

## Management of Asymptomatic Hypertension in the Inpatient Setting

Charles Meadows, MD<sup>1</sup>, Mehiar El-Hamdani, MD<sup>1</sup>,  
Larry Dial, MD<sup>1</sup>, Murad Kheetan, MD<sup>1</sup>, Khaled Al-Baqain, MD<sup>1</sup>

### ABSTRACT

Hypertension is common in hospitalized patients and is most often asymptomatic. While there are no guidelines for managing such patients, aggressive blood pressure treatment, including using intravenous antihypertensives, is often undertaken. Although beneficial evidence is lacking, emerging data suggest that treating asymptomatic hypertension in the inpatient setting is associated with adverse outcomes, including acute kidney injury and ischemic stroke. In addition, intensifying a preexisting antihypertensive regimen at hospital discharge significantly increases the risk of readmission without significant improvement in outpatient hypertension control. Combining this common problem with the demonstrable benefit of a less aggressive approach offers considerable opportunity to improve patient care. This review will discuss the existing literature with a clinical scenario and make suggestions for practice improvement.

### KEYWORDS

Hypertension

*Author affiliations are listed at the end of this article.*

### Corresponding Author:

Charles Meadows, MD  
Marshall University  
Joan C. Edwards  
School of Medicine  
[cmeadows@marshall.edu](mailto:cmeadows@marshall.edu)

### INTRODUCTION

Hypertension is a common disorder, present in 29% of adult outpatients.<sup>1</sup> Its status as a risk factor for myocardial infarction and stroke is well established, as is the risk reduction seen with lowering blood pressure, usually with antihypertensive medications. Complete guidelines for diagnosis and treatment are complex and beyond the scope of this paper; however, current American Heart Association (AHA) guidelines define hypertension as blood pressure > 130/80 mmHg, on multiple occasions, using proper measurement techniques.<sup>2</sup> European guidelines differ slightly, using 140/90 mmHg as the principal threshold.<sup>3</sup> Using AHA definitions, elevated blood pressure occurs in up to 72% of inpatients. However, evidence supporting the treatment of asymptomatic hypertension in inpatients is lacking. Indeed, there are no guidelines that specifically address this common issue.<sup>4</sup> Despite the lack of evidence, routine administration of antihypertensives is common in this setting.<sup>5,6</sup>

Several hypertension scenarios require aggressive

treatment. Hypertensive emergency is defined by elevated blood pressure (>180/110 mmHg) with acute end-organ dysfunction (acute heart failure, intracerebral hemorrhage, posterior reversible encephalopathy syndrome, acute renal failure). Reducing blood pressure by 20-25% within 1 hour with intravenous antihypertensives (labetalol, nicardipine, nitroprusside, hydralazine) is recommended and associated with improved short-term outcomes.<sup>7</sup> These patients should be admitted to an intensive care unit with placement of an arterial line. The term "malignant hypertension" is similar and generally refers to the presence of diffuse microvascular injury (acute retinopathy, microangiopathy, acute renal failure). This, too, constitutes a hypertensive emergency.<sup>7</sup> Elevation of blood pressure >180/110 mmHg with symptoms potentially attributable to blood pressure (headache, nonspecific chest pain) but without clear end-organ damage is termed "hypertensive urgency." Acute lowering of blood pressure is not urgently required, and intravenous medications are not recommended.<sup>7</sup> Treatment improves long-term but not short-term outcomes.<sup>8</sup> In addition, certain conditions (like aortic



dissection), even without elevated blood pressure >180/110 mmHg, require aggressive and acute blood pressure control.

## CLINICAL SCENARIO

A 60-year-old man with a history of hypertension, chronic back pain, emphysema, and coronary artery disease presented to the emergency department with several days of dyspnea and a cough productive of yellow sputum. Home medications included metoprolol and losartan. A chest x-ray suggested pneumonia. Vital signs and labs were unremarkable except for a temperature of 100.4 and mild leukocytosis. On the second hospital day, he complained of increased lower back pain; his blood pressure was 170/100 mmHg. The nursing staff called the resident, who ordered 10mg of intravenous hydralazine without assessing the patient. The following day he was found to have an acute kidney injury, which resolved after 3 days. Based on several elevated blood pressure readings during his stay, the patient was discharged on a modified regimen adding amlodipine 5mg daily. Three days later, he became dizzy upon standing and fell, sustaining a hip fracture requiring surgical repair and inpatient rehabilitation.

The patient sustained adverse events likely attributable to the aggressive treatment of elevated inpatient blood pressure readings. He was given intravenous antihypertensive medication for a high blood pressure reading not associated with end-organ damage or symptoms. The resident physician ordered the medication without any acute assessment of the patient. In addition, he was discharged with an intensified antihypertensive regimen. Each of these decisions probably stemmed from the general perception of hypertension as harmful. This is a perception shared by most of the general public and healthcare providers.<sup>9</sup> The frequency of elevated blood pressure in inpatients and the perception of hypertension requiring treatment means that the scenario this patient experienced is likely playing out with considerable frequency. The last decade has brought many studies addressing this important issue and offering evidence-based guidance.

## INPATIENT HYPERTENSION

Most patients with elevated blood pressure in the inpatient setting fall into the category of “asymptomatic hypertension,” which this review will define as blood pressure >140/90 mmHg in the absence of acute end-organ dysfunction, with or without a previous diagnosis of hypertension. A majority of inpatients experience elevated blood pressure readings, but previous studies suggest that only 2-3% of inpatients truly require acute treatment.<sup>10</sup> In the absence of a hypertensive emergency or urgency, the clinician has time to consider what strategy best suits the patient. Pain, stress, and anxiety likely contribute in many cases.<sup>11</sup> Acute assessment of a patient with elevated blood pressure will likely provide information as to whether one of these factors is present. A short period of quiet rest has been shown to drop blood pressure significantly in a third of patients.<sup>12</sup> Individual assessment is also needed to determine whether end-organ dysfunction is present. Intermittent elevation of blood pressure in a patient with no symptoms or signs of organ dysfunction does not require treatment with antihypertensive medication. Requiring assessment of a high reading before any treatment has been shown to decrease reflexive treatment with intravenous antihypertensives.<sup>11</sup>

Some patients with asymptomatic hypertension will have blood pressure readings >180/110 mmHg, sometimes termed “severe hypertension.” Studies on similar outpatients show that short-term risk in these patients is very low.<sup>13</sup> Nonadherence to prescribed antihypertensive medications is the most substantial risk factor for severe hypertension.<sup>14</sup> More than half of patients with severe hypertension have been prescribed 2 or more antihypertensives chronically.<sup>13</sup> The presence of a somatoform disorder and a higher number of antihypertensive prescriptions are also associated, and seemingly linked, with nonadherence.<sup>13,14</sup> Coronary heart disease and prior stroke are associated with an increased risk of severe acute hypertension.<sup>14</sup> Hyperthyroidism, NSAIDs, illicit drugs, and systemic glucocorticoids have also been shown to elevate blood pressure.<sup>7</sup>

Chronic hypertension is associated with autoregulation of blood flow to multiple organ systems, which allows toleration of higher blood



pressure levels without acute organ damage, such as cerebral edema.<sup>7</sup> This may confer increased susceptibility to hypoperfusion with acute lowering of blood pressure, a phenomenon much more likely to occur with blood pressures >180/110 mmHg.<sup>7,15</sup>

## RISKS OF ACUTE TREATMENT

While evidence for benefit is lacking, several recent studies have shown that significant risk may be associated with aggressive treatment of asymptomatic hypertension in inpatients. A key study by Mohandas et al. showed that as-needed antihypertensives were associated with increased incidence of acute kidney injury, stroke, death, and length of stay.<sup>10</sup> While the retrospective cohort design of this study allows that the group receiving as-needed treatment could have been sicker overall (although propensity-score matching was performed), the results still suggest that using as-needed antihypertensives is associated with increased risk. The adverse events correlated with an abrupt drop in blood pressure, which has been shown to occur in 32% of patients.<sup>6</sup> A single dose of an intravenous antihypertensive has been shown to lower blood pressure by >25% in 22% of patients.<sup>16</sup> Reduction of blood pressure by >25% has been shown to affect autoregulation and predispose to hypotension and organ damage.<sup>17</sup> The association of increased length of stay with as-needed antihypertensives may be greater with intravenous medications.<sup>18</sup>

Hydralazine, an older antihypertensive, seems to be used with considerable frequency (via intravenous route) to treat elevated blood pressure in inpatients. An important study by Campbell et al. examined patterns of use for this agent and found that it was given often for asymptomatic hypertension, including many cases where blood pressure was less than 180/110 mmHg.<sup>5</sup> Nearly half of these doses were given between 11 PM and 7 AM. Additionally, only 25% of patients received an adjustment of their oral regimen after requiring a dose of intravenous hydralazine. Interestingly, while blood pressure lowering effects were unpredictable in this study, concomitant use of ace inhibitors or angiotensin receptor blockers was associated with exaggerated lowering of blood pressure with hydralazine. Despite

these factors, surveys have shown that when medical residents believe treating asymptomatic hypertension in the inpatient setting is necessary, 50% choose hydralazine.<sup>9</sup>

## RISKS OF INTENSIFICATION OF REGIMEN

In addition to treating elevated blood pressure in hospitalized patients, practitioners often elect to add or increase chronic hypertensive medications at discharge. Up to 50% of patients have multiple changes to their chronic medical regimen at discharge.<sup>19</sup> A recent study in older veterans hospitalized for noncardiac conditions reported that 13.9% of patients were discharged with an intensification of their pre-existing antihypertensive regimen.<sup>20</sup> In this study, patients had neither a decrease in cardiac events nor improvement in blood pressure control at 1 year but did have an increased rate of adverse events and readmissions at 30 days. Importantly, the effects were largely limited to patients whose blood pressures were not previously elevated. In addition, overall frailty is strongly correlated with readmissions and poor outcomes after discharge and likely increases the risk for adverse events from medications.<sup>20,21</sup>

## IDENTIFYING THE CAUSE

It is becoming clear that treating blood pressure elevation not associated with acute end-organ dysfunction in the inpatient setting leads to harm. While treatment of chronic hypertension improves outcomes overall, clinicians need to remember that data reflects the benefit of long-term treatment. One would not expect improved blood pressure control for 3 days to improve survival at 5 years. Elevated blood pressure readings can still yield important information, even if they are not a target for pharmacologic intervention. Hypertension guidelines recognize the phenomenon of whitecoat hypertension and the importance of proper measurement. Given that pain and anxiety can raise blood pressure significantly, elevated readings may suggest the need to optimize a patient's analgesic regimen. Consumption of excess caffeine, sodium, or illicit drugs may lie behind elevated blood pressure. Patients who have received a significant amount



of intravenous isotonic fluid may have volume overload as a cause of elevated blood pressure and thus would benefit from diuresis rather than more antihypertensives.

## AREAS OF UNCERTAINTY

While guidelines and evidence from large studies are lacking, the best synopsis of the evidence for treating asymptomatic hypertension in inpatients suggests that the risk/benefit ratio is, on average, not favorable. Since the absolute risk of adverse outcomes from treatment (or lack of) is small, it would take a very large trial to generate a definitive verdict. Still, this does imply that individuals might not benefit from more aggressive treatment. Close individual assessment and risk profile consideration would be needed to determine which patients could be helped.<sup>8</sup> While regimen intensification may confer risk to some patients, starting or increasing medications in patients with questionable access to follow-up care may be appropriate.<sup>22</sup> Conversely, adding or changing medications in patients without follow-up may be risky. The data suggests that older patients are most at risk for adverse events with acute blood pressure lowering and regimen intensification. Thus, this risk from more aggressive treatment may not be generalizable to all younger patients, particularly those with persistently elevated blood pressure. Finally, it is likely that the degree of autoregulation present in hypertensive patients partly determines their risk with acute treatment of hypertension. While general correlations between the blood pressure level and the effect of treatment on organ perfusion are known, effects on individual patients (and thus risk for adverse events) may vary, making individual assessment more important in obtaining the best outcomes.<sup>7,15</sup>

## STRATEGIES FOR IMPROVEMENT

Perhaps the easiest initial steps for improvement lie in education and QI (quality improvement) initiatives. Pasik et al. demonstrated that implementation of a decision algorithm (“assess before Rx”) targeted to all clinical staff, including nurses and physicians, significantly decreased inappropriate use of intravenous antihypertensive medication by >50%.<sup>11</sup>

Widespread use of such an intervention could likely be undertaken with little change to cost or employee work. Likewise, Jacobs et al. showed that an educational campaign (“NoIVForHighBP”) cut the use of intravenous hypertensives by 38%.<sup>23</sup> Their approach, which includes employing a series of presentations and placing educational materials in clinical areas, offers a similarly high return on a small investment of time. While not a primary outcome, Pasik et al. demonstrated some minor cost savings by reducing the number of intravenous antihypertensives.

Another opportunity for improvement is for clinicians to spend more time with their patients. If patients understand why a specific treatment is being given or withheld, they will likely have more trust in their providers and may be more likely to keep proper follow-up. Many patients who experience elevated blood pressure in the hospital have multiple comorbid conditions and polypharmacy. Paying close attention to their individual characteristics will allow for better implementation of the strategies discussed here. In addition, attention to proper blood pressure measurement techniques is important. Proper calibration of instruments, correct cuff size, and allowing the patient to relax before obtaining a reading will minimize spuriously elevated blood pressure.

Perhaps the most significant potential for improvement lies in widespread education. Many patients perceive treatment is needed for high blood pressure readings, whether at home or in the inpatient setting. A survey of nearly 2,000 physicians revealed that 59% had felt pressured by patients or their families to treat high readings.<sup>24</sup> Nurses may also feel compelled to advocate to physicians. Furthermore, data clearly shows that a sizable percentage of physicians feel that treatment of asymptomatic hypertension in hospitalized patients is indicated.<sup>9</sup> The study by Lyu revealed that 84% of physicians feared medical liability if they did not treat elevated blood pressure.<sup>24</sup> Finally, there is potential for error to propagate and live in “systems.”<sup>25</sup> It may be easier for physicians to order as-needed medications for hypertension as part of an order set to treat high blood pressure readings rather than explain that treatment is unnecessary to nurses or patients.



## CONCLUSION

While official guidelines and definitive evidence from large trials are still lacking, it seems sufficiently clear that several current approaches to nonemergent hypertension (including aggressive treatment of blood pressure and intensification of medical regimen at discharge) in the inpatient setting are potentially harmful to patients. Moreover, a significant percentage of clinicians seem unaware of this. While this is a concerning scenario, it presents a significant opportunity to improve the quality of care.

When applied to our patients, these interventions may improve the quality of care and decrease complications. Thus, they have the potential to help all health professionals managing asymptomatic hypertension in inpatient settings, especially nurses and residents who are at the point of care.

Hopefully, educational and quality improvement campaigns would make the nursing staff less likely to request medication for elevated blood pressure readings. In addition, the best course of action for the resident would have been to come and assess the patient and repeat the blood pressure measurement with proper technique (rather than blindly placing medication orders). Such an assessment would have demonstrated an isolated elevated blood pressure reading with no signs of end-organ damage correlated with an episode of back pain. This could have prevented the development of acute kidney injury, which lengthened the patient's stay. Ideally, decisions regarding antihypertensive regimen modification at discharge would have included a review of all blood pressure readings and an assessment of the patient's blood pressure control prior to admission. Access to follow-up and the presence of frailty should have been considered. Prior work in this area suggests that attention to this kind of detail can yield significant improvements in patient outcomes. Perhaps through judicious education and integration of systems, we will be able to pluck some of the low-hanging fruit to prevent adverse events and improve patient outcomes.

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1. Marshall University Joan C. Edwards School of

Medicine, Huntington, West Virginia

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