

SELF-MEASURED BLOOD PRESSURE MONITORING PROGRAM:

ENGAGING PATIENTS IN SELF-MEASUREMENT



Self-measured blood pressure monitoring program: Engaging patients in self-measurement

This program is designed for use by physician offices and health centers to engage patients in self-measurement of blood pressure. This program describes various ways that the patient can obtain blood pressure (BP) measurements outside of the clinical office either through the purchase of a device or a physician-led blood pressure monitor loaner program. Your practice or health center will establish a process for

- Training staff on engaging patients in a self-measurement program
- Educating patients on hypertension
- Measuring blood pressure using proper positioning
- Suggestions for communicating blood pressure measurements back to the care team
- Guidance for instituting a blood pressure monitor loaner program

Disclaimer: Always make sure patients know what to do should they have a blood pressure measurement that is outside the pre-determined acceptable range or if they experience any symptoms with a high or low blood pressure measurement, including seeking emergency treatment if appropriate. This guidance to the patient should be individualized by the clinician and reinforced by clinical staff at the initiation of any SMBP monitoring program.

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Self-measured blood pressure monitoring program: Engaging patients in self-measurement

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Measuring accurately: Self-measured blood pressure monitoring

What is self-measured blood pressure monitoring?

Self-measured blood pressure (SMBP) monitoring, sometimes called home blood pressure monitoring, is a patient-performed measurement of their own blood pressure outside of a clinical setting. Research shows that SMBP:

- Can improve adherence and health outcomes for hypertensive patients¹
- Is different from, and more convenient than, ambulatory blood pressure monitoring, which requires a more specialized monitor to measure multiple blood pressures at set intervals over a 24-hour period²
- Should always be accompanied by additional support, such as a one-time training session by a health care professional, during which patients should be observed to determine that they measure blood pressure readings correctly
- Is proven to improve blood pressure control when a patient/clinician feedback loop is used to provide personalized support and advice based on the patient's data¹

Which SMBP device should patients use?

Most of the methods shown to improve patient outcomes have used an automated (oscillometric) device. With automatic devices, patients wrap a cuff around their arm and press a button to obtain a digital blood pressure reading.

When recommending an automated blood pressure measurement device for self-monitoring, take the following features into careful consideration.

Is the device valid? Automatic devices should be certified by one of three respected organizations:

- Association for the Advancement of Medical Instrumentation
- British Hypertension Society
- European Society of Hypertension

Does the device measure blood pressure from the upper arm? Only upper arm (not wrist) monitors produce reliable measures and these are the only type of monitors that reputable organizations recommend for home use.^{2,3}

Will patients find the device easy to use? Devices come in a range of models with varying features. For example, patients with visual, motor or hearing impairments may prefer devices with large digital display and large buttons and/or that use voice commands to operate.

Does the device make it easy for patients to share results with their provider? Consider whether the device has the ability to:

- Store readings and report them back at a later time
- Calculate an average measure over multiple readings
- Transmit information to other devices, including to apps or to your electronic health record (EHR) system

Does your EHR permit the direct transmittal of blood pressure measurements via a patient portal?

If so, you should establish a protocol to ensure that dangerously abnormal readings reported into the EHR receive timely responses.

How much does the device cost? Many public and private health insurance plans do not cover the cost of self-monitoring devices. Prices for a typical, high-quality device (available for purchase at most drug stores) can range between \$50 and \$150.

How should you and your patients use a home blood pressure monitor?

A universally accepted protocol for self-monitoring blood pressure does not exist. However, many patients and providers have found the following instructions useful. They are adapted from the Finn Protocol⁴ by Michael Rakotz, MD, at Northwestern Medical Group.

- Ask your patients to find a space where they can position themselves appropriately: seated comfortably in a chair with their legs uncrossed, feet flat on the floor, and arm and back supported. The cuff should be wrapped snugly but not tightly around their upper arm.
- Ask your patient to take two blood pressure readings at one- to two-minute intervals, both in the morning and in the evening for seven consecutive days. This will provide four blood pressure measurements a day, totaling 28 measurements for the week, which is ideal. However, it is worth noting that even three days of measurements (i.e., 12 readings) also has prognostic value.
- Ask your patient to record each blood pressure measurement.
- When you receive these measurements calculate the average (mean) value of all the systolic and diastolic blood pressures. Use this single average value to determine if your patient has hypertension or if your patient's blood pressure is controlled.
- It is important to note that self-monitored blood pressure values trend approximately 5mm Hg lower than those obtained by nurses in research settings. Thus a self-monitored systolic blood pressure of 135mm Hg is equivalent to a high-quality systolic blood pressure of 140mm Hg. The American Society of Hypertension recommends that when diagnosing or treating hypertension, providers and patients should consider a mean blood pressure >135/85 as the threshold for diagnosing hypertension or for treating high blood pressure.

Resources

List of validated home blood pressure monitors

Dabl Educational Trust website: <http://bit.ly/1pLvucM>

British Hypertension Society website: bhsoc.org/index.php?CID=247

Additional information on home blood pressure monitors

Association for the Advancement of Medical Instrumentation website: aami.org

European Society of Hypertension website: eshonline.org

Article on wireless blood pressure cuffs and Smartphone applications: <http://bit.ly/1pLvFF4>

References

1. Centers for Disease Control and Prevention Self-Measured Blood Pressure Monitoring: Action Steps for Public Health Practitioners, GA: Centers for Disease Control and Prevention, US Dept. of Health and Human Services; 2013.
2. Pickering TG, Miller NH, Ogedegbe G, Krakoff LR, Artinian NT, Goff D. Call to action on use and reimbursement for home blood pressure monitoring: A Joint Scientific Statement from the American Heart Association, American Society of Hypertension, and Preventive Cardiovascular Nurses Association. *Hypertension*. 2008; 52:10-29.
3. 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 290-2007-10055-1.) 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. Accessed July 9, 2014.
4. Niiranen TJ, Johansson JK, Reunanen A, Jula AM. Optimal Schedule for Home Blood Pressure Measurement Based on Prognostic Data: The Finn-Home Study. *Hypertension*. 2011; 57: 1081-1086. doi: 10.1161/HYPERTENSIONAHA.110.162123
5. Improving Health Outcomes: Blood Pressure. Murakami L, Astalas A, Boonyasai R, Wynia M, Rush C, Rakotz M. *Fast Facts: Home Blood Pressure Monitoring*. 1st ed. Daniel D and Prall M, eds. American Medical Association and the Johns Hopkins University School of Medicine; May 2014.

Make sure patients know what to do should they have a blood pressure measurement that is outside the pre-determined acceptable range, or if they experience any symptoms with a high or low blood pressure measurement, including seeking emergency treatment if appropriate. This guidance to the patient should be individualized by the clinician and reinforced by clinical staff at the initiation of any SMBP monitoring program.

Clinical competency:

Patient self-measured blood pressure at home

Clinical staff should be trained and tested on measuring blood pressure accurately. Using an essential competency like this will help demonstrate that staff can effectively teach patients to perform accurate blood pressure measurement independently at home.

How to use the competency form:

- Perform competencies at least twice a year.
- Fill in the name of the employee and the trainer.
- Follow the procedures step-by-step and determine if the employee is following them correctly.
- Based on the trainer's observation, place a check mark in either the column labeled "Meets competency" or "Needs more training."
- Use the following options to document the "Method of validation":
 - If the trainer showed the employee how to do the procedure and the employee then demonstrated the procedure, write "RD" for **return demonstration in a simulated patient setting**.
 - If the trainer is observing the employee perform the procedure while providing direct patient care, write "PC" for **direct patient care observation**.
- Both the employee and trainer should sign and date the competency form.
- Make the competency form part of the employee's training file.

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This clinical competency is not intended to be comprehensive. Additions and modifications to fit local practice or health center are encouraged.

Clinical competency:

Patient self-measured blood pressure (SMBP) at home

Employee's name (print): _____

Trainer's name (print): _____

Procedure	Meets competency (Check if "Yes")	Needs more training (Check if "Yes")	Method of validation RD: Return demonstration PC: Direct patient care observation
Explain the purpose of SMBP to the patient			
Tell the patient to use the bathroom if they need to prior to measuring their blood pressure (BP)			
Tell the patient to rest sitting in a chair for several minutes prior to measuring their blood pressure			
Ensure the patient's device has the correct cuff size (You may need to guide the patient to purchase a different size cuff from the manufacturer.)			
Show the patient how to position the cuff correctly on the arm against bare skin <i>(NOTE: Refer to the manufacturer's user manual for instruction on placement of the tubing.)</i>			
Teach the patient proper positioning: <ul style="list-style-type: none"> • Seated in a chair with back supported • Legs should be uncrossed • Feet flat on the ground or supported by a foot stool • Arm supported with the BP cuff in place and positioned so that the BP cuff is at the level of the patient's heart 			
Direct the patient not to talk, use the phone, text, email or watch television during the procedure. (Also explain that no one else should be talking during blood pressure measurement.)			
Instruct the patient to take two readings one minute apart, once in the morning and once in the evening			
Show the patient how to turn on the device and press the start button			
If an error reading occurs, direct the patient to start over			
When the cuff completes the deflating process and a reading is displayed, explain to the patient which numbers represent the systolic and diastolic blood pressure			
Show the patient how to document their blood pressure on the flow sheet or wallet card If the device has memory capability, show the patient how to retrieve the readings			
Provide the patient with instructions on what to do if readings show an abnormal blood pressure measurement			

Comments: _____

Employee's signature: _____ Date: _____

Trainer's signature: _____ Date: _____

Measure accurately:

A guide for blood pressure measurement

The importance of accurate blood pressure (BP) measurement cannot be minimized when diagnosing or treating hypertension. Measuring blood pressure accurately every time requires:

- Well-supported standard processes that are easy for staff to follow
- Staff who consistently use proper technique
- Easy availability of equipment and space

Excellent measurement technique requires training and skill building, but a few common problems related to patient preparation and positioning often account for unreliable readings.^{1,2}

Here are several common problems that account for inaccurate blood pressure measurement:

When patient has ...	BP can change by this much ... ^{3,4}
Cuff over clothing	10–40 mm Hg
Full bladder	10–15 mm Hg
Conversation or is talking	10–15 mm Hg
Unsupported arm	10 mm Hg
Unsupported back	5–10 mm Hg
Unsupported feet	5–10 mm Hg
Crossed legs	2–8 mm Hg

A standardized process should be implemented to ensure blood pressure is measured accurately for each patient. Steps to include are:

- Use a validated, automated device to measure BP.⁵
- Ask the patient “Do you need to use the bathroom?” and allow him/her to do so if needed prior to measurement.³
- Use the correct cuff size for the patient’s arm.³
- Ensure the patient is properly positioned³:
 - Seated in a chair with the back supported
 - Legs uncrossed
 - Feet flat on the ground or supported by a foot stool
 - Arm supported with the blood pressure cuff in place and positioned so that the cuff is at the level of the patient’s heart
- Do not allow the patient to talk, use the phone, text or email during the procedure.
- Employees should also not talk during the procedure.

See the “Self-measured blood pressure technique” patient handout for a graphical representation of measuring accurately.

References

1. Williams JS, Brown SM, Conlin PR. Blood-Pressure Measurement. *N Engl J Med*. 2009;360(5):e6.
2. Ogedegbe G, Pickering T. Principles and techniques of blood pressure measurement. *Cardiol Clin*. 2010 Nov;28(4):571-86.
3. Pickering TG, Hall JE, Appel LJ, et al. Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Circulation*. Feb 8 2005;111(5):697-716
4. O'Brien E, Asmar R, Beilin L, et al. European Society of Hypertension recommendations for conventional, ambulatory and home blood pressure measurement. *J Hypertens* 2003; 21: 821-848.
5. Campbell NR, Berbari AE, Cloutier L, et al. Policy statement of the world hypertension league on noninvasive blood pressure measurement devices and blood pressure measurement in the clinical or community setting. *J Clin Hypertens*. 2014; 16(5): 320-322.

How to check a home blood pressure monitor for accuracy*

The first step in choosing an accurate monitor is to select one that has been approved under a formal validation protocol; all self-measured blood pressure devices sold in the United States are required to meet Food and Drug Administration standards. However, even a device that has passed an accepted validation test will not provide accurate readings in all patients; the error may be consistently + 5 mm Hg in many individuals, especially elderly patients or patients with diabetes. For this reason clinicians should encourage patients to bring any home blood pressure monitor they use to their physician's office to measure its accuracy against a mercury sphygmomanometer or comparable device before the readings are accepted. A simple version of the European Society of Hypertension International Protocol has been developed for this purpose and can be done quickly by the physician or other health care clinician and the patient.

The following steps to ensure accuracy take approximately 10 minutes.

1. Have the patient sit down with his or her arm at heart level. The arm should be completely relaxed.
2. Allow the patient to rest for five minutes.
3. Avoid any conversation during the measurements to prevent an increase in blood pressure.
4. Take a total of five sequential same-arm blood pressure readings, no more than 30 seconds apart.
5. Have the patient take the first two readings with his or her own device.
6. Take the third reading, preferably with a mercury sphygmomanometer or comparable device.
7. Have the patient take the fourth reading.
8. The fifth and final reading is taken by the health care clinician.
9. Compare the difference between the readings from the two cuffs.
 - a. BP readings will usually decline over the five measurements. The final systolic blood pressure reading may be as much as 10 mm Hg lower than the first.
 - b. If the difference is 5 mm Hg or less, the comparison is acceptable.
 - c. Do the calibration again if the difference is greater than 5 mm Hg but less than 10 mm Hg.
 - d. The device may not be accurate if the difference is greater than 10 mm Hg.
10. Repeat this procedure annually.

Though there is no established target for how close the readings from the patient's cuff should be to those from the clinician's cuff, the above exercise can provide a general sense of the device's accuracy, which can be taken into consideration for future measurements recorded at home. To further ensure accuracy, consider calibrating the clinic and home devices following the National Health and Nutrition Examination Survey (NHANES) Health Tech/Blood Pressure Procedures Manual. The manual can be found at: cdc.gov/nchs/data/nhanes/nhanes_09_10/bp.pdf

* Adapted from Centers for Disease Control and Prevention. *Self-Measured Blood Pressure Monitoring: Action Steps for Clinicians*. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services; 2014: 24.

Patient selection criteria for a blood pressure monitor loaner program

Practice sites can consider the following criteria for selecting patients to participate in the blood pressure monitor loaner program:

The patient has a measured blood pressure > 140/90 mmHg on the first and subsequent readings during an office visit.

- ✓ The patient has elevated readings persisting for two or more subsequent office visits.
- ✓ The patient has a diagnosis of hypertension, is being ruled out for a diagnosis of hypertension or has white coat hypertension.
- ✓ The practice's device has a cuff size appropriate for the patient.

Recommended cuff sizes for accurate measurement of blood pressure¹

Arm circumference	Cuff size
22 to 26 cm	12 x 22 cm (small adult)
27 to 34 cm	16 x 30 cm (adult)
35 to 44 cm	16 x 36 cm (large adult)

- ✓ The patient has the aptitude to take an accurate measurement and willingness to take blood pressure readings consistently. The patient must also be capable of documenting the readings if the loaner device does not have memory storage capability.
- ✓ The patient meets the above criteria and has expressed a desire to take blood pressure readings at home, but is unable to purchase a home blood pressure device AND/OR the clinician feels home measurement will only be needed for a short period of time and patient purchase would be unnecessary.

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Reference

1. Pickering TG, Hall JE, Appel LJ, et al. Recommendations for blood pressure measurement in humans: An AHA scientific statement from the Council on High Blood Pressure Research Professional and Public Education Subcommittee. *J Clin Hypertens*. February 2005; 7(2): 102-109. Accessed December 22, 2014.

Patient enrollment process for a blood pressure device loaner program

Please use this document as a checklist to ensure continuity and consistency among staff members when distributing a loaner blood pressure (BP) device to the patient.

- The physician or other designated staff member confirmed the patient meets the criteria for patient selection (see "Patient selection criteria" document).
- The physician or other designated staff member discussed the loaner program and expectations with the patient and receive agreement on actively participating in self-measured blood pressure at home.
- Upon agreement, educate the patient on use of the blood pressure monitor:
 - How to measure blood pressure accurately
 - Functionality and use of the blood pressure monitor
 - How to read and understand the digital display
- Provide the following handouts to the patient and review them together:
 - Self-measured blood pressure at home: Patient information
 - Self-measured blood pressure technique
 - High blood pressure (hypertension) overview
 - Self-measured blood pressure and pulse at home flow sheet and/or BP log wallet card
- Fill out the "BP monitor loaner log."
- Complete and have the patient sign the "Patient participation and loaner device agreement."
- Document participation in program in patient medical record.
- Inform patient on specifics of how they should communicate blood pressure measurements back to the office, including how often, and document it in the medical record.
- Upon return of the device, perform infection prevention measures and document the return in the "BP monitor loaner log."

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Patient participation and blood pressure device loaner agreement

- I agree to participate in the Blood Pressure Device Loaner Program.
- I will take my blood pressure using the monitor provided to me and as directed by my doctor or staff member.
- I will record the blood pressure readings as instructed below.
- I will report these readings to my doctor's office as instructed below.
- I will contact my doctor as instructed for any blood pressure reading of more than _____.
- I will return this monitor on the anticipated return date (listed below) as determined by my doctor or staff member.

Blood pressure device serial number: _____

Anticipated date of return: _____

Blood pressure is to be measured and recorded twice daily, two measurements one minute apart every morning and two measurements one minute apart every evening for ____ days.

Alternatively, _____

Blood pressures will be reported back to the doctor's office by (circle one):

- Telephone
- Bringing machine / blood pressure log back to office for review
- Patient portal / secure computer messaging

Patient name (print): _____

Patient date of birth: _____

Patient signature: _____

Date: _____

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Diagnosis, communication, documentation and management

Diagnosis

When patients have elevated blood pressures in the office and the diagnosis of hypertension is suspected, self-measured blood pressure (SMBP) can be very useful in distinguishing between white coat hypertension (or isolated office hypertension) and true hypertension. White coat hypertension occurs when a patient's blood pressure is persistently elevated in the office setting, but out-of-office blood pressures are in the normal range. SMBP is also useful in identifying patients with masked hypertension. Masked hypertension occurs when office blood pressures are normal, but out-of-office blood pressures are elevated. This is one of the most dangerous types of hypertension, as both the patient and physician can remain unaware for long periods of time.

To confirm the diagnosis of hypertension¹ in a patient with elevated office blood pressures or to increase the chance of diagnosing a patient suspected of having masked hypertension, it is best to use multiple readings over time. This is due to the significant variability in everyone's blood pressure over time. There is one protocol for SMBP at home that is the most widely accepted, and used in most guidelines.²

- Have your patients take at least two blood pressure measurements with a validated automated upper arm device (one minute apart) each morning and each evening for at least four days.
- Calculate the average of all of the measured systolic and diastolic blood pressures into a single averaged systolic and single averaged diastolic blood pressure (see "Documentation" below).
- If the average blood pressure is either a systolic blood pressure (SBP) >135 mm Hg or diastolic blood pressure (DBP) > 85 mm Hg then the patient meets the criteria for having hypertension.
- If the diagnosis of hypertension, white coat hypertension or masked hypertension remains uncertain after using SMBP, then use 24-hour ambulatory blood pressure monitoring (ABPM).

Communication

To be most effective, self-measured blood pressures from home should be communicated back to the physician's office for interpretation.

Home blood pressure measurements can be communicated back to the physician or care team in several ways:

- The patient can phone the measurements to the office to an assigned staff member.
- The patient can fax the measurements to the office via a pre-provided secure fax number.
- The patient can send the measurements online through the facility's secure patient portal.
- The patient can send the measurements online through a secure telemedicine site, such as the American Heart Association's Heart360 tool (heart360.org).
- If the blood pressure device has memory storage capability, the patient can bring the device to the office for staff to review or download.
- The patient can return for a scheduled follow-up visit after the home measurement period is completed. (NOTE: If the patient received a loaner blood pressure device, this can assist in securing its return.)

Each physician office is encouraged to analyze the process it uses to have patients communicate home blood pressure readings. Inform to patients how and when you will respond to their communications and what the patient should do in the event of a concerning blood pressure reading, particularly if the office is not able or does not intend to respond immediately.

Documentation

The average SMBP measurement from home should be documented in the patient's health record.

All of the individual blood pressure measurements performed by the patient should be averaged into a single blood pressure that will be used to determine the diagnosis and/or guide treatment.

- Calculate the average of all the readings and document that result.
- If a patient provides you with an average of the readings, verify the method used.
 - Manual patient calculations should be verified by the physician or a member of the office staff.
- Some electronic medical record applications have the capability to do this automatically. If that is not available, perform a manual calculation.
- Place documentation of this average value in the patient's record in a field designated for self-measured or home blood pressure readings.
 - Some electronic medical record systems only provide the capability to record these extra blood pressure measurements within a text field of the clinical note.
 - Consult with your electronic medical record vendor for the best solution based on your electronic medical records' functionality.

Management

SMBP at home is useful in the management of hypertension for several reasons.

SMBP:

- Yields many blood pressure measurements over time, (with fewer office visits) which helps determine if a change in therapy is warranted and helps prevent over-treatment.
 - Variation in blood pressure occurs in everyone, making treatment decisions difficult. No single medication is equally effective for all patients, so multiple measurements over time are needed to determine if control has been achieved.
- Improves blood pressure control, especially if the patient uses a form of clinical support.
 - Examples include telemonitoring with counseling, pharmacist counseling, self-adjustment of medications, remote counseling from a nurse or lifestyle counseling.³
- Provides measurements correlated more closely with target organ damage as compared to office blood pressure measurements.
- Improves adherence to antihypertensive therapy.⁴
- When combined with telemonitoring, can increase aggressiveness of pharmacotherapy⁵ and help reduce therapeutic inertia.

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References

1. Niiranen TJ, Johansson JK, Reunanen A, Jula AM. Optimal schedule for home blood pressure measurement based on prognostic data. *Hypertension*. 2011; 57: 1081-1088.
2. Niiranen TJ, Asayama K, Thijs L, et al. Outcome-driven thresholds for home blood pressure measurement. *Hypertension*. 2013; 61: 27-34.
3. McManus J, Mant J, Bray EP, et al. Telemonitoring and self-management in the control hypertension (TASMINH2): a randomized controlled trial. *Lancet*. 2010; 376: 163-172.
4. Bosworth HB, Powers BJ, Olsen MK, et al. Home blood pressure management and improved blood pressure control: Results from a randomized controlled trial. *Arch Intern Med*. 2011; 171: 1173-1180.
5. Omboni S, Gazzola T, Carabelli G, Parati, G. Clinical usefulness and cost effectiveness of home blood pressure telemonitoring: Meta-analysis of randomized controlled studies. *J Hypertension*. 2013; 31: 455-467.

Recommended infection prevention process for blood pressure monitors loaned to patients

Infection prevention is important in any setting where care is delivered. The Centers for Disease Control and Prevention (CDC) have developed minimum standards for safe care that includes medical equipment.

According to the CDC, non-critical items (e.g., blood pressure cuffs) are objects that may come into contact with intact skin but not mucous membranes and should go through cleaning and low- or intermediate-level disinfection.¹

Per the “CDC Guideline for Disinfection and Sterilization in Healthcare Facilities”:

“Disinfect noncritical surfaces with an [Environmental Protection Agency (EPA)]-registered hospital disinfectant according to the label’s safety precautions and use directions. Most EPA-registered hospital disinfectants have a label contact time of 10 minutes. However, many scientific studies have demonstrated the efficacy of hospital disinfectants against pathogens with a contact time of at least 1 minute. By law, the user must follow all applicable label instructions on EPA-registered products. If the user selects exposure conditions that differ from those on the EPA-registered product label, the user assumes liability for any injuries resulting from off-label use and is potentially subject to enforcement action under [Federal Insecticide, Fungicide, and Rodenticide Act]. Category II, IC.”²

Process

- Upon return of the blood pressure monitor, place it in a location designated for dirty equipment.
- Clean the equipment per CDC guidelines and place it in a location designated for clean equipment.
- Document the disinfection of the blood pressure monitor in the “Blood pressure monitor loaner log.”

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References

1. Centers for Disease Control and Prevention. Infection prevention checklist for outpatient settings: Minimum expectations for safe care; vol 1. CDC publication CS224818. <http://www.cdc.gov/HAI/pdfs/guidelines/Outpatient-Care-Guide-withChecklist.pdf>. Accessed January 23, 2015.
2. Rutala W, Weber D, Healthcare Infection Control Practices Advisory Committee; Centers for Disease Control and Prevention. Guideline for disinfection and sterilization in healthcare facilities, 2008. http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf. Accessed January 23, 2015.

High blood pressure (hypertension) overview

Background

High blood pressure is also known as hypertension. Blood pressure (BP) is the pressure of the blood against the walls of the blood vessels as it moves through the body. Blood pressure rises and falls during the course of the day, but if it is high for a long time, it can cause serious health problems.

Blood pressure is written as two numbers:

- **Systolic blood pressure (SBP)** is the “top” number of your blood pressure measurement. It represents the pressure generated when the heart beats. A systolic blood pressure less than 120 mm Hg is considered normal. An SBP of 140 mm Hg or higher indicates hypertension in most people.
- **Diastolic blood pressure (DBP)** is the “bottom” number of your blood pressure measurement. It represents the pressure in the blood vessels when the heart is at rest. A diastolic blood pressure less than 80 mm Hg is considered normal. A DBP of 90 mm Hg or higher indicates hypertension in most people.

Blood pressure levels	
Normal	Systolic: less than 120 mm Hg Diastolic: less than 80 mm Hg
At Risk (pre-hypertension)	Systolic: 120–139 mm Hg Diastolic: 80–89 mm Hg
High	Systolic: 140 mm Hg or higher Diastolic: 90 mm Hg or higher

Make sure you know what to do should you have a blood pressure measurement that is outside the pre-determined acceptable range or if you are experiencing any symptoms with a high or low blood pressure measurement, including seeking emergency treatment if appropriate. This plan should be established between you and your clinician prior to you initiating home blood pressure monitoring. It should also be reinforced by clinical staff at the initiation of a Self-measured blood pressure monitoring program.

Types of hypertension and risks

- **Essential hypertension** is the most common type of hypertension. It is caused by genetics and environmental factors. It can be affected by your diet and how much salt you use. Obesity increases your risk for essential hypertension. Your risk also increases as you age because your blood vessels become stiffer, which causes your blood pressure to go up.
- **Secondary hypertension** is much less common. It is caused by specific diseases of different parts of your body such as your kidneys, adrenal glands or blood vessels.
- **White coat hypertension**, sometimes called white coat syndrome, is when a patient has elevated blood pressure readings in a medical setting (such as a doctor’s office) and normal blood pressures when not in a medical setting (such as at home or at work). The elevated blood pressure readings are thought to be due to anxiety from being in a medical setting.

Other things that can increase your risk for hypertension include medicines you take. Birth control pills and steroids, for example, can raise your blood pressure. Illegal drugs that are stimulants, like cocaine, can also cause hypertension or make it worse, as can alcohol.

Signs and symptoms of high blood pressure

High blood pressure does not usually have any warning signs or symptoms and is often called a “silent disease.” Effects of prolonged untreated hypertension most often occur late in the disease. That is why it is important for your blood pressure be checked regularly to find out if it is high. Early identification of high blood pressure will help prevent damage to your body’s organs and decrease your risk of heart attack and stroke.

Treating and controlling high blood pressure

- **Medications:** Your doctor may prescribe a number of pills for you to take. It is important to follow the directions for taking these medications. Low cost medications are available. Let your doctor know if these medications present any physical or financial problems for you.
- **Healthy weight:** Maintaining a healthy weight is important to blood pressure control. If you are overweight, losing 5 percent to 10 percent of your current body weight can help lower your blood pressure. That is about 20 pounds for someone who weighs 200 pounds. Excess weight adds to the effort your heart makes to pump blood through your body.
- **Exercise:** Exercising 30 minutes at least five days per week can help lower your blood pressure. If you are not currently exercising, review a plan with your doctor before you start.
- **DASH eating plan:** DASH stands for “Dietary Approaches to Stop Hypertension.” This diet includes a diet with lots of fruits, vegetables, low-fat dairy products, and lower saturated and total fat. The DASH eating plan is also lower in sodium and less sodium is known to help lower blood pressure.
- **Alcohol and tobacco:** Having more than one alcoholic drink per day can raise your blood pressure. It can also cause liver damage and increase your risk for a variety of cancers. Smoking and tobacco use will also raise your blood pressure. Don’t smoke or use any tobacco products.
- **Self-measured blood pressure:** Research shows that people who measure their blood pressure at home and report results to their doctor or care team member have better blood pressure control. Your doctor or care team member may advise you on how often you should check your blood pressure, especially when you are first diagnosed with high blood pressure or when changing your medications.
- **Doctor visits:** Follow up with your doctor regularly when you have high blood pressure. Your doctor may ask you to come to the office as often as every one or two weeks to have your blood pressure checked when you are first diagnosed. Once your BP is under control, your doctor will create a schedule for you to return to the office.

Additional resources

Weight control: cdc.gov/healthyweight/index.html

Exercise: cdc.gov/physicalactivity/index.html

DASH eating plan: nhlbi.nih.gov/files/docs/public/heart/dash_brief.pdf

Limiting alcohol use: cdc.gov/alcohol

Quitting smoking: cdc.gov/tobacco

Self-measured blood pressure at home

Importance of self-measuring blood pressure

Measuring your blood pressure at home and sharing measurements with your doctor has been shown to improve blood pressure control. By providing your doctor with more blood pressure measurements than would normally be taken in the office, your doctor will have a better idea of how well your diet, exercise and medicines are working to control your high blood pressure when you are not in the office.

This handout will show you how to:

- Choose a home blood pressure monitor
- Measure your blood pressure accurately

Choosing a home blood pressure monitoring device

If you are buying your own blood pressure monitor for home use, there are a few points to consider:

- Most upper arm home blood pressure monitors cost \$50 to \$100.
- Using wrist and finger cuffs on blood pressure monitors are less accurate and not recommended.
- Monitors are available with larger displays that are easier to read.
- If you enjoy technology, some monitors can connect with your smart phone and track your blood pressure readings.
- Always purchase a monitor that has the correct size cuff for your arm.

Recommended cuff sizes for accurate measurement of blood pressure

Arm circumference	Cuff size
22 to 26 cm	12 x 22 cm (small adult)
27 to 34 cm	16 x 30 cm (adult)
35 to 44 cm	16 x 36 cm (large adult)

There are many blood pressure monitors to choose from. Always select a blood pressure monitor that has been certified (confirmed to be accurate) by one of these three respected organizations:

- Association for the Advancement of Medical Instrumentation
- British Hypertension Society
- European Society of Hypertension

Additional certified monitors can be found on the internet at <http://tinyurl.com/mxuvn7v>.

If you buy your own device, consider taking it to your doctor's office and ask them to check the accuracy of your machine.

Measuring your blood pressure accurately

You will need to follow certain steps to help make sure that you are measuring your blood pressure accurately. Your doctor or care team may also give you instructions on how often to take your blood pressure. Always follow the advice of your doctor. Most of the time you will take two blood pressure measurements in the morning and two more in the evening for one to two weeks. You should plan to review these results with your doctor or a member of your doctor's staff. This can be done through a phone call, an office visit or using a patient portal on a computer if that is available to you.

To measure blood pressure correctly, there are things you should, and should not, do. Follow these guidelines to help make sure that you measure your blood pressure accurately every time. If you are sharing your machine with another family member or friend, remember to follow the manufacturer's instructions for changing the user.

Before you take your blood pressure:

- Do not exercise, eat a large meal, use caffeine, drink alcohol or take decongestants for 30 minutes before you take your blood pressure.
- Use the bathroom if you need to before taking your blood pressure.
- Sit quietly in a comfortable position for five minutes without crossing your legs or your ankles.
- Sit with your back supported keeping your feet flat on the floor.

When you are ready to take your blood pressure:

- Continue to sit with your back supported, your legs uncrossed and your feet flat on the floor. Use a step stool if needed to make sure your feet are flat on a surface.
- Following the instructions for your device, put the cuff on by wrapping it around your bare arm above your elbow. Face the palm of your hand up to relax your arm muscles.
- Rest your arm on a table or another flat surface at the level of your heart. Keep it stretched out and relaxed and sit still.
- Do not talk, read, text or watch television while taking your blood pressure.
- Following the directions of the monitor you are using, press the button to start the machine. The cuff will inflate and slowly deflate by itself.

When the machine has stopped taking your blood pressure:

- The machine will display two numbers. The top number is the systolic blood pressure and the bottom number is the diastolic blood pressure. Write down the date, time and result of your blood pressure if your machine does not store that information automatically. If there is a pulse recorded on the display, write that down as well.
- Remove the cuff from your arm and place the device in a safe and dry place.
- Remember to follow the instructions that your doctor or care team gave you for reporting your blood pressures. Take your written blood pressure log or the blood pressure machine with you to your next doctor's office visit if you have been instructed to do so.

For additional information on taking your blood pressure at home, see the "Patient self-measured blood pressure technique" handout.

Self-measured blood pressure technique: How to take your own blood pressure

Before you measure

1. Use a certified, automated device to measure your blood pressure (BP) using your arm (not finger or wrist).
2. Use a cuff that is the right size for your arm.
3. Do not exercise, smoke, eat a large meal, take decongestants or have caffeine within 30 minutes of measuring your blood pressure.
4. Use the bathroom if you need to, before the measurement.
5. Rest for five minutes before measuring your blood pressure.

Position yourself correctly

6. **1** Sit in a chair, with your back supported.
- 2** Sit with your legs uncrossed and feet flat on the floor (or stool).
- 3** Rest your arm on a table close to heart level.
- 4** Place the blood pressure cuff over bare skin, on mid-arm at heart level and just above your elbow.



Perform blood pressure measurement

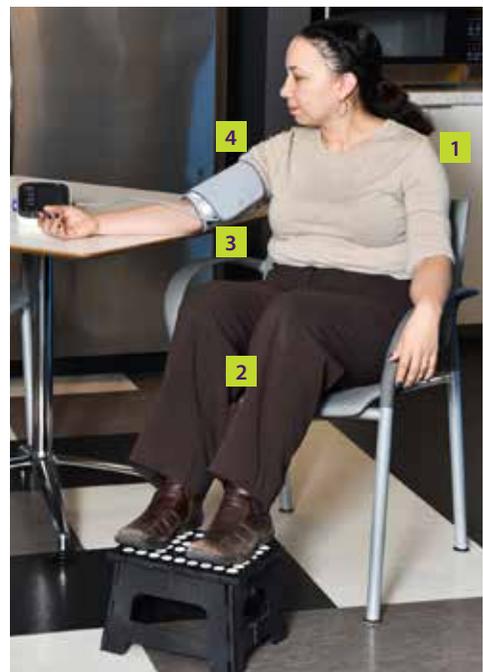
7. Do not talk, text, read, watch TV or use your phone, computer or tablet while measuring your blood pressure.

8. "Power on" the machine and push the start button.

When the machine stops, write down the upper and lower BP numbers (systolic and diastolic) if the machine does not store them automatically.

Wait one minute and then repeat (some machines will do this automatically). You should always check at least two blood pressure measurements one minute apart and write them down.

9. Take your two blood pressure measurements in the morning and two in the evening for one week, and report them to your doctor's office.



Self-measured blood pressure monitoring at home – flow sheet

Name: _____ Date of birth: _____

Instructions for self-measured blood pressure at home

Decide with your doctor or care team if you should use this form. You may not need to use it if your blood pressure device is able to store your readings and you are able to share those readings with your clinician.

(See “Self-measured blood pressure at home” handout for additional information.)

Rest for five minutes before measuring the first blood pressure

1. Take at least two measurements each time you check your blood pressure and write them down. Wait at least one minute between each measurement.
2. Write any factors you feel may have affected your blood pressure in the comments section.
3. Do this two times a day—once in the morning and once in the evening.
4. Give these numbers to your doctor or clinical office staff in person, during a telephone call or through secure computer messaging.

Date	Morning			Evening		
	#1	#2	Comments/average	#1	#2	Comments/average
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						
Day 7						

Date	Morning			Evening		
	#1	#2	Comments/average	#1	#2	Comments/average
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						
Day 7						

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Always measure accurately

- Avoid checking your blood pressure if you have eaten a big meal, exercised, smoked, used caffeine or taken decongestants in the past 30 minutes.
- If you need to use the bathroom, do so before you begin.
- Sit quietly for five minutes in a comfortable position.
- Sit in a chair with your back supported.
- Sit with your legs uncrossed and your feet flat on the floor. Use a step stool if necessary to make sure you support your feet on a flat surface.
- Support your arm on a table or other surface at heart level.

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- Sit in a chair with your back supported.
- Sit with your legs uncrossed and your feet flat on the floor. Use a step stool if necessary to make sure you support your feet on a flat surface.
- Support your arm on a table or other surface at heart level.

How to use this log:

Take your blood pressure as directed by your doctor.

Write down the date and time of your blood pressure measurement in the appropriate column.

Write the top number of your blood pressure reading in the "systolic" column.

Write the bottom number of your blood pressure reading in the "diastolic" column.

Bring this log with you to your doctor visits or communicate the results by telephone or computer.



How to use this log:

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Self-measured blood pressure patient log



Self-measured blood pressure patient log



Self-measured blood pressure patient log



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