treatment protocols for patients found to be hypertensive while in the emergency department. Studies that have sought to identify the cause of these existing barriers have found the most common responses from providers to be a lack of knowledge in regards to the JNC guidelines, time constraints, concern for the accuracy of emergency department blood pressure readings, and concern for a lack of access to follow-up care (Brody et al., 2016; Pirotte et al., 2014; Souffront et al., 2015).

In response to the growing concern of hypertension as a national public health issue, the American College of Emergency Physicians released a policy statement in 2009 recommending that patients with two or more blood pressure readings over 140/90 mmHg should be referred for outpatient follow-up and that those with just one elevated reading could potentially benefit as well (Decker et al., 2006). However, data has shown that the great majority of ED physicians overestimate their perceived number of referrals and underestimate their number of “missed” referrals for patients with multiple hypertensive blood pressure readings (Pirotte et al., 2014). A follow-up ACEP policy released in 2012 to answer two important questions: 1) In patients with asymptomatic elevated BP, does screening for end-organ damage reduce poor outcomes? 2)

Does treating asymptomatic patients with mildly elevated blood pressures in the ED significantly improve outcomes? (Wolf et al., 2012). With a stringent review of the literature, new recommendations were released to answer these questions and concluded that all patients with elevated blood pressure readings in the ED would benefit from receiving follow-up referral, the only potentially beneficial test for target organ injury would be a serum creatinine level, and that for asymptomatic hypertensive patients in the emergency department lowering of their blood pressure is generally not recommended but may be beneficial in high-risk populations (Wolf et al., 2012). Essentially, broad consensus exists that the provider's clinical judgement outweighs all recommendations and that each individual patient presentation should be treated on a case-to-case basis.

Need for Hypertensive Education in the Emergency Department

As previously discussed, a large majority of emergency department providers do not feel that diagnosis or treatment of hypertension is applicable to the emergent setting. However, several recent studies have proven the contrary to be true. About 51% of patients with two or more elevated BP readings in the ED and no history of hypertension had continued elevation of their BP at home the week following discharge (Pirotte et al., 2014). It was also reported that about 58% of men and 78% of women were found to have continued elevation in their blood pressure readings at outpatient follow-up visits (Pirotte et al., 2014). Despite new evidence in support of ED patients receiving hypertensive education, studies estimate that only about 15% of patients are provided with education and follow-up instructions (Prendergast et al., 2015). In an Iranian study with a population sample of 346 patients at a large academic hospital found that the prevalence of undiagnosed hypertension that was discovered in the ED was 4.8% based upon a one-month follow up reading (Dolatabadi, Motamedi, Hatamabadi, & Alimohamaddi, 2014).

Although this study comprised a large sample population (n=346), it was a representation of the Iranian population and may not be applicable to the American population.

Data collected from 2006-2012 shows a significant increase in the number of hypertension-related ED visits in the U.S. (McNaughton, Self, Zhu, Janke, Storrow, & Levy, 2015). Over the seven-year period, hypertension-related ED visits increased by about 5.2% each year and the number of visits with a primary diagnosis of hypertension increased by about 4.4% annually (McNaughton et al., 2015). In more than one-fifth of all ED visits, hypertension was included as a diagnosis and it was listed as a primary diagnosis in approximately 1% of all adult visits (McNaughton et al., 2015). Many clinicians are quick to assume that one of the main reasons for this increase is lack of access to follow-up. However, the relationship between primary care visits and ED use for uncomplicated hypertension was examined and found unexpectedly that as primary care visits increased so did the number of ED visits for uncomplicated hypertension (Walker et al., 2014). What the authors concluded from this was that hospitalizations for uncomplicated hypertension might not be an appropriate indication of access to primary care (Walker et al., 2014). Clinicians are not only seeing increases in undiagnosed hypertension but also large numbers of patients who are already diagnosed and being treated but are noncompliant with their prescribed medications. Antihypertensive noncompliance has been found to be associated with higher systolic blood pressure (SBP) in the ED among patients who had a primary care provider (PCP) and health insurance and who prescribed ≥ 3 antihypertensives (McNaughton et al., 2017). EDs can benefit from the knowledge provided McNaughton et al.'s study (2017) because it helps the clinician to identify patients who are at a higher risk for noncompliance after discharge and who would benefit from an explicit and detailed education intervention.

With electronic medical records (EMRs) broadly in use, new and innovative methods are being introduced to aide clinicians in diagnosing and properly managing patients, especially in the fast pace of the ED. Evidence demonstrates that despite the ease of use associated with EMRs, discharge education being provided for ED patients is still sub-par (Cienki, Guererra, Steed, Kubo, & Baumann, 2013). Findings demonstrated that of the 60% of patients that received either antihypertensive therapy while in the ED or a prescription at discharge only 33% received instructions in lifestyle modifications (Cienki et al., 2013). These statistics demonstrate that there is a significant need for more than just automated clinical reminders for ED providers. Multiple current studies suggest that a simple education intervention may be the perfect answer to this growing gap in care.

Prendergast et al. (2015) evaluated the progression of subclinical heart disease (left ventricular hypertrophy, diastolic dysfunction, or an abnormal ejection fraction) identified by bedside echocardiogram (ECHO) in the ED pre and post receiving a brief education intervention in the ED. The study found significant improvement in blood pressures of the subjects up to one year post-education and with a 78% follow-up rate further supports that emergency departments have a significant role to play in secondary prevention of cardiovascular disease (Prendergast et al., 2015). A similar study evaluated the perceptions of both clinicians and patients of a Screening Brief Intervention and Referral for Treatment (SBIRT) (Pirotte et al., 2014). Results were mixed but demonstrated that physicians and nurses both believed that a SBIRT for hypertension was well-within their scope of practice, however, many patients were found to not believe that they were at risk for undiagnosed hypertension despite multiple elevated blood pressure readings during their ED visit (Pirotte et al., 2014). Prendergast et al. (2015) demonstrated that the strongest motivator for patients to seek follow-up care to get their BP

under control was the potential for reversing the subclinical heart disease that had been identified by the bedside ECHO. Whereas, Pirotte et al. (2014) found that a majority of patients questioned believed that they were not at risk for undiagnosed hypertension despite multiple elevated BP readings during their ED visit. Taking the results of both of these studies into account demonstrates again that when implementing an education intervention for hypertension in the ED setting, clinicians benefit from being explicit in discussing risks and emphasizing the potential for significant health improvement for patients that follow up and get their blood pressure under control.

Theoretical Framework

The theoretical framework that guided this proposed project was the plan-do-study-act (PDSA) cycle. The PDSA method is a way to continuously test a change to practice that is implemented by evaluating the outcome, improving the method, and then testing it again (Agency for Health Care Research and Quality (AHRQ), 2015). The method is very often used in quality improvement projects in health care because it is an easy-to-follow cycle with short-term goals accomplished in sequential order to achieve sustainable improvement (Terhaar, 2016). The application of this framework to this project began with the plan stage in which the problem has been identified as a lack of care guidelines for hypertensive patients that are being released from the emergency department. The *plan* to address this gap was with the use of a hypertensive toolkit provided by the primary nurse at the time of discharge to decrease revisit rates to the ED for hypertension-related complaints (see Appendix C).

The next part of the cycle, *do*, is when the intervention was carried out. This involved multiple steps beginning with holding several staff in-service education sessions for the nursing staff and then also attending the monthly medical staff meeting to provide an in-service for the

physicians, nurse practitioners, and physician assistants. After one month of implementing the toolkit, post-data was collected for three months to determine if there is any change in the 30-day revisit rates for the patients who received the hypertensive education compared to those in the pre-data sample who did not receive education.

The third section of the model was when the individual or group *studied* or analyzed the data that has been collected, compared results to what was predicted, and summarized what was learned (AHRQ, 2015). This was applied by analyzing the data collected from the one month of intervention and comparing the pre and post-data for a potential change in revisit rate. At this point, staff feedback was obtained on the use and implementation of the toolkit.

The fourth and final step in the cycle is *act*. This is the point where conclusions were made and addressed to make changes for future cycles. Applying this step to this project, it began with sharing the results with nursing leadership for the department and the organization. Further investigation and follow-up can be considered for the same patients at six months or one year post-intervention.

Methodology

The proposed project was a pilot study with administration of a hypertensive education toolkit at discharge from the emergency department. A pre-implementation sample was selected from hypertensive patients who were discharged without education during the three months prior to introduction of the education toolkit. A post-implementation sample was comprised of those who received hypertensive education during the one month of implementation. 30-day revisit rates for these two sample will be compared to determine if a statistically significant difference existed between the revisit rates of these two groups.

Setting

This project took place in the Emergency Department of a 700-bed teaching hospital located in Morris County New Jersey. Designated as a Level II trauma center by the state of New Jersey, the emergency department averages about 95,000 visits annually. Morris County has an estimated population of 500,000 with 71% White/Caucasian alone, 11% Asian alone, 3.7 % black or African American alone and about 13% Hispanic or Latino with about 16% of this population over age 65 (United States Census Bureau, 2016). The median household income for Morris County is \$102,798 making it one of the wealthiest counties in the state (United States Census Bureau, 2016). Evaluating education status, about 94% have a high-school diploma and 52% have a Bachelor's degree or higher (United States Census Bureau, 2016).

Study Population

Participants were selected from the adult ED (aged 21 and older) via chart reviews based on the inclusion criteria of a final blood pressure reading $\geq 145/95$ mmHg who did not receive hypertension education in their discharge instructions and were discharged from the ED to home. These patients comprised the pre-data sample population. Patients selected for the post-data evaluation were also chosen on the inclusion criteria of a final blood pressure reading $\geq 145/95$ mmHg and those who are being discharged from the ED to home. Exclusion criteria for both sample populations were patients who are ≥ 90 years old, those who are non-English speaking, and those who have a documented cognitive impairment. The goal sample size for both populations was 50 as this was conducted as a pilot project.

Subject Recruitment

The pre-data convenient sample of patients was selected via chart review of two months prior to implementation of the toolkit. These subjects were selected based on the above-mentioned criteria. The post-implementation sample came from hypertensive patients that were discharged during the one month of implementation of the hypertensive education toolkit. These patients were also selected based on a final blood pressure reading $\geq 145/95$ mmHg and who were being discharged to home from the ED. Data reports run in the Epic charting system for the months of June and July 2018 demonstrated an average of 700-800 patients were discharged meeting the above mentioned criteria.

At the time of discharge, the primary investigator presented the patient with the printed hypertensive education toolkit which included the CDC's hypertensive education pamphlet as well as a list of local clinics and primary care physicians who can be seen for follow up (Appendix D). The patient was instructed by the primary investigator to follow-up with their primary care provider within the next two weeks for re-evaluation. If the patient did not have a primary physician, they were provided with a list of primary physicians or the local clinic for those who were uninsured.

Consent Procedure

A waiver of consent was requested due to the non-experimental nature of this project. Participants were provided with education and follow-up instructions at the time of discharge from the emergency department, which per department protocol, is what should have already been happening. There was no required involvement from the participants beyond receiving this education tool and participants were selected for participation in the project once their treatment had been completed.

Risks/Harms

Participation in this project posed minimal risk. There was a small possibility of the unintentional sharing of the personal health information (PHI) that may have occurred due to study participation. Names and PHI were collected and assigned a number (1-50) which allowed the data to be reviewed without a direct link to patient identifiers. Only the primary investigator, DNP chair, and team member had access to the list that links the PHI to the personal identifiers. As mentioned above, patients were selected for enrollment after care had been provided and therefore posed no potential effects on their treatment.

Subject Costs and Compensation

The proposed project had no projected financial impact on the participants. The costs associated with the project were the sole responsibility of the primary investigator. A summary of the costs can be found in Appendix E. There was no cost to participate and there was no compensation provided for participation.

Study Interventions

The proposed project began with collecting three months of pre-data on sample of 50 patients who were discharged from the emergency department with a final blood pressure reading of $\geq 145/95$ mmHg. The pre-data collected included patient identifiers and blood pressure readings. As the pre-implementation sample was collected, each subject was assigned a number (1-50) and their patient identifiers were removed and kept in a separate list that could only be accessed by the PI, the project chair, or team member. As soon as this list was no longer necessary, all identifying data was deleted. These patients were tracked to determine the number of 30-day revisits for any hypertension-related complaints.

As the three months of pre-implementation data was collected, the hypertensive education protocol was put into place. This began with the provider identifying the patient as hypertensive based on two or more consecutive blood pressure readings of $\geq 145/95$ mmHg. Patients who met this criterium and were being discharged to home received the hypertension education pamphlet (Appendix D) with referral to a primary care provider or clinic if they did not have a primary care physician.

After one month of implementation, three months of post-implementation data were collected on the patients who received the hypertensive toolkit at discharge. These patients were tracked for any revisits within 30 days of discharge from the ED for a complaint of hypertension or any that may be related to hypertension such as headache, stroke, myocardial infarction, unstable angina, or heart failure. The number of 30-day revisits for the post-implementation group was compared to the 30-day revisits for the pre-implementation group to determine if a statistically significant change was made by the patients receiving education and follow-up instructions.

Outcome Measures

As discussed above, both pre and post-implementation data were collected via chart review of the two separate patient cohorts. The variable in question was the percentage or number of 30-day revisits related to hypertension for both the pre and post-implementation sample groups. Patient identifiers were removed from the data as it was collected and each subject was assigned a number that connected them to their PHI. For example, if the first subject's name was Mary Smith, her name was removed and she was listed as number 1 with her PHI following. Please see appendix G for the data collection tool that was utilized. Only the PI,

the DNP chair, and the DNP team member had access to the master list which included each subject's personal information.

Project Timeline

The anticipated project timeline was from May of 2018 to May of 2019. The project began with presentation of the proposal to the DNP team in May 2018 and was approved and subsequently submitted for IRB approval to the IRB of record: the site IRB. The IRB of record approved the project on 7/5/2018 and then approval was immediately applied for through Rutgers IRB. IRB approval from Rutgers was obtained on 8/14/2018 and implementation began with collection of the pre-data for the months of June, and July on the discharge of hypertensive patients. As the pre-data were being collected, implementation of the toolkit also began on 8/15/2018. Due to difficulty in obtaining patients for the project, the implementation timeline was increased from one to two months and ended on 10/14/18. Post-implementation data was collected over about 10 weeks to completion at the beginning of December 2018. Data analysis began in December 2018 and ended in early January 2019. The project will be presented to the DNP team, students, and Rutgers faculty on January 28th, .2019. Finally, with completion and approval of the final project, the primary investigator will graduate in May of 2019. For a GANTT chart timeline please see Appendix E.

Resources Needed

The proposed project required minimal expenditure to complete. Data collection and analysis were all completed by the primary investigator and hospital statistician which did not incur any fees. Educational materials and handouts provided for the patients were printed by the primary investigator with only 20 copies printed to be handed out with three pages per handout

for a total of 60 printed pages. Average color printing is estimated at \$0.40 per page which for 60 pages would cost a total of \$8.00 (officedepot.com). The two educational sessions for the medical and nursing staff also included printed materials for a total cost of \$5.00. The final cost will be dissemination of project findings to hospital administration and the scientific community. Estimated cost of publications for dissemination will include creation of a poster for presentation. For a complete description of the estimated budget for the project please see Appendix F.

Results

In total, 11 patients received the hypertensive toolkit at discharge and only two of them returned within 30 days. One patient returned with a chief complaint of back and leg pain and was no longer hypertensive, per the project parameters of 145/95mmHg. The other patient, however, returned three additional times within 30 days of receiving the toolkit. This patient initially presented for a hand laceration and was found to be persistently hypertensive during his visit with a final BP of 257/127. He returned for his wound check two days later, then for suture removal one week later, and finally 12 days after receiving the toolkit. His final visit he was sent by the clinic for persistent hypertension after following up there as instructed by the primary investigator.

The average age of the implementation group was 67.2 years with six women and five men. Seven (64%) of the patients were married, two (18%) were single, and two (18%) were widowed. The mean systolic blood pressure for the group was 180mmHg and the mean diastolic BP was 108mmHg. The discharge diagnoses of these patients included injuries (27%), genitourinary/renal (18%), chest pain, headache (18%), tendonitis, and hypertension. The 30-day revisit rate for hypertension-related complaints was 9% with only one patient returning for

persistent hypertension. A complete table of the demographics of the implementation group can be viewed in Appendix H.

Eleven patients were selected from the month of June 2018 to form the pre-implementation data set and only one of them returned with a chief complaint of right knee pain. At the time of his return, he was still hypertensive with a blood pressure reading of 168/90. The average age of the pre-implementation group was 62.18 years with four women (36%) and seven men (64%). Nine (82%) were married, one separated (9%), and one widowed (9%). The mean systolic blood pressure of the group was 160mmHg and the mean diastolic BP was 98mmHg. The discharge diagnoses of these patients included injuries (27%), genitourinary/renal (18%), musculoskeletal pain (27%), hypertension (9%), weakness (9%), and inguinal hernia (9%). The 30-day revisit rate for this group was also 9% with only one patient returning. A complete summary table of the pre-implementation group can be found in Appendix I. A bar graph demonstrating the comparison between the two patient cohorts can be found in Appendix J.

Data Analysis

The data were analyzed and compared included the number of patients who returned within 30 days of discharge from the pre-implementation (no hypertensive education) group compared to the post-implementation (those who received the toolkit) group. The 11 patients from each sample group were placed into a category as to if they returned with a hypertensive complaint or did not. The statistical test that was utilized was a Fischer's Exact Test. This was the most appropriate statistical test to use because we sought to determine if there was a statistical significance between the difference of two proportions and this test is ideal for studies with small sample sizes (McDonald, 2014). The control group (pre-intervention) and implementation group were matched for age, gender, and chief complaint category. The

dependent variable was readmission within 30 days with a p value set at 0.05. The findings were not statistically significant with the resulting P value equal to >0.999 . There was no difference between the groups and the intervention did not change the readmission rate in this patient sample.

Data Maintenance and Security

As previously discussed, only the primary investigator, the project chair, and team member had access to any of the PHI collected. As subjects were enrolled in the study, they were assigned a number (1-11) and all identifiers were removed immediately. As soon as the patient identifiers were no longer needed, they were deleted and only de-identified data remained to complete data analysis and write up of the results of the project. During the project, data was stored on the primary investigator's personal laptop as well as a flash drive and did not contain any patient identifiers. Upon completion of the project and closure of the IRB, all data will be destroyed in accordance to Rutgers University guidelines. Hard copies of the final project write up and deidentified aggregate data will be kept in Dr. Helen Miley's office at Rutgers University in the Bergen building at 65 Bergen St. in Newark, NJ.

Discussion

Uncontrolled hypertension is a tremendous global and domestic health concern that can lead to numerous long-term sequelae including structural heart disease, heart failure, myocardial infarction, stroke, kidney disease, and retinopathy (Hamrahian, 2017). Approximately 30-35% of Americans have hypertension and it is estimated that only half of this population has proper control of their blood pressure (Griffin & Schinstock, 2015). In the emergency department (ED) setting, approximately 20% of all patient visits have either a primary or secondary diagnosis of

hypertension at the time of discharge (Niska, Bhuiya, & Xu, 2010). However, no current protocol or standard of care exists for discharge education and follow-up recommendations for hypertensive patients that are being discharged back into the community.

This project sought to address this lack of hypertension follow-up with the use of a hypertensive toolkit provided at discharge including the Center for Disease Control's hypertension education as well as the contact information for Doctor Finder, for those with health insurance, and the local clinic, for those who were uninsured. In recent studies, it has been found that only about 33% of patients who are evaluated and/or treated for hypertension while in the ED actually receive hypertensive education at the time of discharge (Cienki et al., 2013). As the literature suggests, even the smallest of educational interventions has been shown to have a profound impact on the overall health of an individual and, therefore, of a community (Prendergast et al., 2015).

Utilizing the Plan-Do-Study-Act (PDSA) method, adjustments were made throughout the implementation period to attempt to increase recruitment. During implementation, the primary investigator (PI) met with both the nursing staff as well as the medical staff to increase patient recruitment. The PI also created flyers to post throughout the department at each of the nursing stations and doctors' charting areas as a reminder to contact the PI if discharging any patients who met the specified criteria. The objectives of this project included:

- Educate nursing and medical staff on the importance and use of the proposed hypertensive toolkit at discharge
- Collect pre-data on the number of hypertensive patients discharged from the ED monthly who do not receive education

- Implement the hypertensive education toolkit for one month (was extended to two months)
- Compare three months of pre-data to three months of post-data to determine if there is a statistical difference in 30-day revisit rates for hypertension-related complaints

As discussed above, the nursing staff were educated at the department staff meeting and via posters displayed throughout the department. The objectives listed above were all met, however, the overall intended goal of the project was not.

Comparing the pre-implementation and implementation groups there was no difference in 30-day revisit rate and the findings of this project do not support the use of the hypertensive toolkit at discharge. However, this was a pilot project with a very small sample size (N=22) and a short timeline with implementation only occurring over a two-month period. There is a strong probability if the project timeline were extended and the sample size was significantly larger that it would have led to data that supports the use of hypertensive education at the time of discharge from the ED. As the numerous benefits of educational interventions and the tremendous global health impact of hypertension are well-documented and supported, hypertensive education should certainly continue to be utilized throughout the patient care spectrum, including at the time of discharge from the ED. Further exploration is needed to determine if alternative methods of providing education and follow-up instructions would be more beneficial than the selected toolkit. Specifically, studies of larger sample size are needed to delineate the value of education as it is related to revisit/readmission rates and other outcome measures.

Limitations

Although this project was intended to be a pilot study, the sample size of 11 is still much less than the original intended goal of 50. Multiple barriers to recruiting participants including: transition to a new charting system two months prior to beginning implementation, some resistance from staff, patients that were missed in the fast pace environment of the ED, as well as a large number of patients who were hypertensive but were dispositioned as hospital admissions rather than discharged. Despite these barriers, of the 11 patients that were educated, only one patient returned with a hypertensive complaint and uncontrolled BP. The goal of the project was to reduce the number of hypertension-related ED visits, however, in the case of the individual who returned, it led to an increase in his awareness of his uncontrolled hypertension and ultimately lead to him receiving proper follow-up and outpatient treatment. Despite this not being the intended result of the toolkit, it was certainly a positive consequence for this individual who now has better control of his BP. As hypertension is known to be a disease that typically progresses very slowly, tracking patients for 30-day revisits may have been too short of a timeline to produce significant findings with this patient population.

Implications/Recommendations**Clinical Practice**

Although the findings of this project did not produce significant supporting evidence of the benefit of providing hypertensive education and follow-up at discharge; there are numerous existing studies that demonstrate significant improvement in overall patient health and continuity of care with the use of hypertensive education and follow-up care. The largest anticipated impact of the further use of this toolkit or other methods of hypertensive education is the significant

increase in patient knowledge. As the common adage states: knowledge is power. It is anticipated that this increase in patient knowledge will empower the educated individuals to become more aware, and therefore more accountable, of their day to day health status leading to tighter BP control.

As discussed above, hypertension is a phenomenon that develops over an extended period of time, sometimes months to years, and if caught before any advanced disease processes have begun can be very easily controlled with diet, exercise, and medication management. Despite the small sample size, this project as well as other studies all demonstrate the impact of patient education on patient empowerment. It would likely take months to years to manifest, however, if this toolkit or a similar educational intervention could be implemented into daily practice for ED providers, a large reduction in hypertension sequelae such as coronary artery disease, stroke, kidney disease, and retinal damage would occur.

Health Policy

In our ever-evolving health care climate, we are always seeking to improve population health through changes in health policies and with the results obtained from this project there are numerous avenues that health care policy makers could take. First, beginning in our emergency department, new policies could be considered to put in place a standard of care for nurses and providers to follow when discharging hypertensive patients such as the use of this or another toolkit while emphasizing the need for proper follow-up care. If further studies continue to support these initiatives, the American College of Emergency Physicians (ACEP) could also publish a new standard of care for this patient population to ensure that patients are given the tools that they need to achieve their optimal health state. Making nursing staff and physicians aware of the significant benefits of providing hypertension education to their patients would be

vital to implementing these policy changes. This could be achieved through providing further educational sessions and annual requirements for staff to reinforce the knowledge. This evidence that a small education intervention can have such a profound impact can further generate support of stakeholders and could lead to changes in hospital policy which, once established, can be diffused throughout the whole healthcare system with a goal of reaching the global population.

Quality and Safety

In the last decade, patient safety has become the number one concern of all hospital organizations due to changes in policy issued by organizations such as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the World Health Organization (WHO). One of the most significant ways that patient safety and quality of care can be improved is through patient education. As discussed above, by empowering our patients and their family members with stronger education programs, supporting evidence has demonstrated that patients are highly more likely to follow up with a provider and be more concerned with their overall health (Prendergast et al., 2015). In the case of hypertension, as well as all chronic health conditions, patient-centered care has always proven to be the most successful method to achieving long-term healthcare goals and therefore reducing the incidence of poor patient outcomes.

Financial Impact

As discussed, the costs associated with the treatment of hypertension and its sequelae are increasing at an alarming rate. Data collected from 2000-2013 shows that the national annual cost has almost doubled from \$58.7 billion in 2000 to \$109.1 billion in 2013 (Zhang, Wang, Zhang, Fang, & Ayala, 2017). By decreasing the number of emergency department visits for

hypertension and its complications, there are potentially huge financial savings for patients and healthcare organizations in the long-term. With the current costs sky rocketing, educating the patient population is the most economical method to begin to chip away at the financial burdens that patients, families, and healthcare organizations are currently facing.

Sustainability

The applicability of this project knows no bounds. As discussed, hypertension is globally the number one cause of heart disease which is the number one cause of death in the world and in the United States. Educational interventions can be difficult to implement but have proven the strength of their impact on the health of individuals as well as the larger communities.

Opportunities for future scholarship based around this project and its studied phenomena include and are certainly not limited to: studying the same patient cohorts at six months, one year, and several years after receiving the hypertensive toolkit; evaluating these same patients in the outpatient setting with subsequent blood pressure checks and/or echocardiograms to diagnose potential structural heart disease; applying the toolkit in the outpatient and inpatient settings; comparing the effects of this toolkit to other hypertension education modalities; and implementing the same toolkit in other emergency departments to compare patient outcomes. These are just a few of the infinite possibilities to expand upon the topics of interest that were studied in this project.

Professional Reporting

Dissemination strategies that will be utilized include the creation of a formal academic poster and PowerPoint presentation for attending conferences, publication in an academic peer-reviewed journal, and presentations to smaller groups such as hospital administration. The

project will first be presented to the DNP team, Rutgers faculty, and students on January 28, 2019 to qualify for graduation from the Rutgers DNP program. The project will also be presented at the school wide Poster Day for all completed DNP projects on April 15, 2019. The PowerPoint presentation as well as the poster will be further utilized in presenting to stake holders and management at the project site. Finally, the primary investigator will apply to be publish the final write up in at least one academic peer-reviewed journal such as The American Journal of Hypertension.

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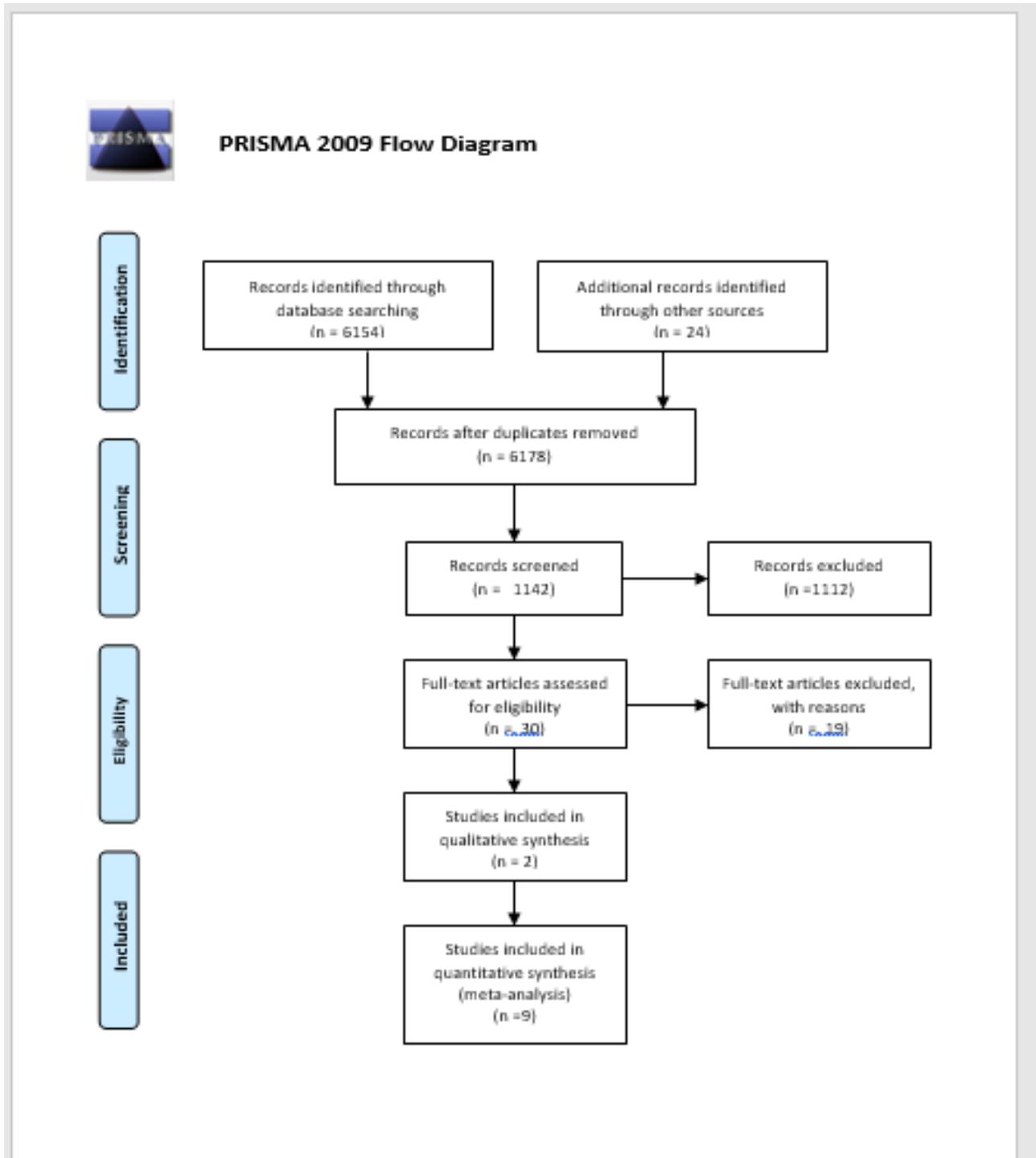
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Appendix A

PRISMA Diagram



Appendix B

Table of Evidence

Article	Author & Date	Evidence Type	Sample, Sample Size & Setting	Study findings that help answer the EBP question	Limitations	Evidence Level & Quality
1	Griffin & Schinstock (2015)	Clinical Practice Guideline	N/A	Provides a professional guideline for selecting hypertensive patients Summarizes updates of the JNC-8 compared to JNC-7	None	Level IV, Quality A
2	Brody, Janke, Sharma, & Levy (2016)	Consensus Statement	N/A	Identifies a provider knowledge gap Provides evidence supporting education as an intervention to treat uncontrolled HTN	Non-research	Level IV, Quality A
3	McNaughton et al. (2017)	Cross-sectional	ED patients at an academic hospital from July 2012 to April 2013, n=85 for patients prescribed ≥3 antihypertensives and n=176 for patients prescribed <3 antihypertensives	Identifies potential causes of uncontrolled HTN in the ED Provides insight to target populations who are in need of education	Interpretation of blood assays may be skewed by several metabolic factors Patients who took NSAIDs or decongestants were not excluded Patient population may not represent the overall hypertensive population	Level II, Quality B

4	Pirrotte, Lerhmann, & Tanabe (2014)	Qualitative	Large, urban, academic emergency department with approximately 85,000 visits per year, n= 9 physicians, 8 nurses, and 8 patients	Identifies several barriers to patients obtaining follow-up care for HTN including: time constraints (of the clinician), difficulty securing follow-up due to poor insurance coverage, forgetfulness, inability to obtain time off work, and length of time to wait for an appointment	Data only obtained from one patient-care site	Level III, Quality B
5	Cienki, Guerrero, Steed, Kubo, & Baumann (2013)	Retrospective cohort	2 urban, academic Emergency Departments, 1000 medical records of patients age ≥ 18 with SBP ≥ 140 and/or DBP ≥ 90	Comparing the number of referrals and hypertensive discharge instructions with paper documentation v. using an EMR did not show a change Demonstrates the need for automatic added alerts, patient education, and referrals for hypertensive patients	Results may vary at different sites with different EMRs Results only focused on what was documented in discharge instructions and not on patients' understanding of instructions	Level I, Quality B
6	Prendergast, Colla, Del Rios, Marcucci, Shulz, & O'Neal (2016)	Cross-sectional	Urban emergency department, adult patients with asymptomatic hypertension and evidence of subclinical heart disease, n= 39	Found significant improvement in blood pressure readings of subjects who received a brief emergency department educational intervention	Small, longitudinal pilot study of a convenience sample from a single urban ED Results do not account for	Level II, Quality B

7	Dolatabadi, Motamedi, Hatamabadi, & Alimohamaddi (2014)	Prospective cross-sectional	Large academic medical center in Teheran, Iran n=346, patients ≥ age 18 with SBP ≥140 and/or DBP ≥90	One-month follow-up of patients demonstrated a positive correlation of newly diagnosed hypertension with older age and lower education level Supports that the ED is an important place to detect undiagnosed HTN in patients of lower educational status	Large percentage of patients were lost between initial evaluation and follow-up Pain level was not measured at the follow-up visit	Level II, Quality B
8	Souffront, Chyun, & Kovner (2014)	Qualitative	Multi-disciplinary sample of emergency department providers from across the United States, n=450 N/A	Demonstrates a gap in knowledge about HTN guidelines and referral among ED providers	Only achieved a 36% response rate among physicians surveyed	Level III, Quality B
9	Wolf, Lo, Shih, Smith, & Fesmire (2012)	Systematic Review with meta-analysis		Provides more specific guidelines for treatment and management of hypertensive patients in the ED The only recommended test for end-organ damage is a	Limited literature available on the evaluation, management, and follow-up of ED patients with asymptomatic	Level III, Quality A

10	Davis (2015)	Clinical Practice Guideline	N/A	<p>serum creatinine but only in at-risk populations</p> <p>In select patient populations, treating HTN in the ED is recommended along with initiation of oral medication</p> <p>Recommend that all patients with asymptomatic blood pressure should be referred for an outpatient follow-up</p> <p>Summarizes the JNC-8 guidelines</p> <p>Provides recommendations for the use of the guidelines by advanced practice nurses</p>	<p>markedly elevated BP</p> <p>None</p>	<p>Level IV, Quality A</p>
11	McNaughton et al. (2015)	Descriptive, epidemiological study	Hypertension-related ED visits from 2006-2012, n= 165,946,807	<p>Hypertension-related ED visits increased by 5.2% each year</p> <p>Rate of ED visits with a primary diagnosis of HTN increased by 4.4% each year</p> <p>HTN was included as a diagnosis in one-fifth of all ED visits from 2006-2012</p>	<p>Inability to determine if increase in HTN-related visits is because of true increase in disease burden versus increased awareness or changes in coding practice or a combination of both</p>	<p>Level III, Quality A</p>

Appendix C

Conceptual Framework

- Share results with nursing leadership for the department and organization
- Continue providing the hypertensive toolkit to patients
- Consider any suggested changes to made to the toolkit
- Consider measuring clinical outcomes of selected patients 6 months or 1 year following the intervention



- Emergency Department patients are being discharged home with elevated blood pressures and no instructions for follow-up and/or education on the risks of hypertension
- Educate staff on the importance of providing hypertensive education and follow-up instructions
- Implement for 1 month a "hypertensive toolkit" provided by the primary nurse at discharge
- Compare 3 months of pre-data to 3 months of post-data to determine if there is a statistical difference in the number of 30-day revisits related to hypertension

- Analyze data collected from 1 month of intervention
- Compare 3 months of pre-data to 3 months of post-data
- Determine if the hypertensive toolkit created the predicted outcome of a decrease in 30-day revisits for hypertension related complaints
- Evaluate staff feedback regarding the use and implementation of the toolkit

- Provide 2-3 staff in-service sessions to educate nurses on the proper use and importance of the hypertensive toolkit
- Attend the monthly staff meeting for the ED medical staff to educate our clinicians on the use of the hypertensive toolkit. Discuss creating a nursing order to provide the toolkit
- Collect feedback on education sessions for nursing and medical staff
- Collect pre and post-data regarding the number of patients who received hypertensive education and the number of those who had a revisit related to hypertension

Adapted from: The W. Edwards Deming Institute. (2018). PDSA Cycle. [Image] Retrieved from

<https://deming.org/explore/p-d-s-a>

Appendix D

Hypertensive Toolkit

KNOW THE FACTS ABOUT

High Blood Pressure



What is high blood pressure?

Blood pressure is the force of blood against your artery walls as it circulates through your body. Blood pressure normally rises and falls throughout the day, but it can cause health problems if it stays high for a long time. High blood pressure can lead to heart disease and stroke—leading causes of death in the United States.¹

Are you at risk?

One in three American adults has high blood pressure—that’s an estimated 67 million people.² Anyone, including children, can develop it.

Several factors that are beyond your control can increase your risk for high blood pressure. These include your age, sex, and race or ethnicity. But you can work to reduce your risk by eating a healthy diet, maintaining a healthy weight, not smoking, and being physically active.

What are the signs and symptoms?

High blood pressure usually has no warning signs or symptoms, so many people don’t realize they have it. That’s why it’s important to visit your doctor regularly. Be sure to talk with your doctor about having your blood pressure checked.

How is high blood pressure diagnosed?

Your doctor measures your blood pressure by wrapping an inflatable cuff with a pressure gauge around your arm to squeeze the blood vessels. Then he or she listens to your pulse with a stethoscope while releasing air from the cuff. The gauge measures the pressure in the blood vessels when the heart beats (systolic) and when it rests (diastolic).

How is it treated?

If you have high blood pressure, your doctor may prescribe medication to treat it. Lifestyle changes, such as the ones listed above, can be just as important as taking medicines. Talk with your doctor about the best ways to reduce your risk for high blood pressure.



¹ CDC: Deaths: Final Data for 2009. www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_03.pdf

² CDC: Vital signs: awareness and treatment of uncontrolled hypertension among adults—United States, 2003–2010. www.cdc.gov/mmwr/preview/mmwrhtml/mm6135a3.htm

National Center for Chronic Disease Prevention and Health Promotion
Division for Heart Disease and Stroke Prevention



KNOW THE FACTS ABOUT

High Blood Pressure

What blood pressure levels are healthy?

To determine whether your blood pressure is normal, your doctor examines your systolic and diastolic pressures, which the gauge measures in millimeters of mercury (abbreviated as mmHg).

	Blood Pressure Levels
Normal	systolic: less than 120 mmHg diastolic: less than 80 mmHg
At risk (prehypertension)	systolic: 120–139 mmHg diastolic: 80–89 mmHg
High	systolic: 140 mmHg or higher diastolic: 90 mmHg or higher

Can high blood pressure be prevented?

You can take several steps to maintain normal blood pressure levels:

- Get your blood pressure checked regularly.
- Eat a healthy diet. Tips on reducing saturated fat in your diet are available on the Web site for CDC's Division of Nutrition, Physical Activity, and Obesity. <http://www.cdc.gov/nutrition/everyone/basics/fat/saturatedfat.html>
- Maintain a healthy weight. CDC's Healthy Weight Web site includes information and tools to help you lose weight. <http://www.cdc.gov/healthyweight/index.html>



- Be physically active. Visit CDC's Physical Activity Web site for more information on being active. <http://www.cdc.gov/physicalactivity/index.html>
- Limit alcohol use. See CDC's Alcohol and Public Health Web site for more information. <http://www.cdc.gov/alcohol>
- Don't smoke. CDC's Office on Smoking and Health Web site has information on quitting smoking. <http://www.cdc.gov/tobacco>
- Prevent or manage diabetes. Visit CDC's Diabetes Public Health Resource for more information. <http://www.cdc.gov/diabetes>

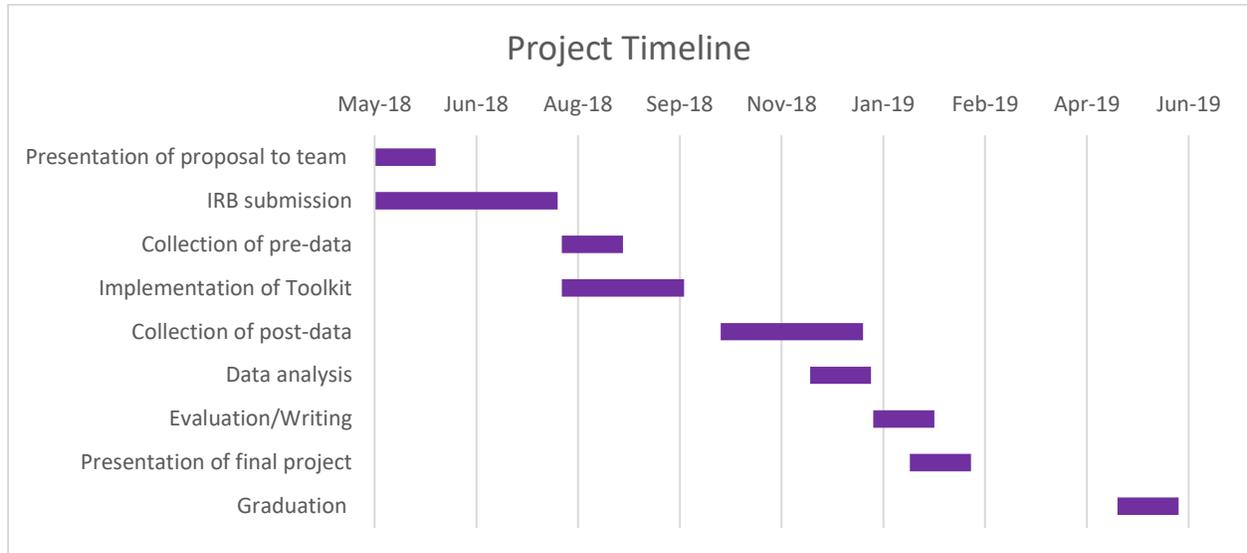
For More Information

Learn more about high blood pressure at the following Web sites:

- Centers for Disease Control and Prevention's Division for Heart Disease and Stroke Prevention: <http://www.cdc.gov/dhdsdp/index.htm>
- American Heart Association: <http://www.americanheart.org>
- National Heart, Lung, and Blood Institute: <http://www.nhlbi.nih.gov>

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Appendix E



Appendix F

Budget Table

Expense	Cost	Total Cost
Education pamphlets	20 @ 0.40 per page	\$8
Lunch-and-learn sessions for medical and nursing staff	2 @ \$5 each	\$10
Materials for poster presentation	\$75	\$75
TOTAL BUDGET		\$93

Appendix G

Data Collection Tool

	A	B	C	D	E	F	G	H	
1	Age	Chief Complaint	Final BP	Sex	Marital Status	Discharge Diagnosis	Return within 30 days	Chief Complaint on Return	
2									
3									
4									
5									
6									
7									
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Sheet1

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Appendix H

Pre-Implementation Data Set

Patient	Age	Chief Complaint	Final BP	Sex	Marital Status	Discharge Diagnosis	Return within 30 days	Chief Complaint on Return
1	60	hypertension	160/103	M	married	weakness	N	N/A
2	51	left thumb laceration	157/74	M	separated	laceration of left thumb without foreign body	N	N/A
3	65	right flank pain, hematuria	151/95	F	married	kidney stone	N	N/A
4	53	left hand laceration	157/95	F	married	laceration of left hand without foreign body	N	N/A
5	43	peripheral neuropathy	131/100	F	married	arthralgia	N	N/A
6	81	left flank pain	149/112	M	married	renal colic, urinary retention	N	N/A
7	79	right sided chest pain and upper back pain	155/92	F	married	musculoskeletal pain, chronic atrial fibrillation	N	N/A
8	56	head injury, ear laceration	153/95	M	married	head injury without skull fracture	N	N/A
9	54	low back pain	168/111	M	married	radiculopathy of leg	N	N/A
10	68	left groin pain	178/95	M	married	left inguinal hernia without obstruction	Y	right knee pain
11	74	hypertension	196/107	M	widowed	hypertension, unspecified	N	N/A

Appendix I

Post-Implementation Data Set

Patient	Age	Chief Complaint	Final BP	Sex	Marital Status	Discharge Diagnosis	Return within 30 days	Chief Complaint on Return
1	62	flank pain	135/100	F	married	renal colic	N	N/A
2	86	chest pain	177/90	F	married	chest pain	N	N/A
3	59	fall	163/87	F	married	fall, contusion of lower back	N	N/A
4	60	partial trauma-fall	175/111	F	married	scalp laceration, head injury	N	N/A
5	68	headache, left sided numbness, hypertension	217/109	M	married	hypertension	N	N/A
6	81	hematuria	168/123	M	widowed	gross hematuria	N	N/A
7	66	headache	169/100	M	married	episodic headache	N	N/A
8	48	hand laceration	257/127	M	single	left palm laceration	Y	wound check, suture removal, hypertension
9	54	left flank pain, difficulty walking	165/128	F	single	chronic back pain	Y	sciatica
10	78	hypertension, smoke exposure	172/109	M	widowed	hypertension	N	N/A
11	64	wrist pain	182/111	F	married	tendonitis	N	N/A

Appendix J

