Clinical Decision Making in Hypertension

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With the abundance of published data, numerous available pharmacologic agents, and multiple clinical practice guidelines, the task of individualizing hypertension treatment can be dauntingly complex. These authors present a clear cut approach to translating evidence into best practice.

The relationship between high blood pressure and cardiovascular disease (CVD) has been established for well over a century. In 1913, Janeway commented that a systolic blood pressure (SBP) level above 160 mm Hg is pathologic.[1] Over the decades that followed, overwhelming information has been presented that confirms this association.

When effective pharmacologic agents for lowering blood pressure became available in the 1950s and 1960s, the focus of care shifted from the concept of preventing hypertension-related diseases to the primary treatment of hypertension itself. Currently, there are more medications used, alone or in combination, to treat hypertension than almost any other disease. In addition, several different organizations have issued guidelines and recommendations for treating hypertension—which don't always agree on all points. Given these factors, the task of making informed clinical decisions about the best approach for managing hypertension in each individual patient can be daunting.

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In order to help clinicians make sense of the abundance of data, we present an overview of the current evidence regarding when and how to treat patients for hypertension. In addition, we compare the major hypertension clinical practice guidelines and provide tips for choosing the right guideline and enhancing provider adherence.

IMPORTANCE OF RISK ASSESSMENT

Determining whether a patient with high blood pressure requires pharmacologic treatment entails much more than simply looking at a table of blood pressure values. The concept of using threshold blood pressure levels for hypertension implies that there is an absolute point at which lower values are normal, or indicative of low cardiovascular risk, and higher values are indicative of an elevated risk. This goes hand in hand with the previously held belief that a person either has high blood pressure or does not—much in the same way that a woman either is pregnant or is not. Over the years, however, we have come to understand that a categorical approach to classifying blood pressure is of little value. There is a direct association between blood pressure and cardiovascular risk, and there is no blood pressure value at which this risk becomes null.[2,3]

On the contrary, because of the vast number of "nonhypertensive" patients with concomitant cardiovascular risk factors, the total burden of blood pressure-related disease is actually greater in so-called nonhypertensive patients than in those with blood pressure levels traditionally considered high.[4] Consequently, categorical values for systolic or diastolic blood pressure do not predict accurately whether a patient will have a cardiovascular event in the future.[5]

This highlights the importance of first determining patients' global cardiovascular risk and then determining whether, based on this risk, their blood pressure levels fall into defined low, medium, high, or very high risk categories—an approach that is advocated by most clinical practice guidelines for evaluating and treating hypertension.[6–10] For example, a patient with an SBP between 140 and 159 mm Hg or a diastolic blood pressure (DBP) between 90 and 99 mm Hg might not need pharmacologic therapy if his or her 10-year absolute risk for coronary heart disease (CHD) is below 15%.[10]

Perhaps it would be better for clinicians to bring the focus of hypertension management back to the prevention of associated diseases rather than lowering blood pressure below a fixed point. This approach provides a rationale for prescribing blood pressure lowering medications to patients at high cardiovascular risk, irrespective of their blood pressure levels.[11]

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ASSESSING CARDIOVASCULAR RISK

Since hypertension adversely affects multiple organ systems, it's important to differentiate between CVD and CHD. CHD is limited to angina, recognized and unrecognized myocardial infarctions, unstable angina, and coronary death. CVD is a more general term that includes stroke, ischemic heart disease, heart failure, and peripheral vascular disease.

Clinicians should conduct a formal assessment of the patient's CHD risk using a validated instrument. The most commonly used tool is the Framingham risk equation (Figure).[12,13] For most patients, especially those over the age of 45 years, it's appropriate to calculate a 10-year absolute risk for CHD events.

Generally, relative risk calculations should be reserved for young adults because relative risk decreases with advancing age. For example, a 30-year-old woman with a blood pressure level of 150/95 mm Hg would have a higher CHD risk relative to a 30-year-old woman with a blood pressure level of 120/70 mm Hg, but her absolute risk of having a CHD event over the next 10 years would be very low. Young patients with a high relative risk should be treated initially with lifestyle modification, since the use of drug therapy may not be cost-effective.

INITIATING PHARMACOLOGIC THERAPY

In 2006, it's projected that the costs associated with hypertensive disease in the United States will reach $63.5 billion.[14] At $24.4 billion, the largest single cost relates to drug therapy.[14] Because of the substantial economic impact of pharmacologic therapy for hypertension, it's imperative to com-

1. For each of the following risk factors, assign a point value based on the accompanying scale:

a. Age (years)

Age	Men	Women	Age	Men	Women
20–34	–9	–7	55–59	8	8
35–39	–4	–3	60–64	10	10
40–44	0	0	65–69	11	12
45–49	3	3	70–74	12	14
50–54	6	6	75–79	13	16

b. Total cholesterol (TC) level (mg/dL)

TC level	Ages 20–39		Ages 40–49		Ages 50–59		Ages 60–69		Ages 70–79	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
< 160	0	0	0	0	0	0	0	0	0	0
160–199	4	4	3	3	2	2	1	1	0	1
200–239	7	8	5	6	3	4	1	2	0	1
240–279	9	11	6	8	4	5	2	3	1	2
≥ 280	11	13	8	10	5	7	3	4	1	2

c. High-density lipoprotein (HDL) cholesterol level (mg/dL)

HDL level	All patients
≥ 60	–1
50–59	0
40–49	1
< 40	2

d. Systolic blood pressure (SBP) level (mm Hg), treated and untreated

SBP level	Untreated		Treated	
	Men	Women	Men	Women
< 120	0	0	0	0
120–129	0	1	1	3
130–139	1	2	2	4
140–159	1	3	2	5
≥ 160	2	4	3	6

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Figure. Framingham point system for estimating 10-year absolute coronary heart disease risk.[13]

pare the efficacy of the various regimens and to make decisions about the best, most cost-effective treatments in various situations. If one class is clearly superior, then its preferential use could potentially avert thousands of major cardiovascular events (including stroke) each year.

The most sound data evaluating the effects of different blood pressure regimens on cardiovascular events come from the Blood Pressure Lowering Treatment Trialists' Collaboration.[15] This evidence-based medicine group reviewed data from 29 randomized trials, involving over 160,000 patients and representing over 700,000 patient-years of follow-up. The group found no regimen to be clearly superior to the others in terms of total mortality.

There were differences, however, in certain cardiovascular outcomes. Calcium channel blockers were more effective in stroke prevention compared to angiotensin converting enzyme (ACE) inhibitors or diuretics/beta-blockers, but were inferior to these drugs in heart failure prevention. There was a trend toward superiority of ACE inhibitors in preventing CHD events, but there was no clear winner in preventing cardiovascular death. Based on these findings, the group supports the premise that any commonly used antihypertensive regimen reduces the risk of total major cardiovascular events.[15] Because of the cost implications, most regimens probably should include a thiazide-type diuretic.

SETTING TARGET BLOOD PRESSURE LEVELS

Deciding whether or not to initiate a pharmacologic agent to lower a patient's blood pressure is only the first hurdle in the clinical decision making process. Clinicians and patients also must agree on the target blood pressure level that should be achieved for optimal outcomes.

Few randomized, controlled trials have been conducted in which

e. Smoking status

Smoking status	Ages 20–39		Ages 40–49		Ages 50–59		Ages 60–69		Ages 70–79	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Nonsmoker	0	0	0	0	0	0	0	0	0	0
Smoker	8	9	5	7	3	4	1	2	1	1

2. Determine 10-year absolute risk based on sum of points, according to the scale below

Men		Women	
Point total	10-year absolute risk (%)	Point total	10-year absolute risk (%)
< 0	< 1	< 9	< 1
0–4	1	9–12	1
5–6	2	13–14	2
7	3	15	3
8	4	16	4
9	5	17	5
10	6	18	6
11	8	19	8
12	10	20	11
13	12	21	14
14	16	22	17
15	20	23	22
16	25	24	27
≥ 17	≥ 30	≥ 25	≥ 30

Figure. (continued) Framingham point system for estimating 10-year absolute coronary heart disease risk.[13]

patients were assigned to different levels of blood pressure control.[16,17] Therefore, specific target pressures are somewhat arbitrary, and the goal of blood pressure lowering should be individualized.

For most patients, a target SBP of less than 140 mm Hg and a DBP of less than 90 mm Hg are recommended. Patients with diabetes or renal disease should aim for a lower target of less than 130/80 mm Hg.

Since the level of proteinuria also has an impact on target blood pressure levels in patients with renal disease and hypertension, clinicians should be sure to obtain this measurement. In patients with urine protein levels of more than 1 g/day, the blood pressure goal should be less than 125/75 mm Hg. In a recent systematic review, Jafar and colleagues extracted data from 11 randomized, controlled trials comparing the efficacy of various antihypertensive regimens in patients with predominantly nondiabetic renal disease.[18] The authors concluded that an SBP goal between 110 and 129 mm Hg might be beneficial for patients with urine protein levels exceeding 1 g/day, but an SBP level less than 110 mm Hg may be detrimental. In these patients, the DBP level had little predictive value.

Most of the data addressing the question of whether the blood pressure target should be based on SBP, DBP, or pulse pressure (PP)—a value obtained by subtracting the DBP from the SBP—have come from observational studies and relate to the risk of future cardiovascular events. The prognostic significance of PP in identifying patients at high risk for heart failure and other cardiovascular events has been reported,[19–21] but the use of target PP values to guide therapy is poorly defined. Since patients with an elevated PP value invariably have systolic hypertension, it is best to assign an appropriate SBP target level for these patients.

A common clinical concern is that aggressive lowering of SBP will cause excessive lowering of DBP. Expert opinion and observational data suggest that DBP should not be reduced to levels below 65 to 70 mm Hg while treating systolic hypertension.[22]

Data from randomized trials are needed before any recommendations can be made regarding the use of PP reduction as a specific target for therapy.

ROLE OF CLINICAL PRACTICE GUIDELINES

Clinical practice guidelines have been defined as "systematically developed statements to assist practitioner and patient decisions about appropriate [health care] for specific clinical circumstances."[15] As such, these guidelines should evaluate available evidence to formulate recommendations that influence clinicians' decisions.

While most clinicians look to clinical practice guidelines when making decisions on hypertension treatment, many are not aware of all the guidelines available or which ones are best to use in a given situation. The major hypertension guidelines include the British Hypertension Society (BHS) guideline,[6] the Scottish Intercollegiate Guidelines Network (SIGN) guideline,[7] the Canadian Hypertension Education Program (CHEP) guideline,[8] the European Society of Hypertension and European Society of Cardiology (ESH/ESC) guideline,[9] and the seventh version of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) guideline.[23] With multiple guidelines available to address hypertension, close attention must be given to the quality and scientific validity of each.

Issues to address in evaluating clinical practice guidelines include the guideline developers' methods for assessing the validity of study results and for determining the strength and clinical importance of recommendations.[24,25] The SIGN, CHEP, and JNC 7 guideline developers all used searches of electronic databases to collect and select evidence and provided detailed descriptions of the process (Table).[6–9,23] These guidelines also include descriptions of the methods used to formulate recommendations. Only the BHS, SIGN, and CHEP guidelines, however, used a rating scheme to assess both the quality and strength of the evidence and the strength of the recommendations. Methods of validation included external and internal peer review for all guidelines except the BHS and ESH/ESC guidelines. These two were subjected to internal peer review only. All of the major hypertension guidelines provide detailed descriptions of financial disclosures or conflicts of interest with the exception of the BHS guidelines.

When deciding which clinical practice guideline is most appropriate in a given situation, you must consider several additional factors. First, does the population targeted in the guideline match your population? The SIGN guidelines specifically address the over-60 age group, while the others refer to older patients only as a subgroup. Second, what is the purpose of the guideline? Some, like the ESH/ECS, are primarily educational and are not designed to serve as clinical tools.

All of the major hypertension guidelines have similar recommendations for treating patients with specific comorbid conditions. Not all of them, however, agree on the SBP or DBP level that requires drug therapy or whether factors such as cardio-

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Table. Hypertension guideline comparison[6–9,23]

Parameter of comparison	Guideline				
	BHS*,[6]	SIGN†,[7]	CHEP‡,[8]	ESH/ESC§,[9]	JNC 7‖,[23]
Year released	2004	2001	2006	2003	2003
Methods for collecting/ selecting evidence	Not specified	Electronic database searches: internet search to identify literature relating to HTN¶ in elders including RCTs,# meta-analyses, and existing HTN guidelines; covered range of general and specialized search engines and medical sites	Systematic review of literature supplemented by personal files to 10/05	Not specified (but authors stated that large RCTs and meta-analyses provided the strongest evidence, and scientific evidence also was used)	Electronic database searches: executive committee identified relevant MeSH** terms, which were used to generate MEDLINE searches focused on English language, peer-reviewed literature from 1/97–4/03
Methods for assessing quality and strength of evidence	Weighting according to rating scheme (Ia, Ib, IIa, IIb, III, IV)	Weighting according to rating scheme (Ia, Ib, IIa, IIb, III, IV)	Evidence-based grading scheme (a–h)	Expert committee	Expert consensus (committee)
Methods for formulating recommendations	Authors were members of BHS executive committee who formed the working party Chair produced first draft from each member's written scenarios Draft reviewed by BHS membership and comments used to modify subsequent drafts Manuscript reviewed and ap-	Evidence tables compiled, summarizing all validated studies from systematic literature review Recommendations based on concept of considered judgment, with subsequent assignment of a level of evidence or "good practice point"	Used Central Review Committee, comprised of methodologists, to improve grading consistency Conference held to discuss recommendations and evidence Draft recommendations presented nationally and revised	Members of guidelines committee, appointed by ESH/ESC and endorsed by International Society of Hypertension, participated independently in guideline preparation, drawing on academic and clinical experience and using objective and critical ex-	Executive committee met six times, including two meetings with entire High Blood Pressure Education Program Coordinating Committee Writing teams met by teleconference and used electronic communications to develop report

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Table. Hypertension guideline comparison[6–9,23] (continued)

Parameter of comparison	Guideline				
	BHS*,[6]	SIGN†,[7]	CHEP‡,[8]	ESH/ESC§,[9]	JNC 7‖,[23]
Methods for formulating recommendations (continued)	proved at each draft stage by all working party members and based on collective interpretation of current clinical evidence	Group reached consensus on all recommendations	Voted on recommendations and ratified those achieving > 70% acceptance Recommendations implemented and evaluated	amination of available literature Guidelines prepared on basis of best available evidence Recommendations directed toward management of patients in their own region	24 drafts created and reviewed reiteratively Executive committee used modified nominal group process at meetings to identify and resolve issues
Rating scheme for strength of recommendation	Grades (A, B, C, D)	Grades (A, B, C) and good practice points	Grades (A, B, C, D)	N/A	N/A
Method for validating guideline	Internal peer review only	External and internal peer reviews	External and internal peer reviews	Internal peer review only	External and internal peer reviews
Basis for initiation of antihypertensive therapy	SBP†† and DBP‡‡ levels; target organ damage; CV§§ disease; diabetes; 10-year CHD‖‖ risk ≥ 15%	SBP and DBP levels; CHD risk; CV risk factors; target organ damage; associated clinical conditions	SBP and DBP levels; target organ damage; CV risk factors	SBP and DBP levels; CV risk factors; diabetes; target organ damage; associated clinical conditions	SBP and DBP levels
Financial disclosures/ conflicts of interest outlined in detail?	"Competing interests: None declared"	Yes	Yes	Yes	Yes

*BHS = British Hypertension Society. †SIGN = Scottish Intercollegiate Guidelines Network. ‡CHEP = Canadian Hypertension Education Program. §ESH/ESC = European Society of Hypertension/European Society of Cardiology. ‖JNC 7 = Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. ¶HTN = hypertension. #RCT = randomized, controlled trial. **MeSH = Medical Subject Headings. ††SBP = systolic blood pressure. ‡‡DBP = diastolic blood pressure. §§CV = cardiovascular. ‖‖CHD = coronary heart disease.

vascular risk or target organ damage should be considered in the decision to initiate drug therapy. Most do agree on which agents should be considered first-line therapies for hypertension.

Successful implementation of guidelines can reduce variations in health care and, ideally, enhance

health care quality by applying the best, most up-to-date evidence to clinical decision making. These improved outcomes are only possible, however, when clinicians are able to use the guidelines consistently and appropriately in their practice.[26] Cabana and colleagues reviewed barriers to physician adherence to clinical practice guidelines and identified seven categories of barriers within three main areas: physician knowledge (lack of awareness and lack of familiarity), physician attitudes (lack of agreement, lack of self-efficacy, lack of outcome expectancy, and inability to overcome the inertia of previous practice), and physician behavior (external barriers, which may be related to the guidelines, the patients, or the practice environment).[27] The best strategies for improving clinicians' adherence to clinical practice guidelines likely vary between settings as barriers to adherence differ.

TRANSLATING EVIDENCE INTO BEST PRACTICE

The goal of health care decision making is to select the action that is most likely to deliver the outcomes desired by both provider and patient.[28] The first step in the process is a thorough evaluation of the evidence. Fortunately, there is good evidence available on the treatment of hypertension.

Next, the clinician must decide whether the benefits of therapy outweigh the potential harm to the patient. The risk-benefit ratio for antihypertensive agents is considered very favorable. The costs of the desired health outcomes also must be evaluated. In general, patients at highest risk for cardiovascular events benefit the most from antihypertensive treatment.

At some point, clinicians must decide at what level of risk drug therapy is not cost-effective. This does not mean that these low risk patients will not benefit from pharmacologic management; it is a reflection of the unfortunate reality that resources are not available to treat everyone. This underscores the importance of assessing the patient's overall CHD risk rather than basing treatment decisions solely on blood pressure parameters.

After a close evaluation of available guidelines, health system administrators can select the best one to disseminate among their providers. Having key opinion leaders tailor this guideline to address concerns unique to the practice environment can enhance the likelihood of adoption in a particular health care system. In 2004 the VHA and DoD undertook such a project when they updated their hypertension guideline based on the JNC 7 guideline.[29] Additionally, the overall evaluation process should include processes to benchmark the quality of care before and after guideline implementation.

EVIDENCE-BASED SUMMARY STATEMENT

Prior to initiating drug therapy, assess the patient's global cardiovascular risk. If the 10-year absolute CHD risk is high (greater than 20%), pharmacologic therapy is warranted. Most patients will need more than one agent to reach their target blood pressure. A regimen including a thiazide-type diuretic would be appropriate for a majority of hypertensive patients to achieve a target blood pressure of less than 140/90 mm Hg. ●

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