



# Monitoring home BP readings just got easier

This novel method of identifying patients with uncontrolled hypertension correlates well with ambulatory BP monitoring.

## PRACTICE CHANGER

Use this easy “3 out of 10 rule” to quickly sift through home blood pressure readings and identify patients with uncontrolled hypertension who require pharmacologic management.<sup>1</sup>

## STRENGTH OF RECOMMENDATION

**B:** Based on a single, good quality, multicenter trial.

Sharman JE, Blizzard L, Kosmala W, et al. Pragmatic method using blood pressure diaries to assess blood pressure control. *Ann Fam Med*. 2016;14:63-69.

## ILLUSTRATIVE CASE

A 64-year-old woman presents to your office for a follow-up visit for her hypertension. She is currently managed on lisinopril 20 mg/d and hydrochlorothiazide 25 mg/d without any problems. The patient’s blood pressure (BP) in the office today is 148/84 mm Hg, but her home blood pressure (HBP) readings are much lower (see **TABLE**). Should you increase her lisinopril dose today?

**H**ypertension has been diagnosed on the basis of office readings of BP for almost a century, but the readings can be so inaccurate that they are not useful.<sup>2</sup> The US Preventive Services Task Force recommends the use of ambulatory blood pressure monitoring (ABPM) to accurately diagnose hypertension in all patients, while The Seventh Report of the Joint National

Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) recommends ABPM for patients suspected of having white-coat hypertension and any patient with resistant hypertension,<sup>3,4</sup> but ABPM is not always acceptable to patients.<sup>5</sup>

HBP readings, on the other hand, correlate well with ABPM measurements and may be more accurate and more predictive of adverse outcomes than office measurements, and the process is often more tolerable to patients than ABPM.<sup>6-8</sup> If the average home BP reading is >135/85 mm Hg, there is an 85% probability that ambulatory BP will also be high.<sup>8</sup>

## Guidelines recommend HBP monitoring for long-term follow-up of hypertension

The European Society of Hypertension practice guideline on HBP monitoring suggests that HBP values <130/80 mm Hg may be considered normal, while a mean HBP ≥135/85 mm Hg is considered elevated.<sup>9</sup> The guideline recommends HBP monitoring for 3 to 7 days prior to a patient’s follow-up appointment with 2 readings taken one to 2 minutes apart in the morning and evening.<sup>9</sup> In a busy clinic, averaging all of these home values can be time-consuming.

So how can primary care physicians accurately and efficiently streamline the process? This study sought to answer that question.

Jennie B. Jarrett, PharmD, BCPS, MMedEd; Linda Hogan, PhD; Corey Lyon, DO; Kate Rowland, MD, MS

University of Pittsburgh Medical Center, St. Margaret Family Medicine Residency Program, Pa (Drs. Jarrett and Hogan); University of Colorado Family Medicine Residency, Denver (Dr. Lyon); Rush Copley Family Medicine Residency, Aurora, Ill (Dr. Rowland)

## DEPUTY EDITOR

Anne Mounsey, MD  
Department of Family Medicine, University of North Carolina, Chapel Hill

CONTINUED

TABLE

### Should you change this patient's lisinopril dose?

A 64-year-old woman is currently managed on lisinopril 20 mg/d and hydrochlorothiazide 25 mg/d. Her blood pressure (BP) in the office today is 148/84 mm Hg, but her home blood pressure (HBP) readings, as shown below, are much lower. However, the patient's HBP log notes 3 systolic readings  $\geq 135$  mm Hg, indicating uncontrolled hypertension. In light of Sharman, et al's<sup>1</sup> findings, the dose of lisinopril should be increased to further control this patient's BP.

Date	Time	2nd BP reading (mm Hg)
9/1/16	7:30 am	124/86
	7:35 pm	<b>135/88</b>
9/2/16	6:30 am	<b>145/96</b>
	6:35 pm	122/82
9/3/16	7:45 am	128/78
	7:50 pm	116/74
9/4/16	6:15 am	130/78
	6:30 pm	126/78
9/5/16	7:15 am	<b>140/88</b>
	7:00 pm	120/84
9/6/16	6:45 am	133/86
	6:30 pm	125/85
9/7/16	7:40 am	123/83
	7:00 pm	124/82

BP, blood pressure.

#### STUDY SUMMARY

##### When 3 of 10 readings are elevated, it's predictive

This multicenter trial compared HBP monitoring to 24-hour ABPM in 286 patients with uncomplicated essential hypertension to determine the optimal percentage of HBP readings needed to diagnose uncontrolled BP (HBP  $\geq 135/85$  mm Hg). Patients were included if they were diagnosed with uncomplicated hypertension, not pregnant,  $\geq 18$  years of age, and taking  $\leq 3$  antihypertensive medications. Medication compliance was verified by a study nurse at a clinic visit. Patients were excluded if they had a significant abnormal left ventricular mass index (women  $>59$  g/m<sup>2</sup>; men  $>64$  g/m<sup>2</sup>), coronary artery or renal disease, secondary hypertension, serum creatinine exceeding 1.6 mg/dL,

aortic valve stenosis, upper limb obstructive atherosclerosis, or BP  $>180/100$  mm Hg.

Approximately half of the participants were women (53%), average body mass index was 29.4 kg/m<sup>2</sup>, and the average number of hypertension medications being taken was 2.4. The patients were instructed to take 2 BP readings (one minute apart) at home 3 times daily, in the morning (between 6 am and 10 am), at noon, and in the evening (between 6 pm and 10 pm), and to record only the second reading for 7 days. Only the morning and evening readings were used for analysis in the study. The 24-hour ABP was measured every 30 minutes during the daytime hours and every 60 minutes overnight. The primary outcome was to determine the optimal number of systolic HBP readings above goal (135 mm Hg), from the last 10 recordings, that would best predict elevated 24-hour ABP. Secondary outcomes were

various cardiovascular markers of target end-organ damage.

■ **The researchers found** that if at least 3 of the last 10 HBP readings were elevated ( $\geq 135$  mm Hg systolic), the patient was likely to have hypertension on 24-hour ABPM ( $\geq 130$  mm Hg). When patients had  $<3$  HBP elevations out of 10 readings, their mean ( $\pm$ standard deviation [SD]) 24-hour ambulatory daytime systolic BP was 132.7 ( $\pm 11.1$ ) mm Hg and their mean systolic HBP value was 120.4 ( $\pm 9.8$ ) mm Hg. When patients had  $\geq 3$  HBP elevations, their mean 24-hour ambulatory daytime systolic BP was 143.4 ( $\pm 11.2$ ) mm Hg and their mean systolic HBP value was 147.4 ( $\pm 10.5$ ) mm Hg.

The positive and negative predictive values of  $\geq 3$  HBP elevations were 0.85 (95% confidence interval [CI], 0.78-0.91) and

> The researchers found that if at least 3 of the last 10 home BP readings were elevated, the patient was likely to have hypertension on 24-hour ambulatory monitoring.

0.56 (95% CI, 0.48-0.64), respectively, for a 24-hour systolic ABP of  $\geq 130$  mm Hg. Three elevations or more in HBP, out of the last 10 readings, was also an indicator for target organ disease assessed by aortic stiffness and increased left ventricular mass and decreased function.

The sensitivity and specificity of  $\geq 3$  elevations for mean 24-hour ABP systolic readings  $\geq 130$  mm Hg were 62% and 80%, respectively, and for 24-hour ABP daytime systolic readings  $\geq 135$  mm Hg were 65% and 77%, respectively.

#### WHAT'S NEW

##### Monitoring home BP can be simplified

The researchers found that HBP monitoring correlates well with ABPM and that their method provides clinicians with a simple way (3 of the past 10 measurements  $\geq 135$  mm Hg systolic) to use HBP readings to make clinical decisions regarding BP management.

#### CAVEATS

##### Ideal BP goals are hazy, and a lot of patient education is required

Conflicting information and opinions remain regarding the ideal intensive and standard BP goals in different populations.<sup>10,11</sup> Systolic BP goals in this study ( $\geq 130$  mm Hg for overall 24-hour ABP and  $\geq 135$  mm Hg for 24-hour ABP daytime readings) are recommended by some experts, but are not commonly recognized goals in the United States. This study found good correlation between HBP and

ABPM at these goals, and it seems likely that this correlation could be extrapolated for similar BP goals.

Other limitations are that: 1) The study focused only on systolic BP goals; 2) Patients in the study adhered to precise instructions on BP monitoring. HBP monitoring requires significant patient education on the proper use of the equipment and the monitoring schedule; and 3) While end-organ complication outcomes showed numerical decreases in function, the clinical significance of these reductions for patients is unclear.

#### CHALLENGES TO IMPLEMENTATION

##### Cost of device and improper cuff sizes could be barriers

The cost of HBP monitors (\$40-\$60) has decreased significantly over time, but the devices are not always covered by insurance and may be unobtainable for some people. Additionally, patients should be counseled on how to determine the appropriate cuff size to ensure the accuracy of the measurements.


The British Hypertensive Society maintains a list of validated BP devices on their Web site: <http://bhsoc.org/bp-monitors/bp-monitors>.<sup>12</sup>

JFP

#### ACKNOWLEDGEMENT

The PURLs Surveillance System was supported in part by Grant Number UL1RR024999 from the National Center For Research Resources, a Clinical Translational Science Award to the University of Chicago. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center For Research Resources or the National Institutes of Health.

Copyright © 2016. The Family Physicians Inquiries Network. All rights reserved.

 Patients using home blood pressure monitors should be counseled on how to determine the appropriate cuff size so that measurements are accurate.

#### References

1. Sharman JE, Blizzard L, Kosmala W, et al. Pragmatic method using blood pressure diaries to assess blood pressure control. *Ann Fam Med*. 2016;14:63-69.
2. Sebo P, Pechère-Bertschi A, Herrmann FR, et al. Blood pressure measurements are unreliable to diagnose hypertension in primary care. *J Hypertens*. 2014;32:509-517.
3. Siu AL; U.S. Preventive Services Task Force. Screening for high blood pressure in adults: US Preventive Services Task Force Recommendation Statement. *Ann Int Med*. 2015;163:778-786. Available at: <http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/high-blood-pressure-in-adults-screening>. Accessed June 16, 2016.
4. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *JAMA*. 2003;289:2560-2572.
5. Mallion JM, de Gaudemaris R, Baguet JP, et al. Acceptability and tolerance of ambulatory blood pressure measurement in the hypertensive patient. *Blood Press Monit*. 1996;1:197-203.
6. Gaborieau V, Delarche N, Gosse P. Ambulatory blood pressure monitoring versus self-measurement of blood pressure at home: correlation with target organ damage. *J Hypertens*. 2008;26:1919-1927.
7. Ward AM, Takahashi O, Stevens R, et al. Home measurement of blood pressure and cardiovascular disease: systematic review and meta-analysis of prospective studies. *J Hypertens*. 2012;30:449-456.
8. Pickering TG, Miller NH, Ogedegbe G, et al. Call to action on use and reimbursement for home blood pressure monitoring: executive summary. A joint scientific statement from the American Heart Association, American Society of Hypertension, and Preventive Cardiovascular Nurses Association. *Hypertension*.

CONTINUED

2008;52:1-9.

9. Parati G, Stergiou GS, Asmar R, et al; ESH Working Group on Blood Pressure Monitoring. European Society of Hypertension practice guidelines for home blood pressure monitoring. *J Hum Hypertens*. 2010;24:779-785.

10. The SPRINT Research Group. A randomized trial of intensive versus standard blood-pressure control. *N Engl J Med*. 2015;373:2103-2116.

11. Brunström M, Carlberg B. Effect of antihypertensive treatment at different blood pressure levels in patients with diabetes mellitus: systematic review and meta-analyses. *BMJ*. 2016;352:i717.

12. British Hypertensive Society. BP Monitors. Available at: <http://bhsoc.org/bp-monitors/bp-monitors>. Accessed June 27, 2016.

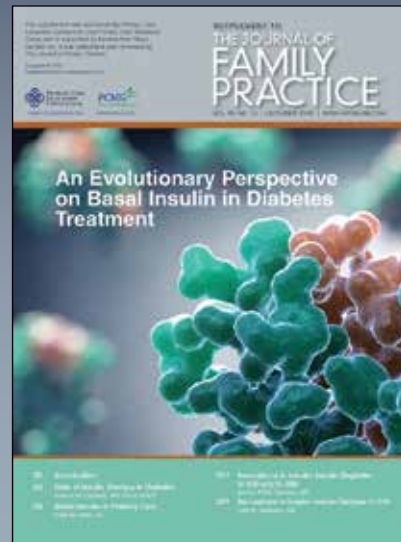
NOW IN PRINT AND ONLINE

A SUPPLEMENT TO THE JOURNAL OF FAMILY PRACTICE

# An Evolutionary Perspective on Basal Insulin in Diabetes Treatment

Discussion of primary care topics in basal insulin includes:

- Role of Insulin Therapy in Diabetes
- Basal Insulin in Primary Care
- Innovations in Insulin: Insulin Degludec U-100 and U-200
- Innovations in Insulin: Insulin Glargine U-300



AVAILABLE ONLINE AT  
JFPPONLINE.COM



This supplement is sponsored by Primary Care Education Consortium and Primary Care Metabolic Group and is supported by funding from Novo Nordisk Inc.

