Treating Acute Hypertension in the Hospital
A Lacuna in the Guidelines

Alan B. Weder

Physicians treat chronic hypertension almost exclusively in ambulatory care settings according to evidence-based guidelines based on blood pressure (BP) measurements obtained under prescribed conditions. Other recommendations cover how to deal with hypertension in dialysis units and emergency departments, but none address a very commonly encountered problem: what to do about acutely elevated BP (which I refer to below in the common parlance of “acute hypertension”) in patients hospitalized for reasons other than hypertension. Indeed, excluding articles on patients with hypertensive emergencies and urgencies, there is little published about treatment of acutely elevated BP in hospitalized patients, although the practice seems to be common and based on firmly held, but poorly justified, beliefs.

In this commentary, I argue for developing a rational approach to treating acute hypertension that de-emphasizes “treating the numbers” and focuses on patient safety.

How Common Is Acute Hypertension in Hospitalized Patients?
Most patients hospitalized for reasons other than hypertensive emergency or urgency who subsequently sporadically manifest acute hypertension deemed worthy of clinical concern probably also have chronic hypertension. In recent national data of hospitalizations, hypertension was listed as a primary diagnosis (International Classification of Diseases [ICD]–9 CM code 401) for 301,000 admissions but as a secondary diagnosis for 9,003,000 hospitalizations. These figures are probably an underestimate of the actual prevalence of hypertension in inpatients because 29% of the US adult population is now affected. One estimate of the rate of hypertension in patients in our center (the University of Michigan Health System [UMHS]) can be derived from patients attending our anesthesiology preoperative evaluation clinic who have an incidence of 26.7% of stage 1 and 10.9% of stage 2 hypertension (unpublished data, 2010). Using these prevalence figures, during a 1-year period (October 1, 2007, to September 30, 2008) in which there were 29,545 adult admissions to UMHS, some 11,100 patients were probably hypertensive. Even this estimate is lower than that suggested by the results of a survey of UMHS full-time hospitalists (n = 31), in which the modal estimate of the prevalence of established hypertension was 50% (Figure 1, left panel). In addition, patients without previously diagnosed hypertension will be encountered (Figure 1, right panel), and even normotensive patients may experience situations (eg, anxiety or pain) that provoke transient hypertension. Although we cannot directly assess how many chronic hypertensives have acutely elevated hypertension while in hospital, it seems likely that many do.

Physician Responses to High BP in Hospitalized Patients
Long-term control of hypertension in outpatients is clearly important because it prevents cardiovascular complications; controlling BP in patients hospitalized for reasons other than hypertension is of no proven value. Indeed, 2 meta-analyses failed to find a benefit of antihypertensive treatment even in patients hospitalized for hypertensive urgencies and emergencies, and it seems doubtful that acute hypertension in the absence of target organ damage confers any greater risk. Nonetheless, Axon et al report that physicians strongly believe that inpatient hypertension control is important and that they very frequently initiate or adjust medications to achieve BP control in hospitalized patients, often at BP levels that are only modestly elevated. In addition, approximately one third of our house officer and hospitalist physicians consider hypertension, even in the absence of target organ damage, to be a sufficient reason for transfer to an intensive care unit (Table); many report a willingness to do so at BP levels that physicians in our hypertension group frequently encounter in the outpatient clinic and that rarely prompt hospital admission. My impression is that many physicians “treat the numbers” in hospitalized patients and that those numbers mostly reflect physician trepidation.

Treatment decisions may well be based on extrapolation from Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC)–7 guidelines because the modal value for the threshold for medication adjustment for many physicians is near that for stage 2 hypertension (Figure 2). There are good reasons to think that applying outpatient criteria to inpatient decision-making is inappropriate. First, it is often not possible to adhere to the American Heart Association methodological recommendations required to ensure accurate readings in clinic settings (eg, having the patient seated in a quiet setting for 5 minutes). Second, although they know that situational factors (eg, anxiety and pain) can cause BP to rise acutely, it is unclear whether physicians evaluate such factors when considering the need for treatment. Finally, a focus on JNC-7 BP thresholds alone ignores the additional guidance offered in the recommendations as to how quickly to treat. For
asymptomatic stage 2 hypertension, physicians should “evaluate or refer to source of care within 1 month. For those with higher pressures (eg, >180/110 mm Hg), evaluate and treat immediately or within 1 week, depending on clinical situation and complications.”\(^1\) In inpatient settings, acute hypertension in asymptomatic patients is very often perceived as a problem requiring immediate treatment, often within minutes or hours, which encourages reliance on intravenous therapies such as labetalol and hydralazine.\(^7\)

**What Are the Consequences of Treating Acute Hypertension?**

In addition to being poorly justified, treatment of acute hypertension is frequently overly aggressive. Because of the perceived need to lower BP quickly, intravenous agents are often favored. Dr Erickson and I previously examined the use of 2 agents frequently used at UMHS for treatment of acute hypertension (and probably for little else): intravenous labetalol and hydralazine.\(^7\) These drugs are usually effective in lowering BP, but because there is no proven benefit of treatment, the potential exists for an adverse risk–benefit ratio. We have yet to try to ascertain whether the use of these agents is actually associated with adverse outcomes, but for hydralazine, the reflex stimulation of the sympathetic nervous system provoked by a sudden drop in BP is similar (although probably less pronounced) to that seen with sublingual nifedipine, a treatment now universally abjured.\(^1\) Labetalol, although preventing a reflex rise in heart rate, could increase the magnitude of the orthostatic BP decrease that results from bed rest,\(^10\) which could lead to cerebral underperfusion, particularly in the elderly. UMHS recently implemented an algorithm that relies on the conservative use of oral agents for treating acute hypertension when necessary. I believe that this approach, although admittedly not based on any evidence of benefit, will decrease the possibility of harm.

In addition to creating a perceived need for treatment during hospitalization, concern about acute hypertension may affect other aspects of medical management. Of patients who have “as-needed” treatment with intravenous labetalol or hydralazine ordered at admission for a BP above an arbitrary threshold, those who actually receive such treatment have much longer hospitalizations than those for whom treatment is ordered but not administered: hospital length of stay was 10.6±13.1 days (mean±SD) for patients receiving hydralazine, 9.6±11.1 days for those receiving labetalol, 13.5±18.9 days for patients who received both drugs, and 6.5±9.7 days for patients for whom drugs were ordered but not administered.\(^7\) Although it is likely that patients treated for acute hypertension are sicker or are cared for in settings in which aggressive BP control is deemed appropriate (eg, intensive care units), only 2.9% had ICD-9 codes documenting conditions typically thought to require prompt BP lowering (ICD-9 codes 437.2

![Figure 1](http://hyper.ahajournals.org/)

Figure 1. Estimates of full-time hospitalists (n=31) of the percentage of patients admitted to the UMHS for reasons other than hypertension who are known to have hypertension (left panel) or are newly diagnosed as having hypertension during the hospitalization (right panel).

![Table](http://hyper.ahajournals.org/)

**Table. Attitudes of UMHS Physicians Toward Transferring Patients to ICU for Acute Hypertension**

<table>
<thead>
<tr>
<th>Response</th>
<th>Physician Group</th>
<th>Percentage</th>
<th>Systolic BP (Mean±SD)</th>
<th>Diastolic BP (Mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>House officers</td>
<td>38%</td>
<td>210±18</td>
<td>117±13</td>
</tr>
<tr>
<td></td>
<td>Hospitalists</td>
<td>32%</td>
<td>193±17</td>
<td>110±10</td>
</tr>
<tr>
<td>No</td>
<td>House officers</td>
<td>62%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospitalists</td>
<td>68%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responses of UMHS house officers (n=130) and hospitalists (n=31) to the questions: “Would you transfer an asymptomatic patient to an intensive care unit because of high BP even in the absence of target organ damage?” And “If ‘yes,’ what is the BP that would prompt the transfer?”

![Figure 2](http://hyper.ahajournals.org/)

Figure 2. Levels of systolic (top) and diastolic BP (bottom) at which initiation or change in antihypertensive medications is appropriate in a patient hospitalized for reasons other than hypertension. UMHS postgraduate year 1 to 3 house officers (n=130).
[hypertensive encephalopathy]; 436 [cerebral vascular accident/cerebral infarction]; 430, 431, 432.0 to 432.9 [subarachnoid hemorrhage]; 428.1 [acute left ventricular dysfunction]; 506.1, 518.4 [acute pulmonary edema]; and 441.0 to 441.3 [aortic dissection]).

Although we do not know why UMHS patients treated with intravenous antihypertensives have longer lengths of stay, and we do not know how prevalent this phenomenon is outside our system, because of the possible cost implications, further investigation is warranted.

Although only about a third of UMHS physicians believe that a markedly elevated BP should prompt intensive care unit transfer, they overwhelmingly assert that there is a level of BP that should delay discharge in patients otherwise deemed fit to go home. Interestingly, the mean values suggested are ones that are considered quite appropriate for outpatient management in JNC-7 guidelines: 182/106 mm Hg for house officers and 191/110 mm Hg for hospitalists. Why the failure to control hypertension in a hospitalized patient should provoke concern at the time of planned discharge is puzzling. I suggest that the issue of how the perceived need to treat acute hypertension affects length of stay is worthy of study because optimizing the length of stay by treating hypertension in the most appropriate setting (ie, usually as an outpatient) is obviously desirable.

The transition to outpatient care is also a source of concern because 91% of physicians believe it to be appropriate to discharge patients in whom antihypertensive medications have been adjusted in the hospital on the final regimen established during hospitalization rather than that in place at the time of admission. For those hypertensives initially diagnosed during an inpatient stay, this practice is reasonable. However, for patients treated previously in an outpatient setting, it is unlikely that the physician providing that care will be the one managing inpatient treatment, and changing an established antihypertensive regimen may disrupt continuity of care. Outpatient care providers already operate under daunting time constraints, and re-establishing regimens previously deemed appropriate does not seem a good use of a limited resource.

Finally, if the assertion that we are mostly treating BP numbers in our inpatients is correct, we should at least be able to rely on the accuracy of the values on which we base that treatment. Conversations with nurses at UMHS reveal that nurse aides, who are usually charged with obtaining BPs, are rarely trained in the technique of BP recording. Indeed, nurses themselves report that other than during nursing school, they have never been observed while measuring BP or certified for accuracy (personal communications). At UMHS, we rely on automated oscillometric devices for monitoring BP in most inpatients, and the usual practice is to simply read a number from the display and assume that value represents a reliable estimate of BP. When values above those ordered for triggering physician contact or drug administration are observed, measurements are usually repeated using the oscillometric monitor, but in general, little attention is paid to concomitant conditions (eg, pain or anxiety) or factors generally controlled for in outpatient settings (eg, posture and arm position). Physicians report that it is unusual for them to actually retake a BP themselves before treating.

Treating Acute Hypertension in Hospitalized Patients

I hope this commentary will stimulate discussion of and research into why physicians feel the need to treat acute hypertension and how we do it. Although most of my experience stems from studies at UMHS, collaboration with investigators at the Medical University of South Carolina demonstrates that the attitudes and practices are not unique to one institution. We urge other investigators, particularly those with access to electronic patient records and pharmacy databases, to study the practice of treating acute hypertension in hospitalized patients with the goal of making the practice rational, effective, and safe.

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References


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