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Evaluating the Effect of an Electronic Health Record Patient Portal on the Management of Hypertension

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Evaluating the Effect of an Electronic Health Record Patient Portal on the Management of Hypertension

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Abstract

Background: Hypertension is the leading cause of cardiovascular disease and affects individuals globally, nationally, and locally. Consequences of uncontrolled hypertension include atherosclerosis, heart failure, stroke, and renal disease. The electronic health portal is a patient-specific, interactive tool that has been shown to promote adherence to provider recommendations and improve chronic disease management.

Purpose: The purpose of this project was to determine the effects of education via an electronic healthcare portal on the blood pressure management of adults at a primary care clinic in a small town in Kentucky.

Methods: This study was a one-group pre/post intervention designed to evaluate provider portal use and its effect on blood pressure management. An email was sent to UK providers by the Clinic Director reminding them to send educational information to patients enrolled on the portal. The first chart review included dates prior to the email, and the second chart review included dates after the email and within a reasonable time for patients to follow-up for chronic care management.

Results: Of the 25 patients included in this study, only 60% were enrolled on the portal. Furthermore, no education was sent via the portal pre and post email during the designated time frames. However, with current practice of verbal education, blood pressure pre/post mean was adequately controlled according to the 2020 MACRA goal of less than 140/90.

Discussion: Although the findings of this project were not statistically significant, several limitations were noted. The COVID-19 global pandemic started during the second chart review time frame which may have contributed to the small sample size.

Conclusion: This study concluded that providers were not utilizing the electronic health portal as a way of educating their patients with a diagnosis of hypertension. Further research is recommended to

determine the effects of the electronic health portal on hypertension management and the facilitators and barriers to provider portal use.

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Background

Hypertension is the leading cause of cardiovascular disease and affects individuals globally, nationally, and locally. Worldwide, high blood pressure affects nearly one-third of adults and it is estimated that 103 million American adults have this condition (American Heart Association, 2018). This silent disease is a burden to not only individuals, but to the healthcare system. In 2015, the total direct costs of high blood pressure were $55.9 billion. By the year 2035, it is estimated that the total direct costs of high blood pressure could extend to $220.9 billion (United Health Foundation, 2019).

Consequences of uncontrolled hypertension include atherosclerosis, heart failure, stroke, and renal disease (Khorsandi, Fekrizadeh & Roozbahani, 2017). There is usually no pain or symptoms associated with hypertension, making the consequences detrimental if not managed. Hypertension can often be prevented and better managed with lifestyle modification, in turn decreasing the risk of associated co-morbidities.

Uncontrolled high blood pressure is unfortunately a common disease among Americans. Patient education is vital for understanding disease, treatment, and prevention of comorbidities. A health portal is a patient-specific, interactive tool that has been shown to promote adherence to provider recommendations and improve chronic disease management (Davis et al., 2015). The purpose of this project was to determine the effects of education via electronic healthcare portal on the blood pressure management of adults at a primary care clinic in a small town in Kentucky.

Purpose

The purpose of this project was to evaluate the effects of education sent via an electronic healthcare portal on the blood pressure management among adults at the study clinic. Specifically, the

overall goal of this project was to evaluate if providers were sending educational materials via the patient portal to patients with a diagnosis of hypertension. Objectives of this study were to:

1. Determine if there was an increase in educational materials being sent via the electronic patient portal to patients diagnosed with hypertension.
2. Determine if there was a decrease in blood pressure readings after educational materials were sent via the electronic patient portal.

Theoretical Framework

The Health Belief Model (Janz & Becker, 1984; Rosenstock, 1974) is a theoretical framework that can be used to understand an individual's perspective on health behavior change. There are key points in this model that will help to guide the project. Perceived susceptibility is acknowledged when an individual feels they may be at risk for developing the disease. The second point is perceived severity, which is when an individual becomes aware of the seriousness of the disease and consequences of mismanagement. Perceived benefits are the patient's perception on the effects of reducing the disease, while perceived barriers include what obstacles might be holding the individual back to making the change. The final two points in this model include cues to action and self-efficacy. Cues to action include what needs to be done or influences that can help change the health behavior. For example, utilizing the electronic portal for patient education is a cue to action and may influence the patient's blood pressure management. Self-efficacy is the confidence of the individual in making the change. Each of these key points are imperative for the patient to thoroughly understand hypertension management and allows the provider to appreciate the patient's views on the diagnosis. Specific to this project, the Health Belief Model may aid the provider to discuss severity, benefits, and barriers to the patient's current behaviors, and provide them with electronic education to help better manage their hypertension.

Literature Review

Methods for Search

Databases used for research included CINHAL and PubMed with key words: Electronic Portal, Education, Blood Pressure, and Hypertension. Articles were narrowed down to find the most relevant research. Inclusion criteria included free full text, years between 2010 and 2020, and English language. Additional filters set for the search included randomized control trial and clinical trial. There are various types of research studies included in this literature review. This paper includes systematic reviews, randomized control trials, qualitative and observational studies. Levels of evidence in the studies include I,II, III and IV.

Research Synthesis of Health Portal Use

Six systematic reviews were included in this literature search. Among the systematic reviews, two articles provided facilitators and barriers with the use of the electronic health portal. Powell (2017) and Goldzweig et al. (2013) found that the main facilitator to the electronic health portal use is empowerment of the patient. Powell (2017) further states that the portal provides increased communication between the provider and patient. Powell (2017) and Goldzweig et al. (2013) suggest lack of knowledge on how to use the portal as the primary barrier. Powell (2017) included fear of a security breach as an additional barrier to portal use.

In a qualitative study, Greysen et al. (2020) provided recommendations for facilitators of portal use. The article states that by providing access, orienting the patient to the portal, and making the information easy to understand, patients will be more likely to use the electronic health portal.

Several of the articles studied the correlation among portal use and adherence to treatment. Systematic reviews by Dendere et al. (2019) and Kruse et al. (2015) determined that increased patient engagement resulted in increased adherence to the medication regimen. Specific to medication

regimen, Kyaw et al. (2019) included a systematic review of 485,632 patients. Although education was related to antibiotics, electronic education for management of medication use did increase patient knowledge.

Research has shown that increased electronic portal engagement results in improved chronic care outcomes (Goldzweig et al., 2013; Kruse et al., 2015; Manard et al., 2016; Tenforde et al., 2012). In fact, Manard et al. (2016) found that active users were 24% more likely to achieve blood pressure control than nonusers. Although results of these studies were not statistically significant, they provided clinically significant findings.

In contrast, Ammenwerth et al. (2012) and Wagner et al. (2012), found that portal use was not associated with significant outcome improvement. Though not statistically significant, Wagner et al. (2012) findings did suggest frequent portal use led to reduced blood pressure (average systolic 3.97 mmHg and diastolic 5.25 mmHg). Similar research has reported that portal use improved outcomes with diabetes and hyperlipidemia but not with hypertension (Tang et al., 2013).

Ammenwerth et al. (2012) concluded with statistically significant findings that patients using the electronic health portal are more likely to adhere to the treatment plan. Goldzweig et al. (2013) found patients that reported greater patient-provider relationship satisfaction had less interest in using the portal.

Summary of the Evidence

Strength of the research provided includes levels I, II, III, and IV with inclusion of systematic reviews, randomized control trails, qualitative and observational studies. Facilitators for the electronic health record include empowerment and patient-provider communication, while barriers include lack of knowledge of the portal and fear of security breach. Furthermore, the literature provides evidence that

increased portal use is associated with improved management, whether that be medication adherence or better chronic disease outcomes.

While the results may not have provided statistically significant changes for blood pressure, management of other chronic diseases such as diabetes and hyperlipidemia have had significant results with increased use of the electronic health portal. The results of this evidence demonstrate the need for further research on education provided via the portal and correlation on hypertension management.

Knowledge gap

There is a significant knowledge gap in the literature, with limited research about the use of the electronic portal for hypertension education purposes. Most of the research conducted, in reference to patient education, included facilitators and barriers for patients using the electronic health portal, not the educational effect. According to the research, patients are currently using this emerging technology to follow health information and keep track of vital signs, immunizations, and appointments. This makes it easy if patients are going to multiple providers and needing to pull up past health documents. However, what is the success with sending education via the portal, the patient reading the information, and incorporating the recommendations into their lifestyle for disease management?

The gap lies with research that accurately studies the education being provided and what result it has on hypertension management. Current research focuses on portal engagement and increased usability, but minimal research was found on education provided for chronic diseases via the electronic portal. Lack of research provides the need for this project, although on a small scale, to assess the effectiveness of electronic health portal education for blood pressure management.

Methods

Project Design

This project involves a retrospective chart review of 25 patients meeting the inclusion criteria. The first review of 25 patients (from November 15, 2019 and January 31, 2020) was performed to determine baseline data for providers sending education via the portal to patients with a diagnosis of hypertension who have a study clinic provider listed as their primary care provider. The second retrospective chart review was conducted on the same 25 patients (from April 1, 2020 and July 31, 2020), to determine if there was increased educational material provided after the Clinic Director sent the email reminder to providers.

Setting

Agency Description

This project was implemented at a primary care clinic in a small town in Kentucky. This is a nurse practitioner run, satellite clinic of UK Healthcare, owned by the UK College of Nursing that opened in September 2015 to fill the need for accessible, basic health services in Jessamine County. Patients' ages range from birth to geriatric. There are a variety of services provided including comprehensive health care such as health promotion, disease prevention, annual pap smears, immunizations, allergy shots, and management of acute and chronic health problems. Furthermore, this clinic also provides patient education and counseling and performs school and sports physicals as well as pre-employment health screenings (UK College of Nursing, 2020).

The clinic is small with three staff members including a healthcare provider (Nurse Practitioner), Medical Assistant/Nurse, and Patient Relations Personnel each day. There are three to four providers that circulate in a week to provide daily care. This clinic is comprised of two patient exam rooms, one

mental health office/patient room, one lab room, and a provider work room. As mentioned previously, this clinic provides basic health services for an array of health problems.

Congruence of DNP project to mission, goals, and strategic plan

This project aligns with the University of Kentucky Healthcare's mission statement, goals, and strategic plan. Within the mission statement, it is stated that UKHC is committed to the pillars of academic health care—research, education, and clinical care. Furthermore, UK's mission is dedicated to the health of the people of Kentucky and to provide the most advanced patient care and serve as an information resource (UK Healthcare Mission, n.d.). This project was to evaluate effectiveness of education via the electronic health portal for blood pressure management.

In relation to the study clinic, there is a focus to meet Medicare Access and CHIP Reauthorization ACT (MACRA) goals for better patient care. This project specifically addressed the goal to control high blood pressure. The MACRA 2020 goal states to evaluate the percentage of patients 18-85 years of age who had a diagnosis of hypertension and whose blood pressure was adequately controlled (<140/90) during the measurement period (Centers for Medicare & Medicaid Services, 2019). This goal aligns with this project.

There are several segments to the UKHC Strategic Plan. This project is in congruence with strengthening partnership. This section emphasizes post-acute care, primary care provider and community care. In particular, providing care across continuum to ensure care is effective, efficient, and appropriate (UK Healthcare, n.d.). This DNP project evaluated if providing education via the portal was effective and efficient for patients with elevated blood pressure in a primary care clinic.

Medicare Access and CHIP Reauthorization Act (MACRA)

The Medicare Access and CHIP Reauthorization Act (MACRA) of 2015 focuses on rewarding healthcare organizations for value over volume, creating a new type of equality payment program (Centers for Medicare & Medicaid Services, 2019). The Merit Based Incentive Payment System (MIPS) is a component of the MACRA Quality Payment Program which measures performance in four areas: quality, promoting interoperability, improvement activities and cost. UK Healthcare (UKHC) monitors each clinic and provider's performance for quality, promoting interoperability and improvement activities. For promoting interoperability, UKHC monitors patient engagement with timely access to the electronic health record portal (percentage of patients enrolled in the electronic health record portal). Improvement activities monitored include how providers improve care by providing up to date information (patient education), via the portal, relevant to chronic diseases such as hypertension (percentage of patient who receive patient education from the provider via the portal) (Quality Payment Program, Retrieved October 2020). Hypertension control is one of the MIPS quality measures that UK Healthcare has selected to focus on that coincides with this project. Specifically, this project aims to determine the usability of the electronic health record in patients with hypertension.

Stakeholders

There are several stakeholders that were involved in this project. First to mention is the patient relation personnel at the front desk. Their role was to ensure the patient was signed in to be seen by the provider. The next stakeholder is the Medical Assistant/Nurse. Their role was to take the blood pressure at the beginning of the visit and document it into their electronic health system. The providers were vital stakeholders in the implementation of this project. Their role was to recognize the elevated blood pressure, document the diagnosis, and send education via the health portal. Other stakeholders include the clinic director, patients, Center for Clinical and Translational Science (CCTS) services, and insurance

companies. The clinic director agreed to initiate the project in this clinic. The CCTS personnel compiled patient records via the electronic medical record, and insurance companies were pivotal in allowing providers to bill for elevated blood pressure and education provided to each patient.

Barriers and Facilitators to Implementation

There were several facilitators and barriers to implementing this project at the study clinic. The first facilitator to mention is the milieu that encompasses this clinic. With being a small clinic in a very small town, the patient-provider relationship is very unique. Providers know not only the patient, but many know their family members and individuals in the community. This is a facilitator because of the close network this clinic provides to its patients. Another facilitator is the relatively newer opening of the facility. With this clinic having just opened in 2015 and recently transitioning to primary care, stakeholders are MACRA-oriented in establishing goals and outcomes.

Barriers with implementing this project included the limited participants and use of the health portal. While it is mentioned that the smaller clinic is a facilitator, it also can present as a barrier. On average, this clinic sees 8 patients a day. At this point, compliance among providers with sending patient education via the portal is 2.57% (S. Lock, personal communication, 2020). Therefore, with lower compliance of education being sent via the portal, effectiveness of patient management has not been evaluated.

Sample

Target Population

The target sample goal was 50 adult patients; however, only 25 patients met the inclusion criteria. Inclusion criteria included adults age 18 years and older, a documented diagnosis of hypertension (ICD-10 code I10), and each patient must have had a study clinic provider listed as their

Primary Care Provider (PCP). Exclusion criteria included children (younger than 18 years of age), walk-in patients and patients that did not have a study clinic provider listed as their PCP.

Procedures

Once IRB approval was achieved, the research project and retrospective chart reviews took place at the study clinic. Charts of adult patients (male and female) 18 years and older with a documented diagnosis of hypertension (ICD-10) were reviewed. Age, gender, race, and type of insurance were collected for demographic purposes. Comorbidities were noted for additional information. Furthermore, patients who had a study clinic provider listed as their primary care provider, enrollment status in the EHR patient portal, and current practice for education materials sent to those patients via the portal were abstracted from the patient's charts via retrospective chart analysis. The goal was 50 charts meeting inclusion criteria; however, only 25 patients met the inclusion criteria in the designated time frames.

The first retrospective chart review included electronic health records of all patients seen in the clinic with a diagnosis of hypertension between November 15, 2019 and January 31, 2020 who had a study clinic provider listed as their PCP. The Clinic Director sent an email reminding providers to send education via the portal on January 6, 2020. Data from the first chart review was aggregated and analyzed.

The second chart review included the same patient records from the first chart review with a diagnosis of hypertension who were seen by a participating provider between April 1, 2020 and July 31, 2020. These dates were selected since patients with hypertension would likely have follow-up appointments during that time. The same variables were abstracted from the patient charts and aggregated. The chart review data were analyzed to determine if there was an improvement in

educational materials being sent by the APRN providers and if there was a reduction in blood pressure readings after education information had been sent.

Evidence-based intervention

The intervention used in this project was the use of the healthcare system portal to provide educational information regarding blood pressure management. Access to patient's medical information is increasing, but there is opportunity for healthcare providers to further engage patients. Heath (2018) states that 52% of patients have healthcare portal access, but fewer patients are using the tools that are being provided. At the study clinic, around 70% of the patients are enrolled in the portal and goal is above 80% (S. Lock, personal communication, 2020). Interestingly, Powell (2017) states that in a conducted systematic review, patient's that had been diagnosed with a chronic disease within the year reported higher portal use. This shows remarkable potential for just how beneficial education via the portal can be.

Data Collection

The Center for Clinical and Translational Science (CCTS) at the University of Kentucky compiled the medical records based on the inclusion criteria and provided access to the electronic health records. Charts of adult patients 18 years and older with a documented diagnosis of hypertension (ICD-10) and who had a study clinic PCP were pulled and review. Enrollment status in the EHR patient portal, current practice for education materials sent to those patients via the portal, vital signs, comorbidities, and demographics were abstracted from the patient's charts via retrospective chart analysis. The data were collected using REDCap (Research Electronic Data Capture), a secure, web-based application designed exclusively to support data capture for research studies. Data were analyzed and reported in a de-identified and aggregate form.

Data Analysis

The patients included in the demographic data analysis involved all participants meeting the inclusion criteria. The blood pressure analysis includes only 13 of the 25 participants, as there were only 13 patients that had blood pressures documented at both visits. Demographic data was analyzed using descriptive statistics including mean and percentages (Table 1). Blood pressure was analyzed using a paired sample t-test (Table 2). SPSS was used to perform statistical analyses and statistical significance was set at a p-value less than or equal to .05.

Results

Demographic Characteristics

Twenty-five patients met the inclusion criteria for this study. Demographic characteristics are presented in Table 1. The mean age for the patients in the study was 53.8 with ages ranging from 32 years old to 69 years old. Of the 25 patients, 60% were male and 40 % were female. Furthermore, 96% patients were White and 4% were African American.

Medicaid patients made up 44% of the sample size, whereas 28% of the sample carried Medicare. UK HMO insurance was carried by 16% of the patients. Private insurance, VA insurance, and Unknown/No insurance incorporated 4% of the patients.

Since comorbidities are associated with uncontrolled hypertension, nine comorbidities (active and history) were included in the data. Hyperlipidemia was the most noted comorbidity, with 76% of the 25 patients with the documented disease. Diabetes was recorded in 40% of the patients and 28% were diagnosed as overweight/obese. Coronary artery disease was noted in 8% of the patients diagnosed with hypertension included in the study. Peripheral vascular disease, cerebrovascular accident, and chronic kidney disease was noted in 4% of the patients. Lastly, 0% of the patients had retinopathy or nephropathy recorded.

Of the 25 patients included in the study, 60% of the patients were enrolled in the portal, whereas 40% of the patients were not enrolled in the electronic portal. Surprisingly, no portal education was sent among providers prior to and after the intervention (Clinic Director reminder email).

Blood Pressure Analysis

Only 13 participants had blood pressure documented at both visits. Twelve charts were excluded due to blood pressure not being recorded at the subsequent visit. The first chart review included patients prior to the education reminder email. The mean blood pressure for this group of patients was a systolic recording of 134.1 and a diastolic recording of 83.1 with a p-value of .74 (see Table 2). The second chart review involved the patients' blood pressure recording after the email had been sent. Systolic mean blood pressure recording was 135.7 and the diastolic recording was 82.3 with a p-value of .81.

Discussion

The literature review denoted electronic portal use improves chronic disease management; however, the findings of this study did not support the results in the literature. Greysen et al. (2020) states that orienting the patient to the portal and making the information easy to understand, patients will be more likely to use the electronic health portal. With this recommendation, providing patients with portal information upon check in may increase portal use among patients.

The Health Belief Model helps to explain both patients and provider portal use. For the patient, severity, barriers, and facilitators have been discussed; however, more research is needed to understand providers facilitators, barriers, and self-efficacy to sending education via electronic portal. As mentioned, using the portal for education is a provider cue to action that in turn, may influence the patient's management.

This project highlighted that providers at the study clinic are not currently sending education via the electronic portal; however, providers need to implement this step into their practice. Next steps for future studies include the effects of online portal education on blood pressure management, identifying why providers are not utilizing the portal, and processes that may make the provider workload easier for electronic portal education.

Implications for Practice and Research

For this study, current practice is not improving or hindering patient's blood pressure management. This project evaluated the effects of education via electronic healthcare portal on blood pressure management among adults at the study clinic. As noted, this finding is inconclusive due to no portal education being sent during the designated timeframes. It is important to note that two patients had portal education sent, however one was on diabetic education and one was after the second chart review timeframe. Furthermore, twelve of the providers notes documented verbal education of hypertension management during at least one visit.

One objective was to determine if there was an increase in educational materials being sent via the portal. No educational material was sent via the portal for the duration of the chart reviews. The second objective was to determine if there was an improvement in blood pressure readings with educational materials being sent via the portal. Providers did not send educational materials related to hypertension management via the portal. There was no statistically significant difference between the first and second visit. However, it is important to note that both pre and post mean systolic and diastolic blood pressure readings were less than the MACRA goal of 140/90.

Implications for practice include ensuring the providers at the clinic understand the importance of MACRA for reimbursement with patients diagnosed with hypertension and to assess their knowledge and confidence on providing education via the electronic portal. Practice implications may include

implementing an automatic reminder system that alerts providers to send portal education to a patient diagnosed with hypertension and utilizing the clinic nurse to send portal education to the patient after the visit.

Although this study's findings were not statistically significant, further study is warranted. With the results and implications of this study, it is imperative for further research to determine the effects of portal education on blood pressure management and evaluation of providers lack of portal use. Furthermore, future study should identify processes that make provider workload easier for portal use, such as the examples previously listed in the practice implications. This study can be used for a base knowledge of portal use and can encourage more studies to investigate its effects.

Limitations

There are several significant limitations noted in this study. The most important limitation is the second chart review was collected during the COVID-19 world-wide pandemic. This resulted in a high percentage of patients not having a second visit recorded or a telehealth appointment where blood pressure was not collected. It is not known why blood pressure was not recorded for those visits. Patients having a telehealth visit might not have had a blood pressure monitor. It is also possible that some abstracted visits included nurse visits where blood pressure is not routinely documented.

A small sample size was another limitation to this study. With the study clinic being located in a smaller community and recently establishing primary care services, it was known prior to study implementation that the sample size was going to be small. However, the inclusion criteria (specifically limiting the charts to only study clinic providers listed as PCP) narrowed the results from a goal of 50 patients to a sample size of 25 patients. This may be due to the clinic still seeing walk-in/acute visits where PCP is either not listed or includes non-study clinic providers.

Barriers to provider portal use is a limitation worth noting. Current research focuses on patient facilitators and barriers; however, with completion of this project, there are unknown barriers to provider portal use. Unfortunately, this study was a retrospective design, and did not include provider input. Further research should be conducted from a provider's viewpoint to determine facilitators and barriers to provider portal use.

Other limitations to note with this study is medication adherence and other factors such as diet, lifestyle choices, and social determinants of health that can influence blood pressure management. Finally, since 40% of the sample was not enrolled in the portal, it is a limitation to conclude the significance of portal use on hypertension management. This is important to note so that goals can be set to improve patient participation.

Conclusion

In conclusion, providers at the study clinic are not utilizing the electronic health portal as a way of educating patients to improve their hypertension diagnosis. With this emerging technology, it is imperative for providers to incorporate this into their workflow. The data presented did illustrate current practice adequately controlling patient's blood pressure, but portal involvement may help patients further understand this disease and how to better manage it while decreasing the risk of comorbidities. Further research should continue to explore the potential effects of the electronic health portal on hypertension management, examine if there is an improvement on blood pressure with education being provided via the portal, evaluate why providers are not using the portal, and determine facilitators and barriers to provider portal use. The electronic health portal is a valuable tool to both the patient and provider for better health management. By researching its usability and effectiveness, hypertension may better be controlled for the future of healthcare.

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Table 1. Descriptive summary of demographic and clinical characteristics (n = 25)

Characteristics	Mean (SD) or n (%)
Age	53.8 (10.8)
Gender	
Male	60%
Female	40%
Race	
White	96%
African American	4%
Insurance	
Medicaid	44%
Medicare	28%
UK HMO	16%
Private	4%
VA	4%
Unknown	4%
Comorbidities	
Hyperlipidemia	76%
Diabetes	40%
Overweight/Obesity	28%
Coronary Artery Disease	8%
Peripheral Vascular Disease	4%
Cerebrovascular Accident	4%
Chronic Kidney Disease	4%
Retinopathy	0%
Nephropathy	0%
Enrolled on Portal	
Yes	60%
No	40%

Table 2. Blood pressure recording pre and post educational email (n = 13)

	Pre Mean (SD)	Post Mean (SD)	*p-value*
Systolic	134.1 (17.7)	135.7 (14.5)	*.74*
Diastolic	83.1 (6.8)	82.3 (9.6)	*.81*