REVIEW

Asymptomatically Elevated Blood Pressure in the Emergency Department: A Finding Deserving of Attention by Emergency Physicians?

Matthew R. Lewin[1, 2]

[1]*Department of Emergency Medicine, University of California, San Francisco, USA*
[2]*Department of Emergency Medicine, Novato Community Hospital, Novato, USA*

(Received for publication on December 10, 2007)
(Revised for publication on August 30, 2008)
(Accepted for publication on September 18, 2008)

Abstract

The Emergency Department (ED) may be an ideal place to screen and refer patients for blood pressure monitoring in the outpatient setting. Yet, little is known about the public health significance of asymptomatically elevated blood pressure measurements in the ED and what to tell patients when these abnormal vital signs are recorded. Since the prevalence of hypertension and inadequately treated hypertension is so high, the incidental finding of elevated blood pressure in a previously undiagnosed patient may be a pivotal moment in that patient's life. For those patients carrying the diagnosis of hypertension, it is the author's opinion that the observation of elevated blood pressures should trigger advice to see their physicians to consider medication adjustments or changes. Emergency Physicians and their staff are in a unique position to screen and refer large populations of patients to their community physicians and help abort the long-term sequelae of unidentified or inadequately managed hypertension. How best to advise physicians and their patients requires research and innovative methods for transmitting important information to patients that may be unrelated to their primary complaint in the ED. (Keio J Med 58 (1) : 19–23, March 2009)

***Keywords*: blood pressure, emergency department, asymptomatic**

Introduction

United States' Emergency Departments have more than 115 million visits each year (~40 visits/100 people)[1] which may make them an ideal place to screen and refer patients for blood pressure monitoring in the outpatient setting. EDs and their staff are in a unique position to screen and refer large populations of patients to their community physicians and help abort the long-term sequelae of unidentified or inadequately managed hypertension. In one year, one of our California University EDs missed the opportunity to recommend follow-up blood pressure checks on as many as 9,600 potentially new diagnoses of hypertension and more than 16,000 patients carrying the diagnosis but with uniformly elevated blood pressures in the ED who might benefit from medication adjustments (unpublished data). Now, we warn all patients with elevated blood pressure measurements to have their blood pressure checked as a matter of departmental policy. Nevertheless, reasonable people can disagree about the value and validity of this practice. The following are my thoughts on the subject of whether asymptomatic elevated blood pressure is a finding worthy of attention by emergency physicians.

In Emergency Medicine, as in other specialties, we often focus on the acute complaints presented us by our patients. Yet, by doing so, we often lose the opportunity to help our patients in ways perhaps more meaningful than simply addressing the acute complaint. An example of this is the failure to warn patients about the presence

Presented at the 1535th meeting of the Keio Medical Society in Tokyo, October 12, 2007
Reprint request to: Matthew R. Lewin, M.D., Ph.D., Box 0208, 505 Parnassus Ave, San Francisco, CA 94143, USA, Tel: +1-415-353-8309, Fax: +1-415-353-1799, E-mail: aplysia99@yahoo.com Alternate Address: Novato Community Hospital, 180 Rowland way, Novato, CA 94945

Table 1 Abridged JNC-7 Classification and Management of Blood Pressure for Adults Aged 18 Years and Older.[7]

Blood Pressure (BP) classification	Systolic BP, mm Hg	Diastolic BP, mm HG
Normal	<120	<80
Prehypertension	120-139	80-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	>160	>100

of a potential killer: Hypertension.

Although the healthcare systems of Japan and the United States are significantly different in terms of prehospital care, emergency care, insurance and liability, the basic goals and tenets of clinical medicine and its practitioners are similar: We strive as individuals, and as a group to do what is in the best interest of our patients.

Even with the differences in style and content between Japanese and U.S. medical care in mind, I ask you: When was the last time you warned your patient with an acute exacerbation of chronic low back pain that, perhaps, those slightly elevated blood pressures in triage and, prior to discharge might represent asymptomatic hypertension? Did you suggest that the patient be seen in clinic or by his or her primary physician to have a recheck of these pressures when the patient is feeling better? If your patient with back pain already carries the diagnosis of hypertension and is taking medications… could it be that those medications need to be adjusted? If you did do this or asked your nurse to talk to the patient prior to discharge, how long did it take? Seconds or minutes? For a young man appearing in your ED with an ankle sprain, your admonition to have his blood pressure checked in clinic when he is feeling better could be a pivotal moment in his life even if it is only to establish a personal relationship with a physician, but especially if this young man does in fact have hypertension or pre-hypertension.

In 2001 the cost of cardiovascular disease in Japanese population 45-69 years old was 20.4% of total---greater than that of any other disease group.[2,3] This cost was directly proportional to the degree of hypertension with average ¥19,090,468/1000 persons/month during 10 year follow-up period 1990-2001, with morbidity and mortality correlate directly with severity of disease.[2] In the United States, the estimated cost is upwards of USD $60,000,000,000 (or more than ¥6.6 x 10^{13}) annually for the treatment of hypertension related complications.[2,4–6]

In the United States, the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7) reported that in individuals aged 40-70 years, each increment of 20 mm Hg in systolic pressure or 10 mm Hg in diastolic pressure doubles the risk of cardiovascular events.[7] In addition, they reclassified the stages of hypertension to include "prehypertension" as an important and large group of patients (**Table 1**). Except for those patients with symptomatic hypertension and evidence of end-organ damage, the committee made little comment about the management of hypertension in the acute care setting.

How to advise patients presenting to the emergency department with an incidental finding of asymptomatically elevated blood pressure is a dilemma faced by every practicing emergency physician countless times each day—but it is only a dilemma if the physician is aware that there is a potential problem unrelated to the patient's chief complaint.

In recent years, some members of the U.S. emergency medicine community have become actively interested in the question of what to do when presented with patients and one or more sets of vital signs containing asymptomatically elevated blood pressures.[8,9] One such group was convened by the American College of Emergency Physicians (ACEP). This working group formulated a policy statement published by the College in 2006. This clinical policy was developed to provide an analysis of the literature about asymptomatic hypertension in the ED.[10]

The critical questions asked by the committee were (a) whether the ED blood pressure readings are accurate and reliable for screening asymptomatic patients for hypertension? (b) How many blood pressure readings should be obtained for screening purposes? (c) Do asymptomatic patients with elevated blood pressure benefit from lowering of their blood pressure?

The American College of Emergency Physicians (ACEP) Policy on Asymtomatically Elevated Blood Pressure in the Emergency Department[9]

The ACEP policy was created after a review and critical analysis of peer-reviewed literature published between 1992 and 2005. The guidelines were intended for physicians working in the hospital-based ED and targeted toward patients over the age of 18 years. Exclusion criteria included those patients with with acute stroke, myocardial infarction, new onset renal dysfunction and

other presentations suggestive of acute end-organ damage. As exist at the present time and at the time of the ACEP recommendations, there were few compelling studies to guide appropriate management of patients with asymptomatic hypertension in the ED. No literature demonstrates that patients who receive pharmacologic intervention for asymptomatic hypertension in the ED have better outcomes than those referred to their physicians or clinics for repeat evaluation and treatment. Similarly, ambulatory blood pressure monitoring prescribed from the ED has yet to be tested on a large scale. Below is a reiteration of the key question and recommendation of the ACEP advisory panel on asymptomatically elevated blood pressure in ED patients.

1. **Patient Management Question: Are ED blood pressure readings adequate for screening asymptomatic patients for hypertension?**

   Recommendation: ***Repeated measurements greater than 140 mmHg or diastolic pressure greater than 90 mmHg, the patient should be referred for follow up for possible blood pressure reevaluation and management***

Relevance to Emergency Medicine Other Specialty Practices

The appropriate steps for the evaluation and treatment of asymptomatic hypertension in the non-primary care setting remain controversial. What is not controversial is that the correct interpretation and management of incipient or actually abnormal vital signs is a cornerstone of medical care in any setting even when these vital signs are not related to the patient's primary complaint. I am frequently reminding my students and residents that the word "vital" takes its origin from the Latin (*vita*) for "life". Vital signs are the "signs of life." We ignore them at the peril of our patients and our own mental and professional discipline.

Despite the importance of vital signs and their ease of acquisition and study, at present, there is insufficient evidence to conclude that the various stressors related to an ED visit are sufficient to attribute a diagnosable cause to a patient's asymptomatically elevated blood pressure. Given the extraordinarily high prevalence of the disease in the general population, emergency physicians are uniquely situated to inform their patients of a potentially insidious killer. I find it surprising how scarce research on this subject is in the current medical literature.

Given the extremely high prevalence of hypertension in the population, it is certain that a significant percentage of patients will actually have the disease. Many authors have studied "white coat" hypertension in Japan and elsewhere.[13–18] It hasn't been studied in the ED, but in my *opinion*, even if we accept that there is white coat hypertension in the ED…its presence would most likely increase the sensitivity of the test for asymptomatic hypertension at some expense to specificity.

Are ED blood pressure readings adequate for screening asymptomatic patients for hypertension? The best available U.S. data are not from prospective, randomized clinical trials. Nevertheless, the ACEP Clinical Policy Committee has recommended that patients with repeatedly elevated readings should be referred for further evaluation and outpatient screening for hypertension. Interestingly, the emergency medicine community's response to this new policy has been minimal, though the reasons for this lack of response are not clear.[19–21] Recent studies have shown that emergency physicians in the U.S. do not identify, diagnose or refer patients for asymptomatically elevated blood pressures in the ED. The first, by Tilman and colleagues[19] assessed the charts of 1547 patients seen in their ED and meeting criteria for a hypertensive state. Only 7% received any type of attention for this finding (*e.g.* referral or medication refill). In a second study, Lehrman *et al* [21] asked a very simple question: Would dissemination of the American College of Emergency Physicians clinical policy on hypertension to emergency physicians would lead to improvements in blood pressure reassessment and referral of ED patients with elevated blood pressure? Knowledge of the policy did not result in any improvement in referral rates…the rates were actually lower (13% before the policy and 7% afterwards) one year after publication. The authors did not speculate about the cause of this "poor" performance, but I suspect it has to do with lack of dissemination and the strength of evidence to support ACEP's recommendations.

Approach to Asymptomatic Elevated Blood Pressure in the ED and Missing Data

My personal approach to asymptomatically elevated blood pressure in the ED is usually to do one of two things in addition to verbally suggesting the patient have his or her blood pressure checked (patients do not often retain much of the information given to them verbally).[22–24] I have printed cards on which I have hand-written the patient's name, the date and their blood pressures in the ED. When discharge instructions are printed from a computer, I type this suggestion into their standardized discharge instructions. In our ED, we have recently automated our charts. The computer automatically prints out a report to the patient and suggests they should have their blood pressure checked by their primary care physician or clinic to have the pressures evaluated for treatment or medication adjustment. The interventions I am discussing, above, represent my personal views about this topic and how I and my colleagues at the University

of California in San Francisco have decided to respond to this issue. We have implemented these changes in our emergency medicine practice realizing that many questions about asymptomatic elevated blood pressure in the ED remain unanswered.

What are some of the missing data? From the standpoint of research and policy, it might be useful to study the following questions, among many others before implementing standardized policies:

1. What is the true prevalence of hypertension in the population presenting to the ED with asymptomatically elevated blood pressures? Should a single elevated blood pressure reading be sufficient to trigger a referral?[25] If not, how many? What values of systolic and diastolic blood pressure should trigger a warning. If we are warning patients at 140mmHg systolic…what about warnings for blood pressures in the range of prehypertension starting at 130mmHg?[7,10]
2. What are the long-term outcomes of ED patients identified, notified and referred for outpatient testing? At present, there are no convincing data to suggest that this advice for follow-up will lead to improved outcomes. Adults who get treatment in the ED but do not have a primary physician and have not had prior hypertension screening may be a population that is at inherent risk of poor cardiovascular or health outcomes for a variety of socioeconomic reasons. It should at least be demonstrated that the proposed recommendation effectively encourages outpatient hypertension screening for those to whom it is given.
3. What are the factors inhibiting emergency physicians from acting on information readily available to them and potentially important to their patients? If it were shown to be useful, what ED resources available could be used to effectively communicate concern about elevated blood pressure to patients? Some possibilities would be the use of nurses,[26] electronic flagging, direct referral, discharge from the ED with ambulatory blood pressure monitors--all of these interventions have been widely studied in other settings, but not in the ED.[15,18,27–30]
4. What are the parameters for identifying incipient or actual hypertension in the pediatric ED population?[31,32]

For advice to be effective and minimize potential anxiety for the patient, a considerable amount of time may need to be allocated by the physician or nurse to explain the significance of the elevated blood pressure finding, including the uncertainties surrounding it. This time commitment could conflict with other pressing ED needs. Research is needed to factor the risks, benefits and costs associated with seemingly simple recommendations. The cost in time and money to the patients must also be considered since many will end up being advised to undergo blood pressure screening in what may turn out to be multiple outpatient visits. These issues need to be anticipated and considered before implementation of a well-meaning, standardized intervention which may have unintended, adverse consequences to individuals and populations.[21,33]

When the U.S. Department of Health and Human Services produced its document, "Healthy people 2010," one of the primary objectives was to lower the proportion of people over the age of twenty with unrecognized hypertension. A second goal is to increase the proportion of people carrying the diagnosis of hypertension to have adequate control.[34–36] Many U.S. emergency departments engage in point of care testing for HIV, provide pneumococcal vaccines and give handouts with referrals to help patients seek help for smoking cessation, substance abuse and domestic violence.[21] These non-acute services have become integral to the practice of emergency medicine in the United States, but may not be needed or may not be appropriate for the practice of emergency medicine in other countries.

Concluding Remarks

There is a growing trend in medicine, world-wide, to move quickly from collegial advice to expert recommendation and consensus then to policy and mandate in the name of quality of care--and at the expense of physician autonomy. A very high burden of proof should be placed on any broad recommendation such as the one proposed by the ACEP to ensure that the physician-patient relationship is not hindered and medical care appropriately individualized. Thus, while I agree with the spirit of the ACEP policy and its value as an educational tool, I am hesitant to endorse it *a priori* without having answered the questions posed earlier.

As emergency medicine evolves in each country, it is probably wise to be aware of the challenges faced by comparable institutions in other countries with special attention to their successes and failures. Screening for hypertension, like so many diseases that do not recognize cultural or geographic boundaries is one that I *believe* deserves attention in emergency departments around the globe and is an area ripe for research and imaginative problem solving by physicians and scientists at any stage of training.

Acknowledgements

I thank Dr. Shingo Hori, Dr. Naoki Aikawa and the Keio University Department of Emergency Medicine for their interest and enthusiasm in the exchange of ideas about the practice of emergency medicine. I also thank Dr. Michel Accad for his critiques of my ideas and assumptions. This manuscript is based on my lecture spon-

sored by Keio University Hospital, School of Medicine and the Keio Medical Society, October 12, 2007.

References

1. Nawar EW, Niska RW, Xu J National Hospital Ambulatory Medical Care Survey: 2005 emergency department summary. Adv Data 2007;1–32
2. Nakamura k, Okamura T, Kanda H, Hayakawa T, Kadowaki T, Okayama A, *et al*.: Impact of hypertension on medical economics: A 10-year follow-up study of national health insurance in Shiga, Japan. Hypertens Res 2005; **28**: 859–864
3. Ishikawa-Takata, K., Ohta, T., Moritaki, K., Gotou, T. & Inoue, S.: Obesity, weight change and risks for hypertension, diabetes and hypercholesterolemia in Japanese men. Eur J Clin Nutr 2002; **56**: 601–607
4. Sokol, M.C., McGuigan, K.A., Verbrugge, R.R. & Epstein, R.S.: Impact of medication adherence on hospitalization risk and healthcare cost. Med Care 2005; **43**: 521–530
5. Druss BG, Marcus SC, Olfson M, Tanielian T, Elinson L, Pincus HA: Comparing the national economic burden of five chronic conditions. Health Aff (Millwood) 2001; **20**: 233–241
6. Hodgson, T.A. & Cai, L.: Medical care expenditures for hypertension, its complications, and its comorbidities. Med Care 2001; **39**: 599–615
7. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, *et al*.: The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. Jama 2003; **289**: 2560–2572
8. Chiang, W.K. & Jamshahi, B.: Asymptomatic hypertension in the ED. Am J Emerg Med 1998; **16**: 701–704
9. Pitts, S.R. & Adams, R.P.: Emergency department hypertension and regression to the mean. Ann Emerg Med 1998; **31**: 214–218
10. Decker, W.W., Godwin, S.A., Hess, E.P., Lenamond, C.C. & Jagoda, A.S.: Clinical policy: critical issues in the evaluation and management of adult patients with asymptomatic hypertension in the emergency department. Ann Emerg Med 2006; **47**: 237–249
11. Frohlich, E.D.: The sixth report of the Joint National Committee: an appropriate celebration of the 25th anniversary of the National High Blood Pressure Education Program. Hypertension 1997; **30**: 1305–1306
12. Fleming, J., Meredith, C. & Henry, J.: Detection of hypertension in the emergency department. Emerg Med J 2005; **22**: 636–640
13. Ejima Y, Hasegawa Y, Sanada S, Miyama N, Hatano R, Arata T, *et al*.: Characteristics of young-onset hypertension identified by targeted screening performed at a university health check-up. Hypertens Res 2006; **29**: 261–267
14. Hozawa A, Ohkubo T, Kikuya M, Yamaguchi J, Ohmori K, Fujiwara T, *et al*.: Blood pressure control assessed by home, ambulatory and conventional blood pressure measurements in the Japanese general population: the Ohasama study. Hypertens Res 2002; **25**: 57–63
15. Imai Y, Tsuji I, Nagai K, Sakuma M, Ohkubo T, Watanabe N, *et al*.: Ambulatory blood pressure monitoring in evaluating the prevalence of hypertension in adults in Ohasama, a rural Japanese community. Hypertens Res 1996; **19**: 207–212
16. Nagai K, Imai Y, Tsuji I, Ohkubo T, Sakuma M, Watanabe N, *et al*.: Prevalence of hypertension and rate of blood pressure control as assessed by home blood pressure measurements in a rural Japanese community, Ohasama. Clin Exp Hypertens 1996; **18**: 713–728
17. Kario, K., Matsuo, T., Ishida, T. & Shimada, K.: "White coat" hypertension and the Hanshin-Awaji earthquake. Lancet 1995; **345**: 1365
18. Imai, Y.: Clinical significance and cost-effectiveness of 24-hour ambulatory blood pressure monitoring. Tohoku J Exp Med 1995; **176**: 1–15
19. Tilman K, Delashaw M, Lowe S, Springer S, Hundley S, Counselman FL: Recognizing asymptomatic elevated blood pressure in ED patients: how good (bad) are we? Am J Emerg Med 2007; **25**: 313–317
20. Baumann BM, Abate NL, Cowan RM, Chansky ME, Rosa K, Boudreaux ED: Characteristics and referral of emergency department patients with elevated blood pressure. Acad Emerg Med 2007; **14**: 779–784
21. Lehrmann JF, Tanabe P, Baumann BM, Jones MK, Martinovich Z, Adamas JG: Knowledge Translation of the American College of Emergency Physicians Clinical Policy on Hypertension. Acad Emerg Med 2007; **14**: 1090–1096
22. Taylor, D.M. & Cameron, P.A.: Discharge instructions for emergency department patients: what should we provide? J Accid Emerg Med 2000; **17**: 86–90
23. Spandorfer, J.M., Karras, D.J., Hughes, L.A. & Caputo, C.: Comprehension of discharge instructions by patients in an urban emergency department. Ann Emerg Med 1995; **25**: 71–74
24. Isaacman, D.J., Purvis, K., Gyuro, J., Anderson, Y. & Smith, D.: Standardized instructions: do they improve communication of discharge information from the emergency department? Pediatrics 1992; **89**: 204–208
25. Backer, H.D., Decker, L. & Ackerson, L.: Reproducibility of increased blood pressure during an emergency department or urgent care visit. Ann Emerg Med 2003; **41**: 507–512
26. Tanabe, P., Steinmann, R., Kippenhan, M., Stehman, C. & Beach, C.: Undiagnosed hypertension in the ED setting--an unrecognized opportunity by emergency nurses. J Emerg Nurs 2004; **30**: 225–259
27. Hansen TW, Kikuya M, Thijs L, Björklund-Bodegård K, Kuznetsova T, Ohkubo T, *et al*.: Prognostic superiority of daytime ambulatory over conventional blood pressure in four populations: a meta-analysis of 7,030 individuals. J Hypertens 2007; **25**: 1554–1564
28. Ohkubo T, Kikuya M, Metoki H, Asayama K, Obara T, Hashimoto J. *et al*.: Prognosis of "masked" hypertension and "white-coat" hypertension detected by 24-h ambulatory blood pressure monitoring 10-year follow-up from the Ohasama study. J Am Coll Cardiol 2005; **46**: 508–515
29. Imai Y, Hozawa A, Ohkubo T, Tsuji I, Yamaguchi J, Matsubara M, *et al*.: Predictive values of automated blood pressure measurement: what can we learn from the Japanese population - the Ohasama study. Blood Press Monit 2001; **6**: 335–339
30. Schettini, C., Bianchi, M., Nieto, F., Sandoya, E. & Senra, H.: Ambulatory blood pressure: normality and comparison with other measurements. Hypertension Working Group. Hypertension 1999; **34**: 818–825
31. Hansen, M.L., Gunn, P.W. & Kaelber, D.C.: Underdiagnosis of hypertension in children and adolescents. Jama 2007; **298**: 874–879
32. Li JS, Eisenstein EL, Grabowski HG, Reid ED, Mangum B, Schulman KA, *et al*.: Economic return of clinical trials performed under the pediatric exclusivity program. Jama 2007; **297**: 480–488
33. Rhodes, K.V., Gordon, J.A. & Lowe, R.A.: Preventive care in the emergency department, Part I: Clinical preventive services--are they relevant to emergency medicine? Society for Academic Emergency Medicine Public Health and Education Task Force Preventive Services Work Group. Acad Emerg Med 2000; **7**: 1036–1041
34. Prevalence of actions to control high blood pressure--20 states, 2005. MMWR Morb Mortal Wkly Rep 2007; **56**: 420–423
35. Okonofua EC, Simpson KN, Jesri A, Rehman SU, Durkalski VL, Eqan BM: Therapeutic inertia is an impediment to achieving the Healthy People 2010 blood pressure control goals. Hypertension 2006; **47**: 345–351
36. Egan, B.M. & Basile, J.N.: Controlling blood pressure in 50% of all hypertensive patients: an achievable goal in the healthy people 2010 report? J Investig Med 2003; **51**: 373–385