Critical Review Form
Prognosis

Routine testing in patients with asymptomatic elevated blood pressure in the ED. Am J Emerg Med. 2010 Feb;28(2):235-42.

Objectives: "to measure the prevalence of abnormalities on a basic metabolic profile that lead to hospital admission in a homogeneous African American ED population presenting with asymptomatic elevated blood pressure." (p. 236)

Methods: This was a cross-sectional study conducted at 2 urban hospital emergency departments using a convenience sample of patients prospectively enrolled between August 2006 and February 2008. Patient were included if they were 18 years or older with a diastolic blood pressure ≥ 100 mm Hg at the time of triage. Exclusion criteria included pregnancy, hemodialysis, or a chief complaint at high risk of acute end-organ damage (altered mental status, shortness of breath, chest pain, syncope, focal neurologic deficit, or abdominal pain). Patients were also excluded if the attending emergency physician caring for them felt they had symptoms suggestive of potential end-organ damage. The study protocol was distributed to emergency medicine residents and faculty at the study onset and monthly thereafter. The protocol did *not* included recommended treatment or disposition, which were at the discretion of the treating physician.

Trained data abstractors assessed patients for inclusion criteria from 10:00 AM to 11:00 PM, 7 days a week. All enrolled patients had a basic metabolic profile (BMP) sent, which includes sodium, potassium, bicarbonate, blood urea nitrogen, creatinine, and glucose measurements. Data abstractors recorded patient demographics, vital signs, chief complaint, current medications and compliance, past medical history, emergency department treatment, discharge prescriptions, laboratory data, and final disposition. Admitted patients underwent chart review by the primary investigators to determine admission diagnosis and reason for admission.

The primary outcome was any abnormality on the BMP that led to admission. A chart review of admitted patients was used to determine whether or not admission was due to such abnormality. The secondary outcome was the prevalence of diminished renal function, defined as a glomerular filtration rate (GFR) less than 60 mL min^{-1} 1.73 m^{-2}, as calculated using the Modification of Diet in Renal Disease Study equation.

A total of 182 patients met initial triage inclusion criteria, of whom 167 were included in the final analysis. The mean age was 55 and 56% were female. The mean systolic blood pressure was 194 and the mean diastolic blood pressure was 112. Of the cohort, 74 (44%) were truly asymptomatic, while 21 (13%) complained of headache,

12 (7%) complained of dizziness, 21 (13%) had extremity/neck/back pain, 5 (3%) had psychiatric complaints, and 34 (20%) had "other" complaints. A total of 107 (60%) had a history of hypertension and 88 (53%) were prescribed an antihypertensive medication. Only 22 (25%) of these were compliant with their antihypertensive medication. Oral antihypertensive medications were given to 69 (41%) patients in the ED, and none received an intravenous antihypertensive agent. Fifty-three (32%) were prescribed an antihypertensive agent at discharge. A total of 27 (16.2%) patients were admitted to the hospital.

Guide		Comments
I.	**Are the results valid?**	
A.	**Was the sample of patients representative?** *In other words, how were subjects selected and did they pass through some sort of "filtering" system which could bias your results based on a non-representative sample. Also, were objective criteria used to diagnose the patients with the disorder?*	Yes. These were adult patients presenting to an urban ED with elevated blood pressure (diastolic ≥ 100) and no symptoms of end-organ damage. Patients were excluded for any chief complaint concerning for end-organ damage or if the attending ED physician felt they had signs or symptoms concerning for end-organ damage. While the latter was a subjective criterion, it is these very patients in whom prognostic uncertainty remains. These results also cannot be applied to children (< 18 years) pregnant patients, or patients on hemodialysis.
B.	**Were the patients sufficiently homogeneous with respect to prognostic risk?** *In other words, did all patients share a similar risk during the study period or was one group expected to begin with a higher morbidity or mortality risk?*	Yes. Patients with high-risk features of end-organ damage (altered mental status, chest pain, shortness of breath, focal neurologic complaint, syncope, or abdominal pain) were excluded. Patients with more severely elevated blood pressure, those with pre-existing renal disease not requiring hemodialysis, or those of more advanced age may be more prone to end-organ damage during periods of severely elevated blood pressure. Also, patients with headache or vision changes were not excluded, which some would consider signs concerning for potential end-organ damage. 30% of patients had diabetes, which would predispose to renal dysfunction.
C.	**Was follow-up sufficiently complete?** *In other words, were the investigators able to follow-up on subjects as planned or were a significant number lost to follow-up?*	Yes. All patients were followed to ED disposition. The lab results and final disposition of all patients was known. Admission records were obtained for all patients admitted to the hospital.
D.	**Were objective and unbiased outcome criteria used?** Investigators should clearly specify and define their target outcomes before the study	No. The primary outcome was any abnormality on the BMP that led to hospital admission, which was subjectively determined by ED chart review by the study investigators, and could be subject to interpretation. It is unclear who exactly made this determination (one or both of the primary investigators), and no statistical

	and whenever possible they should base their criteria on objective measures.	measures of agreement were provided (kappa values).
II.	**What are the results?**	
A.	**How likely were the outcomes?**	150 (90%, 95% CI 85%-94%) patients had one or more abnormal results on their BMP. 12 (7.2%, 95% CI 3%-11%) had abnormal results that led to hospital admission, including: • 10 (6.0%, 95% CI 3%-11%) with renal dysfunction; one of these had an elevated potassium level (5.2mEq/L) which did not require treatment). One patient required dialysis during hospitalization for uremia. • Two patients with elevated glucose (average 657 mg/dL). • One patient was admitted for anemia. 15 patients were admitted for reasons aside from BMP abnormality. 3 of these patients were admitted for uncontrolled elevated blood pressure (mean blood pressure 217/131). There were 27 (16.2%, 95% CI 11%-21%) patients with a GFR < 60 mL min^{-1} 1.73 m^{-2}, of whom 12 had a GFR < 30 mL min^{-1} 1.73 m^{-2}.
B.	**How precise are the estimates of likelihood?** *In other words, what are the confidence intervals for the given outcome likelihoods?*	See above.
III.	**How can I apply the results to patient care?**	
A.	**Were the study patients and their management similar to those in my practice?**	Yes. This study was conducted at 2 urban hospitals with largely homogenous African American patient populations, similar to our institution, and with similar ED volumes (135,000 and 65,000). We frequently see adult patients with elevated blood pressure with no sign or symptoms to suggest end-organ damage.
B.	**Can I use the results in the management of patients in my practice?**	Yes and no. While the study showed that a significant proportion of patients with asymptomatic hypertension had lab abnormalities that led to hospital admission, it is unclear if hospital admission led to improved outcomes or change in management compared to outpatient follow-up for laboratory evaluation.

Limitations:

1) **Community EDs, EDs outside the US, or those with lower African-American populations may see lower rates of renal dysfunction in patients with asymptomatic hypertension (external validity).**

2) **An urban ED setting with poor access to primary care may lead to inflated admission rates (external validity).**

3) **Subjective outcome criteria used with no measures of inter-observer agreement provided (i.e. kappa values).**

4) **More patient-important outcomes (MI, stroke, need for dialysis, death) need to be measured. These outcomes should be compared between groups undergoing routine laboratory testing in the ED versus referral for outpatient follow-up.**

Bottom Line:

This cross-sectional study conducted at 2 large urban EDs with largely African-American population assessed the frequency of abnormalities on BMP testing that led to admission in patients with asymptomatic severely elevated blood pressure. Out of 167 patients, 12 (7.2%) had abnormalities that led to admission. One of these patients had newly diagnosed renal failure that required hemodialysis, and one had newly diagnosed diabetes. The study did not assess whether routine testing in these patients improved long-term outcomes. Additionally, the study has limited external validity, as it was conducted in urban EDs, where patients likely had poor access to outpatient follow-up, thus potentially inflating the admission rates.