HYPERTENSION: DIAGNOSIS AND MANAGEMENT

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ABSTRACT
Systemic hypertension is a chief risk factor for cardiovascular disease and is present in 69% of patients with a first myocardial infarction, in 77% of patients with a first stroke, in 74% of patients with chronic heart failure, and in 60% of patients with peripheral arterial disease. Double-blind, randomized, placebo-controlled trials have found that antihypertensive drug therapy reduces cardiovascular events in patients aged younger than 80 years and in patients aged 80 years and older in the Hypertension in the Very Elderly Trial. Although the optimal blood pressure treatment goal has not been determined, existing epidemiologic and clinical trial data suggest that a reasonable therapeutic blood pressure goal should be <140/90 mm Hg in patients younger than 80 years and a systolic blood pressure of 140-145 mm Hg if tolerated in patients aged 80 years and older. Non-pharmacologic lifestyle measures should be reinvigorated both to prevent development of hypertension and as adjunctive therapy in patients with hypertension. Angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, and diuretics have all reduced cardiovascular events in randomized trials. The choice of specific drugs be contingent on efficacy, tolerability, presence of specific comorbidities, and cost.

KEYWORD: Systemic hypertension presence of specific comorbidities, and cost.

INTRODUCTION
Hypertension (HTN or HT), too known as high blood pressure (HBP), is a long-term medical condition in which the blood pressure in the arteries is persistently elevated.[23] High blood pressure usually does not cause symptoms.[1] Long-term high blood pressure, however, is a chief risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral vascular disease, vision loss, chronic kidney disease, and dementia.[15][16][17][24] High blood pressure is classified as either primary (essential) high blood pressure or secondary high blood pressure.[18] Nearby 90–95% of cases are primary, defined as high blood pressure due to nonspecific lifestyle and genetic factors.[18][19] Lifestyle influences that increase the risk include excess salt in the diet, excess body weight, smoking, and alcohol abusive use.[1][18] The remaining 5–10% of cases are categorized as secondary high blood pressure, defined as high blood pressure due to an identifiable cause, such as chronic kidney disease, narrowing of the kidney arteries, an endocrine disorder, or the use of birth control pills.[18] Blood pressure is expressed by two measurements, the systolic and diastolic pressures, which are the maximum and minimum pressures, respectively.[1] For most adults, normal blood pressure at rest is within the range of 100–130 millimetres mercury (mmHg) systolic and 60–80 mmHg diastolic.[20][25] For most adults, high blood pressure is existing if the resting blood pressure is persistently at or above 130/90 or 140/90 mmHg.[18][20] Different numbers apply to children.[20] Ambulatory blood pressure monitoring over a 24-hour period appears more accurate than office-based blood pressure measurement.[18][23] Lifestyle changes and medications can lower blood pressure and decrease the risk of health complications.[21] Lifestyle changes include weight loss, decreased salt intake, physical exercise, and a healthy diet.[18] If lifestyle changes are not sufficient then blood pressure medications are used.[21] Up to three medications can control blood pressure in 90% of people.[18] The treatment of moderately high arterial blood pressure (defined as >160/100 mmHg) with medications is associated with an improved life expectancy.[27] The effect of treatment of blood pressure between 130/80 mmHg and 160/100 mmHg is less clear, with some reviews finding benefit[20][28][50] and others finding unclear benefit.[1][2][33] High blood pressure affects between 16 and 37% of the population globally.[18] In 2010 hypertension was believed to have been a factor in 18% of all deaths (9.4 million globally).[22]

Detection
In patients aged ≥ 45 years, BP should be recorded at least once every 5 years. This recording should be the average of several measurements. Ensure standardized
technique (e.g., patient in a seated position, selecting the arm with the higher BP) and equipment are being used (refer to Appendix B: Recommended Methods and Techniques for Measuring Blood Pressure). When possible, use an automated office BP measuring electronic device, as an alternative to manual office BP technique. Using automated office BP reduces errors due to improper technique, avoiding an overestimation of BP values (white-coat HTN) or underestimation of BP values (masked HTN).

**Diagnosis**

Assessment of Elevated Blood Pressure If average BP is elevated again, proceed to investigations and work-up to assess target organ damage and cardiovascular disease (CVD) risk. Select which arm to use by measuring BP in both arms with the patient in a seated position. Measure BP three more times using the arm with the higher reading, then discard the 1st reading and average the latter two.

**Figure 1. Diagnosis of hypertension algorithm**

**Abbreviations:** AOBP = automatic office blood pressure; ABPM = ambulatory blood pressure monitoring; BP = blood pressure; CVD = cardiovascular disease; DBP = diastolic blood pressure; Dx = diagnosis; HBPM = home blood pressure monitoring; HTN = hypertension; MOBP = manual office blood pressure. Footnote: a Out-of-office method may include automated BP machines at pharmacies or grocery stores. b Sign/symptoms may include papilledema and retinal haemorrhage.

**Investigations and work-up includes**

- Medical history - ask about risk factors and rule out any exogenous factors Risk Factors o Modifiable: smoking; physical activity levels/sedentary lifestyle; poor diet; body composition (e.g., body weight, body mass index, waist circumference); poor sleep; psychological factors (e.g., stress levels). o Non-modifiable: age; family history; ethnicity (e.g., African, Caribbean, South Asian (East Indian, Pakistani, Bangladeshi, Sri Lankan) origin). Exogenous Factors o White-coat HTN (~20% of patients with high manual office BP readings); prescription drugs (e.g., nonsteroidal anti-inflammatory drugs (NSAIDs), steroids, oral contraceptives, decongestants); and others (e.g., alcohol, stimulants, sodium).
- Physical examination - fundoscopy, central and peripheral cardiovascular examination, and abdominal examination
- Urinalysis - albumin to creatinine ratio (ACR), haematuria.
- Test for blood chemistry - potassium, sodium, creatinine/estimated glomerular filtration rate (eGFR)
- Test for type 2 diabetes - fasting blood glucose OR haemoglobin A1c level
- Test for lipids - full lipid profile
- Electrocardiogram (ECG) standard 12-lead

Consider 24-hour ambulatory or home BP monitoring for appropriate patients (e.g., suspected white-coat HTN, unusual fluctuating office-based BP readings).[^4]
Assessment of Hypertension: If ambulatory or home BP monitoring was not conducted, measure office BP again. A HTN diagnosis may be confirmed at this visit. If a HTN diagnosis cannot be confirmed or ruled out, consider ambulatory or home BP monitoring. Further office visits may be required.

Indications for Consultation with a Specialist: Indications for consultation with a specialist include:

- Hypertensive emergency – DBP > 130 or BP > 180/110 with signs/symptoms;
- Sudden onset in the elderly;
- Abnormal nocturnal BP differences\(^\text{12}\) – an extreme nocturnal BP dip (>20%), non/small nocturnal BP dip (<10%), or an increase in nocturnal BP are at risk for CVD;
- Signs or symptoms suggesting of secondary causes of the HTN; and
- Resistant HTN – BP still difficult to control after treating with 3 antihypertensive medications.

Management:

Once a diagnosis has been confirmed, conduct a patient-specific discussion to decide upon desirable BP readings and an individualized treatment plan. This discussion should consider any benefits and potential harms.

Desirable Blood Pressure Readings:

140/90 or lower is the desirable blood pressure reading for an adult with no-comorbid conditions, diabetes, chronic kidney disease or other target organ damage.\(^\text{12}\)

However, an individual patient’s desirable BP is influenced by their age, presence of target organ damage, CVD risk level and/or the presence of other CVD risk factors.

This guideline uses the term ‘desirable BP’ instead of ‘targets’ to encourage clinical judgement when dealing with an individual patient. The suggested desirable BP readings of 140/90 is provided as guidance only, since recommending a uniform threshold for all patients or even patient groups is not optimal. Also, the term ‘targets’ is not used because the treat-to-target approach is not recommended.

Controversies in Care: Blood Pressure Readings in the Diabetes Population:

This guideline recommends a desirable BP reading of 140/90 for the diabetes population. There is an
acknowledgement that this does not align with the Canadian Hypertension Education Program’s\textsuperscript{7} or the Canadian Diabetes Association’s\textsuperscript{12} recommendation of a 130/80 target; but it does align with the Eighth Joint National Committee’s\textsuperscript{9} and National Institute for Health and Care Excellence’s\textsuperscript{8} guidance. The target of 130/80 is not supported by any randomized controlled trials, and therefore is mostly consensus based. However, there is no evidence to completely discard the 130/80 either. A desirable BP of 140/90 is based on a recent large clinical trial\textsuperscript{11} that found no significant difference between a target of 140/90 versus 120/80, thus a 130/80 would unlikely be beneficial versus 140/90. Future trials are needed to bring clarity to this issue.

**Lifestyle Management**

Recommend lifestyle management for patients with mild HTN (average BP = 140 – 159/90 – 99), low-risk for CVD and no co-morbidities (refer to Table 3 for list of co-morbidities).\textsuperscript{6}

The benefits of pharmacologic treatment in the mild HTN group is unknown, and may not outweigh the potential harms (e.g., increased risk of falls).\textsuperscript{13} In a recent systematic review, pharmaceutical treatment within this patient group did not reduce total mortality, total CV events, coronary heart disease or stroke, when compared to a placebo treatment.\textsuperscript{14} Whereas, the benefits of lifestyle management (e.g., smoking cessation, increasing physical activity, obtaining or maintaining a healthy body composition, eating a well-balanced diet, and monitoring salt intake) with this patient group has been documented (refer to Table 3).

### Table 2. Impact of health behaviours on blood pressure\textsuperscript{7,8}

<table>
<thead>
<tr>
<th>Intervention</th>
<th>SBP (mm Hg)</th>
<th>DBP (mm Hg)</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet and weight control</td>
<td>-6.0</td>
<td>-4.8</td>
<td>• BMI &lt; 25 kg/m\textsuperscript{2}; WC ≤ 102/88 cm (Caucasian men/women), ≤ 90/80 cm (Asian men/women)</td>
</tr>
<tr>
<td>Reduced salt/sodium intake</td>
<td>-2.8</td>
<td>-5.5</td>
<td>• &lt; 2000 mg of sodium\textsuperscript{9}</td>
</tr>
<tr>
<td>Reduced alcohol intake (heavy drinkers)</td>
<td>-3.4</td>
<td>-1.8</td>
<td>• ≤ 2 drinks/day</td>
</tr>
<tr>
<td>DASH diet\textsuperscript{b}</td>
<td>-5.5</td>
<td>-5.5</td>
<td>-</td>
</tr>
<tr>
<td>Physical activity</td>
<td>-3.1</td>
<td>unknown</td>
<td>• 30-40 minutes 4-7 days/week</td>
</tr>
<tr>
<td>Smoking cessation</td>
<td>-3.7</td>
<td>-3.5</td>
<td>• Smoke free environment</td>
</tr>
<tr>
<td>Relaxation therapies</td>
<td>-5.5</td>
<td>-4.5</td>
<td>-</td>
</tr>
<tr>
<td>Multiple interventions</td>
<td>-3.7</td>
<td>-3.5</td>
<td>-</td>
</tr>
</tbody>
</table>

**Pharmacologic Management\textsuperscript{7}**

Instigate pharmacologic management in context of the patient’s overall CVD risk (e.g., not solely based on a patient’s BP) and in conjunction with lifestyle management.\textsuperscript{15} Pharmacologic management may be considered if:

1. Average BP is > 140/90 and with target organ damage or CVD risk >20%;
2. Average BP is > 140/90 with 1+ co-morbidities (refer to Table 3 for co-morbidities list);
3. Average BP is ≥ 160/100
4. Desirable BP is not reached with lifestyle management.
CONCLUSION
Adolescents with significant hypertension or obesity or those who are not successful in lowering their blood pressure may require intensive counseling from a registered dietitian or nutritionist. Referral to a public health nurse and/or coordination with the school nurse for ongoing monitoring may also be useful. Smokers may benefit from an age-appropriate smoking cessation program.

Those who abuse alcohol or other drugs may need referral to a chemical dependency counselor for in-depth evaluation and treatment. The hypertensive adolescent needs the positive support and role modeling of all family members. Their commitment to also make necessary lifestyle changes, including increased physical activity, smoking cessation, reduction in dietary sodium, and adopting the DASH eating plan will make it possible for the adolescent to be successful in managing hypertension.

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