Critical Review Form
Prognosis

Utility of routine testing for patients with asymptomatic severe blood pressure elevation in the emergency department. Ann Emerg Med. 2008 Mar;51(3):231-9.

Objectives: **"to determine how frequently screening tests for acute hypertensive target-organ damage reveal abnormalities that were not anticipated" and "to assess how often unanticipated test abnormalities were clinically meaningful." (p. 232)**

Methods: **This prospective, observational cross-sectional study was conducted at 3 inner-city teaching hospital emergency departments (EDs), 2 of which support emergency medicine residency training programs. The study was conducted for 4 weeks in the summer of 2004, and an additional 4 weeks in the summer of 2005. A convenience sample of patients was enrolled by research associates between 8 AM and midnight. Eligibility criteria included age ≥ 18 and either a systolic blood pressure (SBP) ≥ 180 mmHg, or a diastolic blood pressure (DBP) ≥ 110 mmHg *at any time during the ED visit.***

Exclusion criteria included any acute illness or injury requiring immediate intervention (aside from intervention for asymptomatic hypertension), injury requiring activation of the trauma system, acute head or spinal cord injury, prior head or spinal cord injury with persistent neurologic deficits, pregnancy, and general anesthesia in the past week. Patients who did not speak English or Spanish or with whom the research coordinator was unable to communicate with despite the use of an interpreter were also excluded. Consenting patients underwent a questionnaire that asked if they had any symptoms in the past 24 hours suggestive of end-organ damage (chest pain, shortness of breath, confusion/altered mental status, unilateral weakness or numbness, severe headache, or epistaxis); patients reporting any of these were excluded from further analysis.

Patients underwent repeat blood pressure measurement at least 30 minutes after the initial vital sign assessment. Patients with a SBP < 180 or DBP < 110 were excluded from further analysis. The remaining patients underwent diagnostic testing including a basic metabolic profile (BMP), complete blood count (CBC), electrocardiogram (ECG), urinalysis, and chest radiograph. The protocol did not mandate or restrict any additional testing, management, or treatment options, which were at the discretion of the treating physician. After the tests were ordered, but prior to the results being available, the treating physician (attending physician or 2nd, 3rd, or 4th year resident) was interviewed by the research associates. Physicians were asked to choose a reason for ordering each test, with answer choices as follows:

1) **The medical history suggested the test would be abnormal**

2) **The history of present illness or physical exam suggested the test would be abnormal**
3) **The test was obtained only because it was recommended in the evaluated of patients with severely elevated blood pressure.**

A second interview with the treating physician was conducted once the results were available. With regards to abnormal results, the physician was asked whether the result changed their management, with answer choices:

1) **Yes, the patient was admitted specifically because of the results.**
2) **Yes, further testing or consultation was ordered because of the results.**
3) **Yes, medications were initiated or changed specifically because of the results.**
4) **No, test results did not alter management.**

The primary outcome was the frequency of clinically meaningful unanticipated test abnormalities. "Unanticipated" was defined as the treating physician ordering the test solely due to the elevated blood pressure with no signs or symptoms to suggest end-organ damage. "Clinically meaningful" was defined as an abnormal result leading to hospitalization, additional testing or consultation, or modification of the medication regimen. Two investigators otherwise blinded to the data and results assessed the test abnormalities as being "likely," "possible," or "unlikely" manifestations of hypertensive end-organ damage, with disagreement resolved by consensus.

During the two 4-week enrollment periods, 409 patients were severe elevated blood pressure presented to the 3 participating EDs and were screened for inclusion. Of these, 109 were included in the final analysis. The mean age was 56.5, 60 (54%) were female, and 92 (83%) were black. Past medical history included hypertension in 95 (86%), heart disease in 23 (21%), kidney disease in 20 (18%), and stroke in 18 (16%). The mean SBP was 199±17 and the mean DBP was 11019. The attending physician was interviewed in 82 (74%) cases, and a resident physician was interviewed in 29 (26%) cases. The reason for ordering the test was cited as assessment of severely elevated blood pressure alone in 55%-76% of studies ordered.

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-*	Yes. These were adult patients presenting to any of three urban EDs with a SBP ≥ 180 mmHg or a DBP ≥ 110 mmHg without symptoms suggestive of end-organ damage in the previous 24 hours. Patients were excluded if they had any illness or injury requiring immediate intervention, any significant trauma, any history of spinal cord injury, were pregnant, or had general anesthesia in the previous week. This is likely representative of the patients with whom we are concerned.

	representative sample. Also, were objective criteria used to diagnose the patients with the disorder?	
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, severe headache, and epistaxis) were excluded. Patients with more severely elevated blood pressure, those with pre-existing renal disease or 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 vision changes, abdominal pain, and syncope were not excluded, which some would consider signs concerning for potential end-organ damage.
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 enrolled were followed throughout their ED visit. Physician interviews were presumably conducted for all patients.
D.	**Were objective and unbiased outcome criteria used?** Investigators should clearly specify and define their target outcomes before the study and whenever possible they should base their criteria on objective measures.	No. The outcome involved subjective assessment of whether a test was considered likely to be abnormal based on the patients presentation, as well as subjective assessment of whether any abnormalities required further testing or consultation, medication change, or hospital admission. In addition, the study investigators subjectively ranked the likelihood that each abnormal result was due to end-organ damage from the elevated blood pressure. More objective outcomes such as stroke, MI, renal failure, or death were not assessed.
II.	**What are the results?**	
A.	**How likely were the outcomes?**	57 patients (52%, 95% CI 43%-62%) had at least one unanticipated abnormal test result. Unanticipated test abnormalities resulted in changes in management in 7 patients (6%, 95% CI 2%-11%) (Table 1). Of these: • 2 had abnormalities considered “unlikely” to be related to the elevated blood pressure. • 5 had abnormalities considered “possibly” related to the elevated blood pressure. There was complete agreement between the independent assessors of this outcome.

<table>
<tr><td></td><td></td><td>Table 1. Unanticipated clinically significant abnormalities
<table>
<tr><th>Age/Sex</th><th>Unanticipated Abnormality</th><th>Due to elevated BP?</th></tr>
<tr><td>66/F</td><td>Nonhemolytic anemia</td><td>Unlikely</td></tr>
<tr><td>49/M</td><td>Abnormal CXR</td><td>Unlikely</td></tr>
<tr><td>42/M</td><td>Renal insufficiency, hematuria, proteinuria, nonhemolytic anemia</td><td>Possible</td></tr>
<tr><td>46/M</td><td>Ischemic ECG changes</td><td>Possible</td></tr>
<tr><td>52/M</td><td>Ischemic ECG changes, renal insufficiency, proteinuria</td><td>Possible</td></tr>
<tr><td>35/M</td><td>Renal insufficiency, LVH, hypokalemia, proteinuria</td><td>Possible</td></tr>
<tr><td>47/F</td><td>Renal insufficiency, hematuria, proteinuria, nonhemolytic anemia</td><td>Possible</td></tr>
</table></td></tr>
<tr><td>B.</td><td>How precise are the estimates of likelihood? In other words, what are the confidence intervals for the given outcome likelihoods?</td><td>See above.</td></tr>
<tr><td>III.</td><td>How can I apply the results to patient care?</td><td></td></tr>
<tr><td>A.</td><td>Were the study patients and their management similar to those in my practice?</td><td>Yes. This study was conducted at 3 urban hospitals with a large proportion of African American patients (83%), similar to our institution. We frequently see adult patients with elevated blood pressure with no sign or symptoms to suggest end-organ damage.</td></tr>
<tr><td>B.</td><td>Can I use the results in the management of patients in my practice?</td><td>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 these abnormalities were the direct result of the acutely elevated blood pressure or were incidental findings. It is also unclear if hospital admission led to improved outcomes or change in management compared to outpatient follow-up in these patients.</td></tr>
</table>

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) **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

Prospective, cross-sectional study conducted at 3 urban emergency departments to assess the frequency of unanticipated test results in patients with asymptomatic hypertension leading to change in management. Out of 109 patients, 7 (6%) had abnormal results leading to a change in management. Of these, 5 patients had abnormalities that were felt likely related to the elevated blood pressure. 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.