Hypertension

Diagnosis/Condition:	Essential hypertension Malignant Benign Unspecified
Discipline:	Integrated
ICD-10 Codes:	I10
Origination Date:	2005
Review/Revised Date:	10/2024
Next Review Date:	10/2026

Hypertension (high blood pressure, HBP, or HTN) is defined by most major guidelines for adults older than 18 years of age as a systolic blood pressure of ≥140mm Hg, a diastolic blood pressure of ≥90mmHg or both on repeated examination.[1] **There are many different guidelines that define hypertension.** Approximately 50% of the population has HTN, with 25% of them having pre-HTN. It is estimated that more than 116 million US adults older than 20 years have HTN, however, fewer than 24% of those aware of having HTN are able to control it with medications.[1] The incidence of HTN is higher in minority groups in the United States and this warrants special comments. US data suggests racial minorities experience disproportionate morbidity and mortality compared to non-Hispanic whites and are affected by HTN at an earlier age. It also appears that black men and women have double the mortality compared to other racial groups.[2] The causes of these disparities are multifactorial, including HTN epidemiology, risk factors and, most importantly, social determinants of health such as systemic and structural racism. For more on Racial Health Inequities see statement below.*

Classification of Hypertension (AHA, ACA; November 2017) [1,3]

Classification	Systolic (mmHg)	Diastolic (mmHg)
Normal	less than 120 and	less than 80
Prehypertension	120-129 and	80-89
Stage 1 hypertension	130-139 or	80-89
Stage 2 hypertension	at least 140 or	at least 90
Hypertensive Crisis	over 180 and/or	over 120

2020 ISH (International Society of Hypertension) Blood Pressure Classification[4]

Classification	Systolic (mmHg)	Diastolic (mmHg)
Normal	less than 130 and	less than 85
High normal	130-139 and	85-89
Stage 1 hypertension	140-159 or	90-99
Stage 2 hypertension	Greater than 160 or	Greater than 100

HTN is the most common condition seen in primary care and by other health practitioners with about one third of adults in communities in the developed and developing world having hypertension. About 95% of patients have high blood pressure for unknown reasons (primary or essential hypertension), believed to be a combination of genetic and environmental factors (diet, activity level, alcohol consumption).**Error! Bookmark not defined.** The remainder of hypertension is termed secondary, and can usually be traced to a specific cause, disease process, or drug interaction. The US Preventive Services Task Force (USPSTF) strongly recommended that clinicians screen adults aged 18 and older for high blood pressure (HBP).[5] HTN can lead to myocardial infarction, stroke, renal failure, and death if not detected early and treated properly. Additional treatments to current medical management are needed, even if they result in only small further reductions in BP. A recent Guideline statement reinforces this notion, as the authors suggest, "*For all persons with hypertension, the potential benefits of a healthy diet, weight control, and regular exercise cannot be overemphasized. These lifestyle treatments have the potential to improve BP control and even reduce medication needs*."[6]

Treatment is necessary to reduce risk factors and there are similar treatment guidelines from multiple national and international societies many which are easily referenced. Despite this, there continues to be ambiguities about the guidelines and anxiety among patients.[7,8,9,10,11,12,13]

History and Risk Factors[14]*

- History of pre-HTN or HTN.
- History or symptoms to rule out coronary heart disease (CHD), heart failure, cerebrovascular disease, peripheral vascular disease, renal disease, diabetes mellitus (DM), dyslipidemia, gout, sexual dysfunction, stroke, TIA's, dementia, or sleep apnea.
- Family history of HTN, premature coronary heart disease, cerebrovascular accident (CVA), DM, dyslipidemia, or renal disease.
- Other symptoms suggesting other causes of elevated blood pressure, which include muscle weakness/tetany, cramps, arrhythmias (hypokalemia/primary aldosteronism), flash pulmonary edema (renal artery stenosis), sweating, palpitations, frequent headaches (pheochromocytoma), snoring, daytime sleepiness (obstructive sleep apnea), symptoms suggestive of thyroid disease.
- Adverse effects of any previous antihypertensive therapy.
- Age (older than 55 years for men, 65 years for women).
- History of recent change in weight, physical activity level, or tobacco use (particularly cigarettes).
- Dietary assessment, including intake of sodium, saturated fat, alcohol, and caffeine.[15,16]
- History of all prescribed and over-the-counter medications, herbal remedies, and dietary supplements. Some may raise BP or interfere with the effectiveness of antihypertensive medications.
- History of alcohol and illicit drug use (especially cocaine and other stimulants).
- Psychosocial and environmental factors (e.g., family situation, employment status and working conditions, level of comprehension) that may influence HTN control.

- Symptoms are often absent (silent). Subjective complaints that may develop secondary to end-organ damage include headache, chest pain (angina), shortness of breath (SOB), dizziness, insomnia, irritability, and tinnitus.
- Non-Hispanic Blacks[17] and South Asians in the US are at higher risks due to socioeconomic, educational, healthcare behavior, and insurance status.[18]
- Poor adherence to medications/treatments.[19]
- Cardiovascular risk should be evaluated in all hypertensive patients. Scores based on BP levels and other risk factors can be assessed using ESC-ESH Guidelines.[20]
- Patients with a diagnosis of type 2 diabetes have specific evaluation and treatment guidelines.[21,22]
- Increasing evidence has proven that the pathogenesis of hypertension is closely related to the dysbiosis of gut microbiota.[23]
- 2023 study showed that the middle-aged females with Subclinical Hypothyroidism (SCH) had an increased risk of HTN.[24]

Objective Findings

- HTN often presents no objective abnormalities other than elevated BP readings. Office-based *sphygmomanometer* or automated electronic device (arm cuff is more accurate than finger or wrist cuff) readings properly performed (seated comfortably with back supported, legs resting on the ground and uncrossed for 5 minutes; arm resting comfortably on a table at heart level) It is preferable to take 2 readings, 1-2 minutes apart and use the average. In general, the diagnosis of HTN should be confirmed at an additional patient visit 1-4 weeks after the first measurement. Some patients may exhibit "white coat" HTN, where readings are only elevated in the clinical setting. In this case, ambulatory readings or self- monitoring may be useful and should be averaged over the course of 5-7 days.
- See CHP's Blood Pressure Measurement Advisory, available on our website, www.chpgroup.com, behind the Provider Hub log-in.
- With target organ damage may see: presence of S4, broad notched P waves, evidence of left ventricular hypertrophy on electro-cardiogram (ECG or EKG), CXR, or echocardiogram.
- Signs of cardiac decompensation and poor peripheral circulation.
- Focused examination of potential causes and/or end-organ damage includes height, weight; body mass index (BMI) can be calculated via http://www.nhlbi.nih.gov/guidelines/obesity/BMI/bmicalc.htm ; waist circumference (>102cm in men and >88cm in women is high risk for type 2 diabetes)[Error! Bookmark not defined.]; fundoscopic exam; auscultation and palpation of chest, major and peripheral vessels; inspection of extremities for peripheral edema.
- Laboratory examination: 12-lead ECG, sodium, potassium, fasting glucose, fasting lipids (lipoprotein panel), hematocrit, complete blood count (CBC), liver function tests, serum uric acid, comprehensive metabolic panel, including glomerular filtration rate (GFR) calculation, urinalysis (UA) with micro-albuminuria and creatinine. Consider exercise stress test, thyroid testing, (CXR), and C-reactive protein (CRP).

- When blood pressure control is not achieved, consider additional tests to identify cause of secondary hypertension, including rapid sequence intravenous urogram (IVU), renal scintigraphy, vanillylmandelic acid (VMA) (for pheochromocytoma), renin-sodium profiling, homocysteine, allergy, and heavy metals.
- Special diagnostic tests (as needed): echocardiogram, carotid ultrasound, kidney/renal artery or adrenal imaging, fundoscopy, brain CT/MRI.

Assessment[25]

- Differentiate primary/essential HTN from secondary HTN.
- If primary/essential HTN, determine the patient's stage of HTN to develop treatment plan.
- Treatment thresholds are dependent on which guidelines are followed.

TCM Perspective

Clinical impressions should be correlated to history, complaints, and objective finding to differentiate syndromes according to Chinese medicine. What is called HTN in Western medicine may correspond with the following two primary patterns for hypertension. Primarily, the condition is considered a deficiency of the Kidney system. This will lead to either 1) excess liver yang and/or liver wind, or 2) kidney yin or yang deficiency.[26] The specific Chinese pattern differentiation of these imbalances is based on the nature and location of the symptoms (e.g. headache, dizziness and edema) and other secondary symptoms (e.g. digestion, sleep and bowel function).

Plan

Treatment goals:

- Normalize BP – a 5 mm Hg decrease in systolic BP has been associated with a 7% reduction in all-cause mortality.[27] Risk of cardiovascular events, strokes and kidney disease is lowest at 115/75 and for every increase of 20mmHg systolic or 10mmHg diastolic, the major risk in cardiovascular and stroke events doubles.[28]
- Achieve lifestyle modifications (diet, exercise, stress reduction, and weight control, salt reduction, smoking cessation, include alcohol consumption up to 2 drinks/day.[29]
- Improve cardiovascular health and prevent organ damage and reduce morbidity and mortality, (reduces risk of stroke, myocardial infarction (MI), and heart failure).
- Treatment decisions may be made in the context of risk factors and the stage of high blood pressure.

Treatment strategies:

Treatment strategies recommend incorporating lifestyle recommendations and medication based on the assessment of blood pressure thresholds and other elements such as cardiovascular and other risk factors.[30]

Mind-Body Therapies:

- Yoga: A 2022 study concluded that the findings suggest yoga interventions may effectively manage hypertension.
    - A 2022 study concluded that the findings suggest yoga interventions may effectively manage hypertension.[31]
    - An earlier study in 2018 found that only yoga without yoga postures induced a short-term lowering of ambulatory systolic blood pressure.[32]
- Benefits have been shown with device-guided therapeutic breathing, stress management, and patient education in controlling BP.[33]
- Results suggest that a brief workplace stress management intervention can produce clinically significant reductions in BP.[34]
- The Mindfulness-Based Stress Reduction (MBSR) program is a promising behavioral complementary therapy to help people with hypertension lower their blood pressure through modifications in their lifestyle.[35]

Lifestyle Changes:

- One of the therapies that remains consistent across guidelines is the implementation of lifestyle changes.[1,3,4] Lifestyle changes play a role in cardiovascular disease prevention and treatment by having positive effects on modifiable risk factors, (i.e., smoking, unhealthy diet, overweight/obese, diabetes mellitus, physical inactivity, BP and lipids).[36]
- Weight loss: achieve and maintain a healthy weight (refer to 2013 Obesity Expert Panel Report for recommendations).[37,38]
- Nutritional/Dietary modifications[39,40:] emphasize vegetables, dietary fiber[41] , fruits[42], whole grains; includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; limits intake of sodium, sweets, sweetened beverages, and red meats. Adapt to appropriate caloric requirements and for other medical conditions, e.g., DM. This can be achieved by following plans such as the Dietary Approach to Stop Hypertension (DASH), United States Dept. of Agriculture (USDA) Food Patterns, or American Heart Association (AHA) Diet.
- Alcohol consumption: Reduction may be helpful in up to 10% of people with HTN.[3]
- Smoking cessation.

Lifestyle Counseling:

- In addition to genetic predisposition, lifestyle may play a large role in acquiring HTN for many patients. Overwork, psychological and physical stressors, irregular diet, lack of exercise, lack of adequate rest and leisure can all play a role in the development of hypertension.
- Stress reduction techniques including meditation biofeedback, and regular physical exercise, such as daily walking (30 minutes).
- Psychosocial support, stress management, and coping skills used in cardiac rehabilitation.[43,44,45,46,47] Biofeedback has been shown to be effective for "white coat" HTN.[48]

Movement and Exercise:

- Exercise:[49,50,51,52] regular aerobic exercise and integrate physical activity into daily routines: engage in 2.5 hours/week of moderate-intensity or 1.25 hours/week of vigorous-intensity aerobic physical activity, or a combination of the two. Aerobic activity should be performed in episodes of at least 10 minutes spread throughout the week.
- *Qi Gong:* 2021 Meta-analysis suggests benefit.[53]
- *Tai Chi:* a 2023 Meta-analysis and a 2024 overview of SRs both suggest benefit.[54,55]

Soft Tissue Therapies:

- Massage for relaxation.[56]
- Hydrotherapy: constitutional and alternating foot baths for circulation.

Manual Adjustments/Manipulation:

- Published clinical trials of chiropractic adjusting for high blood pressure have yielded mixed results. There is currently little evidence that adjusting may assist in long-term reduction of HTN.[57] Chiropractic adjusting may assist in the resolution secondary problems that, for example, may prevent patient compliance with recommended lifestyle changes.
- Osteopathic manipulation in combination with lifestyle modifications and pharmacologic therapy.[58]
- High velocity, low amplitude therapy of cervical spine (mixed results).[59,60]

Supplements and Nutrients:

- Assess diet; lower fat intake, increase fiber; avoid caffeine, nicotine.
- Long-term BP reduction has been associated with regular consumption of minimally processed dark chocolate and other foods derived from the cacao bean.[61,62]
- Short-term fasting has a hypotensive effect. [63,64]
- Consider food allergies as a contributing factor to elevated blood pressure.
- Calcium, magnesium,[65] CoQ10 (mixed results),[66,67] EFAs, vitamins E, C, D,[68,69,70] garlic, and antioxidants.[71]
- Botanicals to support vascular endothelium, heart function and tone, enhance diuresis or to enhance inotropic activity as needed. (See below)
- Melatonin.[72,73]
- Homeopathic remedies as indicated by symptom picture.
- Flavanol rich cocoa as an addition to the diet.[74,75,76]
- Lycopene.[77]
- Psyllium.[78]
- Cinnamon.[79,80]
- Probiotics.[81,82,83]
- Phytosterols.[84]
- Vitamin B6, Taurine, rutin, quercitin.

Acupuncture Treatment:

Several RCTs on the effects of acupuncture for essential hypertension have been conducted in China and published in Mandarin, yet few RCTs have been published in English. As an example, the 2018 SR by the Cochrane Collaboration identified 22 RCTs assessing the effects of acupuncture on hypertension, 86% (n=19) were published in Chinese (remaining three in English).[85] To date, all of the RCTs have been summarized in the most recent systematic reviews.[88,86,87,88] Based on the literature the following conclusion can be drawn:

Some evidence suggests short-term benefits, but limited evidence suggests lasting benefit from acupuncture for the treatment of essential hypertension.

- A 2024 meta-analysis (10 RCTs; n=1,196) assessed the effects of acupuncture grade 1 hypertension.[91]
    - Analysis at the end of treatment (median: 36 days) suggests *"acupuncture was more effective than lifestyle modification alone, placebo treatment, or no treatment at all."*
    - Caution is warranted as only 2/10 RCTs had low risk of bias.
- A 2018 SR also suggests benefit at end of treatment and similarly cautioned *"…benefits… unclear because of methodology flaws and low reporting quality."*[89]
- A 2018 Cochrane review identified a single RCT assessing the long term-effects of acupuncture for essential hypertension and concluded, **"***…there is no evidence for the sustained BP lowering effect of acupuncture that is required for the management of chronically elevated BP."*[88]
- A 2006 trial, the largest RCT (n=192), found no clinically or statistically significant effect from acupuncture (as a monotherapy) for mild-moderate hypertension.[89]
- A 2007 trial, second largest RCT (n=160), found a positive effect of acupuncture (adjunctive to medication) at the end of treatment, but effects were not sustained at 3-month follow-up.[90]

Herbal Medicine (Western):

- Botanicals to support vascular endothelium, heart function and tone, enhance diuresis or to enhance inotropic activity as needed.
- Although there are a variety of herbs and formulas that may be helpful for the hypertensive patient, it is suggested that practitioner use caution when prescribing herbs because of the potential for interactions with other medications being taken by the patient as well as the possibility of reduced kidney functioning in these patients. There are some botanicals (e.g., cola, ginger, licorice) that have pharmacodynamic interactions with antihypertensive drugs that will counteract their hypotensive effects.
- Botanicals that have evidence of use in the treatment of hypertension.[9192,93]

- TEAM herbal formula may be helpful.
    - Most recent SR (2024) assessed efficacy and safety of different ginkgo-based Chinese patent medicines (CPMs) via a network meta-analysis framework (n=46).[94]
        - Results suggest that Ginko-based CPMs + usual care (UC) are more effective than UC alone; caution warranted due to low quality trials.
    - A 2023 meta-analysis (N=29; 2,623 patients) assessed the effects & safety of Chinese herbal medicine (CHM).[95]
        - Results suggest benefits of combined CHM + UC vs. UC alone in reducing blood pressure for patients with primary hypertension; caution warranted due to low quality trials.
- Essential oils.[96]

Pharmaceuticals (Prescription):

The following recommendations are summarized from the most current guideline for hypertension management. In the general population, pharmacologic treatment should be initiated when:

- BP is ≥140/90 mmHg in adults ≤60 years.
- BP is ≥150/90 mmHg in adults ≥60 years.

- In patients with hypertension and diabetes, pharmacologic treatment should be initiated when:
    - BP is ≥140/90 mmHg (regardless of age).
- Initial antihypertensive treatment options:
    - General African American population.
        - Thiazide diuretic (TZ) or calcium channel blockers (CCB).
    - General non-African American population.
        - Initially with TZs, CCBS, ACE-Is or angiotensin receptor blocker (ARBs).
    - Patients with chronic kidney disease (CKD).
        - Treatment should include ACE-Is or ARBs.
    - Therapy should be titrated up or additional therapies added after 1 month if blood pressure goal is not achieved.
    - ACE-Is and ARBs should not be used together.
    - If more than 3 drugs are needed and blood pressure goal is not achieved, a cardiologist should be consulted.
- Another similar guideline by the American College of Cardiology and American Heart Association was released in 2018.[97] This guideline concludes that pharmacological management is only recommended for Stage I if additional risk factors are noted; for stage II and hypertensive crisis, medical management is immediately recommended.[3]
- Specific pharmacologic treatment guidelines are summarized in several places, including in the International Society of Hypertension Global Hypertension Practice Guidelines.[98]

Other Therapies:

- Reducing indoor fine particulate matter (PM) exposure using high-efficiency indoor air filters or personal air cleaners over a median 13.5-day duration was associated with a ≈4 mmHg reduction in SBP.[99]
- Other prescription pharmaceuticals as appropriate and for co-morbidities.

Length of Treatment

- Depends on individual patient response to treatment and underlying pathology.
- With successful reduction of blood pressure, and lack of underlying pathology and organ damage, patients should be regularly assessed and undergo complete physical evaluation once per year.
- The American Society for Hypertension (ASH) Guideline recommends an effective medication treatment regimen be achieved within 6-8 weeks of starting treatment. For those patients with uncomplicated Stage 1 HTN who are using lifestyle modifications only, 6-12 months are permitted, before further intervention is recommended.[4]
- If a patient's goal BP is not achieved within 1 month of treatment with lifestyle and medication interventions, the dose of the initial antihypertensive agent should be increased or the addition of an agent from another of the recommended drug classes is recommended; if 2-drug therapy is unsuccessful for reaching the target BP, the addition of a third agent from the recommended drug classes is recommended.

Criteria for Referral or Re-evaluation

- Development of recalcitrant or additional symptoms suggests need for further evaluation and/or referral.
- Hypertension in pregnancy.[100,101]
- Hypertensive emergencies in which a patient has a significantly elevated BP along with Hypertension Mediated Organ Damage (HMOD) constitutes an immediate referral to a hospital to avoid progressive organ failure.[98,102]
- Failure to achieve normalized blood pressure with development of new symptoms.
- Resistant hypertension affects about 10% of individuals with HTN. This is when a patient has a seated office BP >140/90 mm Hg in a patient treated with three or more antihypertensive medications at optimal (or maximally tolerated) doses including a diuretic and after excluding "pseudo-resistance" (poor BP measurement technique, white coat effect, nonadherence, and suboptimal choices in antihypertensive therapy). Consider screening for secondary causes. A referral is warranted. Continue to optimize behavioral health changes.[103]

Resources for Clinicians*

Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension.* 2018; 71:1269–1324.

Jones NR, Mccormack T, Constanti M, Mcmanus RJ. Diagnosis and management of hypertension in adults: NICE guideline update 2019. *Br J Gen Pract*. 2020;70(691):90-91.

Nerenberg KA, Zarnke KB, Leung AA, et al. Hypertension Canada's 2018 Guidelines for Diagnosis, Risk Assessment, Prevention, and Treatment of Hypertension in Adults and Children. *Can J Cardiol.* 2018;34(5):506-525.

Umemura S, Arima H, Arima S, et al. The Japanese Society of Hypertension Guidelines for the Management of Hypertension (JSH 2019). *Hypertens Res.* 2019;42(9):1235-1481.

The International Society of Hypertension global hypertension guidelines
https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.120.15026

The Faststats site provides quick access to statistics on topics of public health importance and is organized alphabetically. Links are provided to publications that include the statistics presented, to sources of more data, and to related web pages.
http://www.cdc.gov/nchs/fastats/hypertension.htm

Dreisbach AW & Sharma S. Hypertension. http://emedicine.medscape.com/article/241381-overview

Society for Acupuncture Research. Acupuncture for the Treatment of Hypertension. www.AcupunctureResearch.org.

Resources for Patients*

Mayo Clinic.com contains Information and tools to help you manage a chronic disease or condition. http://www.mayoclinic.org/diseases-conditions/high-blood-pressure/basics/definition/con-20019580

*Health Disparities/Inequities, Caveats to Race-Based Medicine, and Related Resources

- It is recognized that unequal distribution of resources (e.g. environmental, economic) and other social determinants of health (e.g. employment, housing) are root causes of health disparities and differences of health status in racial, ethnic, and other groups.[1, 2] When a study attributes race to a difference in prevalence of a disease or clinical outcome or presentation, it should be understood that race is a social construct and genetic or biologic interpretations of race are not supported by science. Indeed, the Human Genome Project demonstrated that on average, humans are 99.9% identical at the DNA level; there is more genetic variation within 'races' than between them.[3]
- CDC: https://www.cdc.gov/healthequity/racism-disparities/index.html
- NIH: https://www.training.nih.gov/2020_inclusion_anti-racism_and_wellness_resources
- OHSU: https://www.ohsu.edu/center-for-diversity-inclusion/anti-racist-resources

- Seattle: https://providernews.seattlechildrens.org/anti-racism-resources-for-healthcare-professionals/

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