

What is the initial work-up in the diagnosis of hypertension?

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EVIDENCE-BASED ANSWER

Patients with a new diagnosis of hypertension should be evaluated with a history and physical exam and the following initial studies: serum potassium and creatinine, fasting serum glucose and lipid panel, hematocrit, urinalysis, and electrocardiogram (strength of recommendation [SOR]: **C**, based on a consensus of expert

opinion). Consensus is lacking for measuring serum sodium, calcium, and uric acid.

Testing for microalbuminuria is optional in the work-up for a patient without diabetes (SOR: **C**, expert consensus). Some expert panels list limited echocardiography as another option.

CLINICAL COMMENTARY

Not all recommendations for working-up hypertensive patients are cost-effective

There is obvious enthusiasm among the expert panels for a detailed workup of patients with hypertension. But are the recommendations cost-effective? Annual urine dipstick testing beginning at age 30 for hypertensive patients is highly cost-effective. Identification of proteinuria and treatment with an ACE inhibitor or angiotensin receptor blocker prevents the

progression of renal disease at a quality-adjusted life-year cost of \$15,484 to \$26,320, depending on the age group.¹ Unfortunately, evaluation for secondary causes of hypertension, screening for LVH, and ruling out comorbidities have not been explicitly evaluated for cost-effectiveness.

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■ Evidence summary

There are currently no large outcome studies evaluating the initial work-up of hypertension; however, 4 international expert panels have published recommendations.²⁻⁵ These panels advise 3 initial objectives: 1) assess lifestyle and identify other cardiovascular risk factors or concomitant disorders that may affect prognosis and guide treatment; 2) search for treatable causes of high blood pressure; and 3) assess for the presence of target organ damage that would change the management of the patient (such as chronic kidney disease or heart disease).

In addition to a thorough history and physical, the following studies are recommended for patients with newly diagnosed hypertension:

Serum potassium and creatinine. All 4 panels recommend measuring serum potassium and creatinine in order to: 1) monitor the effects of diuretics and angiotensin-converting enzyme (ACE) inhibitors used in hypertension therapy, 2) screen for unexplained hypokalemia that may indicate a low-renin form of hypertension, 3) calculate baseline creatinine clearance, and 4) screen for chronic kidney disease.

Fasting blood glucose. All 4 panels recommend measuring a fasting glucose level to screen for diabetes. An abnormal glucose level may also reveal glucose intolerance, one of the diagnostic criteria of metabolic syndrome. Up to 60% of patients with diabetes also have hypertension.⁶

Fasting lipid panel. All 4 expert panels

FAST TRACK

LVH detected by ECG better predicts CV complications than LVH detected by echocardiography

recommend screening for dyslipidemia with a fasting lipid panel to assess cardiovascular risk. A cohort study evaluating 356,222 men aged 35 to 57 years found a continuous, positive, graded correlation between plasma cholesterol levels and coronary risk.⁷

Hematocrit. All 4 panels recommend a hematocrit to screen for anemia, which may be due to chronic kidney disease.

Urinalysis. All 4 panels recommend a urinalysis to screen for renal disease.

Electrocardiogram (ECG). All 4 panels recommend an ECG to screen for findings associated with hypertension, including left ventricular hypertrophy (LVH), myocardial infarction, and rhythm abnormalities. A cohort study followed 2363 patients for 14 years who had untreated hypertension and were without pre-existing cardiovascular disease. After controlling for age, sex, diabetes, and mean blood pressure, LVH by ECG conferred a significant increased risk for cerebrovascular events (relative risk=1.79; 95% confidence interval [CI], 1.17–2.76).⁸ However, in a cohort of 4684 subjects from the Framingham Heart Study, ECG had a sensitivity of only 6.9% for the detection of LVH (specificity 98.8%; positive likelihood ratio=5.3; negative likelihood ratio=0.94).⁸

Echocardiography. Two panels^{3,4} and an online text¹⁰ recommend echocardiography, preferably limited echo, as an optional study. A systematic review of studies comparing the sensitivities and specificities of ECG and echo found that each was highly specific for the detection of LVH (77%–97%), but the sensitivity of echocardiography (88%–93%) exceeded that of ECG (21%–54%). However, LVH detected by ECG is a better predictor of cardiovascular complications.¹¹ Because echocardiography may help assess disease duration and guide management, both panels recommend it for patients with severe or refractory hypertension but without other target organ damage.

Microalbuminuria. All panels listed microalbuminuria testing as an optional study for patients without diabetes because

of its association with an increased incidence of cerebrovascular disease.¹² It is unclear whether microalbuminuria results from the increased intraglomerular pressure in hypertension or if it represents glomerular damage.¹³

Sodium, calcium, uric acid. There is no consensus on the routine inclusion of several studies: serum sodium (recommended by 2 panels and an online text^{4,5,10}), serum calcium (recommended by 1 panel and the text^{2,10}), and uric acid (1 panel³ recommends it while the text¹⁰ lists it as optional).

Recommendations from others

Recommendations from major organizations are included in Evidence Summary, above.

REFERENCES

1. Boulware LE, Jaar BG, Tarver-Carr ME, Brancati FL, Powe NR. Screening for proteinuria in US adults. A cost-effective analysis. *JAMA* 2003; 290:3101–3114.
2. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension* 2003; 42:1206–1252.
3. 2003 European Society of Hypertension-European Society of Cardiology guidelines for the management of arterial hypertension. *J Hypertens* 2003; 21:1011–1053.
4. Hemmelgarn BR, Zarnke KB, Campbell NRC, et al. The 2004 Canadian Hypertension Education Program recommendations for the management of hypertension: Part I—Blood pressure measurement, diagnosis and assessment of risk. *Can J Cardiol* 2004; 20:31–40.
5. Institute for Clinical Systems Improvement (ICSI). *Hypertension Diagnosis and Treatment*. Bloomington, Minn: ICSI; 2004.
6. Arauz-Pacheco C, Parrott MA, Raskin P. The treatment of hypertension in adult patients with diabetes. *Diabetes Care* 2002; 25:134–147.
7. Stamler J, Wentworth D, Neaton JD. Is relationship between serum cholesterol and risk of premature death from coronary heart disease continuous and graded? Findings in the 356,222 primary screenees of the Multiple Risk Factor Intervention Trial (MRFIT). *JAMA* 1986; 256:2823–2828.
8. Verdecchia P, Porcellati C, Ambrosio G, et al. Left Ventricular Hypertrophy as an independent predictor of acute cerebrovascular events in essential hypertension. *Circulation* 2001; 104:2039–2044.
9. Levy D, Labib SB, Anderson KM, Christiansen JC, Kannel WB, Castelli WP. Determinants of sensitivity and specificity of electrocardiographic criteria for left ventricular hypertrophy. *Circulation* 1990; 81:815–820.
10. Kaplan, NM. Initial evaluation of the hypertensive patient. UpToDate Monograph. Available at www.uptodate.com.
11. Dijkstra RF, van Schayck CP, Bakx JC, Thien T, Verheugt FW, Mookink HG. Left ventricular hypertrophy; differences in the diagnostic and prognostic value of elec-

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CLINICAL INQUIRIES

trocardiography and echocardiography. *Ned Tijdschr Geneesk* 1997; 141:1969-1972.

- Gerstein HC, Mann JF, Yi Q, Yusuf S, et al. Albuminuria and risk of cardiovascular events, death, and heart failure in diabetic and non-diabetic individuals. *JAMA* 2001; 286:421-426.
- Rosa TT and Palatini P. Clinical value of microalbuminuria in hypertension. *J Hypertens* 2000; 18:645-654.

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