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Playing a role in secondary prevention in the ED: longitudinal study of patients with asymptomatic elevated blood pressures following a brief education intervention: a pilot study

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Keywords

Emergency department; Asymptomatic hypertension; Screening; Emergency provider; Echocardiograms

Introduction

Uncontrolled hypertension contributes significantly to cardiovascular morbidity and mortality and is more frequently encountered among patients presenting to the emergency department (ED).^{1,2} Approximately 50% of patients with previously undiagnosed hypertension who present with elevated blood pressures in the ED will continue to have BP elevations one week after being discharged to home.³

Hypertensive patients presenting to the ED are a particularly high-risk group with >50% with stage II or higher hypertension (SBP ≥ 160 or DBP ≥ 100).¹ Significant percentages of elevated blood pressures in the ED are incidental findings and not related to the patient's chief complaints. Incidental hypertension represents a quandary for the emergency physician who cannot guarantee follow-up treatment.^{4,5} Several studies have found that only 7–25% of ED patients with elevated BP are given instructions for outpatient BP follow-up.^{3–5}

Currently, there is no risk assessment or stratification based upon blood pressure assessment performed on hypertensive patients prior to discharge from the emergency department. The emergency medicine literature does not provide definitive recommendations on screening tests for patients with asymptomatic elevated blood pressures.⁶ Published guidelines regarding the management of these patients only recommend referral of these patients for close primary care follow-up within 48–72 h.⁶ These same guidelines also urge future research related to the optimal screening for this patient population in the ED.⁶

The purpose of this study was to determine the progression of subclinical heart disease in an urban ED population with asymptomatic elevated blood pressure and examine the

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Ethical approval

The University of Illinois Institutional Review Board reviewed and approved this study.

Competing interests

None declared.

correlation with blood pressure changes after a brief ED hypertension education intervention.

Methods

Subjects previously enrolled in a cross-sectional study of ED patients with asymptomatic elevated blood pressures and evidence of subclinical heart disease (SHD) were contacted for repeat point-of care ultrasounds and blood pressure measurement one-year after initial study enrolment. Subjects had bedside echocardiograms (point-of-care ultrasounds) performed by ultrasound trained ED physicians. At the time of study enrollment subjects were educated concerning uncontrolled hypertension and secondary complications.

Specifically subjects were informed that 1) Hypertension is a silent disease; 2) Complications of uncontrolled hypertension includes heart failure, strokes, and kidney failure; 3) Early changes of uncontrolled hypertension can be detected on echocardiograms; and 4) these changes are potentially reversible with better blood pressure control. The total time for the brief educational intervention was 5 min. Subjects were then discharged home with outpatient referrals for follow-up care with their primary care provider. Subjects were informed that study personnel would contact them in one year to determine any changes in the echocardiogram findings.

The original study cohort included 39 subjects. Of the 39 subjects, there were 12 subjects with evidence of subclinical heart disease (left ventricular hypertrophy (12), diastolic dysfunction (6), and abnormal ejection fraction (3)). Subclinical heart disease was defined as the presence of diastolic dysfunction, left ventricular hypertrophy, and an abnormal ejection fraction. Echocardiogram findings were not mutually exclusive with several subjects having more than one finding of subclinical heart disease.

Of the selected echocardiogram criterion defining subclinical heart disease, studies have shown that diastolic dysfunction and left ventricular hypertrophy are more likely to be reversible with improved blood pressure control. Therefore the longitudinal component of the study included only those subjects with evidence of diastolic dysfunction and/or left ventricular hypertrophy. Subjects with abnormal ejection fractions were excluded ($n = 3$) leaving nine subjects for the study reassessment.

Subjects had bedside echocardiograms performed by ED physicians trained in ultrasound. All echocardiographic measurements were performed using a commercially available ultrasound system equipped with a harmonic 4.0 MHz variable-frequency phased-array transducer.

Descriptive characteristics of study participants included demographics, body mass index (BMI), tobacco use, and medical history. To test the change between pre and post measures, Singed Rank test and Friedman's test were utilized for continuous and ordinal outcomes respectively. Data analysis was performed using SAS 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

Of the original study cohort with left ventricular hypertrophy and diastolic dysfunction ($n = 9$), seven patients were reassessed representing 78% of the original study cohort. There were two subjects who were not studied on longitudinal follow-up. One subject declined to return and one subject was unable to be contacted via telephone. The characteristics of the longitudinal follow-up were as follows: mean age 48.1 years ($SD = 3.9$ years), four females (57.1%), six African Americans (85.7%) and one Latino (14.3%). Of the seven subjects on initial assessment, all had left ventricular hypertrophy (LVH) and 4 (57.1%) had diastolic dysfunction. On repeat assessment diastolic dysfunction was resolved in 2 (28.6%) patients, unchanged in 1 (14.3%) patient, and worsened in 1 (14.3%) patient. LVH was noted in only three subjects (42.9%). Blood pressure was better controlled in six subjects (85.7%) and remained uncontrolled in 1 (14.3%). Under the significance level 0.05, diastolic blood pressure ($P = 0.05$) and left ventricular hypertrophy ($P = 0.05$) appear statistically changed. Diastolic BP median decreased 19 mm Hg (Table 1).

Discussion

This study found significant improvements in blood pressures of subjects upon reassessment following a brief emergency department educational intervention. The majority of subjects indicated the primary reason was ED study return was education on the potential reversibility of echocardiogram findings with improved blood pressures. One of the salient features of the original intervention (non-invasive bedside ultrasound) was the ability to risk stratify subjects based upon the presence or absence of early subclinical heart disease on echocardiogram and provide a brief educational intervention. The 78% study follow-up rate among study participants at the 1-year mark highlights the clinical strength of the role that emergency departments can play in secondary prevention of cardiovascular disease.

Given its position as the point of entry into the health care system, early identification and treatment of uncontrolled/undiagnosed hypertension in the ED meets many of the principles of early disease detection established by the World Health Organization (WHO) more than four decades ago. In addition, point-of care ultrasound are quickly becoming part of the mainstream diagnostic options in many emergency departments thus allowing for a rapid and enhanced ability to assess true risk status for patients with elevated blood pressures. Current guidelines on the management of asymptomatic hypertension in the ED recommends urgent follow-up for high risk patients as opposed to the routine standard outpatient referral of 3–5 days.⁶ An intervention targeting better blood pressure control by utilizing non-traditional identification areas such as the ED is a novel concept that is practical and feasible.

A recent article published in the Emergency Medicine literature suggests that if evidence-based guidelines were available for management of these patients with asymptomatic elevated blood pressures and more assured follow-up mechanisms were in place, there would be greater compliance with referral guidelines and heightened awareness of secondary prevention interventions available to ED physicians.⁷

Limitations

This study involved a small longitudinal pilot study of a convenience sample of emergency department patients with asymptomatic elevated blood pressures from a single urban academic emergency department; thus limiting the generalizability of the study findings. In addition the study design reflects point prevalence only at the time of reassessment, and does not account for any changes that may have occurred during the interval study time.

Conclusions

Emergency departments are well suited at the interface between inpatient and outpatient care and can serve as a portal for identification of high-risk individuals and initiation of non-invasive validated screening methods. Providers of emergency care can be powerful advocates for secondary prevention because they manage the secondary complication when primary prevention fails.

An educational intervention targeting better blood pressure control by utilizing non-traditional identification areas such as the emergency department is practical and feasible.

This study underscores the clinical importance of the role that emergency departments can play in secondary prevention of cardiovascular complications due to uncontrolled hypertension. EDs often care for high-risk populations and, through education and early risk stratification of patients using non-invasive techniques such as point-of-care ultrasound, emergency providers can quickly identify those patients in need of more aggressive therapy and referral.

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Table 1

Characteristics of Longitudinal Study Cohort Pre and Post ED assessment for subclinical heart disease.

	Initial ED assessment	1 year ED- follow-up
Age, mean (SD)	48.1 (3.9)	
Female, N (%)	4 (57.1%)	
Race, N (%)		
African American	6 (85.7%)	
Caucasian	0 (0.0%)	
Hispanic	1 (14.3%)	
BMI, mean (SD)	31.2 (5.8)	30.3 (6.1)
Systolic BP, mean (SD)	159.1 (16.1)	137.9 (22.0)
Diastolic BP, mean (SD)	102.3 (14.9)	85.4 (12.8)
Tobacco Use, N (%)	0 (0.0%)	0 (0.0%)
Diabetes, N (%)	4 (57.1%)	5 (71.4%)
Controlled BP, N(%);[BP < 140/90]	0 (0.0%)	6 (85.7%)
Uncontrolled BP, N (%);[BP ≥ 140/90]	7 (100%)	1 (14.3%)
Left ventricular hypertrophy N (%)	7 (100%)	3 (42.9%)
Diastolic dysfunction (DD), N (%)	4 (57.1%)	3 (42.9%)
• Improvement in DD N(%)		2 (28.6%)
• No change in DD grade N (%)		1 (14.3%)
• Worsening of DD grade N (%)		1 (14.3%)