II. Criteria for Diagnosis of Hypertension and Recommendations for Follow-up (Figure 1)

DIAGNOSIS AND ASSESSMENT

http://guidelines.hypertension.ca/diagnosis-assessment/diagnosis/

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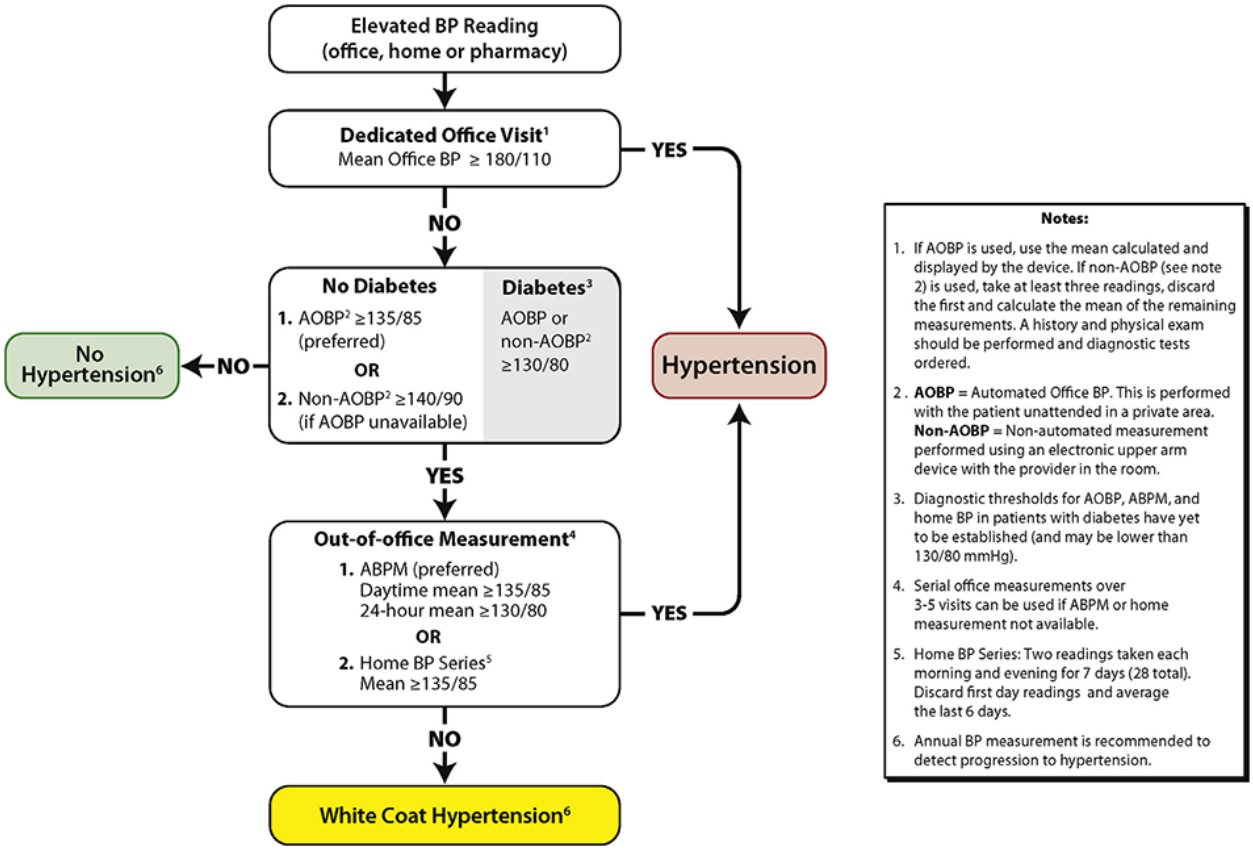
Recommendations

1. At initial presentation, patients demonstrating features of a hypertensive urgency or emergency (Supplemental Table S3) should be diagnosed as hypertensive and require immediate management (Grade D). In all other patients, at least two more readings should be taken during the same visit. If using OBPM, the first reading should be discarded and the latter readings averaged. If using AOBP, the BP calculated and displayed by the device should be used.
2. If the visit 1 OBPM is high-normal (see thresholds outlined in Section I-3) annual follow-up is recommended (Grade C).
3. If the visit 1 mean OBPM or AOBP is high (see thresholds outlined in Section I-3), a history and physical examination should be performed and, if clinically indicated, diagnostic tests to search for target organ damage (Supplemental Table S4) and associated cardiovascular risk factors (Supplemental Table S5) should be arranged within two visits. Exogenous factors that can induce or aggravate hypertension should be assessed and removed if possible (Supplemental Table S6). Visit 2 should be scheduled within one month (Grade D).
4. If the visit 1 mean OBPM or AOBP SBP is ≥180 mm Hg and/or DBP is ≥110 mm Hg then hypertension is diagnosed (Grade D).

5. If the visit 1 mean OBPM SBP is 140-179 mm Hg and/or DBP is 90-109 mm Hg OR the mean AOBP SBP is 135-179 mm Hg and/or DBP is 85-109, out-of-office BP measurements should be performed before visit 2 (Grade C).
    i. ABPM is the recommended out-of-office measurement method (Grade D). Patients can be diagnosed with hypertension according to the thresholds outlined in Section I-3.
    ii. HBPM is recommended if ABPM is not tolerated, not readily available or due to patient preference (Grade D). Patients can be diagnosed with hypertension according to the thresholds outlined in Section I-3.
    iii. If the out-of-office BP average is not increased, white-coat hypertension should be diagnosed and pharmacologic treatment should not be instituted (Grade C).
6. If the visit 1 mean OBPM SBP 140-179 mm Hg and/or DBP is 90-109 mm Hg AND out-of-office measurement, although preferred, is NOT performed, then patients can be diagnosed as hypertensive using serial office OBPM visits if any of the following conditions are met:
    i. At visit 2, mean OBPM (averaged across all visits) is ≥140 mm Hg systolic and/or ≥90 mm Hg diastolic in patients with macrovascular target organ damage, diabetes mellitus, or CKD (glomerular filtration rate [GFR] <60 mL/min/1.73m2) (Grade D);
    ii. At visit 3, mean OBPM (averaged across all visits) is ≥160 mm Hg systolic or ≥100 mm Hg diastolic;
    iii. At visit 5, mean OBPM (averaged across all visits) is ≥140 mm Hg systolic or ≥90 mm Hg diastolic.
7. Investigations for secondary causes of hypertension should be initiated in patients with suggestive clinical and/or laboratory features (outlined in sections V and VI) (Grade D).
8. If at the last diagnostic visit the patient is not diagnosed as hypertensive and has no evidence of microvascular target organ damage, the patient's BP should be assessed at yearly intervals (Grade D).
9. Hypertensive patients actively modifying their health behaviours should be followed up at 3- to 6-month intervals. Shorter intervals (every 1 or 2 months) are needed for patients with higher BP (Grade D).
10. Patients receiving antihypertensive drug treatment should be seen monthly or every 2 months, depending on the level of BP, until readings on two consecutive visits are below their target (Grade D). Shorter intervals between visits will be needed for symptomatic patients and those with severe hypertension, intolerance to antihypertensive drugs, or target organ damage (Grade D). When the target BP has been reached, patients should be seen at 3- to 6-month intervals (Grade D).



Background

1. At initial presentation, patients demonstrating features of a hypertensive urgency or emergency (Supplemental Table S3) should be diagnosed as hypertensive and require immediate management (Grade D). In all other patients, at least two more readings should be taken during the same visit. If using OBPM, the first reading should be discarded and the latter readings averaged. If using AOBP, the BP calculated and displayed by the device should be used.

A marked elevation in blood pressure in the presence of acute symptoms or progressive target organ damage in the brain, eye, heart, or kidney is a hypertensive emergency (1). An asymptomatic severe blood pressure elevation without evidence of target organ damage and not due to an acutely reversible cause (e.g. pain, urinary retention) constitutes a hypertensive urgency (1). Historically, a ≥180/110 mm Hg has been used to define severe blood pressure elevation (2); however, this threshold is arbitrary should be interpreted in the context of the baseline blood pressure and rate of increase. Asymptomatic patients with chronic blood pressure elevations above this threshold may not necessarily have an acute hypertensive urgency. Conversely, patients with low baseline blood pressure levels (e.g. early pregnancy) may develop a hypertensive urgency or emergency at blood pressure levels lower than this threshold (2). The diagnosis of a

hypertensive urgency should also be confirmed by performing multiple readings during the visit (and not just with one measurement).

Untreated patients with hypertensive emergencies have a median survival of 10.5 months and a 1-year mortality rate of 79% (3). Furthermore, blood pressure rarely normalizes patients presenting with blood pressure levels ≥180/110 mm Hg (4). Therefore, both conditions require the immediate initiation of antihypertensive drug therapy, typically administered intravenously for a hypertensive emergency or orally for a hypertensive urgency.

2. If the visit 1 OBPM is high-normal (see thresholds outlined in Section I-3) annual follow-up is recommended (Grade C).

In a trial of subjects with high normal BP, 40% of subjects in the placebo arm developed hypertension within two years and 63% within four years (5). This is consistent with observational data, indicating that these individuals exhibit higher four-year rates of progression to overt hypertension (6). In addition, the 10-year risk of incident cardiovascular disease was greater in both men (hazard ratio 1.6; 95% CI 1.1 to 2.3) and women (hazard ratio 1.8; 95% CI 1.0 to 3.1) with high normal BP than in subjects with BP levels lower than 120/80 mm Hg (7). Those older than 65 years of age with high normal BP levels had the highest risk of progression to hypertension and development of cardiovascular disease. In this group, the crude incidence rate of cardiovascular events per 1000 patient years was 20 in women and 28 in men (7). These data indicate that patients with high normal blood pressure have (a) a higher risk of progression to overt hypertension; and (b) a worse prognosis than patients with optimal blood pressure levels. Therefore, although antihypertensive therapy is not recommended, close surveillance in the form of annual blood pressure checks is recommended.

3. If the visit 1 mean OBPM or AOBP is high (see thresholds outlined in Section I-3), a history and physical examination should be performed and, if clinically indicated, diagnostic tests to search for target organ damage (Supplemental Table S4) and associated cardiovascular risk factors (Supplemental Table S5) should be arranged within two visits. Exogenous factors that can induce or aggravate hypertension should be assessed and removed if possible (Supplemental Table S6). Visit 2 should be scheduled within one month (Grade D).

OBPM (which can be done using electronic [oscillometric] or auscultatory devices although the former is preferred) and AOBP (using electronic [oscillometric devices]) are used to initially assess BP. If readings are high, further investigations are indicated and the diagnosis must be verified using out-of-office measurement unless readings are very high (see next sections).

4. If the visit 1 mean OBPM or AOBP SBP is ≥180 mm Hg and/or DBP is ≥110 mm Hg then hypertension is diagnosed (Grade D).

Given that the greatest fall in BP occurs between the first and second visits (8-11), it is highly unlikely that BPs in this range will fall to normotensive values at subsequent visits.

5. If the visit 1 mean OBPM SBP is 140-179 mm Hg and/or DBP is 90-109 mm Hg OR the mean AOBP SBP is 135-179 mm Hg and/or DBP is 85-109, out-of-office BP measurements should be performed before visit 2 (Grade C).

I. ABPM IS THE RECOMMENDED OUT-OF-OFFICE MEASUREMENT METHOD (GRADE D). PATIENTS CAN BE DIAGNOSED WITH HYPERTENSION ACCORDING TO THE THRESHOLDS OUTLINED IN SECTION I-3.

II. HBPM IS RECOMMENDED IF ABPM IS NOT TOLERATED, NOT READILY AVAILABLE OR DUE TO PATIENT PREFERENCE (GRADE D). PATIENTS CAN BE DIAGNOSED WITH HYPERTENSION ACCORDING TO THE THRESHOLDS OUTLINED IN SECTION I-3.

III. IF THE OUT-OF-OFFICE BP AVERAGE IS NOT INCREASED, WHITE-COAT HYPERTENSION SHOULD BE DIAGNOSED AND PHARMACOLOGIC TREATMENT SHOULD NOT BE INSTITUTED (GRADE C).

If mean OBPM and/or AOBP readings are high, out-of-office measurement (ABPM or HBPM) should be performed to make the diagnosis of hypertension. Out-of-office measurements are prognostically superior to OBPM in predicting mortality and cardiovascular events (12-16). HBPM is also often categorized as self-measured blood pressure (SMBP).

ABPM is preferred to HBPM because it permits blood pressure to be assessed over the entire 24-hour period, including at night. Nocturnal blood pressure, including failure of the blood pressure to dip by 10-20%, is the strongest predictor of future cardiovascular events or total mortality (17). If ABPM is unavailable or unsuccessful, HBPM should be performed.

Out-of-office BP measurement allows diagnosis of hypertension to be made earlier and more accurately. Early diagnosis can facilitate faster blood pressure control and, in clinical trials of higher risk hypertensive patients, early control was associated with reductions in cardiovascular events (18-20).

Studies supporting the prognostic value of ABPM include the Office versus Ambulatory Pressure (OvA) study (21), in which 1963 subjects treated for hypertension were followed for five years. ABPM was an independent risk factor for new cardiovascular events (RR for each 1 SD increase in SBP of 1.34 [95% CI 1.11 to 1.62]) after adjusting for other risk factors, including office measurement of BP. The Ohasama cohort (22), with 1542 Japanese subjects followed for more than eight years, also reported that ABPM was independently predictive of cardiovascular mortality, as did a substudy (23) of the Systolic Hypertension in Europe (Syst-Eur) Trial, which was limited to elderly patients with isolated systolic hypertension.

There are also several studies supporting the prognostic value of home/self BP monitoring and, thus, the inclusion of this technique for the diagnosis of hypertension. The Self measurement of blood pressure at Home in the Elderly: Assessment and Follow-up (SHEAF) study (24), followed 4939 treated hypertensive patients for a mean of 3.2 years, and reported that home monitoring was independently predictive of future cardiovascular events. Each 10 mm Hg increase in home monitored BP increased the risk of a cardiovascular event by 17.2% (95%CI 11.0% to 23.8%). The Ohasama cohort, including 1913 Japanese subjects followed for approximately 11 years, has also shown that baseline home BP measurement is predictive of several outcomes, including stroke (25), all-cause mortality (26) and cardiovascular mortality (27). These prognostic studies, with extended follow-up and 'hard' end points, are the evidence on which the use of home BP measurement was included in the diagnosis of hypertension.

Out-of-office measurement is preferred because it identifies individuals with 'white coat hypertension', also known as 'isolated office hypertension'. White coat hypertension is defined as elevated OBPM (≥140/90 mm Hg) with normal out-of-office readings (<135/85 mm Hg daytime ABPM or HBPM and/or <130/80 mm Hg 24-hr ABPM). The prevalence of white coat hypertension in patients with elevated screening readings ranges from 9-30% (28-30). Both ABPM and HBPM have been shown to be effective in diagnosing WCH, and both methods have been shown to be more strongly associated with cardiovascular outcomes than OBPM (31-41).

Using office blood pressure measurement alone can misclassify patients who do not have hypertension (42-44). In Canada, this will misdiagnose 100 patients daily or 36,500 patients annually as hypertensive (who actually have white coat hypertension)(45). Many of these patients will be treated unnecessarily with anti-hypertensive medications as pharmacologic treatment of subjects with white coat hypertension is currently not recommended. (30,46-48).

White coat hypertension is not entirely benign, as it may be an intermediate condition between normotension and hypertension and should be followed up for future progression to hypertension (49,50). White coat hypertensives have higher left ventricular mass index when compared with normotensive subjects (51). However, the overall risk of cardiovascular events appears similar to normotension (30,31,52,53).

6. If the visit 1 mean OBPM SBP 140-179 mm Hg and/or DBP is 90-109 mm Hg AND out-of-office measurement, although preferred, is NOT performed, then patients can be diagnosed as hypertensive using serial office OBPM visits if any of the following conditions are met:

I. AT VISIT 2, MEAN OBPM (AVERAGED ACROSS ALL VISITS) IS ≥140 MM HG SYSTOLIC AND/OR ≥90 MM HG DIASTOLIC IN PATIENTS WITH MACROVASCULAR TARGET ORGAN DAMAGE, DIABETES MELLITUS, OR CKD (GLOMERULAR FILTRATION RATE [GFR] <60 ML/MIN/1.73M2) (GRADE D);

II. AT VISIT 3, MEAN OBPM (AVERAGED ACROSS ALL VISITS) IS ≥160 MM HG SYSTOLIC OR ≥100 MM HG DIASTOLIC;

III. AT VISIT 5, MEAN OBPM (AVERAGED ACROSS ALL VISITS) IS ≥140 MM HG SYSTOLIC OR ≥90 MM HG DIASTOLIC.

If neither ABPM nor HBPM are available, serial OBP measurements over several visits can be used to make the diagnosis although this is not a preferred diagnostic method and every effort should be made to perform out-of-office measurement. If OBP is used to diagnose hypertension, a stepwise approach is required, with measurements performed over 3-5 visits and the diagnosis contingent upon the degree of BP elevation (when averaged across all visits). In general, the closer the initial readings are to normal, the greater the risk of misclassification (8,11,54). More readings, at more frequent intervals, are required to establish a diagnosis of hypertension in those whose blood pressure is close to the normal blood pressure range. For those whose blood pressure is between 90 and 95 mm Hg at the first clinic visit, 7% to 24% will be misclassified as hypertensive after 4 visits (8,11).

7. Investigations for secondary causes of hypertension should be initiated in patients with suggestive clinical and/or laboratory features (outlined in sections V and VI) (Grade D).

Background and references are cited in the appropriate sections below.

8. If at the last diagnostic visit the patient is not diagnosed as hypertensive and has no evidence of microvascular target organ damage, the patient's BP should be assessed at yearly intervals (Grade D).

This expert consensus recommendation is made to ensure that these individuals are not lost to follow-up. Because they have had initially high screening readings, they remain at higher risk for hypertension and follow-up is warranted.

9. Hypertensive patients actively modifying their health behaviours should be followed up at 3- to 6-month intervals. Shorter intervals (every 1 or 2 months) are needed for patients with higher BP (Grade D).

These expert-consensus recommendations have been provided to give practitioners some guidance for the follow-up of patients diagnosed with hypertension.

10. Patients receiving antihypertensive drug treatment should be seen monthly or every 2 months, depending on the level of BP, until readings on two consecutive visits are below their target (Grade D). Shorter intervals between visits will be needed for symptomatic patients and those with severe hypertension, intolerance to antihypertensive drugs, or

target organ damage (Grade D). When the target BP has been reached, patients should be seen at 3- to 6-month intervals (Grade D).

These expert-consensus recommendations have been provided to give practitioners some guidance for the follow-up of patients diagnosed with hypertension.

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