A DNP PROJECT

A GAP ANALYSIS OF PRIMARY CARE PROVIDERS’ MANAGEMENT OF ANTIHYPERTENSIVE MEDICATION NON-ADHERENCE

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Abstract

Purpose of Project: Hypertension is the most common chronic problem causing nearly half a million deaths annually in the United States as well as putting individuals at risk for heart disease, stroke, and other complications. Only one in four adults have their hypertension under control, primarily due to poor adherence to antihypertensive medication.

Methodology: A survey to assess practices of medication non-adherence management by primary care providers was completed by six primary care providers.

Results: The survey identified that most providers are assessing antihypertensive medication adherence (83.3%) but a majority are not using an evidence-based tool (83.3%). Additionally, specific barriers were identified only 63.3% of the time and the most common barriers identified were financial difficulties, forgetfulness, and patient’s perceptions and beliefs.

Implications for Practice: An evidence-based toolkit that was tailored to identified gaps was created. Using this toolkit and addressing antihypertensive medication non-adherence, will, hopefully, improve blood pressure control and improve care of hypertensive patients.

Keywords: hypertension, medication adherence, primary care providers, gap analysis
Introduction

Hypertension is the most common chronic disease in the United States. Approximately one in three adults living in the United States has a diagnosis of hypertension (CDC, 2017). As a result of its asymptomatic nature, hypertension is the leading cause of stroke, cardiovascular disease, and chronic kidney disease. Rapsomaniki et al. (2014) found a direct correlation between level of blood pressure and adverse outcomes of hypertension among 1.25 million patients with no prior history of cardiovascular disease in a primary care office. Subsequently, the lowest group at risk for cardiovascular disease or stroke were those with systolic blood pressure (SBP), 90-114 mm Hg, and diastolic blood pressure (DBP), 50-74 mm Hg, (Rapsomaniki et al., 2014). Pharmacological and non-pharmacological treatments have shown to reduce cardiovascular and cerebrovascular risks and increase longevity of patients with hypertension. Nevertheless, in spite of availability of effective antihypertensive therapies, blood pressure control remains suboptimal.

There are many barriers to adequate control of blood pressure. These include: lack of knowledge regarding asymptomatic nature of the condition, poor adherence to lifestyle changes and medications, and inadequate self-management skills. Primary care providers are well positioned to educate and help hypertensive patients develop self-care skills in order to improve patient outcomes. The purpose of this DNP quality improvement project is to utilize mobile phone text messaging in combination with patient education in order to improve adherence to antihypertensive medications and blood pressure control among hypertensive adults in a primary care setting.
Background and Significance

Prevalence of Hypertension

According to the World Health Organization, an estimated 1.13 billion people worldwide were diagnosed with hypertension in 2015 (WHO, 2019). In the United States, the prevalence of hypertension is higher in older adults when compared with younger adults, and in non-Hispanic black individuals when compared to non-Hispanic whites and Hispanic people (CDC, 2017). It is evident that hypertension is a very common problem that requires serious attention.

Hypertension-related Morbidity and Mortality

Hypertension is associated with significant cardiovascular morbidity and mortality. It is often referred to as the “silent killer” due to its asymptomatic nature and its significant adverse effect on patient’s health and longevity. Hypertension affects every major organ, causing target organ damage in the heart, brain, and kidneys. It increases the risk of heart attacks, congestive heart failure, ischemic and hemorrhagic strokes, chronic kidney disease, and end-stage renal disease (Whelton et al., 2017). Additionally, for older individuals, hypertension is a main contributor to cognitive decline resulting in a loss of autonomy, premature disability and institutionalization (Whelton et al., 2017).

Quantitatively, hypertension is the most prevalent modifiable risk factor for premature cardiovascular disease, being more common than cigarette smoking, dyslipidemia, or diabetes (Whelton et al., 2017). Hypertension often coexists with these other comorbidities as well as obesity and metabolic syndrome. The presence of more than one risk factor increases the risk of adverse cardiovascular events.
The likelihood of vascular complications increases as blood pressure rises. The risk begins to go up in all age groups with blood pressures greater than 115/75 mmHg. Every 20 mm Hg higher systolic blood pressure and 10 mm Hg higher diastolic blood pressure doubles the risk of stroke, heart disease, or other vascular disease (Whelton et al., 2017).

Hypertension is associated with increased mortality. High blood pressure was a primary or contributing cause of death for more than 410,000 Americans in 2014—that’s more than 1,100 deaths each day (CDC, 2017). The major causes of hypertension-related death are cardiovascular disease (myocardial infarction, heart failure) and stroke. Untreated hypertensive patients and those treated, but not having control, are at increased risk of death (Zhou, 2018). Therefore, efforts are required to better control blood pressure.

**Hypertension-related Healthcare Cost**

In addition to being a major risk factor to cardiovascular disease and premature death, hypertension is a very costly condition. In 2012-2013, hypertension cost the nation about $51.2 billion while total cardiovascular disease, including myocardial infarction and stroke, cost the nation about $316 billion (Benjamin et al., 2017). Average annual costs on a per person basis, including medications, follow-up appointments, and possible complications, was estimated to be about $1,494 in 2013 (Zhang et al., 2017). Better hypertension control can lead to decreased personal spending, reduced societal economic burden, and improved clinical outcomes.

**Benefits of Hypertension Treatment**

Hypertension is not a curable condition, but a treatable condition. In general, a combination of lifestyle changes and pharmacological therapies are required to control blood pressure. Antihypertensive medications are effective in reducing the risk of cardiovascular
disease. In large-scale trials, pharmacologic antihypertensive therapy (across all antihypertensive classes) when compared with placebos, produces a nearly 50% risk reduction in the incidence of heart failure, a 30 to 40% risk reduction in stroke, and a 20 to 25% risk reduction in myocardial infarction (Whelton et al., 2017). The risk reduction is greater in patients with higher baseline risk (e.g., patients with a previous history of cardiovascular events). There is strong evidence regarding the benefits of non-pharmacological therapies (dietary salt restriction, dietary patterns high in vegetables and fruits, potassium supplementation, weight loss, regular exercise, limited alcohol intake) on the reduction of blood pressure. However, the impact of these measures on cardiovascular outcomes is less clear (Whelton et al., 2017).

**Blood Pressure Control**

Despite availability of effective therapies, blood pressure control rates remain low. In the U.S. adult population, hypertension control has been steadily improving since the 1960s (Whelton et al., 2017). This overall improvement in control is due to higher rates of awareness (from 73 to 81%), treatment (from 55 to 72%), and an increased proportion of treated patients who attained adequate blood pressure control (from 51 to 69%) (Fryar et al., 2017). With adoption of the 2017 American College of Cardiology/American Heart Association guidelines, the proportion of adults already on antihypertensive medication with blood pressures that remain above goal (a systolic pressure ≥130 mmHg and/or a diastolic pressure ≥80 mmHg) increased from 39 to 53% (Muntner et al., 2018). The segment of untreated adults for whom treatment with antihypertensive medication is recommended increased by 2% (from 34 to 36 %) (Muntner et al., 2018). Improved rates of blood pressure control may lead to decreased cardiovascular morbidity and should be a priority for primary care providers.

**Non-Adherence to Antihypertensive Therapies**
One of the main barriers to adequate blood pressure control is nonadherence to lifestyle modifications and antihypertensive medications. Adherence is defined as the extent to which a patient correctly follows a prescribed therapy (Thakkar et al., 2016). Adherence is the medically preferred term because it reflects active involvement of the patient and a therapeutic alliance between the patient and his or her healthcare provider. This term is in contrast to compliance, which reflects a more paternalistic approach (Thakkar et al., 2016).

Adherence to long-term therapies, including antihypertensive medications, is generally low. In a study of one hundred and forty-nine patients completed in the United States, 42% were categorized as nonadherent to treatment where nonadherence is defined as taking less than 80% of prescribed antihypertensive medication (Gallagher et al., 2015). According to the American Heart Association, three out of four Americans do not take their medication as directed (AHA, 2020). Up to 25% of patients do not fill their initial prescription for antihypertensive therapy (Whelton et al., 2017). According to the American Medical Association, two of the main reasons for this are lack of symptoms and misunderstanding regarding the need for the prescribed medicine (AMA, 2015).

Poor adherence to medications has been linked to increased need for medical interventions as well as increased morbidity and mortality (Thakkar et al., 2016). This poor medication adherence takes the lives of 125,000 Americans annually and costs the healthcare system nearly $300 billion in additional doctor visits, emergency department visits, hospitalizations, and further required testing (AHA, 2020).

There are multiple barriers to medication adherence. A systematic review conducted by Brown & Bussel (2011) identified provider and patient-related factors of poor adherence to therapies. Among patient-related factors are lack of understanding of their disease, lack of
involvement in the treatment decision-making process, and suboptimal health literacy. In a study done in Sri Lanka with three hundred and three patients, 30.1% of participants had very little knowledge about their diagnosis of hypertension and 75% of patients, who were aware of their blood pressure levels, mistakenly thought that those numbers were adequate and that their blood pressure was controlled (Pirasath et al., 2017).

The patient’s attitudes concerning the effectiveness of the treatment, their previous experiences with pharmacological therapies, forgetfulness, and lack of motivation may also contribute to poor medication adherence and insufficient blood pressure control (Brown & Bussel, 2011). A study done in Oman with two hundred and fifteen participants found that those patients with more concerns about medications were significantly less likely to take the medications and have less adherence (Al-Noumani et al., 2018).

One of the major provider-related factors of poor adherence is a failure to explain the benefits of treatment (Brown & Bussel, 2011). Ineffective communication between the primary care provider and the patient further compromises the patient's understanding of his or her disease, its potential complications, and the importance of medication adherence. Communication among clinicians is often insufficient and may contribute to medication nonadherence (Brown & Bussel, 2011).

Interventions that improve adherence may have far greater effect on the health of a population than any improvement in specific medical treatment. There are several strategies identified to improve patient medication adherence and increase self-management skills. Educating and maintaining contact with the patient and the patient's family is beneficial. Information about medications, when written in simple language and attractively presented, can
also be useful (Brown & Bussel, 2011). Additionally, engaging the patient in clinical decision making improves medication adherence (Brown & Bussel, 2011).

In recent years, mobile health technologies have emerged as a strategy to improve the implementation of evidence-based practice (Thakkar et al., 2016). Mobile telephone text messaging may be an appropriate platform to deliver electronic reminders. The technology is relatively old and therefore can be delivered to any existing mobile telephone. Subscription to mobile telephones is ever increasing and prevalent in our society, and this technology is increasingly used by individuals of all ages and socioeconomic classes (Thakkar et al., 2016). Recently, text messages have been widely used as a reminder and support in various health programs (Thakkar et al., 2016). This DNP project will use a mobile text messaging medium in combination with an educational component in order to improve adherence to therapies and ultimately blood pressure control.

Needs Assessment

Hypertension, recognized by the IOM as the most common primary diagnosis in America, is a silent killer that puts millions of affected individuals at risk for complications such as heart disease and stroke. Those complications of heart disease and stroke are also the first and third leading, respectively, causes of death in the United States (CDC, 2014). Hypertension is one of the most common health problems in New Jersey, the state where this DNP quality improvement project was implemented.

In New Jersey, it is estimated that about 33% of the population has a documented diagnosis of hypertension and 76% of those patients are on an antihypertensive medication (CDC, 2017). According to the New Jersey Hospital Association, one in five New Jersey
residents that visit an emergency room have a diagnosis of hypertension (NJHA, n.d). According to the CDC, in NJ, 198.1 deaths per 1000 are related to HTN (CDC, 2017).

This DNP quality improvement project took place in an outpatient office located in Morris County, New Jersey. In Morris county, approximately 27.4% of the population has a diagnosis of hypertension (New Jersey State Health Assessment Data, 2019). Although hypertension is a treatable disease, it is also poorly controlled. Inadequate hypertension control places about a quarter of Morris county’s population at risk for cardiovascular complications.

The primary care office where the DNP QI project was implemented employs six internal medicine physicians, one internal medicine nurse practitioner, one cardiologist, one cardiology nurse practitioner, and one gastroenterologist. The office sees approximately one hundred and thirty patients per day, dependent on providers scheduled. However, it is calculated that only about 73% of patients with a documented diagnosis of hypertension have a blood pressure that is adequately controlled (S. Paine, personal communication, March 2, 2020). Of note, the definition of adequate blood pressure control is defined as 140/90, which is not the most current guideline of adequate blood pressure control. Therefore, one can hypothesize that the number with adequately controlled hypertension would be lower if the dashboard was completed with a goal of < 130/80 mm Hg. As evidenced by this data, hypertension is an extremely prevalent yet inadequately controlled condition, requiring further intervention.

Problem/Purpose Statement

Hypertension is the most common modifiable cardiovascular risk factor that contributes to significant morbidity and mortality in affected patients yet despite the availability of effective
and inexpensive therapies, this disease remains uncontrolled primarily due to medication non-adherence.

**Aims/Objectives**

The aim of this DNP project was to improve management of nonadherence to antihypertensive medications by primary care providers. In order to accomplish this aim, the next objectives were developed:

1) Surveyed current practices of management of nonadherence to antihypertensive medications by primary care providers

2) Performed a gap analysis to identify differences between current practices and evidence-based best practices in management of nonadherence to antihypertensive medications

3) Made specific recommendations to address gaps in management of nonadherence to antihypertensive medications

4) Created a practical tool kit to help primary care providers in the management of nonadherence to antihypertensive medications

**Literature Review**

A thorough review of literature was conducted to identify and synthesize the evidence supporting the use of electronic short message reminders, or text messages, in chronic diseases, especially in hypertension and cardiovascular diseases. The literature search was conducted using the following databases: the Cochrane Library, the Joanna Briggs Institute Evidence-Based Practice Database, and the Cumulative Index of Nursing and Allied Health Literature (CINAHL). The key terms applied to the literature search included: SMS and hypertension, text messages and hypertension, text messages and chronic disease, management of chronic disease through text message reminders, SMS in chronic disease, hypertension and medication
adherence, anti-hypertensives and medication adherence, and antihypertensive medication adherence. The search was limited to articles written in English and published after 2015. The initial search yielded four hundred and thirteen results. These articles were then reviewed based on their abstracts. Twenty-eight articles were found to be relevant to the topic of interest. After further review of full text articles, ten articles were included in the literature review.

The Table of Evidence (Appendix A) summarizes studies which were included in the final literature review. Six included studies were randomized controlled trials (RCT), two included studies were systematic reviews with meta-analysis, and two included studies were solely systematic reviews. All of the studies were reviewed for methodological quality using the Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool. Nine out of the ten included studies had level I strength of evidence and one was assigned to a level II strength of evidence. Three systematic reviews by Adler et al. (2017), Tao et al. (2015), and Tan et al. (2019) included only RCT’s in their analysis. The systematic review by Vargas et al. (2018) included 5 RCT’s and 1 quasi-experimental study.

The studies in this review included participants of both sexes, various racial and ethnic backgrounds, different countries of origin, and diverse socio-economic statuses. Most studies were conducted in the outpatient primary care setting. All participants in the included studies had a diagnosis of cardiovascular disease or hypertension, and were prescribed at least one medication.

Literature regarding electronic reminders in hypertension and education in management of hypertension is scarce. For this reason, this review included studies on use of education and SMS reminders in the care of cardiovascular disease, stroke, and other chronic conditions.  

**Mobile Phone Text Messages and Antihypertensive Medication Adherence**
There is solid evidence that mobile phone text messaging is effective in improving antihypertensive medication adherence and blood pressure control in patients diagnosed with hypertension. Maslakpak & Safaie (2015) conducted a randomized controlled trial that included 123 participants to compare the efficacy of mobile text messages on antihypertensive medication adherence. The participants were randomly divided into the SMS group and the control group (education only). The subjects in the SMS group were sent six text messages a week for three months. The Johns-Hopkins Hill-Bone medication adherence scale was completed by all the participants before the intervention as well as three months after the intervention. The study found that after the intervention, the control group had a decrease in their mean adherence to treatment score ($p<0.001$). The text message group had an increase in post-intervention mean adherence score ($p<0.001$). The findings of the present research demonstrated that training and distance-monitoring via SMS promote medication adherence of patients. Therefore, healthcare teams and nurses are recommended to apply such training methods.

Adler et al. (2017) conducted a systematic review which assessed the effects of mobile phone text messages on adherence to medication in secondary prevention of cardiovascular disease. The review included thirteen randomized controlled trials with a total of 1,310 participants. Follow-up ranged from one month to twelve months. Due to diversity of methods, meta-analysis was not able to be completed. All seven studies that reported adherence showed a beneficial effect of mobile phone text messaging on medication adherence. There were several limitations of this systematic review. First, multiple different scales were used to assess adherence which made it difficult to compare results. Next, the included studies were small, heterogeneous, and included participants recruited directly after acute events. Lastly, all studies were assessed as having high risk of bias across at least one domain and most of the studies came
from high-income countries. Based on limited evidence, mobile text messaging increases adherence to medications.

**Mobile Phone Text Messages and Hypertension Control**

The effect of mobile phone text messaging on antihypertensive drug adherence and blood pressure control was investigated by Varleta et al. (2017). The researchers conducted a six-month trial involving twelve primary care centers in Santiago, Chile. They included three hundred and fourteen patients with a confirmed diagnosis of hypertension who had been given their first antihypertensive medication in the previous one to six months. Participants were randomized to a control group (n=151) and an intervention group (n=163). The intervention consisted of monthly text messages regarding healthy diet, salt intake, and antihypertensive medication schedule. Adherence was assessed by the self-reported four-item scale Morisky questionnaire at baseline and after six months of follow-up. The results demonstrated that medication adherence decreased in the control group (from 59.3% to 51.4%, \( p=0.1 \)) and dramatically improved in the intervention group (from 49% to 62.3%, \( p<0.01 \)). Text messages also had a significant effect on mean blood pressure. Baseline mean BP was 142.7/81.1 mm Hg and 140/78.4 mm Hg in the SMS and non-SMS groups, respectively. At the end of the study, BP data was available for 165 patients (57%). After the six-month follow-up, mean BP was 134.6/77.5 mm Hg in the SMS group and 136.8/78.3 mm Hg in the non-SMS group. While BP reduction was higher in the text-messaging group, there was not enough power to make statistical comparisons.

Bobrow et al. (2016) conducted a single-blind randomized trial evaluating the effect of mobile phone text messages on levels of blood pressure control after twelve months. This trial consisted of 1,372 participants which were randomly assigned into three groups: usual care
group (n=457), informational SMS text group (n=457), and interactive SMS text group (n=458). All three groups received written education regarding hypertension while the informational and interactive SMS text group also received weekly text messages. The text messages sent to the informational group consisted of medication reminders and education regarding hypertension as well as alerts that medication was ready or information regarding upcoming clinic appointments. The interactive text group received the same texts but also had the option to speak to a healthcare representative, cancel or change an appointment, or change the timing or language of the text message. The mean systolic blood pressure in the usual care group pre-intervention was 135.4 mm Hg and 134.3 mm Hg post intervention, showing limited change. The baseline mean systolic BP in informational SMS text group pre-intervention was 135.1 mm Hg and post-intervention was 132.1 mm Hg. The interactive text group was 135.6 mm Hg pre-intervention and 132.7 mm Hg post-intervention. The mean adjusted difference in change between the informational text group and control group was -2.2 mm Hg (-4.4 to -0.04, p=0.046) and for interactive text group compared to control group was -1.6 mm Hg (-3.7 to 0.6, p=0.16). Additionally, participants who received at least 80% of their antihypertensive medications during the twelve-month period was 62.8% in the informational text group, 59.7% in the interactive text group, and 49.4% in the control group. As evidenced by the study’s findings, there is no significant added benefit to the interactive text messages versus the traditional informative text messages. These findings imply that text messages, whether informational or interactive, leads to increased medication compliance and improved blood pressure control.

A systematic review done by Vargas et al. (2017) was composed of six studies, five RCT’s and one quasi-experimental study, which examined the effect of SMS text messages on blood pressure control. The included studies had two to twelve months follow-up. Three out of
the six studies showed a significant improvement in BP control as a result of the mobile phone text message. The other studies had significant limitations as participants were not fully engaged in their treatment plan, either because of the participant not being fully ready for change or not often using text messaging itself.

Similar results of increased level of blood pressure control were found in an RCT done by Rehman et al. (2018). The study included one hundred and twenty-two participants who were randomly assigned into an intervention group and a control group. Both groups were actively taking antihypertensive medications. However, patients in the intervention group received twice daily text educational and reminder messages over the course of three months. At the end of the study, both the control and intervention groups had a decrease in blood pressure levels but the intervention group had a more significant reduction. Baseline BP in the control group pre-intervention averaged 148.91 mm Hg (±5.58)/94.25 mm Hg (±3.61) and decreased to 146.78 mm Hg (±5.73)/91.28 mm Hg (3.05) post-intervention. Baseline BP in the intervention group before the intervention averaged 149.31 mm Hg (±5.57)/94.00 mm Hg (±3.23) and decreased to 141.15 mm Hg (±5.73)/88.63 mm Hg (±3.97) post-intervention. As evidenced by these results, the implementation of text message reminders as well as non-pharmacological treatments were effective in reduction of blood pressure in patients with hypertension.

In comparing the studies completed by Varleta et al. (2017), Bobrow et al. (2016), and Rehman et al. (2016), the main differing factor is the length of time the studies were completed over. Rehman et al. studied the effects of text message reminders over three months, Varleta et al. studied the same effect over the span of six months, and Bobrow et al. studied the same effect over the span of twelve months. Comparing the results of these three studies, it can be seen that length of time of intervention is not a contributing factor to increased medication adherence and
subsequent increased level of blood pressure control. While all three studies showed an increase in levels of blood pressure control, the biggest increase was seen in the study by Rehman et al. (2016) which is the study with the shortest time span of three months.

Kamal et al. (2015) conducted an RCT assessing the impact of SMS on medication adherence in stroke patients in a hospital in Pakistan. Two hundred participants were randomly assigned to a control (n=100) or intervention group (n=100). The follow-up period was eight weeks. The control group received the usual care consisting of regular follow-up visits. The intervention group received interactive twice-weekly text messages that were used to educate patients on stroke care and remind them to take their medications. To assess adherence, the Morisky medication adherence survey was administered. Prior to the implementation, both groups had the same level of medication adherence (6.6). A multivariable analysis showed that the adjusted difference in adherence scores between the intervention group and the control group was 0.54 (95% CI; 0.22-0.85, p<0.01). The mean diastolic blood pressure in the intervention group was 2.6 mm Hg (95% CI; -5.5 to 0.15, p=0.06) lower than the control group after the implementation of the text messages. These results show that the implementation of text messages increases medication adherence and lowers blood pressure levels.

Akhu-Zaheya & Shiyab (2017) also conducted an RCT on one hundred and sixty participants to assess the effects of text message reminders on medication adherence as well as on following a healthy diet and smoking cessation. This study used the same Morisky medication adherence scale as used in Kamal et al. (2015). In this study, a one-way ANOVA was run and found significant differences on adherence to medication and adherence to a healthy diet (p<0.01) but no significant difference was found in terms of smoking cessation (p = 0.34). This
further emphasizes that text message reminders can be useful in increasing medication adherence but not necessarily in other cardiovascular risk factors, such as smoking cessation.

Lastly, a systematic review and meta-analysis was completed by Tao et al. (2015) which analyzed the use of electronic reminders on 3,152 patients regarding medication adherence in chronic disease. This systematic review with meta-analysis included twenty-two RCT’s which studied patients diagnosed with diabetes, asthma, cardiovascular diseases, AIDS, glaucoma, and allergic rhinitis. Most studies used text message reminders while some studies did use pager and alarm-triggered reminders. Regardless of the type of reminder, there was a statistically significant result (d=0.29, 95% CI 0.18-0.41, p <0.01)

Education and Antihypertensive Medication Adherence

A systematic review with meta-analysis was completed by Tan et al. (2018) which focused mainly on the impact of additional education on medication adherence for patients diagnosed with hypertension, hyperlipidemia, and diabetes. This systematic review with meta-analysis consists of eighteen RCT’s and includes 2,307 participants with follow-up periods ranging from nine weeks to thirty-six months. Different models of education were used including both group and individual education as well as education led by nurses, pharmacists, multi-disciplinary teams, and community health workers. The random effects model was used to complete this meta-analysis and showed that educational interventions significantly improved medication adherence (d=0.69; 95% confidence interval 0.25-1.12, p <0.05). The review found that, regardless of the type of education or who it was led by, additional education led to an increase in medication adherence.

Medication Adherence Evidence-Based Practice
There are many reliable questionnaires and adherence scales which are used by primary care providers to assist in assessing and measuring medication non-adherence. Gallagher et al. (2015) evaluated the validity of two commonly used adherence tools among one hundred and forty-nine patients with uncontrolled hypertension against the gold standard of an electronic pill box. The two scales included were the Morisky Medication Adherence Scale (MMAS-8) and the Visual Analog Scale (VAS). When compared to the electronic pill box as the gold standard, a MMAS-8 score less than 6 had a sensitivity of 32% (95% CI 21-44%) and a specificity of 84% (95% CI 1.10-365) and negative likelihood ratio was 0.81 (95% CI 0.66-0.98). With a MMAS-8 score less than 8, sensitivity and specificity for identifying nonadherence on electronic monitoring were 71% (95% CI 60-82%) and 53% (95% CI 42-63%). When looking at the VAS, scores less than 80% had a sensitivity of 18% (95% CI 8-27%) and a specificity of 98% (95% CI 95-100%) while a VAS score less than 100% had a sensitivity of 48% (95% CI 36-62%) and specificity of 68% (95% CI 58-78%). As evidenced by the results, the MMAS-8 and VAS are useful tools in assessing antihypertensive medication non-adherence.

There are also many different barriers to antihypertensive medication nonadherence. Ashoorkhani et al., (2018) completed a study of thirty-five patients with hypertension and three cardiologists regarding reasons they were nonadherent to antihypertensive medications. Answers were grouped into three categories of predisposing, enabling, and reinforcing factors. Predisposing factors consisted of knowledge, beliefs, and culture while enabling factors consisted of access to care and reinforcing factors consisted of provider support and resources. Most patients in the study verbalized that the lack of emotional support and information from physicians played a big role in their medication non-adherence. Participants stated that they felt they did not have the opportunity to ask questions or get a good understanding of their
medications and therefore did not take them. This emphasizes the importance of increased education when prescribing antihypertensive medications.

**Limitations of Studies**

There were several limitations on the included studies. Three trials had short durations of follow-up and small sample sizes (Maslakpak & Safaie, 2016; Vargas et al., 2017; Rehman et al., 2018). Replication of these studies with a larger sample size and longer duration of follow-up would be beneficial to confirm the results of these studies. The study by Varleta et al. (2017) did not have post intervention comparison of blood pressure as the final check-in was done over the phone and did not have final BP measurements. Two systematic reviews were unable to perform meta-analysis due to heterogeneity of methodology of the included studies (Adler et al., 2017; Vargas et al., 2017). In the study conducted by Bobrow et al. (2016) medication was provided free of charge which may have aided an increase in medication adherence by removing possible non-adherence barriers. Lastly, most studies relied on self-reported adherence (using validated surveys) and didn’t use objective methods of assessing adherence (measuring plasma/urine drug levels), which could lead to underreported non-adherence.

The included studies used multiple different medication adherence scales and different measurement variables in their methodology. One obstacle in this literature review was the inability to compare the efficacy between two similar studies but using different adherence scales. Another obstacle is that some studies only assessed adequate medication adherence but not its effect on blood pressure control. Through these obstacles, all studies had the mutual result finding that text message reminders lead to increased antihypertensive medication adherence.

**Evidence**
This literature review provides substantial evidence to support the overall objective of this project: to improve blood pressure control in adults with hypertension by including education regarding importance of antihypertensive medication as well as implementation of text message reminders to assist patients in continued medication adherence. The included studies have confirmed that text messages, as well as additional education, improves medication adherence and blood pressure control.

**Theoretical Framework**

Initiation of a new evidence-based protocol to assess and manage antihypertensive medication non-adherence requires a behavioral change. The Transtheoretical Model (TTM) is a comprehensive model which summarizes various stages of behavioral change by describing the process of how individuals adapt to a new situation or setting (Prochaska & Di Clemente, 1982). While the time to overcome each stage may vary for individuals, the tasks required in each stage are constant and applicable to any behavioral change.

This behavioral change model is composed of five stages: precontemplation, contemplation, preparation, action, and maintenance. The participants in this project went through the following five stages as they worked towards their new learned behavior of effectively assessing and managing antihypertensive medication nonadherence. A visual representation of this model, as applied to this project, can be found in Appendix B.

**Precontemplation**

Precontemplation was the initial stage of the transtheoretical model that described the stage where individuals did not see a need for change or did not intend to make a change. This may be due to lack of knowledge, hesitancy to change, or lack of motivation. In regards to this project, this stage applied to providers who felt like they were addressing these barriers
effectively or did not see a reason to change their outdated practices. Providers in this stage were continuing to provide their usual care.

**Contemplation**

The contemplation phase was the second phase of the transtheoretical model where an individual noticed the need for a change and was actively preparing to change their problematic behavior. However, the individual still had doubts about this new change and was not fully convinced to adapt a new behavior. During this stage, it was imperative to provide the provider with additional education, likely in the form of a paper or electronic hand-out, and provide support. This support was in the form of addressing concerns regarding the new behavior or providing additional education regarding the positive impact this change will bring.

**Preparation**

During the preparation phase, the provider was ready to make a change to adapt this new behavior. The individual had outweighed the positives against the negatives and now saw the importance of adapting this new behavior. As part of this project, participants identified the importance of evidence-based guidelines in assessing and managing antihypertensive medication nonadherence and were ready to adapt these guidelines in their practice.

**Action**

During the action stage, an individual has started to make active changes in their lifestyles and has begun to adapt the new behavior. The participants in this project were beginning to implement the evidence-based guidelines in their practice.

**Maintenance**
Continued maintenance of this new healthy behavior is the ultimate aspiration for this project. During this stage, individuals have developed a routine which they feel confident in and are adequately addressing antihypertensive medication non-adherence. This new level of confidence and well-being is the contributing factor for continued success in this cycle.

Pertaining to this study, the participant in the maintenance stage will be routinely implementing evidence-based guidelines to assess and manage antihypertensive medication non-adherence in their patients. With time, the provider will see a decrease in antihypertensive medication non-adherence and subsequent decreases in systolic and diastolic levels of blood pressure. These positive reinforcements will assist in increasing confidence for the provider to continue to use these evidence-based practice guidelines.

**Methodology**

Due to the sudden switch to social distancing and telehealth in response to the Covid-19 pandemic, the original focus and subsequent objectives of this project were redesigned. The original project was unable to be completed via social distancing. This new project was formed in response to the transition to telemedicine, keeping in mind the original population of patients diagnosed with hypertension.

**Design**

This proposed quality improvement project conducted a gap analysis to determine gaps in care related to the management of antihypertensive medication non-adherence during the Covid-19 pandemic. Based on the results, an evidence-based toolkit was created to assist providers in assessing and managing antihypertensive medication non-adherence.

**Setting**
The proposed project was implemented in a large, multi-specialty outpatient office in North New Jersey. This practice has been open for over twenty years and is a busy office, seeing an average of one hundred and thirty patients per day during a typical day without social distancing, spanning from newborn to elderly. Five family medicine physicians, one family medicine nurse practitioner, one pediatrician, one cardiologist, one cardiology nurse practitioner, and one gastroenterologist are providers in this office. There are twenty-three patient exam rooms across the various specialties. The office also has in-house lab and radiology as well as the capability to perform exercise and nuclear stress tests. The office has very flexible hours and is open a total of six days per week and four nights per week until eight PM. Due to social distancing requirements and transition to telehealth, the project was implemented via an online survey which was sent to all appropriate providers.

Of these one hundred and thirty daily patients, many have a diagnosis of hypertension. Unfortunately, the exact number of patients with hypertension is unavailable. However, it is established that only about 73% of patients with a documented diagnosis of hypertension have a documented blood pressure that is adequately controlled (S. Paine, personal communication, March 2, 2020). Of note, in this office, the definition of adequate blood pressure control is defined as levels of blood pressure equal or less than 140/90 mmHg, which is higher that the levels of control recommended by the 2017 American Heart Association and the American College of Cardiology published guidelines (< 130/80 mm Hg). Therefore, one can hypothesize that the number of patients with adequately controlled hypertension would be lower if the current goal of < 130/80 mm Hg would be considered. The major barrier for better control of hypertension is medication non-adherence.

**Study Population**
Inclusion criteria for this study included healthcare providers (MD, DO, NP, PA) in the practice who provide care for adults diagnosed with hypertension. Providers who do not provide care for adult patients diagnosed with hypertension were excluded from the project. The recruitment emails and following survey were sent to eight of the providers in this office who met the inclusion criteria. Of the eight included providers, six providers completed the survey. This provided to a 75% participation rate.

**Subject Recruitment**

This study included a convenience sample of providers in this chosen practice. An email invitation with the recruitment flyer (Appendix C and D) was sent out to all providers in the office who fit the inclusion criteria. The recruitment flyer provided a general overview of the project, the aim of the project, inclusion criteria, the project intervention, and the principal investigator’s contact information. All potential participants were made aware that participation was voluntary and would not affect their employment at the current practice. Potential participants had the opportunity to speak with the DNP student to address any questions or concerns regarding the study. Given the pilot nature of this project, the sample size was not determined in advance.

**Consent Procedure**

Since this study was a minimal risk study and no personal identifiers were collected, a waiver of consent was requested and approved by both Atlantic Health IRB and Rutgers IRB. Therefore, there was no formal consent process.

**Risks/Harms/Benefits**
This study did not pose any risk of physical harm or discomfort. There was a potential risk related to possible breach in confidentiality and privacy. To minimize this risk, the computer containing the information was password protected. Additionally, the only person with access to this computer was the DNP student.

No personal identifiers were included in the survey. The survey was anonymous. Participant’s personal information was not collected. All survey results were stored in the password-protected computer of the DNP student. The potential benefit of this study included improved practice addressing antihypertensive medication non-adherence. A practical toolkit (with resources to manage medication non-adherence) will assist providers to manage non-adherence and improve blood pressure control in patients with hypertension.

**Subject Costs and Compensation**

Participants did not receive any monetary compensation from being involved in the study. There was also no cost to the DNP student associated with this research study.

**Study Interventions**

The initial recruitment email, informing them of the study purpose and design, was sent to all included providers in the office. The electronic survey (Appendix E), sent via Survey Monkey, was sent one week after the initial recruitment email. A final follow-up email was sent one week later to remind providers to complete the survey who have yet to complete it. Providers had a total of two weeks to complete the survey.

The survey is a twelve-question survey which addressed current practices of management of medication non-adherence among patients with hypertension. The survey was developed de
novo by the DNP student. The survey reflects evidence-based best practices of management of
non-adherence to antihypertensive medications.

Once all of the results of the survey were available, the DNP student completed a gap
analysis to assess differences between current practice and evidence based best practice. Based
off of the results, a toolkit was created to address these identified gaps. The toolkit included
recommendations for practice (including rationale) and resources, electronic only due to
COVID-19 restrictions, to manage non-adherence to medications in patients with hypertension.
The toolkit, along with survey results and the DNP student’s contact information, was sent
electronically to all providers.

**Outcomes Measured**

The initial outcomes that were measured were practice patterns of management of
antihypertensive medication non-adherence by primary care providers. Practice
recommendations and a practical toolkit were developed to address gaps in practice.

**Project Timeline**

From the beginning stages of the project’s development and proposal to its final
presentation and defense, the project is projected to take nine months to complete. Project
development and proposal began in December 2019 and a final presentation occurred in
September 2020. A visual representation showing the timeline of this project can be seen in
Appendix F.

**Resources Needed/Economic Considerations**
All resources were electronic and free of charge to both the DNP student and study participant.

**Evaluation Plan**

Descriptive statistics (mean, frequencies) were used to analyze the results of the survey.

**Data Maintenance/Security**

No personal identifiers were collected. The survey results were stored in a password protected computer that only the primary co-investigator was able to access. Only de-identified data was entered into data analysis. After completion of the project, all survey data will be securely stored for three years on the password-protected personal laptop of the DNP student. After this mark, all remaining survey data will be destroyed in accordance with Atlantic Health guidelines.

**Results**

Eight individuals who met the inclusion criteria were invited to participate in the study. The initial recruitment email was sent on June 17, 2020. The initial survey email with the link was sent on June 24, 2020. The final reminder to complete the survey was sent on July 5, 2020. A total of six participants completed the survey, equaling a 75% participation rate. At the conclusion of the survey, all collected results were analyzed via descriptive statistics.

**Survey Results**

**Assessing Adherence to Antihypertensive Medication**

The survey results showed that adherence to antihypertensive medications was “always” assessed by four providers (66.6% of sample) and “most of the time” by two providers (33.3% of
sample). Five providers (83.3% of sample) never used a validated tool or questionnaire while one provider (16.6% of sample) always used a validated tool or questionnaire. The one provider who did use a tool or questionnaire to measure adherence chose another survey outside of Morisky-4, Morisky-8, and Hill-Bone scale as their tool of choice.

**Identifying Barriers to Medication Non-adherence**

As mentioned earlier, identifying barriers to medication adherence is an essential component of measuring actual adherence. Four providers (66.6% of sample) stated they always assessed barriers to medication adherence, one provider (16.6% of sample) stated they assessed barriers most of the time, and one provider (16.6% of sample) stated they assessed barriers half of the time. Of note, these results indicate that in 33.3% of patient-provider encounters, barriers to medication adherence were not always assessed.

Three of the providers (50% of sample) stated that patient’s perceptions and/or beliefs are the most significant barriers in their practice. Two providers (33.3% of sample) found that forgetfulness is the most significant factor while one provider (16.6% of sample) found that financial difficulties are the most significant. The alternate barriers of low health literacy, limited English proficiency, and depression were not significant barriers in this study.

**Addressing Medication Non-Adherence Barriers**

The results of this survey regarding addressing barriers to non-adherence were fairly inconsistent. Three of the providers (50% of sample), “always” advised patients to use different reminders to take daily medications, one provider (16.6% of sample) advised patients “most of the time”, while two of the providers (33.3% of sample) advised patients “some of the time” to use reminders to improve adherence.
The results of this survey regarding simplification of medication regimen were very inconsistent. When asked how often providers prescribed a combination pill instead of several individual pills for patients requiring more than one antihypertensive medication, two providers (33.3% of sample) answered they “always” did this, two providers (33.3% of sample) answered they did this “most of the time”, while the last two providers (33.3% of sample) answered “half of the time”. Additionally, five providers (83.3% of sample) stated they prescribed once daily regimen instead of a multiple-times a day regimen while only one provider (16.6% of sample) stated they “always” tried to prescribe a once daily medication regimen over one with multiple doses.

In addition, three of the providers (50% of sample) “always” provided positive reinforcement, one of the providers (16.6% of sample) provided positive reinforcement “most of the time”, and two of the providers (33.3% of sample) provided positive reinforcement “some of the time”.

**Patient Education About the Diagnosis of Hypertension and Antihypertensive Medications**

The results regarding patient education were also varying in this study. Five providers (83.3% of the sample) stated they “always” educated their patients regarding prescribed medications while only one provider (16.6% of the sample) stated they educate their patients about their medications “most of the time”. The results on Education about the nature and complications of hypertension was heterogeneous. Four out of the six providers (66.6% of the sample) said they “always” educated their patients regarding the nature and complications of hypertension while two of the six providers (33.3% of the sample) said they provided the same education “most of the time”. The results with regards of education on monitoring blood pressure at home was the least consistent. Only three providers (50% of sample) “always” educated their
patients on monitoring their blood pressure at home. The remaining three providers each chose “most of the time”, “half of the time”, and “some of the time”, respectively. These results can be seen in Tables 1-3.

Table 1

Results of Hypertension Medication Adherence Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Always</th>
<th>Most of the Time</th>
<th>Half of the Time</th>
<th>Some of the Time</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you assess adherence to antihypertensive medication?</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How often do you use a validated tool/questionnaire to assess adherence?</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>How often do you assess barriers to adherence?</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How often do you educate your patients regarding prescribed medications?</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How often do you educate your patients regarding the nature and complications of hypertension?</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How often do you educate patients on monitoring their blood pressure at home?</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>How often do you advise your patients to use different reminders to take daily medications?</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>How often do you prescribe a combination pill instead of several individual pills for patients requiring more than one antihypertensive medication?</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How often do you prescribe once daily regimen instead of multiple times daily regimen?</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How often do you provide positive reinforcement, or other incentives, when patients take their medications as prescribed?</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 2

Using a Validated Tool to Assess Adherence

<table>
<thead>
<tr>
<th>Morisky-4</th>
<th>Morisky-8</th>
<th>Hill-Bone</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1 (100.00%)</td>
</tr>
</tbody>
</table>

If you use a validated tool/questionnaire, which one do you currently use?

Table 3

Barriers in Antihypertensive Medication Non-Adherence

<table>
<thead>
<tr>
<th>Financial difficulties</th>
<th>Low health literacy</th>
<th>Limited English proficiency</th>
<th>Forgetfulness</th>
<th>Depression</th>
<th>Patient’s perceptions/beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (16.67%)</td>
<td>0</td>
<td>0</td>
<td>2 (33.33%)</td>
<td>0</td>
<td>3 (50.00%)</td>
</tr>
</tbody>
</table>

Which barrier do you find to be the most significant in your practice?

Discussion and Gap Analysis

The results of the survey helped to identify gaps in the assessment and management of antihypertensive medication non-adherence. The results of the survey were analyzed and an evidence-based toolkit (Appendix G) was created based upon identified gaps in practice.

The results of the survey revealed several deficiencies. First, providers are not always assessing adherence to antihypertensive medication and when they do assess adherence, an evidence-based tool is rarely used. Secondly, barriers to medication adherence are also not consistently assessed but when they are assessed an evidence-based tool is not used. Thirdly, education is almost always provided regarding patient’s prescribed medications but education is
not consistently provided regarding the nature and complications of hypertension as well as the importance of checking blood pressure at home. Finally, providers are not always addressing identified barriers: advising patients to use reminders to take daily medications, providing positive reinforcement for proper medication adherence, prescribing a combination pill instead of several separate pills for patients requiring more than one antihypertensive medication, and prescribing a once daily regimen instead of a multiple times a day regimen.

A lack of assessment of antihypertensive medication adherence, that was identified in this survey, is fairly consistent with the literature. According to Meddings et al. (2012), primary care providers recognized antihypertensive medication non-adherence in less than half of the patients who had gaps in their refill history. As part of this study, 100% of providers assessed adherence in more than half of the patients but only 66.67% of providers always assessed adherence at every visit. Additionally, only one provider used a standardized tool to measure adherence. We can infer from these results that most providers are using a patient self-report or a pharmacy refill report to assess adherence. It is well known that self-report is not an accurate method to measure patient adherence. The most accurate methods, in order of accuracy from least accurate to most accurate, are patient diary, adherence questionnaire, electronic pill count and measurement of serum/urine drug levels (Vrijens et al., 2017). Since electronic pill count and detection of levels of drugs in the blood are not feasible options, providers should use validated questionnaires to assess adherence.

The most frequently used evidence-based questionnaires to measure antihypertensive medication adherence are the Morisky Medication Adherence Scale and the Hill-Bone Medication Adherence Scale. Multiple research studies have been done including both of the scales and have validated the studies by showing significant associations between blood pressure
control and the medication adherence score provided by the scale. Additionally, all scales address various aspects of medication adherence including forgetfulness, asymptomatic nature of disease, and patient’s perceptions and beliefs. The Morisky Medication Adherence Scale started as a four-item questionnaire (MMAS-4) and has expanded to an eight-item questionnaire (MMAS-8). Both scales are equally useful and validated and can be applied to any chronic condition which requires assessment of medication adherence. The Hill-Bone Compliance to High Blood Pressure Therapy scale (HB-HBP Scale) is a fourteen-item scale specifically designed to measure antihypertensive medication adherence. The HB-HBP scale has a standardized alpha of 0.74 and 0.84 and average correlations of the 14 questions were 0.18 and 0.28 (Kim et al., 2000). This medication adherence scale is also available free of charge after a brief permission request form. Templates of all surveys will be included in the evidence-based toolkit for provider use.

A significant component of medication adherence includes identifying barriers to adherence. In this study, only 66.67% of providers always assessed barriers to adherence. Failure to assess barriers is comparable to a failure to assess overall adherence. Without knowing difficulties contributing to medication non-adherence, the provider cannot fully address the problem. Primary care providers’ early identification of barriers can improve adherence, reduce unnecessary costs, and lead to appropriate blood pressure control (Abegaz et al., 2017). Providers can use the questionnaires in the attached toolkit as a method to assess patient’s barriers to adherence.

When barriers were addressed by providers, the most common barriers in this study were patient’s perceptions and beliefs about the medication followed by forgetfulness and financial difficulties. These barriers are ones which can be addressed by providers by tailoring specific
interventions. Providers can assess patient’s perceptions and beliefs by asking questions about how the patient feels about the medicine. If the patient states inaccurate information, the provider can use this as an opportunity for education. Financial difficulties can be dealt by identifying cost-effective options using discount programs such as Good Rx and the New Jersey Statewide Prescription Assistance Program (PAP). This program gives a drug card to any New Jersey resident which provides for savings of up to 75% at more than 68,000 pharmacies (New Jersey Drug Card, 2020). If forgetfulness is a primary barrier, the medication can be tied to a daily activity that the patient already does. For example, if the patient is on a once or twice daily medication, the patient can place the medication next to their toothbrush. In this situation, whenever the patient brushes their teeth in the morning or evening, they will remember to take their medication. This can be applied to different activities including taking a shower, making coffee, or reading the newspaper. Each barrier, once assessed, can be managed via a specific intervention.

There are many ways to address the common barrier of forgetfulness. Currently, only 50% of providers are always advising patients to use reminders to take their medications. Along with tying the medication to a specific activity, another practical tool is to set an alarm for the prescribed time. Once the alarm rings, the patient should immediately take the medication to ensure they do not forget. Positive reinforcement, or incentives if available, can also be a helpful tool for proper medication adherence. According to Ogedegbe et al., (2012), a positive affect intervention enhanced with self-affirmation led to significantly higher medication adherence when compared to education by itself (42% vs 36%, p = 0.49).

Prescribing a once daily regimen instead of a multiple times daily regimen and prescribing combination pills instead of several individual pills are two methods that lead to
increased medication adherence. In this study, only 16.67% of providers always prescribed a once daily regimen instead of multiple times daily. For patients requiring more than one antihypertensive medication, only 33.33% of providers always prescribed a combination pill instead of several individual pills. Patients are more likely to be adherent to a single pill combination medication versus several tablets of the same medication (Konstantinos et al., 2020). The dosing of medication is something that can be easily adjusted by the primary care provider to set up their patients for success.

In this study, low health literacy, limited English proficiency, and depression were not barriers for non-adherence. It is possible that the population served by this office appears to be relatively homogenous. The study took place in Morris county which has a high per capita income and consistently ranks as one of the top ten wealthiest counties in the United States with a median household income of $107,034 in 2018 (Galvin, 2018). For this reason, it would be interesting to perform the same study in a more diverse population to identify the most common barriers in a more heterogenous setting.

While not present in this particular study, other barriers for non-adherence are language barriers and low health literacy. Language barriers can be overcome by having the assistance of a translator line or providing patient information in their native language. Health literacy can be assessed using a simple tool such as the Short Assessment of Health Literacy tool (SAHL-E) which has been found to have good reliability and validity for identifying low health literacy (Lee, 2010). Additionally, this tool is available in both English and Spanish. Once health literacy is identified, the provider can educate the patient at the level of their health literacy. Medical jargon should be avoided and information should be given in lay language.
Proper education is essential in order to achieve adequate levels of medication adherence and subsequent levels of blood pressure control. In this study, 83.33% of providers always provided education regarding prescribed medications, and 66.67% of providers consistently educated their patients regarding the nature and complications of hypertension, however, only half of providers always provided education regarding monitoring blood pressure at home. Patient education improves adherence to medication and also increases patient satisfaction (Schoenthaler et al., 2017). Another factor to consider is that hypertension is usually an asymptomatic disease. Patients may believe that since they do not have any symptoms that their blood pressure is controlled. Additionally, a lay person may not understand the complications of uncontrolled hypertension such as heart attack, stroke, and premature death. To reinforce the fact that hypertension is a silent killer and proper medication adherence is required to prevent further complications, proper education is imperative. Home monitoring is another piece of education that is not strongly emphasized. The recommendation and implementation of home blood pressure monitoring can improve antihypertensive medication adherence (Fletcher et al., 2015).

There are many resources for education for both patients and providers. Providers can find already-made resources for patients from the Centers for Disease Control and Prevention (CDC) and American Heart Association (AHA). Examples of these resources are included in the EBP toolkit. Providers can find more in-depth information through these resources or through sites offering continuing education credits such as the American Nurses Association and the American Association of Nurse Practitioners.

**Project Limitations**

There were a few limitations to this study. The first limitation was the small sample size. Due to the COVID-19 pandemic, the project had to be changed from an in-person hands-on
project with a larger sample size to a smaller sample size with an electronic survey. Another limitation is possible selection bias and lack of generalizability. The study was implemented at a single primary care office located in an affluent suburban town in North New Jersey. Thus, generalizability of the result to other clinical setting is limited.

**Facilitators and Barriers to Project Implementation**

The previously stated objectives of the study, of which, included: surveying current practices of management of nonadherence to antihypertensive medications by primary care providers, performing a gap analysis to identify differences between current practices and evidence-based best practices in management of nonadherence to antihypertensive medications, making specific recommendations to address gaps in management of nonadherence to antihypertensive medications, and creating a practical tool kit to help primary care providers to management of nonadherence to antihypertensive medications were all met.

The primary facilitators that allowed for the study’s objectives to be met included the flexibility of included providers, open communication with the manager and nursing director in the office, and the inclusion of an easily accessible electronic survey which could be completed at the participant’s convenience. There were also barriers which included the rapid transition to telehealth, requirement of social distancing, provider’s initial resistance to change, and lack of knowledge regarding tools for measuring medication adherence.

The project progressed smoothly according to the pre-proposed plan. The flexibility of the study being electronic and available to be completed 24/7 as well as the support of the providers and management in the office assisted and led to a higher participation rate.
During the span of the project, the DNP student received adequate support and guidance from the project’s chair, team member, and the staff at the primary care office. There were no costs to the participants or the DNP student for this project. If this project is to be implemented in a larger scale, it would be prudent to administer the survey in multiple primary care settings with heterogeneous samples to increase the generalizability of the results. Additionally, it would be helpful to see what kind of effect the evidence-based toolkit has as a result of the survey results.

**Implications for Clinical Practice**

The findings of this study demonstrated that there are still gaps present in the care of patients diagnosed with hypertension in the primary care setting, specifically associated with antihypertensive medication non-adherence. Based on these results, it would be recommended to follow the evidence-based recommendations and use the evidence-based toolkit with the ultimate goal of increasing antihypertensive medication adherence, improving blood pressure control and ultimately, reducing hypertension-related adverse events.

The necessity of better blood pressure control to prevent heart attack and stroke is widely recognized. The CDC and the Centers for Medicare & Medicaid Services (CMS) are co-leading an initiative titled “Million Hearts 2022” with the goal to prevent one million heart attacks and strokes within five years. There are specific goals that include improving blood pressure control, reducing dietary sodium intake, and reducing physical inactivity (Million Hearts, 2020). As a method to achieving greater levels of medication adherence, specifically related to hypertension, the Million Heart Initiative has outlined the SIMPLE method. SIMPLE is an acronym abbreviating Simplify the regimen, Impart knowledge, Modify patients’ beliefs and behaviors, Provide communication and trust, Leave the bias, and Evaluate Adherence. By following this
plan, the initiative aims to increase levels of antihypertensive medication adherence which will lead to increased levels of blood pressure control and decreased levels of heart attacks and strokes. A copy of the SIMPLE method template will be included in the EBP toolkit.

**Implications for Healthcare Policy**

This project recognized the need for further education to assist in the assessment and management of antihypertensive medication adherence to address suboptimal levels of adequate blood pressure control. This is in line with the National Hypertension Control Roundtable (NHCR) which is a group of organizations, founded in February 2020, formed to improve hypertension control rates by at least 30% by 2025. This task force aims to spotlight the need for improved hypertension control rates and to highlight efficient hypertension control strategies which will help assist in the improvement of adequate blood pressure control levels by at least 30%. Founding members include the American Association of Nurse Practitioners, the American Heart Association, the American Medical Association, the CDC Foundation, and more than forty other influential healthcare organizations (CDC, 2020). Hypertension is a major risk factor for many cardiovascular complications such as heart attack and stroke and the imminent need for strict control to prevent adverse outcomes and subsequent financial outcomes is being publicly recognized by health organizations now more than ever.

Several strategies from Million Hearts 2022 are addressed by this pilot project. Applied strategies include conducting research related to improving medication adherence, detecting and investigating reasons for medication nonadherence, and developing and implementing public health strategies that reduce medication nonadherence. By administering a survey to providers that regularly identify and treat hypertension, completing a gap analysis with current office practices, and forming an evidence-based toolkit with specific recommendations, this project
assists to evaluate and identify interventions and current practice strategies to improve medication adherence.

**Implications for Quality/Safety**

Antihypertensive medication nonadherence is a major health problem that can lead to adverse cardiovascular events. Additionally, medication nonadherence accounts for 125,000 deaths and $100 to $300 billion in additional spending (Bosworth et al., 2011). Results of this study demonstrated that there are multiple gaps in the assessment and management of antihypertensive medication nonadherence, which is a leading cause of cardiovascular morbidity and mortality. Providers should be educated regarding the most up to date evidence-based practice guidelines. Evidence is constantly changing so it is crucial that providers are staying up to date with the latest information that help them to provide the best care for their patients.

**Implications for Education**

Due to the constantly changing evidence, it is necessary that providers continue to educate themselves. There are many continuing education resources available by the American Heart Association, the American Association of Nurse Practitioners, and the Centers for Disease Control and Prevention. These resources can also be used to meet eligibility for recertification of medical licenses and other professional licenses. The American Association of Nurse Practitioners also offers many resources highlighting the newest 2017 guidelines from the American Heart Association and the American College of Cardiology regarding identification and management of hypertension.

Managers of primary care offices can assist providers in learning new information by sharing new guidelines from trusted sources such as the CDC, WHO, and AHA. Clinical
managers can post a public display board in the doctor’s break room in a private practice displaying most recent guidelines and recommendations from trusted organizations as well as an email with more information for interested providers. This visual in a public space can be easily seen by providers and the email will give them the resources to do their own research.

After providers receive their education either from their own research or from information provided to them from external sources, they can then pass this new-found knowledge to their patients. Patients often rely on their primary care providers for the most up to date information and place a large amount of trust on them. By relaying new information, it is anticipated that patients will be eager to implement new evidence-based techniques.

**Plans for Future Scholarship**

Sharing the results of this project can assist in changing current ineffective practices and improving patient outcomes. Results of this study were shared with the eight providers who were invited to participate. Being that the study was anonymous, it was impossible to identify the six providers who specifically participated in the study. The ultimate goal for sharing this study’s findings with the office were that providers can implement these new evidence-based practice guidelines and can identify increased rates of medication adherence and decreased hypertension-related adverse outcomes. The final project was also presented at Rutgers University in front of an audience of other graduate students and faculty. A visual representation of the project will additionally be shared and displayed for public viewing at the university’s poster day.

After the defense of this project, future scholarship efforts will also include submission to the American Academy of Nurse Practitioners. It is anticipated that the results of this project will
encourage the growth and development of similar research studies in a larger, more heterogenous setting over a longer period of time.

**Conclusion**

The purpose of this study was to evaluate primary care providers’ assessment and management of antihypertensive medication non-adherence. Based on the completed data analysis, it was found that there are still many gaps in care despite the vast amount of resources available. Based on the prior literature review, improving blood pressure is important and medication non-adherence is a primary contributory factor. Addressing antihypertensive medication non-adherence is a building block to increase blood pressure control and decreased cardiovascular complications. As the former surgeon general Everett Koop stated, “Drugs don’t work in people who don’t take them.”
References


Centers for Disease Control. (2017). Division for Heart Disease and Stroke Prevention: Data Trends and Maps.

https://nccd.cdc.gov/DHDSP_DTM/rdPage.aspx?rdReport=DHDSP_DTM.ExploreByLocation&rdProcessAction=&SaveFileGenerated=1&isILocation=34&irbFilterby=1&islPriority=P3&islTopic=T9&hidLocation=34&hidTopic=T9&hidTopicName=Hypertension&islYear=9999&islYear=9999&irbShowFootnotes=Show&rdICL-iclIndicators=BR011%2cBR012&iclIndicators_rdExpandedCollapsedHistory=&iclIndicators=BR011%2cBR012&hidPreviouslySelectedIndicators=&DashboardColumnCount=1&rdShowElementHistory=divTopicUpdating%3dHide%2cislTopic%3dShow%2c&rdScrollX=0&rdScrollY=166&rdRnd=29029


https://www.cdc.gov/dhdsp/programs/hypertension-roundtable.htm#members


Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension, 71(6), 13-115. doi/10.1161/HYP.0000000000000065


DNP Project Chair: Dr. Irina Benenson, DNP, FNP-C

Project Title: Implementation of Text Message Reminders in Combination with Patient Education to Improve Medication Adherence and Blood Pressure Control Among Adults with Hypertension

EBP Question: The following appraisal contributed to the project’s clinical question: “Do text message reminders, combined with supportive education, increase anti-hypertensive medication adherence and blood pressure control in patients with hypertension in a primary care setting?

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Author/ Date</td>
<td>Adler et al., (2017)</td>
</tr>
<tr>
<td>Study Type</td>
<td>Systematic Review</td>
</tr>
<tr>
<td>Sample/ Sample Size/ Setting</td>
<td>This systematic review included 7 RCT’s comparing studies looking at medication adherence without and without text messages. There were a total of 1310 participants. Inclusion criteria: trials with at least 50% of participants with established arterial occlusive events, trials using SMS or MMS with aim to improve adherence to medication for secondary prevention of cardiovascular events Follow-up = 1-3 months</td>
</tr>
<tr>
<td>Findings that help answer EBP Question</td>
<td>Six out of seven trials showed a positive effect of mobile SMS messages for medication adherence</td>
</tr>
<tr>
<td>Limitations</td>
<td>Unable to complete meta-analysis due to heterogeneity in outcome measure and population in included trials Most studies came from high-income countries</td>
</tr>
<tr>
<td>Evidence Level/ Quality</td>
<td>Level 1. This systematic review only included RCT’s. This is a good quality systematic review due to lack of meta-analysis and some low-quality studies being included due to small sample size, short duration of study, and differences of the content in the SMS messages</td>
</tr>
<tr>
<td><strong>Author/Date</strong></td>
<td><strong>Study Type</strong></td>
</tr>
</tbody>
</table>
| Maslakpak & Safaie., (2016) | RCT | Inclusion criteria: age between 20-60 years, literacy, expert confirmation of uncontrolled hypertension, currently prescribed an antihypertensive medication, living in city of Urmia, access to a mobile phone and able to use text messaging function, willingness to participate in study  
Exclusion criteria: being on medication for prostate in male patients, hospitalization during duration of study, moving to a different city, being permanently treated for hypertension, and loss of contact with mobile phone  
123 participants were involved in the study and randomly divided into three groups (SMS group, reminder card group, and control group)  
This study was conducted at Hill-Bone medication adherence scale was completed by all participants before and three months after the intervention | Tukey’s post hoc test showed that after the intervention, the mean score of adherences for patients in the control group (46.63±2.99) compared with the two groups of text messaging (57.70 ±2.75) and reminder cards (57.51 ±2.69), showed a statistically significant difference (p <0.001). | Sample size was small.  
Duration of follow-up and interval between intervention and outcome assessment was short.  
Outcome of level of BP control was not assessed | Level 1/ high quality |
<p>| | | | | | |
|  |  |  |  |  |  |</p>
<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Study Type</th>
<th>Sample/Sample Size/Setting</th>
<th>Findings that help answer EBP Question</th>
<th>Limitations</th>
<th>Evidence Level/Quality</th>
</tr>
</thead>
</table>
| Bobrow et al., (2016) | RCT        | **Inclusion criteria:** adults >21 years old, diagnosed with hypertension by a clinician using local guidelines, prescribed antihypertensive medication, SBP < 220 and DBP < 120, regular access to mobile phone, and residence in one of the two study communities  
Exclusion criteria: patients requiring specialist care for hypertension at a hospital, pregnant women, postpartum women within three months  
1,372 participants were involved in the study and divided into three groups: usual care (n= 457), informational SMS texting (n=457) and interactive SMS texting (n=458).  
This study was conducted in a primary care facility in Cape Town, South Africa. | Mean systolic pressure difference in change for the information only message group compared to usual care was -2.2 mmHg (-4.4 to -0.04, \( p = 0.046 \)) and for interactive message group compared to usual care -1.6 mm Hg (-3.7 to 9.6, \( p =0.16 \)).  
The adjusted odds ratios for participants achieving a controlled blood pressure (<140/90 for study purposes) at 12 months for information-only messages was 1.4 (1.0-1.9; \( p =0.04 \)) and for interactive messages 1.4 (1.0-1.9; \( p=0.04 \))  
The number of participants who had 80% of their blood pressure lowering medications dispensed over the 12-month period was 248 (62.8%) for the information-only message group, 225 (59.7%) for the interactive message group, and 190 (49.4%) for usual care. | Availability of free medication at the clinic may have reduced nonadherence.  
Measure of adherence only reflects dispensing in the clinic and not the act of taking the medication.                                                                 | Level 1, high quality |
<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Study Type</th>
<th>Sample/Sample Size/Setting</th>
<th>Findings that help answer EBP Question</th>
<th>Limitations</th>
<th>Evidence Level/Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vargas et al., (2018)</td>
<td>Systematic review</td>
<td>Inclusion criteria: describe quasi-experimental or randomized controlled trial (RCT), target adult population (&gt;18 years old), integrate hypertension prevention or management, evaluate blood pressure as outcome measure, and utilize SMS as intervention component.</td>
<td>Three of the six studies showed significant improvement in BP outcomes as a result of SMS messaging. Mean difference calculations of SBP and DBP resulted in I² of 93.5% and 89.9% indicated substantial statistical heterogeneity. SMS utilization in HTN management was limited if either party was not fully engaged in SMS.</td>
<td>Unable to complete meta-analysis due to small number of included articles. Number of studies (sample size) that met inclusion criteria is small. The 3 RCT’s used SMS differently. Levels of BP control were not evaluated in all studies and when evaluated, they were self-reported.</td>
<td>Level 2 – This systematic review is composed of 5 RCT’s and 1 quasi-experimental study. It is of good quality due to the small sample size and only half eligible for meta-analysis.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Study Type</th>
<th>Sample/Sample Size/Setting</th>
<th>Findings that help answer EBP Question</th>
<th>Limitations</th>
<th>Evidence Level/Quality</th>
</tr>
</thead>
</table>
| Varleta et al., (2017) | RCT        | Inclusion criteria: patients with a confirmed diagnosis of hypertension, patients who had been given their first antihypertensive medication prescription during the previous 1-6 months, patients aged 30-80 years, patients who owned a mobile phone with access to SMS  
Exclusion criteria: inability to receive SMS text messages secondary to mental disabilities, patients who were unable to read, patients with history of myocardial infarction, stroke, heart failure, and renal failure on dialysis  
314 patients were enrolled in the study and randomly divided into 2 groups: those with SMS (n=163) and those without SMS (n=151)  
This study took place in 12 different primary care centers in Santiago, Chile | Medication adherence improved significantly in the SMS text message group from 49% to 62.3% (p=0.01)  
The logistic regression model (risk ratio, 1.3; 95% CI, 1.0-1.6[p<0.05]) showed that SMS intervention improved antihypertensive medication adherence by 30% in the study population. Additionally, a greater improvement in 6-month medication adherence in the baseline nonadherent subgroup (risk ratio, 2.3; 95% CI, 1.4-4.4 [p<0.001])  
After 6-month follow-up, the SMS group mean BP was 134.6/77.5 mm Hg while the non-SMS group the mean BP was 136.8/78.3. | This study lacked statistical power to confirm efficacy in subgroups (age, sex).  
The study was not powered to identify differences in BP-many patients conducted final visit by phone with no BP measurement  
A questionnaire was used to measure adherence but this is not as accurate as an electronic device or pill count device. | Level 1 – high quality |
### Article #6


<table>
<thead>
<tr>
<th><strong>Author/Date</strong></th>
<th><strong>Study Type</strong></th>
<th><strong>Sample/Sample Size/Setting</strong></th>
<th><strong>Findings that help answer EBP Question</strong></th>
<th><strong>Limitations</strong></th>
<th><strong>Evidence Level/Quality</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamal et al., (2015)</td>
<td>RCT</td>
<td>Inclusion criteria: age &gt; 18 years old, history of stroke confirmed by neuroimaging, &gt;1 month since last episode of stroke, use of at least two drugs such as anti-platelets, statins, or antihypertensives to control risk factors for stroke, modified Rankin score of 3 or less, possession of a cell phone, ability receive, comprehend, and reply to SMS. Exclusion criteria: biological impairment in reading or responding to SMS, diagnosed organ dysfunction or malignancy, plans to travel outside the country in the two months after enrollment. 200 participants were enrolled and randomized to form control group (n=100) and intervention group (n=100). This RCT took place in the Control group- usual care Intervention group- personalized prescription tailored daily medication reminder and twice weekly health information SMS.</td>
<td>The Morisky medication adherence score was elevated in both control and intervention group but intervention group increased by 0.8 while the control group increased by 0.1. Multivariate analysis showed that mean difference in adherence score between the intervention group and usual care group was 0.54 (95% CI; 0.22-0.85) (p=&lt;0.01) The mean diastolic BP in the intervention group was 2.6 mmHg (95% CI; -5.5 to 0.15; p=0.06) lower compared to the control group after the intervention.</td>
<td>Self-reported outcome of the Morisky Medication Adherence scale (MMAS) Effect on diastolic blood pressure not strong due to lack of study power and duration.</td>
<td>Level 1- high quality</td>
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<tr>
<td><strong>Author/Date</strong></td>
<td>Akhu-Zaheya &amp; Shiyab., (2017)</td>
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<tr>
<td><strong>Study Type</strong></td>
<td>RCT</td>
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<tr>
<td><strong>Sample/Sample Size/Setting</strong></td>
<td>Inclusion criteria: outpatient with hypertension or cardiovascular disease, &gt;18 years old, active phone number and mobile telephone, are able to read, Exclusion criteria: patients with other comorbidities (mainly diabetes mellitus and renal disease), patients with neurological and mental disorders, and patients who are severely ill This RCT was completed in several outpatient clinics in Jordan There were 164 participants in this study Control group receiving routine care (n=56), placebo group receiving daily general messages (n=52), and experimental group receiving reminder text messages regarding medications and five rights of medication administration (n=52)</td>
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<tr>
<td><strong>Findings that help answer EBP Question</strong></td>
<td>A one-way ANOVA showed a significant difference regarding the influence of SMS on decreasing frequency of forgetting to take prescribed medication (F (2,157)) = 3.44, p&lt;0.05) and effect on decreasing frequency for others reasons (F (2,157) = 3.87, p&lt;0.05).</td>
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<tr>
<td><strong>Limitations</strong></td>
<td>Self-reporting bias may not be entirely accurate and may be skewed by patient’s subjective answers</td>
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<tr>
<td><strong>Evidence Level/Quality</strong></td>
<td>Level 1- high quality</td>
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<thead>
<tr>
<th>Author/Date</th>
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<th>Sample/Sample Size/Setting</th>
<th>Findings that help answer EBP Question</th>
<th>Limitations</th>
<th>Evidence Level/Quality</th>
</tr>
</thead>
</table>
| Tao et al., (2015)  | Systematic Review with Meta-Analysis | Inclusion criteria: RCT’s, examined effects of electronic reminders on medication adherence, delivered reminders directly to patients with any type of chronic disease, articles in English and peer-reviewed  
Exclusion criteria: electronic reminders used for disease screening, appointment attendance or non-chronic conditions, were delivered to physicians, or not main component of interventions evaluated  
Twenty-two studies included in review  
Chronic conditions included diabetes, asthma, cardiovascular diseases, AIDS, glaucoma, and allergic rhinitis  
Total of 3,152 patients | Pooled estimate showed that the use of electronic reminders was associated with a significant improvement in patient adherence to treatment (d=0.29, 95% CI, CI=0.18, 0.41) | Using studies with different adherence measures may be variable  
Small number of trials | Level 1- high quality |
<table>
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<tr>
<th>Author/Date</th>
<th>Study Type</th>
<th>Sample/Sample Size/Setting</th>
<th>Findings that help answer EBP Question</th>
<th>Limitations</th>
<th>Evidence Level/Quality</th>
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<tbody>
<tr>
<td>Tan et al., (2019)</td>
<td>Systematic review with meta-analysis</td>
<td>Inclusion criteria: participants aged 18 years old or older, participants with an official diagnosis of hypertension, participants taking at least one medication for these 3 diseases, face-to-face educational interventions focusing on either perceived severity, perceived sustainability, perceived benefits, and perceived barriers, and healthcare professionals in conducting studies Exclusion criteria: patients with mental conditions such as depression or schizophrenia, interventions using telephone calls, web-based technology or messaging, non-validated methods for measuring medication adherence, absence of control group, and educational interventions to prevent hypertension, hyperlipidemia, or diabetes mellitus 16 RCT’s included Total of 2,307 participants</td>
<td>Meta-analysis showed that educational interventions significantly improved medication adherence (d=0.69; 95% confidence interval (CI) 0.25-1.12; p=0.002) Studies conducted in the clinic showed a statistically significant moderate effect (d=0.50, 95% CI 0.13, 0.88; p=0.008)</td>
<td>Wide variety of medication adherence tools were used across the study Multiple studies lacked information regarding the control group and usual care Most studies used self-reports for medication adherence which may be inaccurate</td>
<td>Level 1- high quality</td>
</tr>
<tr>
<td>Author/Date</td>
<td>Study Type</td>
<td>Sample/Sample Size/Setting</td>
<td>Findings that help answer EBP Question</td>
<td>Limitations</td>
<td>Evidence Level/Quality</td>
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<tr>
<td>Rehman et al., (2018)</td>
<td>RCT</td>
<td>This study was done in an outpatient ward of a hospital in Multan, Pakistan. Inclusion criteria: age 25-65 years old, systolic BP 140-160 mm Hg for last 2 years, diastolic BP 90-100 mm Hg for last 2 years, ability to measure BP in morning and evening, ability to read and send SMS. Exclusion criteria: age &lt;25 and &gt;65 years old, systolic BP &lt;140 mm Hg or &gt;160 mm Hg, diastolic BP &lt; 90 or &gt;100 mm Hg, and other significant comorbidities. 122 hypertensive patients were divided into control and intervention group. Intervention group was briefed on ways they can improve HTN control, were sent regular text messages about healthy diet, exercise, and adherence, and were sent reminder SMS twice daily to remind them to take their prescribed medications.</td>
<td>Control group showed a 2 mm HG decline in systolic blood pressure and 3 mm Hg decline in diastolic blood pressure. Intervention group declined by 8 mm Hg (average 141.15 ± 5.73 mm Hg) and diastolic blood pressure declined by 6 mm Hg (average 88 ± 3.97 mm Hg).</td>
<td>Short time period. Reliance on patient-reported results regarding medication compliance so bias may be present.</td>
<td>Level 1- Good quality due to lack of information regarding demographics in control and intervention group.</td>
</tr>
</tbody>
</table>
Appendix B - Transtheoretical Model of Change

Appendix C- Email Invitation

Dear Health Care Provider,

My name is Cristina Zamora and I am a doctoral nurse practitioner (DNP) student at Rutgers University. I am kindly requesting your participation in my doctoral scholarly project that I am conducting. The aim of the project is to assess gaps in management of non-adherence to antihypertensive medications among adults with hypertension.

This project involves completing a survey that focuses on current practices of identifying and managing non-adherence to antihypertensive medications in adult patients. Once survey data is analyzed, the practice recommendations to address specific gaps in practice will be made. In addition, a practical toolkit with appropriate resources will be created to assist with the management of antihypertensive medication non-adherence in a primary care setting.

Participation is completely voluntary and you may withdraw from the study at any time. The survey is completely anonymous and there will be no personal identifiers collected. The informed consent will be attached to the survey. Once received, please read and sign the consent before starting the survey. For any questions, please do not hesitate to contact me. My email is and my phone number is.

Your participation in this project will greatly help patients diagnosed with hypertension and ensure they are receiving optimal treatment.

Thank you for your time and participation.

Sincerely,

Cristina Zamora BSN RN, DNP Student, Rutgers University
Appendix D- Recruitment Flyer

ARE YOU TREATING PATIENTS WITH HYPERTENSION?

VOLUNTEER PARTICIPANTS WANTED FOR A QUALITY IMPROVEMENT SCHOLARLY PROJECT

Actively recruiting healthcare providers who are treating patients with hypertension in a scholarly project aimed at improving management of nonadherence to anti-hypertensive medications.

Participants will be asked to:
- Complete one brief survey

Additional eligibility criteria:
- Participants must be treating adult patients diagnosed with hypertension

Benefits:
- Gain additional resources to assist you in management of medication non-adherence in patients with hypertension

Location:
- The survey will be completed online

Project Title: A Gap Analysis of Management of Non-Adherence to Antihypertensive Medications by Primary Care Providers

Co-Investigator: Cristina Zamora, Doctorate Nurse Practitioner Student at Rutgers University

Contact the DNP Student (co-investigator) for more information at any time via email or by phone.
Appendix E - Current Telehealth Practices Survey

Current Telehealth Practices Survey

Please choose the most appropriate answer to each question.

1. How often do you assess adherence to antihypertensive medication?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never

2. How often do you use a validated tool/questionnaire to assess adherence?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never
   f. Fill-in if applicable

3. If you use a validated tool/questionnaire, which one do you commonly use?
   a. Morisky -4
   b. Morisky-8
   c. Hill Bone scale
   d. Other
   e. Not applicable

4. How often do you assess barriers to adherence?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never

5. If so, which barrier do you find to be the most significant in your practice?
   a. Financial difficulties
   b. Low health literacy
   c. Limited English proficiency
   d. Forgetfulness
   e. Depression
   f. Patient’s perceptions/beliefs

6. How often do you educate your patients regarding prescribed medications?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never
7. How often do you educate your patients regarding the nature and complications of hypertension?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never

8. How often do you educate patients on monitoring their blood pressure at home?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never

9. How often do you advise your patients to use different reminders to take daily medications?
   a. Always
   b. Most of the time
   c. Half of the time
   d. Some of the time
   e. Never

10. How often do you prescribe a combination pill instead of several individual pills for patients requiring more than one antihypertensive medication?
    a. Always
    b. Most of the time
    c. Half of the time
    d. Some of the time
    e. Never

11. How often do you prescribe once daily regimen instead of multiple times daily regimen?
    a. Always
    b. Most of the time
    c. Half of the time
    d. Some of the time
    e. Never

12. How often do you provide positive reinforcement, or other incentives, when patients take their medications as prescribed?
    a. Always
    b. Most of the time
    c. Half of the time
    d. Some of the time
    e. Never
Appendix F - Timeline of Project
Appendix G - Evidence-Based Toolkit

Evidence-Based Toolkit

How to Best Assess and Manage Antihypertensive Medication Non-Adherence

Respectfully submitted by Cristina Zamora BSN RN
This toolkit will contain essential information regarding the assessment and management of antihypertensive medication non-adherence. A reference page is available at the end of the toolkit for further research.

**Assessment of Antihypertensive Medication Adherence**

**When should adherence to antihypertensive medication be assessed?**

- Adherence to antihypertensive medication should be assessed at each visit with the patient’s primary care provider, regardless of the reason for the visit.
- Example - A patient is seeing their PCP for allergy management and is on an antihypertensive medication. The PCP should be assessing the blood pressure reading taken and ensuring that the medication is being taken as prescribed as well as managing the patient’s chief complaint.

**How should medication adherence be assessed?**

- Antihypertensive medication adherence can be assessed through different methods. The most accurate methods, in order of accuracy from least accurate to most accurate, are patient diary and/or conversation, adherence questionnaire, and pill counts (Vrijens et al., 2017)
- While patient diary and conversation may be the easiest, it may be skewed by patient’s perception.
- Pill counts are very costly and rarely used due to lack of resources.
- Adherence questionnaires can be used as a feasible yet reliable option

**When should barriers to antihypertensive medication adherence be assessed?**

- Barriers should be addressed at each visit with their PCP
- Early identification of barriers by primary care providers can improve medication adherence, reduce unnecessary costs, and lead to appropriate blood pressure control (Abegaz et al., 2017)
## Examples of evidence-based adherence questionnaires:

### Morisky-4

**Morisky Medication-Taking Adherence Scale-MMAS (4-Item)**

**English Version**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you ever forget to take your (name of health condition) medicine?</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2. Do you ever have problems remembering to take your (name of health condition) medication?</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>3. When you feel better, do you sometimes stop taking your (name of health condition) medicine?</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4. Sometimes if you feel worse when you take your (name of health condition) medicine, do you stop taking it?</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

*Retrieved from Morisky et al., 2008.*

### Interpretation:

- An answer of yes = 1 point
- Score of 0 = perfect adherence
- Score of 1-2 = medium adherence
- Score of 3-4= low adherence
## Morisky-8

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you sometimes forget to take your medication?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. People sometimes miss taking their medications for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medication?</td>
<td></td>
<td></td>
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<tr>
<td>3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. When you travel or leave home, do you sometimes forget to bring your medication?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Did you take all your medication yesterday?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. When you feel like your symptoms are under control, do you sometimes stop taking your medication?</td>
<td></td>
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<tr>
<td>7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. How often do you have difficulty remembering to take all your medication?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never/Rarely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once in a while</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the time</td>
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</tbody>
</table>

© Morisky Medication Adherence Scale (MMAS-8-Item). Use of the ©MMAS is protected by US copyright laws. Permission for use is required. A license agreement is available from: Donald E. Morisky, ScD, ScM, MSPH, Professor, Department of Community Health Sciences, UCLA School of Public Health, 650 Charles E. Young Drive South, Los Angeles, CA 90095-1772.

Retrieved from Morisky et al., 2011

### Interpretation:

- An answer of yes = 1 point
- Score < 6 = low adherence
- Score 6-8 = medium adherence
- Score of 8 = high/perfect adherence
**Hill-Bone Compliance to High Blood Pressure Therapy Scale**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How often do you forget to take your HBP medicine?</td>
<td>1. All of the time</td>
</tr>
<tr>
<td>2</td>
<td>How often do you decide NOT to take your HBP medicine?</td>
<td>2. Most of the time</td>
</tr>
<tr>
<td>3</td>
<td>How often do you eat salty food?</td>
<td>3. Some of the time</td>
</tr>
<tr>
<td>4</td>
<td>How often do you shake salt on your food before you eat it?</td>
<td>4. None of the time</td>
</tr>
<tr>
<td>5</td>
<td>How often do you eat fast food?</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>How often do you make the next appointment before you leave the doctor's office?*</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>How often do you miss scheduled appointments?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>How often do you forget to get prescriptions filled?</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>How often do you run out of HBP pills?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>How often do you skip your HBP medicine before you go to the doctor?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>How often do you miss taking your HBP pills when you feel better?</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>How often do you miss taking your HBP pills when you feel sick?</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>How often do you take someone else's HBP pills?</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>How often do you miss taking your HBP pills when you are careless?</td>
<td></td>
</tr>
</tbody>
</table>

* Reverse coding

**Interpretation:**

- Answer is on a scale of 1-4 (see grid at top right)
- Higher score = increased adherence
- Lower score= decreased adherence
- Questions 3-5 = reducing sodium intake
- Questions 6 & 7 = appointment keeping
- Questions 1, 2, 8 – 14 = medication taking

Retrieved from Kim et al., 2000
Patient Education

How often should patients be educated regarding hypertension?

- Patients should be educated at each visit regarding hypertension
- Providing patients with sufficient information achieves better adherence scores as well as higher patient satisfaction scores, which directly correlates to increased adherence (Schoenthaler et al., 2017).

What should patients be educated about?

- Patients should be educated regarding diet, exercise, importance of medication adherence, possible complications, and home BP monitoring.

What resources can I use to educate my patients?

- There are resources available from credible organizations such as the CDC and AHA which have already-made education handouts for patients. Two examples from the AHA can be seen below. The first is a general handout regarding hypertension and the second handout is regarding taking a proper at home blood pressure measurement.
What is High Blood Pressure?

Blood pressure is the force of blood pushing against blood vessel walls. It is measured in millimeters of mercury (mm Hg).

High blood pressure (HBP) means the pressure in your arteries is higher than it should be. Another name for high blood pressure is hypertension.

Blood pressure is written as two numbers, such as 112/78 mm Hg. The top (systolic) number is the pressure when the heart beats. The bottom (diastolic) number is the pressure when the heart rests between beats.

**Normal blood pressure** is below 120/80 mm Hg. If you’re an adult and your systolic pressure is 120 to 129, and your diastolic pressure is less than 80, you have elevated blood pressure.

**High blood pressure** is a systolic pressure of 130 or higher, or a diastolic pressure of 80 or higher, that stays high over time.

High blood pressure usually has no signs or symptoms. That’s why it is so dangerous. But it can be managed.

Nearly half of the American population over age 20, has HBP, and many don’t even know it. Not treating high blood pressure is dangerous. High blood pressure increases the risk of heart attack and stroke.

Make sure you get your blood pressure checked regularly and treat it the way your health care provider advises.

<table>
<thead>
<tr>
<th><strong>BLOOD PRESSURE CATEGORY</strong></th>
<th><strong>SYSTOLIC mm Hg (upper number)</strong></th>
<th><strong>DIASTOLIC mm Hg (lower number)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>LESS THAN 120</td>
<td>and LESS THAN 80</td>
</tr>
<tr>
<td>ELEVATED</td>
<td>120-129</td>
<td>and LESS THAN 80</td>
</tr>
<tr>
<td><strong>HIGH BLOOD PRESSURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(HYPERTENSION)</td>
<td>130-139</td>
<td>or 80-80</td>
</tr>
<tr>
<td>STAGE 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HIGH BLOOD PRESSURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(HYPERTENSION)</td>
<td>140 OR HIGHER</td>
<td>or 90 OR HIGHER</td>
</tr>
<tr>
<td>STAGE 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HYPERTENSIVE CRISIS</strong></td>
<td>HIGHER THAN 180</td>
<td>and/or HIGHER THAN 120</td>
</tr>
<tr>
<td>(consult your doctor immediately)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INTERVENTION TO IMPROVE ADHERENCE

What is High Blood Pressure?

**How can I tell I have it?**
The only way to know if you have high blood pressure is to get it checked regularly by your healthcare provider. For proper diagnosis of HBP, your healthcare provider will use an average based on two or more readings obtained on two or more visits.

**What can I do about HBP?**
- Don’t smoke and avoid secondhand smoke.
- Reach and maintain a healthy weight.
- Eat a healthy diet that is low in saturated and trans fats and rich in fruits, vegetables, whole grains and low-fat dairy products. Aim to consume less than 1,500 mg/day of sodium (salt). Even reducing your daily intake by 1,000 mg can help.
- Eat foods rich in potassium. Aim for 3,500 – 5,000 mg of dietary potassium per day.
- Limit alcohol to no more than one drink per day if you’re a woman or two drinks a day if you’re a man.
- Be more physically active. Aim for 150 minutes of moderate-intensity physical activity or at least 75 minutes of vigorous physical activity per week, or a combination of both, spread throughout the week. Add muscle-strengthening activity at least two days per week for more health benefits.
- Take medicine the way your healthcare provider tells you.
- Know what your blood pressure should be and work to keep it at that level.

**MY QUESTIONS:**

**Do you have questions for your doctor or nurse?**
Take a few minutes to write down your questions for the next time you see your healthcare provider.

For example:
- **Will I always have to take medicine?**
- **What should my blood pressure be?**

**How can I learn more?**

1. **Call 1-800-AHA-USA1** (1-800-242-8721), or visit [heart.org](http://heart.org) to learn more about heart disease and stroke.
2. **Sign up to get Heart Insight**, a free e-newsletter for heart patients and their families, at [HeartInsight.org](http://HeartInsight.org).
3. **Connect with others sharing similar journeys with heart disease and stroke** by joining our Support Network at [heart.org/SupportNetwork](http://heart.org/SupportNetwork).

We have many other fact sheets to help you make healthier choices to reduce your risk, manage disease or care for a loved one. Visit [heart.org/AnswersByHeart](http://heart.org/AnswersByHeart) to learn more.
**BLOOD PRESSURE MEASUREMENT INSTRUCTIONS**

1. **Don’t smoke, exercise, drink caffeinated beverages or alcohol within 30 minutes of measurement.**
2. **Take at least two readings 1 min. apart in morning before taking medications, and in evening before dinner. Record all results.**
3. **Rest in a chair for at least 5 minutes with your left arm resting comfortably on a flat surface at heart level. Sit calmly and don’t talk.**
4. **Use properly calibrated and validated instrument. Check the cuff size and fit.**
5. **Place the bottom of the cuff above the bend of the elbow.**
6. **Make sure you’re relaxed. Sit still in a chair with your feet flat on the floor with your back straight and supported.**

**American Heart Association recommended blood pressure levels**

<table>
<thead>
<tr>
<th>BLOOD PRESSURE CATEGORY</th>
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<th>AND</th>
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</tr>
<tr>
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<td>130-139</td>
<td>OR</td>
<td>80-89</td>
</tr>
<tr>
<td>(STAGE 1)</td>
<td></td>
<td>OR</td>
<td>90 OR HIGHER</td>
</tr>
<tr>
<td>HIGH BLOOD PRESS (HYPERTENSION)</td>
<td>140 OR HIGHER</td>
<td>OR</td>
<td>HIGHER THAN 120</td>
</tr>
<tr>
<td>(STAGE 2)</td>
<td></td>
<td>AND/OR</td>
<td>HIGHER THAN 120</td>
</tr>
<tr>
<td>HYPERTENSIVE CRISIS (consult your doctor immediately)</td>
<td>HIGHER THAN 120</td>
<td>AND/OR</td>
<td>HIGHER THAN 120</td>
</tr>
</tbody>
</table>

**Blood pressure higher than 180/120 mm Hg is a crisis.**

*Wait a few minutes and take blood pressure again. If it’s still high, contact your doctor immediately.

Learn more at [Heart.org/HBP](http://Heart.org/HBP)
How do I set my patients up for success to take their medication?

- **SIMPLIFY** the regimen
  - Encourage patients to use adherence tools
  - Attempt to match the action of taking medication with a patient’s daily routine that they already are completing

- **IMPART** knowledge
  - Write down prescription instructions clearly and reinforce verbally
  - Provide resources for additional information

- **MODIFY** patient’s beliefs and behavior
  - Provide positive reinforcement
  - Evaluate patient’s concerns and address them

- **PROVIDE** communication and trust
  - Allow patients to speak freely
  - Use plain language – “Did you take all of your pills?”
  - Collaborate with patient when discussing recommendations and making final decisions
  - Remind your patient that your office is always available if questions arise

- **LEAVE** the bias
  - Ask patients questions about beliefs and cultural norms in terms of taking medications as prescribed

- **EVALUATE** adherence
  - Ask patients directly if they are following their prescribed regimen
  - Use a medication adherence scale

Adapted from Division for Heart Disease and Stroke Prevention, 2020
Assessing & Managing Barriers

How can we, as primary care providers, manage barriers in adherence?

- After identifying barriers, proper interventions can be implemented to prevent these barriers from becoming more significant
  - Financial difficulties
    - Prescribe the medication which is both best suited for the patient and most affordable
    - Discount programs - Good RX
    - New Jersey Statewide Prescription Assistance Program (PAP)
      - New Jersey drug card for NJ residents that provides discount prescriptions (New Jersey Drug Card, 2020)
      - Savings of up to 75% at more than 68,000 pharmacies
      - Free to any NJ resident
      - Coupon may be printed at: [www.newjerseydrugcard.com/index.php](http://www.newjerseydrugcard.com/index.php)
  - Language barriers
    - Language translators or patient handouts in their native language
  - Low health literacy
    - Identify their reading level and find patient handouts which can accommodate that reading level
    - Simplify medical language - speak in lay language, do not use medical jargon
    - Health literacy can be assessed via the Short Assessment of Health Literacy tool (SAHL-E)
      - Has been tested and found to have good reliability and validity for identifying low health literacy (Lee, 2010)
      - Available in English and Spanish
      - See English tool below
  - Lack of recognition
    - Give positive reinforcement when patient’s comply with prescribed regimen
  - Depression
    - Assess this during appointments with PCP and treat as medically indicated
  - Patient’s perceptions and beliefs
    - Assess patient’s perceptions and beliefs and address any incorrect perceptions
    - Provide education where gap in information is identified
  - Forgetfulness
    - Set reminders to take medications
- Alarm clocks
- Tie it to an activity which is done routinely such as brushing teeth
- Combination medicine
  - Patients are more likely to be adherent to a single pill combination medication versus several tablets of the same medication (Konstantinos, 2020)
- Daily instead of multiple daily dosing
  - Patients on once daily dosing regimens have a 39-61% higher likelihood of medication adherence compared with patients on BID dosing regimens (Srivastava et al., 2013)
Instruction for Administering SAHL-E

**SHORT ASSESSMENT OF HEALTH LITERACY-ENGLISH (SAHL-E)**

**Interviewer’s Instruction**

The Short Assessment of Health Literacy-English, or SAHL-E, contains 18 test items designed to assess an English-speaking adult’s ability to read and understand common medical terms. The test could help health professionals estimate the adult’s health literacy level. Administration of the test could be facilitated by using laminated 4”×5” flash cards, with each card containing a medical term printed in boldface on the top and the two association words—i.e., the key and the distracter—at the bottom.

**Directions to the Interviewer:**

1. Before the test, the interviewer should say to the examinee:
   “I’m going to show you cards with 3 words on them. First, I’d like you to read the top word out loud. Next, I’ll read the two words underneath and I’d like you to tell me which of the two words is more similar to or has a closer association with the top word. If you don’t know, please say ‘I don’t know’. Don’t guess.”

2. Show the examinee the first card.

3. The interviewer should say to the examinee:
   “Now, please, read the top word out loud.”

4. The interviewer should have a clipboard with a score sheet to record the examinee’s answers. The clipboard should be held such that the examinee cannot see or be distracted by the scoring procedure.

5. The interviewer will then read the key and distracter (the two words at the bottom of the card) and then say:
   “Which of the two words is most similar to the top word? If you don’t know the answer, please say ‘I don’t know’.”

6. The interviewer may repeat the instructions so that the examinee feels comfortable with the procedure.

7. Continue the test with the rest of the cards.

8. A correct answer for each test item is determined by both correct pronunciation and accurate association. Each correct answer gets one point. Once the test is completed, the interviewer should tally the total points to generate the SAHL-E score.

9. A score between 0 and 14 suggests the examinee has low health literacy.
The 18 items of *SAHL-E*, ordered according to item difficulty (keys and distracters are listed in the same random order as in the field interview)

<table>
<thead>
<tr>
<th>Stem</th>
<th>Key or Distracter</th>
<th>Distracter</th>
<th>Distracter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. kidney</td>
<td><em>urine</em></td>
<td><em>fever</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>2. occupation</td>
<td><em>work</em></td>
<td><em>education</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>3. medication</td>
<td><em>instrument</em></td>
<td><em>treatment</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>4. nutrition</td>
<td><em>healthy</em></td>
<td><em>soda</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>5. miscarriage</td>
<td><em>loss</em></td>
<td><em>marriage</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>6. infection</td>
<td><em>plant</em></td>
<td><em>virus</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>7. alcoholism</td>
<td><em>addiction</em></td>
<td><em>recreation</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>8. pregnancy</td>
<td><em>birth</em></td>
<td><em>childhood</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>9. seizure</td>
<td><em>dizzy</em></td>
<td><em>calm</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>10. dose</td>
<td><em>sleep</em></td>
<td><em>amount</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>11. hormones</td>
<td><em>growth</em></td>
<td><em>harmony</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>12. abnormal</td>
<td><em>different</em></td>
<td><em>similar</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>13. directed</td>
<td><em>instruction</em></td>
<td><em>decision</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>14. nerves</td>
<td><em>bored</em></td>
<td><em>anxiety</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>15. constipation</td>
<td><em>blocked</em></td>
<td><em>loose</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>16. diagnosis</td>
<td><em>evaluation</em></td>
<td><em>recovery</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>17. hemorrhoids</td>
<td><em>veins</em></td>
<td><em>heart</em></td>
<td>_don’t know</td>
</tr>
<tr>
<td>18. syphilis</td>
<td><em>contraception</em></td>
<td><em>condom</em></td>
<td>_don’t know</td>
</tr>
</tbody>
</table>
References


