Diagnosing hypertension

Evidence supporting the 2015 recommendations of the Canadian Hypertension Education Program

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Abstract

Objective To highlight the 2015 Canadian Hypertension Education Program (CHEP) recommendations for the diagnosis and assessment of hypertension.

Quality of evidence A systematic search was performed current to August 2014 by a Cochrane Collaboration librarian using the MEDLINE and PubMed databases. The search results were critically appraised by the CHEP subcommittee on blood pressure (BP) measurement and diagnosis, and evidence-based recommendations were presented to the CHEP Central Review Committee for independent review and grading. Finally, the findings and recommendations were presented to the Recommendations Task Force for discussion, debate, approval, and voting. The main recommendations are based on level II evidence.

Main message Based on the most recent evidence, CHEP has made 4 recommendations in 2 broad categories for 2015 to improve BP measurement and the way hypertension is diagnosed. A strong recommendation is made to use electronic BP measurement in the office setting to replace auscultatory BP measurement. For patients with elevated office readings, CHEP is recommending early use of out-of-office BP measurement, preferably ambulatory BP measurement, in order to identify early in the process those patients with white-coat hypertension.

Conclusion Improvements in diagnostic accuracy are critical to optimizing hypertension management in Canada. The annual updates provided by CHEP ensure that practitioners have up-to-date evidence-based information to inform practice.

EDITOR'S KEY POINTS

- Each year, the Canadian Hypertension Education Program (CHEP) carefully reviews the literature in order to provide annual evidence-based updates to their hypertension guidelines to ensure practitioners have up-to-date information to support clinical decision making.
- In 2015, CHEP is making 4 new recommendations for blood pressure (BP) measurement and diagnosing hypertension. Recommendations address in-office and out-of-office assessment, including ambulatory BP measurement and home BP measurement.
- A diagnostic algorithm that has been developed by CHEP to reflect these recommendations is provided.

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For 2015, the Canadian Hypertension Education Program (CHEP) has introduced new recommendations to improve blood pressure (BP) measurement and the diagnosis of hypertension. The recommendations and the evidence supporting them are presented.

Since CHEP initially began making annual recommendations for the diagnosis and treatment of hypertension in 1998, Canada has achieved one of the highest levels of treatment and control of hypertension in the world.[1] However, there remains a substantial number of patients who are not aware of their hypertension, who are misdiagnosed, or who are inadequately treated.

Quality of evidence

A systematic search was performed current to August 2014 by a Cochrane Collaboration librarian using the MEDLINE and PubMed databases. The search results were critically appraised by the CHEP subcommittee on BP measurement and diagnosis, and evidence-based recommendations were presented to the CHEP Central Review Committee for independent review and grading. Finally, the findings and recommendations were presented to the Recommendations Task Force for discussion, debate, approval, and voting. The main recommendations are based on level II evidence.

Main message

New recommendations. Following an extensive and rigorous literature review,[2] CHEP is introducing several changes to the recommendations for BP measurement and the diagnosis of hypertension in 2015.[1] New recommendations include the following:

- Routine office BP measurement (OBPM) should be performed using an electronic oscillometric device (level II evidence).
- If a patient has elevated BP readings in the office, a series of standardized out-of-office BP measurements should be performed in order to rule out white-coat hypertension (WCH) and identify those patients who truly have hypertension (level II evidence).
- The out-of-office assessment should preferably be done using 24-hour ambulatory BP measurement (ABPM). A series of measurements with home BP measurement (HBPM) can be done if ABPM is not available or not tolerated by the patient (level II evidence).
- If the average of the out-of-office readings is normal, a diagnosis of WCH is made. Patients with WCH should have their BP assessed annually and should not be treated pharmacologically, although a healthy lifestyle should be encouraged and supported at all times (level II evidence).

A new diagnostic algorithm (**Figure 1**)[2] has been developed to reflect these recommendations and is being distributed widely among health care professionals in Canada.

Blood pressure measurement. Several methods currently exist to measure BP. Manual measurement performed by a clinician using a stethoscope and a mercury or aneroid sphygmomanometer was first introduced in 1896 by Riva-Rocci. Other than the introduction of Velcro for fastening the cuff, this method has changed very little over the past 100 years. Several key studies in the 1940s and 1950s showed a strong correlation between elevated manual BP readings, taken with carefully performed standardized techniques, and increased cardiovascular risk. Unfortunately, more than 30 studies published over the past 3 decades have repeatedly and consistently demonstrated that these standardized techniques are rarely followed in routine clinical practice and, consequently, most auscultatory measurements performed in clinical practice are inaccurate.[3-6] Most frequently these manual readings in the office are higher, but this is not always the case. For these reasons CHEP is recommending that electronic BP measurement is the preferred method for in-office BP assessment.

Electronic BP measurement using the oscillometric technique was introduced in the 1960s and has become ubiquitous in clinical practice. Several organizations have created validation protocols to compare these devices to standardized manual measurements to verify their accuracy.[7,8] Validated devices are now available for clinical use in offices and for 24-hour ambulatory monitoring, as well as for personal use by patients in their homes. These devices eliminate many of the errors that occur when nonstandardized auscultatory measurements are done (rapid deflation, rounding the results, etc). The key advantage of electronic devices is that the measurements are reproducible and accurate when validated.

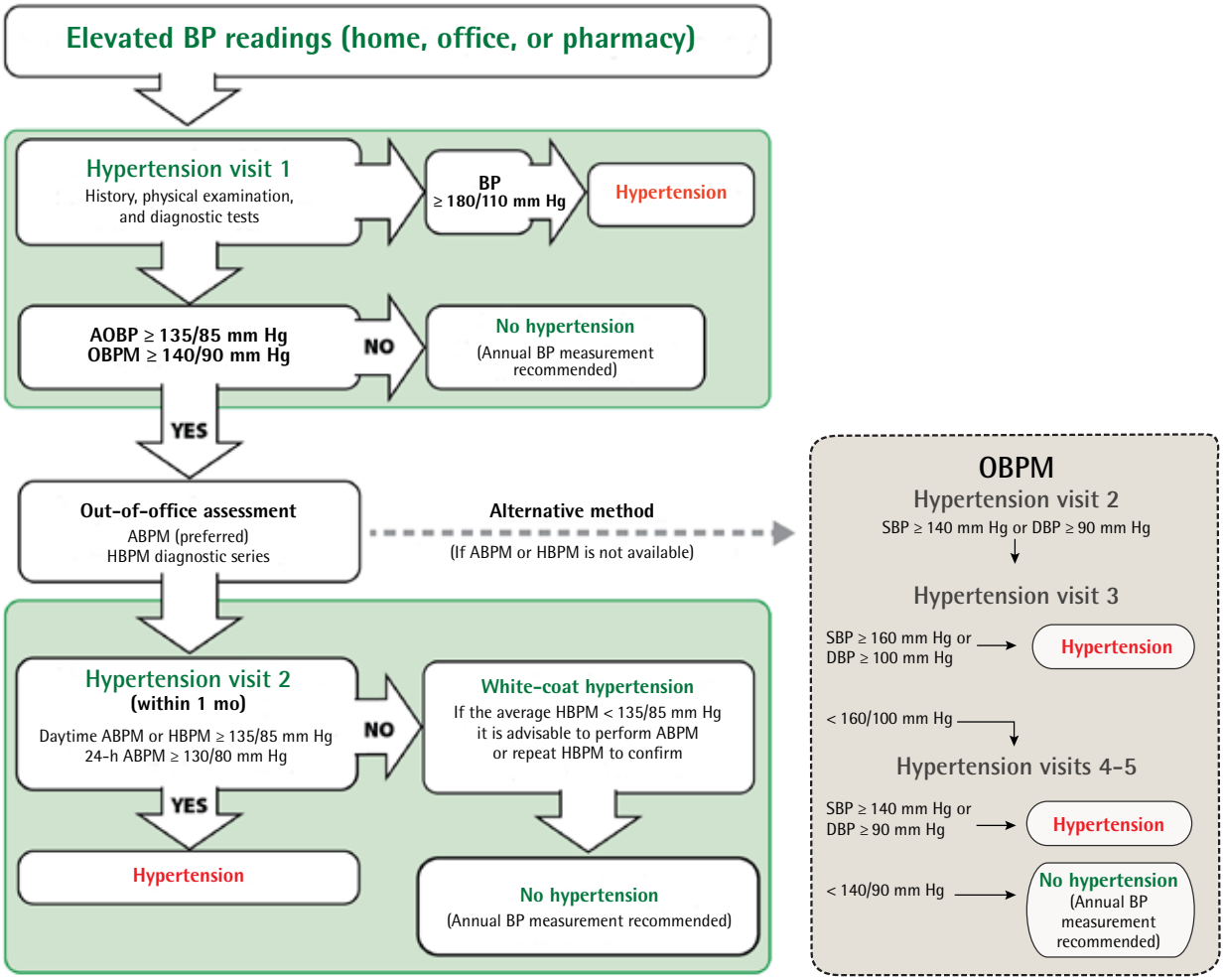
A specific type of OBPM known as automated office BP (AOBP) measurement utilizes electronic oscillometric devices that are preprogrammed to take a series of readings automatically (3 to 6 readings over 4 to 7 minutes) and calculate an average. When done correctly, the patient is left alone in the room. This technique has been shown to significantly reduce the white-coat effect ($P<.001$)[9] and correlate more closely with the criterion standard of 24-hour ambulatory BP daytime average, which in turn correlates well with the risk of adverse cardiovascular outcomes.[9-11]

The key differences between these 2 methods of office BP measurement is whether the health care professional remains in the room with the patient during the readings (OBPM) or not (AOBP), and whether multiple readings are automatically performed and averaged (AOBP) or not (OBPM). The upper limit for the AOBP average is 135 mm Hg systolic BP and 85 mm Hg diastolic BP; the upper limit for OBPM is 140 mm Hg systolic BP and 90 mm Hg diastolic BP.

White-coat hypertension. White-coat hypertension occurs when patients have elevated office BP but normal out-of-office BP. Several studies, and meta-analyses of the data in these studies, have shown that patients with WCH have similar cardiovascular risk to normotensive patients.[12,13] Some patients with recognized WCH will go on to develop true hypertension within a few years, but many will remain normotensive.[14,15] The CHEP guidelines recommend that patients with WCH should not be treated with medications[16]; however, they should have annual BP measurement and should be encouraged to adopt healthy lifestyle changes when clinically appropriate.

Out-of-office measurement. Over the past several decades, dozens of studies have looked at which method of BP measurement best correlates with clinical outcomes. Ambulatory BP measurement has emerged as the preferred method[17] owing to its many measurements in the patient's normal environment, as well as its unique ability to measure BP during sleep.[18-21] It requires some technical expertise to ensure the correct cuff is placed accurately, the first reading is checked, and the report is generated. Patients need to attend appointments 2 days in a row for application and removal of the equipment. Finally, some education is needed for clinicians to interpret the report.

Figure 1. Diagnosis of hypertension: *Measurement using electronic (oscillometric) upper-arm devices is preferred over auscultation.*



ABPM—ambulatory blood pressure measurement, AOBP—automated office blood pressure, BP—blood pressure, DBP—diastolic blood pressure, HBPM—home blood pressure measurement, OBPM—office blood pressure measurement, SBP—systolic blood pressure.

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When done properly, HBPM is an alternative method for assessing a patient's out-of-office BP when ABPM is not available or not tolerated by the patient.[22-24] For this purpose, CHEP recommends a series of 2 readings in the morning and 2 readings in the evening for 7 days (ie, 28 total readings). The first day's readings should be discarded and the average of days 2 to 7 is calculated. The upper limit of normal for the HBPM average is 135 mm Hg systolic BP and 85 mm Hg diastolic BP. It is critical to instruct patients on good BP measurement technique, which includes sitting with the back supported, legs uncrossed with feet on the floor, and the arm supported so the cuff is positioned at heart level. An important difficulty with HBPM is that it can be misreported by patients, so it is important to instruct patients to report all readings as taken without any editing.[25] To this end, home BP devices with memories, printouts, or telemonitoring capability are encouraged. Health care professionals play an important role in patient education. Support materials created by CHEP can be found on **www.hypertension.ca**.

Recommendations in other countries. The CHEP task force is not alone in making these recommendations. In 2011, the National Institute for Health and Care Excellence in the United Kingdom recommended that ABPM be

performed for all patients suspected of having hypertension to confirm the diagnosis.[26] In December 2014, the US Preventive Services Task Force made the same recommendation.[27] Both of these agencies have done extensive literature reviews on both the effectiveness and the cost-effectiveness of this approach. The province of British Columbia has also recently released a clinical practice guideline for hypertension that recommends ABPM to confirm the diagnosis of hypertension.[28]

Role of family physicians. Canadian family physicians deserve much of the credit for the high rates of treatment and control of hypertension that already exist in Canada. Improvements in diagnostic accuracy are critical to achieving the goal of further optimizing hypertension management, which cannot be accomplished without buy-in from primary care providers. To date, uptake of automated oscillometric AOBP devices within Canadian primary care practices has been relatively high; however, it is not clear if they are being used optimally. The availability of ABPM has been limited owing to cost and lack of reimbursement in many provinces.

In order to achieve the goal of better diagnosis and better control of hypertension, family physicians should be encouraged to invest in both AOBP and ABPM devices and to use them routinely and appropriately in clinical practice. Some provincial health plans already offer reimbursement for ABPM, and efforts are under way in other provinces to establish new billing codes. A "best-practice" table has been created by CHEP to assist providers with performing and interpreting ABPM (**Box 1**),[2] as have similar tables for OBPM, AOBP, and HBPM, available from **www.hypertension.ca**. In many practices the roles of measuring BP, educating patients about HBPM, and administering ABPM are undertaken by nurses and pharmacists; this is another reason for supporting the move to a team-based medical home model for family practice.

Conclusion

Family physicians and their teams have an important role to play in the identification and management of hypertension. The 2015 CHEP recommendations ensure that family physicians continue to have up-to-date evidence-based information to support their clinical practice.

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Contributors
All authors contributed to the development of the recommendations and preparing the manuscript for submission.

Competing interests
Dr Gelfer has received consulting fees from BpTRU, Microlife, and PharmaSmart in the past. **Dr Dawes** has received research funds from AstraZeneca, Pfizer, Janssen, Merck, Roche, and GlaxoSmithKline. No funding was received for preparing this article.

Box 1. Standardized protocol for ABPM:
Recommendations are grade D (based on poor-quality studies or expert opinion).

The Canadian Hypertension Education Program makes the following recommendations for ABPM for 2015

- The appropriately sized cuff should be applied to the nondominant arm unless the SBP difference between arms is > 10 mm Hg, in which case the arm with the highest value obtained should be used
- The device should be set to record for a duration of at least 24 h, with the measurement frequency set at 20- to 30-min intervals during the day and 30- to 60-min intervals at night
- A patient-reported diary to define daytime (time awake), nighttime (time sleeping), activities, symptoms, and medication administration is useful for study interpretation
- Daytime and nighttime should preferrably be defined using the patient's diary. Alternatively, predefined thresholds can be used (eg, 8 AM to 10 PM for day and 10 PM and 8 AM for night)
- The ABPM report should include all of the individual BP readings (both numerically and graphically), the percentage of successful readings, the averages for each time frame (daytime, nighttime, 24 h), and the "dipping" percentage (the percentage the average BP changed from daytime to nighttime)
- Criteria for a successful ABPM study are as follows:
  -at least 70% of the readings are successful and
  -at least 20 daytime readings and 7 nighttime readings are successful

ABPM—ambulatory blood pressure measurement, BP—blood pressure, SBP—systolic blood pressure.
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