# Screening for Hypertension
# Proposed Work Plan

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# Work Plan

## Contents

# 1. Purpose and Background

## Purpose

The purpose of this review is to provide recommendations on hypertension screening. The Canadian Task Force on Preventive Health Care (CTFPHC) has not reviewed this topic since 1994 (Ref Red Brick). Current clinical practice guidelines by the Canadian Hypertension Education Program recommend routine screening without a clearly specified frequency. This review aims to determine the efficacy and effectiveness of hypertension screening (in primary care practice) in reducing the risk of cardiovascular events and all-cause mortality. Determining the effectiveness of screening in reducing blood pressure (BP) is a subsidiary aim. The harms of hypertension screening – excluding harms caused by treatment – will also be reviewed.

The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7)[1]guidelines recommend yearly screening for hypertension in patients with baseline systolic blood pressure (SBP) 120-139 millimeters of mercury (mmHg) and/or diastolic blood pressure (DBP) 80-89 mmHg. In patients with BP less than 120/80 mmHg, they recommend screening every two years [2]. The absence of similar in depth Canadian recommendations motivated the selection of this topic for a new review by the CTFPHC in 2010.

## Background

1. *Definition*

   Hypertension is conceptually defined as the presence of a blood pressure at which an otherwise healthy person would have an increased cardiovascular risk that could be mitigated through blood pressure-lowering treatment. Although mortality increases linearly with blood pressure, hypertension is defined in Canada by auscultatory office SBP averaging ≥140 mmHg and/or auscultatory office DBP averaging ≥90 mmHg over a number of visits. Classification criteria for ambulatory and home blood pressure measurements are slightly lower with SBP averaging ≥ 135 mmHg and/or DBP averaging ≥ 85 mmHg.

2. *Prevalence and burden of disease*

   Hypertension is present in an estimated 4.6 million Canadian adults, or 19% of the adult population. The prevalence of hypertension is nearly identical between men (19.7%) and women (19.0%) but rises rapidly with age, from 2% of 20-39 year olds to 53% of 60-79 year olds [3].

3. *Etiology*

   The etiology of hypertension is thought to be multifactorial. Obesity, sedentary lifestyle, poor diet with excess intake of salt and alcohol are major contributors [4]Candidate genes have been identified in a number of genome-wide association studies [5,6]. Hormonal factors contributing to the development of hypertension include increased activity of angiotensin II, mineralocorticoids, and

the sympathetic nervous system [7].. Secondary causes of hypertension include drugs, renal and vascular disease, endocrine disorders, and obstructive sleep apnea [8].

4. *Consequences if not treated*

   Hypertension is the most important risk factor for premature vascular disease, consequences of which include transient ischemic attack and ischemic stroke from cerebral arterial disease, angina and myocardial infarction from coronary artery disease, and abdominal aortic aneurysm and limb ischemia from peripheral arterial disease[9]. Hypertension is also a major risk factor for chronic kidney disease, left ventricular hypertrophy and congestive heart failure, intracerebral hemorrhage, and dementia [9-11].Severe and acute elevations in blood pressure may cause encephalopathy, retinopathy, acute decompensated congestive heart failure, aortic dissection, and acute kidney injury [12].

5. *Risk factors*

   Hypertension is more common in patients who are overweight, physically inactive, who have a poor diet, a family history of hypertension and in patients of African ancestry[4,13,14]. It is also more common in patients with other major vascular risk factors, including dyslipidemia, diabetes mellitus, and is part of the metabolic syndrome[15]. The prevalence of hypertension rises with age in most societies and is higher in men than women.

6. *Rationale for screening*

   The usual screening test for hypertension is measurement of blood pressure. As blood pressure is considered to be a vital sign that should be routinely measured during many or most clinical encounters, hypertension screening is implicitly part of routine medical practice. A large body of evidence supports the effectiveness of antihypertensive therapy in preventing the consequences of hypertension[16]. As hypertension is usually asymptomatic until complications develop, hypertension screening could be a valuable strategy in preventive health care. However, the optimal methods, frequency and target population for screening are unknown and practitioners would benefit from having these clearly defined within a guideline.

7. *Screening strategies*

   Office BP measurement, home BP measurement, and ambulatory blood pressure monitoring are the screening strategies that will be considered in this review. The optimal timing of screening will also be addressed.

   Because hypertension is traditionally defined by office blood pressure measurements, the performance characteristics of office blood pressure measurement as a screening test for hypertension cannot be determined. For the same reason, studies using office blood pressure as a gold standard likely underestimate the performance of ambulatory and home blood pressure monitoring in the diagnosis of hypertension [17]. Ambulatory blood pressure monitoring is superior to office blood pressure measurement in the prediction of mortality and cardiovascular morbidity [18,19], and home blood pressure measurement is also superior to office measurement[1],[20]

8. *Interventions/treatments*

   Patients diagnosed with hypertension are recommended to have a global assessment of cardiovascular risk and to undergo laboratory investigation and electrocardiography as a screen for target organ damage, secondary causes of hypertension, and associated vascular risk factors. Lifestyle measures, including physical exercise, weight loss, restricted alcohol and salt consumption, and healthy diet are broadly encouraged. Antihypertensive drug therapy is recommended for patients with stage 2 hypertension (BP > 160/100), or stage 1, BP>140/90 with target organ damage, or other vascular risk factors and for those with stage 1 hypertension without target organ damage (BP> 140/90 after 4-5 visits) whose BP is not lowered with nonpharmacological approaches. First-line agents include thiazide-type diuretics, beta-blockers, angiotensin-converting enzyme inhibitors (ACEIs), long-acting calcium channel blockers (CCBs), and angiotensin II receptor blockers (ARBs). The agent(s) of choice and the target blood pressure depend on a number of patient characteristics[21].The goals of therapy are to prevent target organ damage and to improve survival. The effectiveness of therapy for high blood pressure is beyond the scope of this current review.

9. *Current clinical practice*

   The 2010 Canadian Hypertension Education Program (CHEP) recommendations for the management of hypertension propose that the blood pressure of all adult patients should be assessed at all appropriate visits for the determination of cardiovascular risk[21]. This does not imply a specific interval for hypertension screening. In practice, blood pressure is measured during most clinical encounters – whether explicitly for the purpose of hypertension screening or not. A recent cohort study that screened unselected Canadian adults found that 83% of patients with BP > 140/90 had already been informed of a diagnosis of hypertension implying that screening is widely performed [3]. However, the appropriate timing, frequency and target populations for blood pressure screening have not been identified.

## 2. Previous Review and CTFPHC Recommendations

The Canadian Task Force on Preventive Health Care last published recommendations on screening for hypertension in 1994. These recommendations reaffirmed the 1984 recommendation that all persons aged 25 or over should receive a blood pressure measurement during any visit to the physician. In 2007 the United States Preventive Services Task Force (USPSTF) recommended screening for high blood pressure in adults aged 18 and older [22]. On the basis of insufficient evidence, they did not recommend a screening frequency. They did, however, refer to the JNC 7 guidelines, which recommend screening every 2 years in patients with baseline blood pressure less than 120/80 mmHg and every year in patients with SBP 120-139 mmHg and/or DBP 80-89 mmHg. The JNC 7 guidelines do not provide supporting evidence for this recommendation, nor do they grade its strength[1]. As mentioned above, the 2010 CHEP recommendations propose blood pressure measurement “at all appropriate visits” without specifying a frequency. This recommendation, too, is not graded[21].The absence of updated CTFPHC

recommendations, the imprecision of the 2010 CHEP recommendations, and the uncertain evidence supporting the 2010 CHEP and JNC7 recommendations motivated the selection of this topic for a new review by the revitalized Canadian Task Force in 2010.

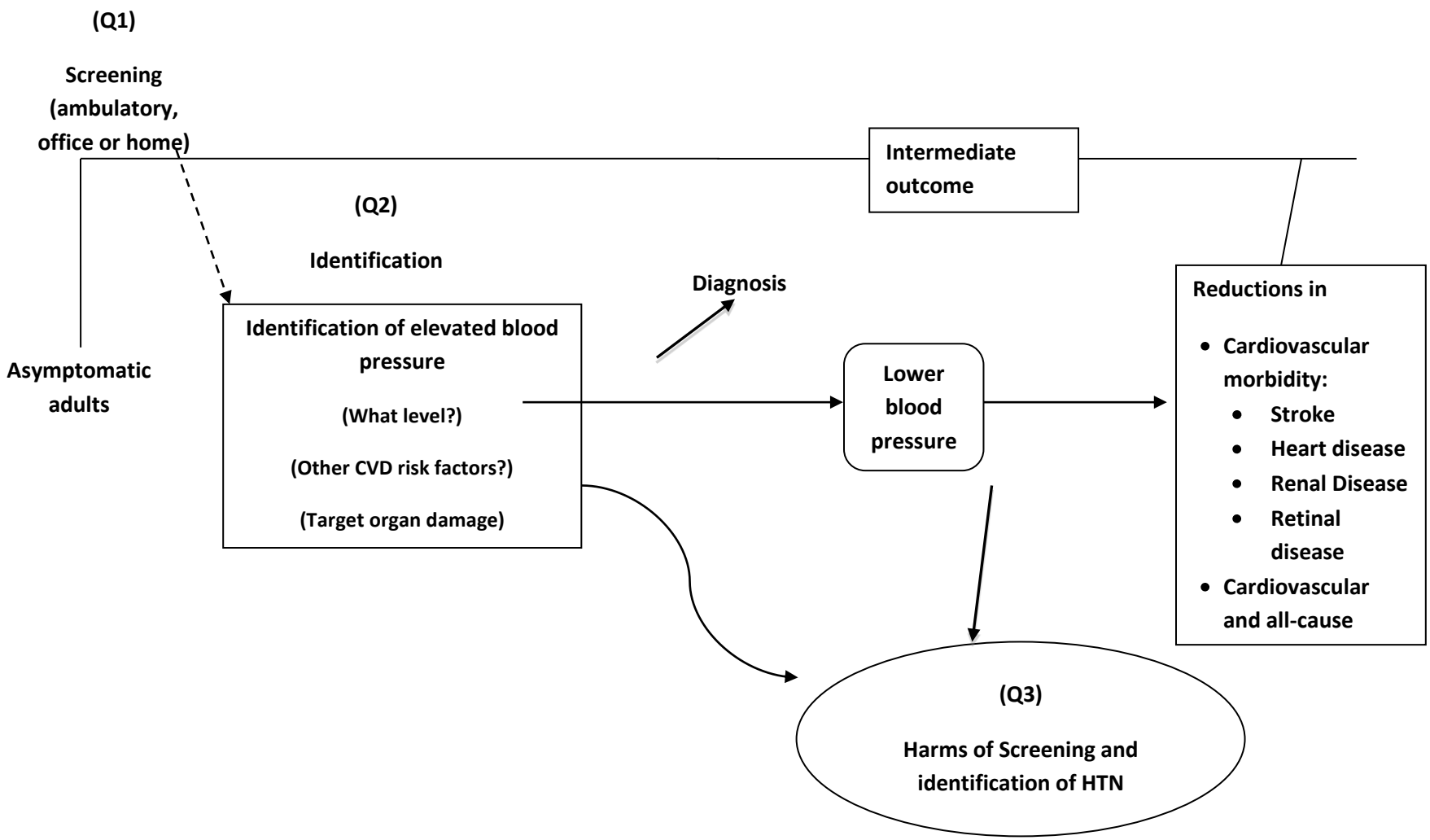
# 3. Analytic Framework

## Purpose of the guideline and its associated systematic review

Our goal is to determine the effectiveness and efficacy of screening for hypertension in achieving better control of blood pressure and reducing vascular morbidity and mortality. The review will also attempt to determine the methods for screening and target populations that will lead to the greatest benefit. We recognize and acknowledge the work done by CHEP to address the treatment aspects related to hypertension. The goal of the Task Force is to build on this work completed by CHEP and add new information in areas not systematically addressed by other guideline groups.

## Hypertension Analytical Framework

**Note: This framework does not include management of diagnosed hypertension, as it is beyond the scope of the CTF mandate**



# 4. Key Questions

## Key Question #1

Does screening for hypertension in primary care practice reduce the risk of cardiovascular morbidity[1], cardiovascular mortality, and all-cause mortality? Does it lead to sustained reductions in blood pressure?

| | |
|---|---|
| *Population:* | *General adult population including subsets with higher risk of hypertension* |
| *Intervention:* | *Screening, any method* |
| *Comparison:* | *Not screening* |
| *Outcomes:* | *1. Cardiovascular morbidity (stroke, heart disease, renal disease, retinal disease); cardiovascular-related mortality and all-cause mortality*<br>*2. Systolic and diastolic blood pressure* |

## Key Question #2

How can we most effectively screen for people in whom blood pressure reduction may be beneficial?

**KQ 2a** Which method of blood pressure screening (ambulatory, office or home blood pressure measurements) is most effective for identifying patients who might benefit from treatment?[2]

| | |
|---|---|
| *Population:* | *General adult population including subsets with higher vascular risk and higher than optimal baseline blood pressure* |
| *Intervention:* | *Ambulatory, office, home blood pressure measurements* |
| *Comparison:* | *Other screening methods and no screening* |
| *Outcomes:* | *1. Cardiovascular morbidity (stroke, heart disease, renal disease, retinal disease); cardiovascular-related mortality and all-cause mortality*<br>*2. New diagnosis of hypertension* |

**KQ 2b** What is the optimal frequency and timing of screening (including age of onset of screening) for identifying patients who might benefit from treatment? Are there specific criteria that should trigger an increase in the frequency of screening?

| | |
|---|---|
| *Population:* | *General adult population including subsets with higher vascular risk and higher than optimal baseline blood pressure* |
| *Intervention:* | *Frequency and timing of screening (including age of onset of screening) for normotensive people; "pre-hypertension"/high-normal blood pressure, and people with high vascular risk.*<br>*Criteria for recommending a change in frequency based on screening results* |
| *Comparison:* | *Other screening methods and no screening* |
| *Outcomes:* | *1. Cardiovascular morbidity (stroke, heart disease, renal disease, retinal disease); cardiovascular-related mortality and all-cause mortality* |

[1] Cardiovascular morbidity includes stroke, heart disease, renal disease, and retinal disease

[2] The recommendations will defer to CHEP for a description of the specific processes for taking blood pressure in office, home and ambulatory

*2. New diagnosis of hypertension*

## Key Question #3

Excluding harms directly related to treatment of hypertension, what are the harms associated with screening to identify hypertension?

| | |
|---|---|
| *Population:* | *General adult population including subsets with higher than average vascular risk* |
| *Intervention:* | *Screening, identification* |
| *Comparison:* | *Not screening* |
| *Outcomes/Harms:* | *False positive or false negative diagnosis, anxiety, psychosocial impact, economic costs (lost work time, insurance)* |

## Contextual Questions

- Is there evidence that the burden of disease, the risk:benefit ratio of screening or the optimal screening method differ in the following subgroups: people of south-east Asian or African ancestry; Aboriginal populations; women with hypertension in pregnancy?
- Is there evidence that access to screening differs for the following subgroups: Aboriginal populations; rural and remote populations?
- What are the resource implications and cost effectiveness of blood pressure screening in Canada?
- What are patients' values and preferences regarding blood pressure screening?
- What process and outcome performance measures (indicators) have been identified in the literature to measure and monitor the impact of screening for hypertension?
- Is there any evidence that the utility of screening in the workplace, at a health fair or pharmacy differs from screening in the family physician's office?

## 5. Literature Search and Review

The proposed search will go back to 1996 in Medline, EMBASE and EBM Cochrane Controlled Trials databases. We anticipate approximately 15,000 to 20,000 titles and abstracts to be searched. The review will focus on adults. See Appendix A for detailed search terms.

## 6. Inclusion/Exclusion Criteria

The following inclusion/exclusion criteria were established:

| | **Inclusion** | **Exclusion** |
|---|---|---|
| **Population** | Adults > 17 years (KQ1,KQ2,KQ3)<br><br>General population including subsets with higher than average:<br>a) risk of hypertension (KQ1);<br>b) cardiovascular risk (KQ2a&b, KQ3);<br>c) baseline blood pressure (KQ2a&b)<br><br>Population groups at high risk include:<br>• Family history of hypertension<br>• Individuals of African ancestry<br>• Individuals with other vascular risk factors including dyslipidemia, diabetes mellitus, obesity (metabolic syndrome) | Focus on children or adolescents (although we will identify papers with pediatric and adolescent populations 17 and under, they will not be included in this report. Rather they will be addressed in a follow-up set of recommendations).<br><br>Patient High risk groups excluded:<br>• Individuals with established or documented cardiovascular disease |
| **Interventions** | Any program or process, in any setting, by which people with undiagnosed hypertension will be identified(KQ1,KQ2,KQ3) | System level, or hypertension care management interventions that did not involve screening<br><br>Screening trials must have used the results in the care of the intervention participants and MUST not have used screening results in the care of the control participants |

| | Inclusion | Exclusion |
|---|---|---|
| **Study Design** | Systematic reviews (KQ1, KQ2, KQ3)<br>RCT/ CCT (KQ1,KQ2,KQ3)<br>Observational studies (case control and cohort) with control group (KQ1, KQ2, KQ3) | Single cohort before/after comparisons (KQ1, KQ2a&b)<br>Case series (KQ1,KQ2a&b) |
| **Screening Instruments** | Any blood pressure measurement by any equipment in any setting(KQ1,KQ2,KQ3) | |
| **Outcomes** | Health outcomes:<br>1. Cardiovascular morbidity (stroke, heart disease, renal disease, retinal disease); cardiovascular-related mortality and all-cause mortality (KQ1, KQ2a&b)<br>2. Systolic and diastolic blood pressure (KQ1)<br>3. New diagnosis of hypertension (KQ2a&b)<br>Harms:<br>False positive or false negative diagnosis; anxiety; psychosocial impact; economic costs (lost work time, insurance) (KQ3) | |
| **Follow-up time** | 1 year or more (KQ1) | Anything <1 year |
| **Language** | English and French language publications (KQ1,KQ2a&b,KQ3) | Not English or French language. |
| **Setting** | Primary Care setting or<br>Setting supervised by a healthcare professional (KQ1,KQ2a&b,KQ3) | |

# 7. Quality and Strength of Evidence

The retrieved included studies will be reviewed according to the criteria set out in the CTFPHC Procedure Manual using the GRADE methodology.

# 8. Appendix A: Search Terms

**Proposed Hypertension Search**

**MEDLINE 1996 to Present**

1. exp Hypertension/
2. hypertens*.ti.
3. hypertension.tw.
4. high blood pressure.mp.
5. or/1-4
6. mass screening/
7. screen*.mp.
8. diagnos*.ti.
9. or/6-8
10. 5 and 9
11. ((blood pressure or hypertension) adj3 (screen* or diagnos*)).tw.
12. 10 or 11
13. animals/ not (animals/ and humans/)
14. 12 not 13
15. limit 14 to (english or french)
16. limit 15 to yr="1996 -Current"

1. Asayama K, Ohkubo T, Kikuya M, et al. Prediction of stroke by self-measurement of blood pressure at home versus casual screening blood pressure measurement in relation to the Joint National Committee 7 classification: the Ohasama study. Stroke 2004;35:2356-61.

2. Chobanian A and JNC7. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Bethesda: National Institutes of Health; 2004.

3. Wilkins K, Campbell NR, Joffres MR, et al. Blood pressure in Canadian adults. Health Reports 2010 Mar;21(1):37-46.

4. Staessen JA, Wang J, Bianchi G, et al. Essential hypertension. Lancet 2003 May 10;361(9369):1629-41.

5. Levy D, Ehret GB, Rice K, et al. Genome-wide association study of blood pressure and hypertension. Nature Genetics 2009 Jun;41(6):677-87.

6. Newton-Cheh C, Johnson T, Gateva V, et al. Genome-wide association study identifies eight loci associated with blood pressure. Nature Genetics 2009 Jun;41(6):666-76.

7. Mullins LJ, Bailey MA, Mullins JJ. Hypertension, kidney, and transgenics: a fresh perspective. Physiological Review 2006 Apr;86(2):709-46.

8. Chiong JR, Aronow WS, Khan IA, et al. Secondary hypertension: current diagnosis and treatment. International Journal of Cardiology 2008 Feb 20;124(1):6-21.

9. Lawes CM, Vander HS, Rodgers A. Global burden of blood-pressure-related disease, 2001. Lancet 2008 May 3;371(9623):1513-8.

10. Alonso A, Mosley TH, Jr., Gottesman RF, et al. Risk of dementia hospitalisation associated with cardiovascular risk factors in midlife and older age: the Atherosclerosis Risk in Communities (ARIC) study. Journal of Neurology,Neurosurgery & Psychiatry 2009 Nov;80(11):1194-201.

11. Woo D, Haverbusch M, Sekar P, et al. Effect of untreated hypertension on hemorrhagic stroke. Stroke 2004 Jul;35(7):1703-8.

12. Vaughan CJ, Delanty N. Hypertensive emergencies. Lancet 2000 Jul 29;356(9227):411-7.

13. Leenen FH, Dumais J, McInnis NH, et al. Results of the Ontario survey on the prevalence and control of hypertension. CMAJ 2008 May 20;178(11):1441-9.

14. Liu RLS. Cardiovascular risk factors in ethnic populations within Canada: results from national cross-sectional surveys. Open Medicine 2010;4(3):e143-e153

15. de Simone G, Devereux RB, Chinali M, et al. Risk factors for arterial hypertension in adults with initial optimal blood pressure: the Strong Heart Study. Hypertension 2006 Feb;47(2):162-7.

16. Turnbull F. Effects of different regimens to lower blood pressure on major cardiovascular events in older and younger adults: meta-analysis of randomised trials. BMJ On-Line First 2010;336(1121):1-7. doi:10.1136/bmj.39548.738368.BE.

17. Stergiou G, Skeva I, Baibas N, et al. Diagnosis of hypertension using home or ambulatory blood pressure monitoring: comparison with the conventional strategy based on repeated clinic blood pressure measurements. Hypertension 2000;18:1745-51.

18. Clement D, De Buyzere M, De Bacquer D, et al. Prognostic value of ambulatory blood-pressure recordings in patients with treated hypertension. New England Journal of Medicine 2003;348:2407-15.

19. Dolan E, Stanton A, Thijs L, et al. Superiority of ambulatory over clinic blood pressure measurement in predicting mortality: the Dublin oucome study. Hypertension 2005;46:156-61.

20. Bobrie G, Chatellier G, Genes N, et al. Cardiovascular prognosis of "masked hypertension" detected by blood pressure self-measurement in elderly treated hypertensive patients. JAMA 2004;291(11):1342-9.

21. Campbell NR, Kaczorowski J, Lewanczuk RZ, et al. 2010 Canadian Hypertension Education Program (CHEP) recommendations: the scientific summary - an update of the 2010 theme and the science behind new CHEP recommendations. Can J Cardiol 2010 May;26(5):236-40.

22. Wolff T, Miller T. Evidence for the reaffirmation of the U.S. Preventive Services Task Force recommendation on screening for high blood pressure. Annals of Internal Medicine 2007 Dec 4;147(11):787-91.