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Original Contribution

Effect of predischarge blood pressure on follow-up outcomes in patients with severe hypertension in the ED☆

Paisit Nakprasert, MD [a], Khrongwong Musikatavorn, MD [a,b,*], Dhanadol Rojanasarntikul, MD [a], Khuansiri Narajeenron, MD [a], Patima Puttaphaisan, MD [a], Suthaporn Lumlertgul, MD [a]

[a] Emergency Medicine Unit, Outpatient Department, King Chulalongkorn, Memorial Hospital, the Thai Red Cross Society, 1873, Rama 4 Rd, Patumwan, Patumwan, Bangkok 10330, Thailand
[b] Emergency Medicine Unit, Department of Medicine, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, the Thai Red Cross Society, 1873, Rama 4 Rd, Patumwan, Patumwan, Bangkok 10330, Thailand

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ABSTRACT

Background: Although emergency department (ED) patients with asymptomatic severe hypertension (ASH) generally have no serious short-term hypertension-related adverse events, it is unclear whether persistently high discharge blood pressure (BP) affects the outcome due to the dynamic nature of BP.
Objectives: This study aims to investigate the effect of predischarge BP on short-term follow-up results for ED patients with ASH.
Methods: The prospective observational study was performed in the ED of a tertiary care hospital during a 3-month period. Adult patients who had systolic BP ≥180 mm Hg and diastolic BP ≥100 mm Hg without acute end-organ damage were enrolled and treated at the emergency physicians' discretion. Discharge BP was precategorized into severely high and moderately high groups. We compared the groups using direct telephone contact and medical record reviews of follow-up BP within 1 week and identified their related adverse events.
Results: One hundred and forty-six eligible cases were identified in this study; 1 patient (0.7%) had a serious hypertension-related adverse event. One hundred and thirteen patients had follow-up BP information available. There was no difference in mean systolic BP and diastolic BP at follow-up between patients who were discharged from the ED with severely high vs moderately high BP.
Conclusion: Predischarge BP value is not associated with immediate serious adverse events and does not affect short-term BP control in ED patients with ASH. Further study on the need to lower BP during the ED stay and on antihypertensive prescriptions for these patients is required.

1. Introduction

Asymptomatic severe hypertension (ASH) is commonly seen in the emergency department (ED) [1–3]. Patients with ASH usually present to the ED with illnesses that are unrelated to coincident high blood pressure (BP) and without acute end-organ damage. The recent guidelines for ASH treatment in the ED recommend, based on a low level of evidence, that the BP of these patients should not be rapidly decreased in the ED; instead, they should have close outpatient reassessment, and initiation of treatment is indicated in selected patients who are extremely hypertensive and likely to have poor follow-up [4–6]. However, many emergency physicians are treating and discharging these patients who have severe BP elevation with some initial BP-lowering treatment in their practice [7], although patients with ASH are thought to have insignificant short-term adverse events [8].

Unfortunately, there has been some ambiguity in the time point for recording BP in the ED in the past literature, and high BP on ED admission may significantly decrease without any medication [9]. As a result, reduction of BP definitely influences ED treatment strategy. The importance of predischarge BP after ED management, which can spontaneously decrease or still be persistently and critically high, and how it affects the follow-up outcome have never been studied. The aim of our study is to assess the incidence of immediate serious hypertension-related adverse event in patients with severely and moderately elevated predischarge BP after management of ASH at the ED. Our secondary outcome is to compare BP at follow-up in these 2 groups. We also described the physician treatment strategies for ASH in the era of the current recommendations. Our results may validate the clinical safety of the current guidelines as well as clarify the effect of predischarge BP after ED management on the effectiveness of BP control at follow-up.

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* Corresponding author. Tel./fax: +66 2 256 4553.
E-mail addresses: quest_p_n@hotmail.com (P. Nakprasert), khrongwong.m@chulahospital.org, kmusikatavorn@gmail.com (K. Musikatavorn), d.nadol@gmail.com (D. Rojanasarntikul), khuansiri9@gmail.com (K. Narajeenron), patiputt@gmail.com (P. Puttaphaisan), lltongtaa@gmail.com (S. Lumlertgul).

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2. Methods

This prospective, observational study was performed in the ED of an urban, 1500-bed, university-affiliated tertiary care hospital. This ED treats more than 70,000 new cases per year. Our institutional review board approved this study, including written informed consent for patient information and scheduled follow-up. The enrollment started in August 2015 and was completed in October 2015. This cohort study was registered with ClinicalTrials.gov, identifier NCT02534324.

2.1. Population

Adult patients (≥18 years old) who presented in our ED with systolic BP (SBP) ≥180 mm Hg and diastolic BP (DBP) ≥100 mm Hg were consecutively enrolled in this study. Eligibility was assessed by ED physicians during all work shifts. The ED patients with minor chief concerns that were not related to severe hypertension (eg, dizziness, minor traumatic lacerations, wound dressings) or those who presented to the hospital for routine outpatient visits (eg, prearranged appointments, scheduled vaccination) and were triaged or referred to ED because of coincident severe hypertension were included in the study. Patients who had and had not been previously diagnosed with long-standing hypertension as their comorbidity were included in the eligibility evaluation.

Patients were excluded if they met any of the following conditions: (1) acute end-organ damage related to severe hypertension that required rapid intravenous antihypertensive drugs for acute treatment, including cardiovascular (acute chest pain, heart failure, acute coronary syndromes, and acute aortic syndromes), renal (acute kidney injury), ocular (retinal hemorrhage or hypertensive retinopathy), and central nervous system (seizure, acute cerebrovascular diseases, and hypertensive encephalopathy) damage; (2) hypertension caused by medical toxicology (eg, use of sympathomimetic drugs [amphetamine and its derivatives]) and alcohol withdrawal syndrome; (3) significantly decreased renal function (serum creatinine ≥1.5 mg/dL or creatinine clearance ≤30 mL/min); (4) pregnancy; (5) moderate to severe pain (eg, pain score on visual analog scale ≥5 of 10); (6) BP decrease to less than 180 mm Hg after 10-minute bed rest without any medical treatment; and (7) concurrent medical conditions requiring hospitalization.

Initial SBP, DBP, and mean arterial pressure (MAP, calculated by DBP + 1/3[SBP − DBP]) were measured in the patients in supine or semisupine position by standard measurement with automated sphygmomanometers at least twice after absolute rest for 10 minutes, and the lowest BP was recorded. Patients with a spontaneous decrease in SBP to <180 mm Hg or DBP <100 mm Hg after rest were excluded at this stage.

After an eligible patient was identified and informed consent was obtained, complete blood count, blood urea nitrogen, creatinine, electrolytes, chest radiograph, and electrocardiography (ECG) were part of the compulsory workups in all patients. General physical examination was performed, including fundoscopic evaluation with a direct ophthalmoscope to detect ocular complications together with the pulse and BP of all extremities. Patients with acute end-organ dysfunction that was identified by a suspicious clinical history, physical examination, or laboratory results were excluded from the study and properly treated. The treatment for high BP, choices of antihypertensive drugs, other investigations, and patient disposition were at the discretion of the treating physicians and were recorded. The reason for presenting to the hospital, initial BP, types of antihypertensive medications administered, predischarge BP, and length of ED stay (ED-LOS) were also noted.

All patients with newly diagnosed or noncompliant hypertension were discharged with all-new antihypertensive medications. Additional oral antihypertensive drugs or instructions for adjusting their current regimens were given to patients with underlying hypertension for better BP control. The management strategy, including whether to start the drugs in the ED with or without a period of observation or immediately discharge without any obse0ation, was according to the treating physicians' judgment.

2.2. Study definitions

We categorized eligible patients based on prespecified discharge BP into 2 groups: moderately high BP (predischarge SBP <180 mm Hg) and severely high BP (predischarge SBP ≥180 mm Hg) group. The hypertension-related major adverse events included acute chest pain, heart failure, acute coronary syndrome, acute aortic syndrome, retinal hemorrhage, hypertensive retinopathy, seizure, acute cerebrovascular disease, hypertensive encephalopathy, or revisit to the hospital with a related illness before the scheduled appointment within 10 days after presenting to the ED.

2.3. Outcome measurement

In this study, we defined the rate of hypertension-related major adverse events as the primary outcome, and the BP measured at the internal medicine clinic within a 1-week period was the secondary outcome. Every eligible patient was scheduled for an internal medicine clinic visit for continuous high BP care within 3-7 days after discharge from the ED with physicians who were not investigators and were not involved in the study. The patients' medical records were again retrieved for the follow-up BP, drug compliance, and associated adverse events at the clinic. We made telephone follow-up calls to the participants or their identified alternative contacts in every case at 10 days after the ED presentation to identify patients who had died or had major morbidity as well as assess their compliance with their antihypertensive medications.

2.4. Data analysis

SPSS version 17.0 for Windows (Chicago, IL) was used for all statistical tests. We performed normality testing in all continuous variables using the Q-Q plot with Kolmogorov-Smirnov test. The normally and nonnormally distributed data were analyzed using the 2-independent-samples *t* test and Mann-Whitney *U* test, respectively. A χ^2 test was used to compare the proportions between the groups. All tests were 2-sided and were considered to have statistical significance for a P value < .05.

3. Results

3.1. Overall cohort

In total, 221 patients were evaluated for eligibility. The assessment indicated that 146 eligible cases were available for primary outcome analysis and 113 patients for secondary outcome evaluation. The patient flow diagram and causes of exclusion are shown in Fig. 1. The indications for presenting to the ED and demographic data of the eligible patients are summarized in Tables 1 and 2, respectively.

The majority of our patients were treated with at least 1 BP-lowering drug in the ED and were prescribed discharge antihypertensive medications by emergency physicians until the follow-up dates (92.5% and 97.3%, respectively).

Focusing on the primary outcome, we identified 1 case out of a total of 146 patients (0.7%) with a serious hypertension-related event. However, we found no statistical difference of the serious adverse event rate between the moderately high and severely high predischarge BP group (1% vs 0%, respectively, P = .49). The comparison are demonstrated in Table 2. The brief description of this patient is as follows:

An 82-year-old man with a history of hypertension, ischemic heart disease, and stroke arrived to the ED with headache and dizziness; he had not had any cardiopulmonary symptom for 2 hours. His vital signs were as follows: BP 196/118 after bed rest and pulse 98 beats per minute. The results of his chest radiograph was normal, and the ECG showed left ventricular hypertrophy without an ischemic pattern. Initial laboratory tests revealed that his creatinine was 0.99 mg/dL, and he had normal high-sensitive troponin I levels. The patient was treated with