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UPDATE ON THE MANAGEMENT OF HYPERTENSION IN 2023

Introduction

Hypertension is the most common condition managed in the primary care setting. It is a potent but modifiable risk factor for cardiovascular disease (CVD) and premature mortality.[1] Currently, approximately 25% of Canadian adults have a diagnosis of hypertension.[2,3] However, the global community is experiencing challenges with optimizing hypertension management; it is estimated that at least 23% of individuals globally have effectively managed hypertension.[4] Furthermore, if clinicians were able to identify and adequately intervene in these cases, we could prevent 10.8 million deaths per year.[1] This statistic is extremely relevant to Canadian practitioners as our most recent Canadian data suggest that 34% of adults with hypertension are not achieving target blood pressure (BP) due to undertreatment or lack of awareness.[3]

The undertreatment of hypertension is complex. There are a number of structural and environmental drivers of CV risk, and there is increasing recognition that if we are going to be effective at CV risk reduction, we must acknowledge the significant role that social determinants play in the development of risk factors including hypertension, smoking, obesity and diabetes.[5]

The clinical guidance concerning hypertension may inadvertently contribute to the challenges we are seeing globally with hypertension management.[6,7] There are numerous guidelines available to inform clinicians about how to provide supportive care for individuals with hypertension, and discordance between guidelines and the granularity of guidelines make implementation challenging.[7,8] While there is disparity between guidelines, as well as differences regarding hypertension nomenclature, there is unanimous agreement that accurate BP measurement, risk-based thresholds for intervention, simplified approaches to pharmacotherapy, and well-structured care are the foundations of effective hypertension management.[9]

Accurate Blood Pressure Measurement

Accurate BP measurement is critical to the diagnosis of hypertension. While it is a very common clinical procedure, errors in BP measurement are frequent due to a variety of factors including patient preparation and positioning, incorrect use of measurement equipment, and human errors in interpreting and documenting measured results.[10] As quality BP measurement does take some time, measurement quality can also be compromised or neglected in clinical settings where appropriate measurement training and workflows have not been implemented.[11]

Electronic (oscillometric) BP measurement is the preferred method for all office measurements as it is easy to perform and eliminates many of the human factors that contribute to erroneous or inconsistent BP measurement results.[12] *Standardized office BP* measurement (using electronic devices) is currently recommended *for screening adults* for hypertension and for *assessing response to treatment*.

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Out-of-office measurements (24-hour ambulatory BP monitoring and home BP measurement [HBPM]) are recommended to *confirm a diagnosis of hypertension* and to identify individuals with white coat and masked hypertension.[12]

Visit-to-visit variability (VVV) in in-office BP measurement is a significant challenge for clinicians. A recent cohort study by Lu et al examined nearly eight million systolic BP (SBP) measurements from just over 500,000 adults and found that the average variation in SBP between visits (≤90 days apart) was +/-12 mmHg.[13] This is concerning, as the magnitude of variation is as significant as a change one might expect to see with initiation or discontinuation of therapy.

The reality of significant VVV in the face of guidelines that recommend standardized in-office BP monitoring be used to determine when therapy should be initiated and how well patients are responding to treatment is a challenging one. Unlike the real-world study by Lu et al, clinical studies that inform the guidelines use a standardized approach to measurement that ensures quality and reproducibility.[11] The study by Lu et al highlights two important points: 1) That every effort must be made to optimize the quality of in-office BP measurements; 2) That there is a role for out-of-office and unattended, automated in-office measures to further inform therapeutic decision-making.

With respect to out-of-office measures, 24-hour ambulatory BP monitoring (ABPM) is the preferred measurement method.[12] While both ABPM and HBPM better predict CV events than in-office BP measurement,[14-16] ABPM has the advantage of providing nocturnal BP measurements and insights into the integrity of BP diurnal variation. Nocturnal BP is a very sensitive predictor of increased CV risk in individuals with known hypertension and among those without it.[17,18] Individuals who have lost diurnal variations in BP have also been found to have a CV event rate that is nearly double that of individuals with normal BP circadian rhythms.[17,19]

Unfortunately, access to ABPM is a challenge in many clinical settings. If it is unavailable, HBPM provides a reasonable and valid alternative for the diagnosis of hypertension, white coat hypertension and masked hypertension. Given the prevalence of hypertension and the importance of valid out-of-office measures, normalizing the presence of a validated HBPM device and familiarizing adults with HBPM are important discussion points at wellness visits in primary care. While there are several emerging technologies that can estimate BP (wrist and watch devices, for example) there is limited use for these tools in a clinical setting. Hypertension Canada recommends that validated wrist cuffs be used solely to *estimate* BP in individuals with a large upper arm circumference.[12] Abnormal levels for each measurement modality are tabulated in **Table 1**.

The Hypertension Canada diagnostic algorithm is displayed in **Figure 1**; it can be divided into four distinct steps: screening visit; BP assessment visit; collection of further BP data; and diagnosis. A diagnosis of hypertension can be made in individuals with highly elevated BP (≥180/110 mmHg) at the time of the assessment visit; however, out-of-office measures are still encouraged for risk assessment and to engage patients in self-monitoring of BP.

Clinical, Biochemical and Risk Assessment of Adults with Hypertension

Following diagnosis, patients should be assessed for conditions that can guide therapeutic decision-making and determine whether any hypertension-mediated organ damage (HMOD) has occurred. Therefore, when a patient is diagnosed with hypertension, the following investigations are recommended:[12,20]

1. Screening neurologic exam
2. Fundoscopy
3. 12-lead ECG
4. Urinalysis
5. Electrolytes
6. Creatinine/eGFR
7. Lipid profile
8. HbA1c and/or fasting glucose (if not already diagnosed with diabetes)
9. Pregnancy test (in individuals with potential for pregnancy)

While not currently recommended at the time of diagnosis, screening for primary aldosteronism (PA) with an aldosterone-renin ratio may be considered. The prevalence of PA among adults with hypertension is currently estimated at 5%; it is as high as 20% among those with resistant hypertension and in the under-diagnosed population.[21,22] As PA is associated with significant and premature CV morbidity and mortality, identifying individuals that could benefit from surgery or early treatment with a mineralocorticoid receptor antagonist is important.

Cardiovascular Risk Assessment

CVD is the leading cause of death among patients with hypertension, and patients should be engaged in regular discussions about their risk.[1,12,20,23,24] Risk assessment provides an opportunity to engage patients regarding how individual risk factors can be modified, in addition to informing therapeutic decision-making. CVD risk (or the presence of clinical CVD) also determines the threshold at which hypertensive therapy is initiated, as well as the therapeutic target (**Table 2**).

Hypertension Canada recommends that the Framingham Risk Score be calculated as this was the tool used to identify high-risk individuals (10-year risk >15%) in the context of the Systolic Blood Pressure Intervention

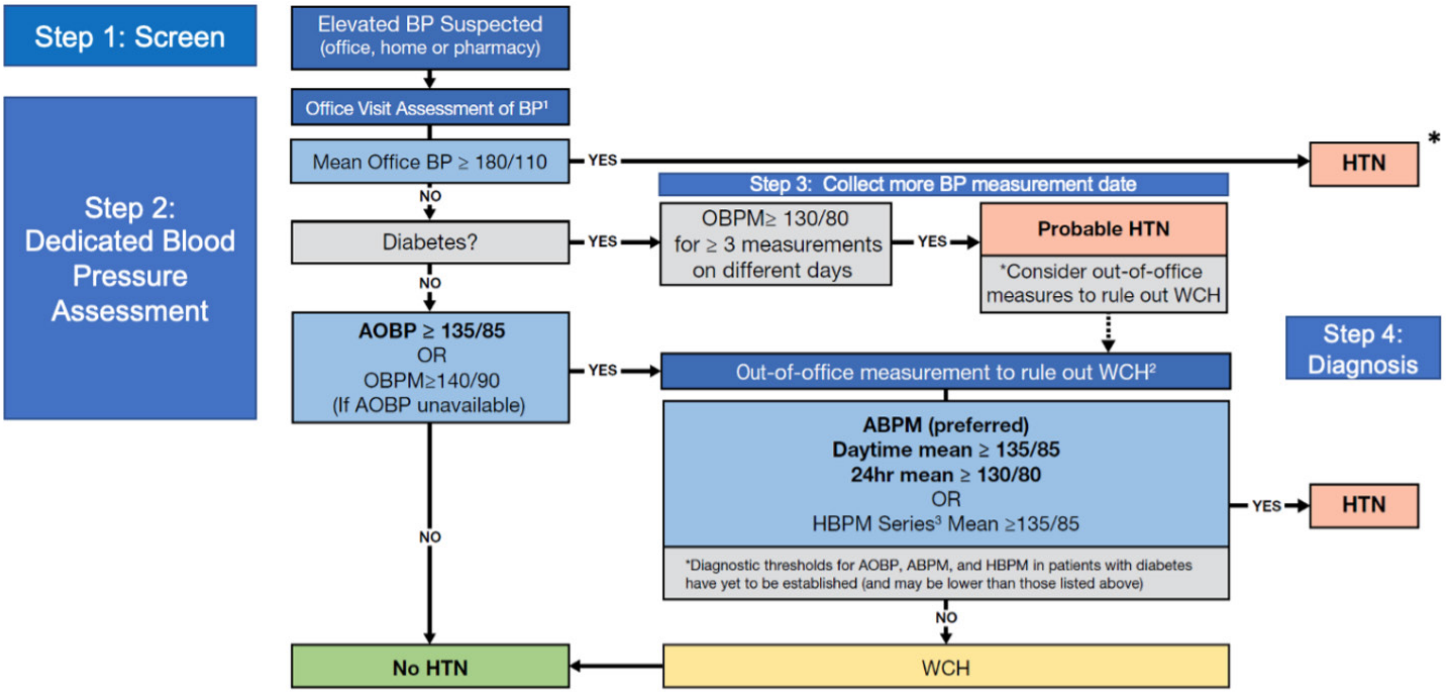

Figure 1: Hypertension Canada diagnostic algorithm.

** In individuals with very high blood pressures in office >180/110, a diagnosis of hypertension can be made, however out of office blood pressure measurement can still assist in characterizing hypertension and CV risk prediction*

Standardized Office Measures	**Automated (oscillometric), unattended Office BP measurement (AOBP)**	Displayed mean SBP ≥ 135 mmHg or DBP ≥ 85 mmHg is **high**
	Automated (oscillometric), attended Office BP measurement (AOBP)	Mean SBP ≥ 140 mmHg or DBP ≥ 90 mmHg is **high**
Out of Office Measures	**24-hour Ambulatory BP Monitoring (ABPM)**	Mean awake SBP ≥ 135 mmHg or DBP ≥ 85 mmHG **OR** mean 24-hour SBP ≥ 130 mmHG or DBP ≥ 80 mmHG are **high**
	Home BP Monitoring (HBPM)	mean SBP ≥ 135 mmHg or DBP ≥ 85 mmHg are **high**

Table 1: Identifying abnormally high BP readings by measurement modality.

(SPRINT) trial[25]; however different CVD risk assessment approaches are encouraged by other guidelines in the U.S. and Europe, and newer Canadian population data risk prediction models have been developed.[23,24,26] Regardless of the specific tool used, risk assessment as a practice is universally considered an important activity, particularly in the context of shared decision-making.[20] A thoughtful clinician-patient discussion about CV risk is valuable; clinicians should use the tools they feel are most appropriate to support those discussions.

In addition to risk factor assessment, patients with hypertension must also be screened for evidence of HMOD, including hypertensive retinopathy, nephropathy, and peripheral vascular, CV and cerebrovascular disease. This is particularly important for individuals who have not been identified as having an elevated predicted risk (i.e. lower risk factor burden) for several reasons:

1) Individuals have varying degrees of vascular tolerance for hypertension and the presence of HMOD with low risk factor burden identifies those with particular sensitivity to the vascular effects of hypertension;
2) Individuals with specific patterns of organ injury may have a higher risk for secondary hypertension;
3) The natural history of HMOD can be modified with appropriate treatment; and
4) The presence of HMOD may also influence therapeutic agent selection.[1]

Simplified Approaches to Pharmacotherapy

BP lowering is highly effective in improving health outcomes. All patients should be counselled on healthy behaviours such as engaging in 150 minutes of physical activity per week; reduction of dietary sodium; increased

Patient Population	BP threshold (mmHg) for initiation of therapy	BP target (mmHg) for treatment
Low risk (no HMOD or CV risk factors)	SBP ≥ 160 DBP > 100	SBP < 140 DBP < 90
High risk of CVD*	SBP > 130	SBP < 120
Diabetes mellitus	SBP > 130 DBP > 80	SBP < 130 DBP < 80
All others (HMOD, CV risk factors without CVD)	SBP > 140 DBP > 90	SBP < 140 DBP < 90

Table 2: Hypertension Canada treatment thresholds and targets (OBPM unless otherwise stated).[12]

* *Hypertension Canada defines "High Risk" as a person that is >50 years, a known diagnosis of hypertension and an automated office BP measure of ≥130/80 plus at least one of the following:*

1. *Clinical/sub-clinical CVD*
2. *Non-diabetic, non-proteinuric chronic kidney disease (eGFR 20-59 ml/min/1.73m²)*
3. *Age ≥ 75 years*

consumption of fresh fruits and vegetables; maintenance of a healthy body mass; reduction of alcohol consumption; cessation of tobacco use; and optimizing mental health, as non-pharmacologic interventions are both effective and preferred by patients.[12,27] Reducing BP by 20 mmHg/10 mmHg reduces the risk of adverse CVD events by 50%, which makes efforts to reduce BP in hypertensive patients an extremely cost-effective strategy to lessen the burden of CV disease at a population level.[28-30] In the absence of compelling indications, ACE inhibitors (ACEi's), angiotensin receptor blockers (ARBs), dihydropyridine calcium channel blockers (DCCBs), thiazide (and thiazide-type) diuretics are first-line therapies for most hypertensive individuals.[12,23,24,31] Network meta-analyses suggest that there are no significant differences between the ability of each of these agents to lower BP, and recent evidence has demonstrated that there is significant heterogeneity in the antihypertensive effect of first-line agents at the individual level.[31,32] Therefore, it is perhaps not surprising that within populations, it has been established that using combination therapy achieves better BP lowering than using the maximum dose of a single agent.[33,34] Furthermore, single-pill combination (SPC) therapy (combinations of two or three first-line medications at low doses) is an approach that is both well tolerated and more effective at promoting consistent medication use, lowering BP and achieving improved CVD outcomes.[34]

Guidelines from various organizations have suggested that race/ethnicity be considered in the selection of BP-lowering medication.[12,23,24] Although they are well-intended, specific prescribing patterns based on race can be harmful as they suggest biological differences related to the entirely socially constructed concept of race (i.e., they can perpetuate biological racism).[35] While the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) suggested that individuals who identify as Black experience attenuated BP lowering with lisinopril relative to participants who identify as Caucasian,[36] the nearly 20-year directive to tailor therapy by race has not improved the quality of treatment for racialized patients.[5,37] The reality is that low-dose combination therapy is more effective and better tolerated than standard dose monotherapy, and it is often under-prescribed. Dual combination therapies that include ACEi's, ARBs, DCCBs, or a thiazide (or thiazide-type) diuretic appear similarly effective in reducing CVD risk across patient subgroups.[34] Using race-based approaches to prescribing can contribute to epistemic bias and overly complicated guidelines; single pill combination approaches are highly effective and should be used to a greater degree.

Organization of Patient Care

Community-based healthcare and multidisciplinary care models that support accurate BP pressure measurement in-office and out-of-office; clear treatment protocols for therapeutic management and medication titration; and frequent contact with a healthcare professional (HCP) (physician, nurse and/or pharmacist) are highly effective at promoting BP lowering at a practice and community level.[38-40] The structure and process of patient care are fundamental to the quality of care and are often under-discussed in clinical practice guidelines,[41] even though they are strongly supported by evidence. Funding models, professional regulatory and licensing bodies that determine scope of practice, and health professional education must all align to enable highly functioning multidisciplinary teams. The organization of patient care directly impacts primary healthcare professionals (PCPs), but they have limited power to influence this end result.

When Hypertension Canada's inaugural guidelines were launched nearly 30 years ago, they were just one component of a population-based quality improvement approach to hypertension care optimization. Several implementation strategies were deployed that included empowering hypertension screening within the community (at local fire stations and grocery stores, for example) and using peer champions to facilitate hypertension awareness and participation in screening.[38,39,42] In addition, several continuing medical education (CME) programs and capacity-building initiatives have been developed to help propel Canada

into the position of a global leader in hypertension management.[43] Many of these programs were supported by industry and community partnerships, and they were discontinued when funding was no longer available—even though they were unquestionably impactful.[42] Communities, particularly those in which healthcare professionals are under-represented but in which there is an elevated risk of hypertension and its complications, need to be empowered to care for their population and encouraged to determine how to support high-quality primary care that is trusted by these communities. This has never been more urgent.

Key Messages

- ✓ Hypertension is a clinical challenge with several effective interventions; however, it continues to grow in scale and scope
- ✓ Enabling communities to be active partners in BP screening, education and prevention is urgently needed
- ✓ At the point of care, ensure that BP is consistently and appropriately measured
- ✓ CV risk should be regularly reviewed, discussed and optimally managed
- ✓ Ensure that single-pill combination therapies are prescribed early
- ✓ Plan regular follow-up with a PCP (MD, pharmacist, or nurse)

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