

## Home and Online Management and Evaluation of Blood Pressure (HOME BP) Using a Digital Intervention in Poorly Controlled Hypertension: Randomized Controlled Trial



### What is already known?

Hypertension, or high blood pressure increases the risk for heart disease, stroke, and kidney disease, which are among the leading causes of death in the United States.<sup>1,2</sup> Nearly half of adults in the United States (47.3%) have hypertension defined as a systolic blood pressure  $\geq 130$  mm Hg or a diastolic blood pressure  $\geq 80$  mm Hg or are taking medication for hypertension.<sup>3</sup> Yet, among the nearly 108 million adults with hypertension, about 75% do not have their condition under control.<sup>3</sup> The increased focus on managing high blood pressure to reduce the risk of cardiovascular disease and mortality has led to expanded efforts to improve the monitoring, management, and control of hypertension within healthcare systems, among clinicians, public health practitioners, and patients.

Evidence-based strategies are utilized in clinical and public health practice to improve blood pressure control for those with hypertension. One proven strategy, endorsed by the Community Preventive Services Task Force, the Million Hearts Initiative, and many other national blood pressure guidelines is self-measured blood pressure monitoring (SMBP).<sup>4,5</sup> SMBP

refers a patients' use of personal, automated blood pressure monitoring devices to assess and record blood pressure outside of a clinical setting, typically at home or elsewhere.<sup>5,6</sup> When coupled with additional clinical support, there is strong scientific evidence that SMBP can contribute to a reduction in blood pressure for individuals with hypertension.<sup>7</sup> The specific types of additional support may include one-to-one counseling, telephone or web-based support, and/or education such as classes and support groups. Assessing the effectiveness of interventions using SMBP supports is a growing area of cardiovascular health research; however, more studies are needed to better understand the role of telemedicine in SMBP and the implementation of web-based interventions to reduce high blood pressure.

### What is added by this article?

This randomized trial, conducted across 76 general practices in the United Kingdom, assessed the impact of a digital intervention for hypertension management in primary care by combining SMBP with guided self-management (intervention group), compared to patients receiving routine hypertension care (control group). Looking at National Institute for Health and Care Excellence Hypertension Guidelines for blood pressure targets, patients aged 18 or older with treated but poorly controlled hypertension ( $>140/90$  mm Hg) who had access to the internet were eligible for the study. Participants were identified from a national registry and an electronic health records database. Eligible participants were randomized and matched one-to-one to either the intervention group or to the control group based on baseline systolic blood pressure, age, diabetes status, and provider facility.



The HOME BP intervention for SMBP is an integrated patient-practitioner online digital tool. Patients in the intervention group and their providers, received feedback on self-monitored blood pressure results and optional lifestyle advice and motivational support. These patients were additionally linked to individualized antihypertensive drug titration plans directed by their healthcare practitioner, including up to three potential medication changes if blood pressure did not drop below target levels. Patients received automated email reminders to take and record their blood pressure readings online for seven days each month. Based on an average of their home blood pressure readings, tailored feedback was provided to participants and their providers. Following UK national guidelines for target blood pressure, if average blood pressure remained above target levels for two consecutive months, practitioners were notified via email to implement a drug titration plan. Conversely, if average blood pressure was controlled for three consecutive months, patients were notified to reduce monitoring to once every eight weeks. After nine weeks, the HOME BP intervention integrated an additional education and evidence-based lifestyle modification tool targeting sodium reduction, physical activity, weight management, and alcohol reduction, in addition to optional motivational support. In the control group, routine hypertension care included clinic-based

blood pressure monitoring, appointments, and drug titrations directed by the health practitioner. Additionally, patients assigned to the control group were provided online access to educational materials for information about hypertension.

After one year, patients in the intervention group had a mean systolic blood pressure reduction of -3.4 mm Hg (95% confidence interval -6.1 to -0.8 mm Hg). Among those in the intervention group, younger participants (<67) had a larger, statistically significant reduction compared to older patients (>67) [-7.7 mm Hg (95% CI: -11.9, -3.5 mm Hg) vs. -0.4 mm Hg (95% CI: -3.9, 3.0 mm Hg)]. Differences in levels were attributed by socioeconomic status, ethnicity, and age. Additionally, engagement remained high among the intervention group (70%), though with a low proportion among those opting to utilize the optional lifestyle modification tool (30%).

### **What are the implications for these findings?**

The results of this study, although modest overall, indicate that a cost-effective, online digital interventional tool, including SMBP, antihypertensive drug titration planning, evidence-based lifestyle advice, and additional motivational support resulted in a larger systolic blood pressure reduction, particularly among younger participants (<67 years old), when compared to routine, clinic-based hypertension care. The authors note that the results of this intervention are suggestive of a potential 10–15% reduction in stroke, and a 5–10% reduction in future coronary events among patients. While the authors acknowledge that increased antihypertensive drug use likely drove lower blood pressure, they report that the high rates of drug adherence reflected in the data may have been improved by self-monitoring. Additionally, this may indicate increased action by healthcare providers. The authors also suggest that implementing

evidence-based, digitally delivered SMBP interventions, integrating patient and clinician engagement, can be cost-effective, noting the need for further research to assess cost-effectiveness and evaluate health outcomes over the long term. As the evidence base continues to evolve, clinicians and public health practitioners may consider new ways to implement digital SMBP tools into hypertension management programs.



## Resources

Self-Measured Blood Pressure Monitoring With Clinical Support [Self-Measured Blood Pressure Monitoring With Clinical Support | CDC | DHDS](#)

Cardiovascular Disease: Self-Measured Blood Pressure Monitoring Interventions for Improved Blood Pressure Control — When Used Alone [Hypertension: Self-Measured Blood Pressure | The Community Guide](#)

## References

1. Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, Dennison C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. *Hypertension*. 2018;71(19):e13–115.

2. Kochanek KD, Murphy SL, Xu J, Arias E. Deaths: Final Data for 2017. *National Vital Statistics Reports*, 68(9). Hyattsville, MD: National Center for Health Statistics; 2019.
3. Centers for Disease Control and Prevention (CDC). Hypertension Cascade: Hypertension Prevalence, Treatment and Control Estimates Among US Adults Aged 18 Years and Older Applying the Criteria From the American College of Cardiology and American Heart Association's 2017 Hypertension Guideline — NHANES 2013–2016. Atlanta, GA: US Department of Health and Human Services; 2019.
4. Community Preventive Services Task Force. The Guide to Community Preventive Services. *Cardiovascular Disease*. <https://www.thecommunityguide.org/findings/cardiovascular-disease-self-measured-blood-pressure-when-used-alone>. Accessed March 15, 2021.
5. Million Hearts. Self-Measured Blood Pressure Monitoring. <https://millionhearts.hhs.gov/tools-protocols/smbp.html>
6. Shimbo D, Abdalla M, Falzon L, Townsend RR, Muntner P. Role of ambulatory and home blood pressure monitoring in clinical practice: a narrative review of blood pressure monitoring. *Ann Intern Med*. 2015;163(9):691–700.
7. Uhlig K, Balk EM, Patel K, Ip S, Kitsios GD, Obadan NO, et al. Self-Measured Blood Pressure Monitoring: Comparative Effectiveness. *Comparative Effectiveness Review No. 45*. (Prepared by the Tufts Evidence-based Practice Center under Contract No. HHS 290-2007-10055-I.) AHRQ Publication No. 12-EHC002-EF. Rockville, MD: Agency for Healthcare Research and Quality, US Dept of Health and Human Services; 2012. - [http://www.effectivehealthcare.ahrq.gov/ehc/products/193/893/CER45\\_SMBP\\_20120131.pdf](http://www.effectivehealthcare.ahrq.gov/ehc/products/193/893/CER45_SMBP_20120131.pdf).

## Citation

McManus RJ, Little P, Stuart B, Morton K, Raftery J, Kelly J, Bradbury K, Zhang J, Zhu S, Murray E, May CR, Mair FS, Michie S, Smith P, Band R, Ogburn E, Allen J, Rice C, Nuttall J, Williams B, Yardley L; HOME BP investigators. Home and Online Management and Evaluation of Blood Pressure (HOME BP) using a digital intervention in poorly controlled hypertension: randomised controlled trial. *BMJ*. 2021 Jan 19;372:m4858. doi: 10.1136/bmj.m4858. PMID: 33468518; PMCID: PMC7814507.



U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention