

Highlights of the 2022 Vietnamese Society of Hypertension guidelines for the diagnosis and treatment of arterial hypertension

The collaboration of the Vietnamese Society of Hypertension (VSH) task force with the contribution of the Vietnam National Heart Association (VNHA)

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Abstract

Hypertension is uncontrolled in over 50% hypertensive population in Vietnam which indicated a compelling need for new hypertension guidelines. The highlights were composed of three parts: the diagnosis of arterial hypertension, the recommendation of home blood pressure monitoring, and the treatment of hypertension. Our guideline applied flexibility based upon the “essential” and “optimal” concepts in the diagnosis and management of hypertensive patients according to the socio-economic status of Vietnam. Hypertension is defined as an office systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg which is equivalent to a 24-hr ambulatory blood pressure monitoring average of $\geq 130/80$ mmHg or home blood pressure monitoring average of $\geq 135/85$ mmHg. We established an integrated hypertensive diagnostic algorithm for adults with the optimal option by the role of out-of-office blood pressure measurement, especially home blood pressure monitoring, which is fully recommended in this guideline. The threshold and target of hypertension treatment were individualized in safety range and effective evidence-based medicine. We also update for the management of resistant hypertension, hypertension in diabetic patients, hypertension with heart failure, and with other comorbidities. Vietnam has tried on the best strategy for improving the control of hypertension and recently received several achievements in the world, especially in the Asian region. Because the conditions for conducting our national data have not been fully conducted, we have to adapt from existing guidelines so there are still certain limitations that need to be supplemented and adjusted in the upcoming version.

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KEYWORDS

guidelines, hypertension, Vietnamese

1 | INTRODUCTION

Since the publication of the 3rd Vietnamese Hypertension Diagnosis and Treatment Guideline in 2018,¹ new studies have been released. In response to the recent development and the new guidelines in the world, the Vietnamese Society of Hypertension (VSH) began to revise its guideline. To perfectly tailor the needs of clinical practice, the guidelines must be based on large trials and studies performed in their own country. Unfortunately, in reality, there was not currently such study results. Our committee, therefore, decided to establish the guideline in the form of adaptation with the important guidelines in the world. Our recent guideline was released by consulted on hypertension guidelines from the International Society of Hypertension (ISH),² the World Health Organization (WHO) guidelines for the pharmacological treatment of hypertension in adults in 2021,³ the European Society of Hypertension/the European Society of Cardiology,⁴ American College of Cardiology/American Heart Association (ACC/AHA)⁵; Canadian Cardiovascular Society⁶; Hypertension Cardiovascular Outcome Prevention and Evidence (HOPE) Asia Network⁷; World Heart Federation⁸; and other neighbor Asian hypertension guidelines in which have a broad scope of recommendations and were chosen. Our recommendation is also based on the 2020 ISH Global Hypertension Practice Guidelines for application in low-resource and high-resource settings by advising on essential and optimal standards.² Regarding the method of measuring BP, in this guideline, we focus on the method of measuring Home Blood Pressure Monitoring (HBPM). For the 24-hr Ambulatory Blood Pressure Monitoring (ABPM) technique, we have included it in the 2018 VSH/VNHA recommendation for the management of arterial hypertension and will update it in a separate guideline soon.

2 | PART I: THE DIAGNOSIS OF ARTERIAL HYPERTENSION

2.1 | Epidemiology of hypertension

Hypertension and atherosclerotic cardiovascular diseases (ASCVD) are becoming important public health issues in Vietnam. This is due, in part, to changing dietary patterns and lifestyles accompanying economic growth in the country. The prevalence of hypertension in Vietnam has increased so the Vietnam Ministry of Health has included hypertension in their prevention of non-communicable diseases program. A national epidemiological survey (2001–2008) including 9832 individuals aged ≥ 25 years old, reported that 25.1% of the population had hypertension, almost half of whom were aware of their disease; the treatment rate in patients who were aware of hypertension was 61.1%, of whom 36.3% had controlled hypertension.⁹ More recently,

the May Measurement Month (MMM) 2017 data showed hypertension in 28.7% of those surveyed, and 37.7% of patients receiving antihypertensive medication had uncontrolled blood pressure (BP).¹⁰ In the next Vietnam MMM campaigns in 2018 and 2019, the proportion of hypertensive patients among surveyors was 30.3% and 33.8%, respectively, and the rate of uncontrolled BP in surveyors who taking antihypertensive medicine increased by year 46.6% and 48.8%, respectively.^{11,12} The prevalence of important cardiovascular risk factors in Vietnam is high. Among 25–64 years old in 2015, the prevalence of hyperlipidemia was 30.2% and the prevalence of diabetes mellitus was 4.1%.¹³ In addition, among the Vietnamese population aged 25–64, the proportion of overweight/obesity was 12.0% in 2010 but increased dramatically up to 17.5% in 2015.¹³ Vietnamese also have a high consumption of salt and sweetened non-alcoholic drinks, and high rates of smoking and alcohol consumption in males.¹³ In 2005, 46% of patients with acute myocardial infarction treated at the Vietnam National Heart Institute were directly associated with hypertension.⁹ Furthermore, Vietnam National Neurology Institute data from 2003 showed that more than one-third of all cerebrovascular accidents treated in hospitals were associated with high BP.⁹

2.2 | Definition and classification of hypertension

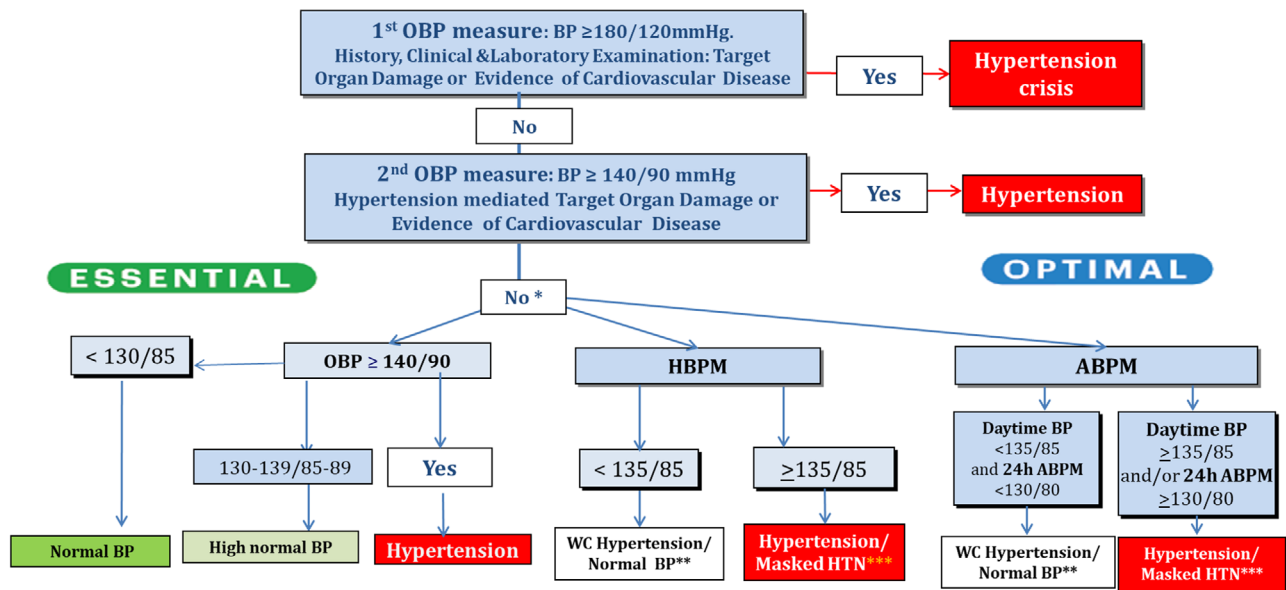
Hypertension is defined as systolic blood pressure (SBP) or diastolic blood pressure (DBP) greater than or equal to 140 or 90 mmHg, respectively, as shown in Table 1. Normal BP is defined only as both SBP less than 130 mmHg and DBP less than 85 mmHg. When SBP is greater than or equal to 130 but below 140 mmHg and/or DBP is greater than or equal to 85 but below 90 mmHg, the patient is considered as high-normal BP or pre-hypertension. High-normal BP is intended to identify individuals who could benefit from lifestyle interventions and who would receive pharmacological treatment if compelling indications are present. Hypertension crisis is defined as SBP and/or DBP greater than or equal to 180 and/or 120 mmHg, in that situation, target organ damage assessment is required to diagnose urgently or emergency hypertension for applying the appropriate management.

2.3 | Algorithm for the diagnosis of hypertension

Vietnamese studies using ABPM report a prevalence of 27% for white-coat hypertension (WCH), 21% for masked (MH), and 29% for sustained hypertension in general.¹⁴ In addition, the non-dipping pattern of nocturnal BP was relatively common, reported in 29%–86% of local studies, and the rate of morning BP surge was also high, 58%.¹⁵ Physicians can rely on office BP as an essential standard for diagnosing hypertension but HBPM and/or ABPM is used as an optimal standard.

TABLE 1 Office blood pressure threshold in the diagnosis of hypertension

Category	Systolic BP (mmHg)		Diastolic BP (mmHg)
Normotension	<130	and	<85
High – normal BP (pre-hypertension)	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	≥160	and/or	≥100
Hypertension crisis	≥180	and/or	≥120
Isolated systolic hypertension	≥140	and	<90



* Consider OBP with Essential standard and HBPM or ABPM with Optimal standard if available. ** Normal BP if OBP < 130/85 mmHg and HBPM < 135/85 mmHg; WC Hypertension if OBP ≥ 140/90 mmHg and HBPM < 135/85 mmHg; *** Masked HTN if OBP < 140/90 mmHg and HBPM ≥ 135/85 mmHg or 24h ABPM average ≥ 130/80 mmHg or daytime BP mean of ABPM ≥ 135/85 mmHg; HTN if OBP ≥ 140/90 mmHg and HBPM ≥ 135/85 mmHg, or 24h ABPM average ≥ 130/80 mmHg or daytime BP mean of ABPM ≥ 135/85 mmHg
 ABPM = ambulatory blood pressure monitoring; BP = blood pressure; OBP = Office blood pressure; HBPM = home blood pressure monitoring; HTN = hypertension; WC HTN = White coat hypertension

FIGURE 1 Diagnosis algorithm for hypertension.

The lack of awareness and the use of ABPM in Vietnam might be due to the cost and intricacy of this technique. In 2022, the VSH guideline emphasizes the use of out-of-office measurements and diagnostic procedures are presented in Figure 1. Although WCH and MH are diagnosed based on HBPM or ABPM, the combination of HBPM and ABPM allows the identification of WCH or MH with a favorable or poor prognosis. Individuals with WCH are identified when they have elevated BP only in the office and normal BP with ABPM or HBPM. In contrast, MH is diagnosed in those with non-elevated BP in the office but elevated BP out-of-office measured by HBPM and/or ABPM. These conditions are common among both untreated subjects and those treated for hypertension. Subjects with WCH have been shown to have an overall cardiovascular risk that approximates that of normotensive subjects. There is no pharmacologic treatment for WCH subjects unless they have high cardiovascular risk or hypertension-mediated organ damage (HMOD) and they should be followed annually k lifestyle modification. MH patients are at the same cardiovascular risk as sustained hypertensive patients and may require medication treatment. The possibility of

MH should be suspected in the following circumstances: elderly, male, current smoking, heavy alcohol drinking, obesity, diabetes, or other traditional cardiovascular risk factors, as well as in cases of electrocardiograph shows left ventricular hypertrophy and high-normal office BP.

2.4 | Baseline investigations

The recommended routine basic investigations include essential standards such as sodium, potassium, creatinine, estimated Glomerular Filtration Rate (eGFR), urine dipstick, lipid profile, fasting blood plasma glucose, and 12 leads ECG and optimal standard with the additional tests to consider (extended biochemistry, cardiac/kidney/brain/vascular imaging, funduscopy...).² Abnormal results, risk factors, and comorbidities are assessed to evaluate HMOD and stratify the cardiovascular risk such as low, moderate, and high cardiovascular risk, as shown in Table 2.

TABLE 2 Risk stratification in hypertension²

Other risk factors, HMOD, or disease	High-normal BP SBP 130–139 DBP 85–89		Grade 1 SBP 140–159 DBP 90–99	Grade 2 SBP ≥ 160 DBP ≥ 100	
	Low	Moderate	Moderate	High	High
No other risk factor	Low		Low	Moderate	High
1 or 2 risk factor(s)	Low		Moderate	High	High
≥ 3 risk factors	Low	Moderate	High	High	High
HMOD, CKD grade 3 or higher, diabetes mellitus, CVD	High		High	High	High

Other risk factor: Age (>65 years), sex (male > female), heart rate (>80 beat-per-minutes), increased body weight, diabetes, high LDL-C/Triglyceride, family history of CVD, family history of hypertension, early-onset menopause, smoking habits, psychosocial, or socioeconomic factors.

HMOD: Left ventricular hypertrophy (with ECG), moderate to severe CKD (CKD: eGFR < 60 ml/min 1.73 m²), any other available measure of organ damage.

Disease: previous coronary heart disease, heart failure, stroke, peripheral vascular disease, atrial fibrillation, CKD stage 3 or higher.

Abbreviations: CKD, chronic kidney disease; CVD, cardiovascular disease; DBP, diastolic blood pressure; ECG, electrocardiogram; eGFR, estimated Glomerular filtration rate; HMOD, hypertension-mediated organ damage; LDL-c, low-density lipoprotein cholesterol; SBP, systolic blood pressure.

2.5 | Cardiovascular risk stratification in hypertension

Following a recent WHO statistic data, the cardiovascular death in Vietnam was 178 per 100,000 persons in the population, belonging to a high-risk country. Assessment of overall cardiovascular risks in hypertensive patients is recommended. Cardiovascular risks are considered when having family history of hypertension, premature cardiovascular disease, older age, male sex, smoking status, diet, alcohol abuse, physical inactivity, psychosocial aspects, hypercholesterolemia, diabetes.² Multifactorial risk assessment models can be used to predict an individual's general cardiovascular risk accurately and have a hand in efficient management strategies. In the absence of Vietnam data to determine the accuracy of risk calculations, we recommend using the most current cardiovascular risk scores, relatively such as the 2020 ISH risk score according to additional HMOD and comorbidities, as Table 2.² According to the WHO statement, we can base on whatever score is available, WHO - ISH score for Southeast Asia¹⁶ (for the essential standard), or SCORE2,¹⁷ SCORE 2 - OP¹⁸ or use the ASCVD risk score (optimal standard).

3 | PART II: THE 2022 VSH/VNHA RECOMMENDATIONS ON HOME BLOOD PRESSURE MONITORING

In Vietnam, HBPM was included in the VSH 2018 recommendation but only integrated into the BP measurement technique. In 2021, comes from the important role of HBPM in the clinical practice of hypertension, for the first time, HBPM is emphasized and specifically introduced to physicians and patients. Because WCH and MH may increase the cardiovascular risk, the patient should check BP at the both office and HBPM routinely. HBPM is also an effective method used to evaluate treatment therapy efficacy, titrate antihypertensive therapy, and diagnose WCH, MH, and hypertension in pregnancy. Meanwhile, HBPM results must be consulted by the physician, and must not be used by

the patient to titrate the patient's medication without permission from a physician. Our recommendations were written based on the recommendations of the ESC 2021,⁴ the AHA/ACC 2017,⁵ and especially according to HBPM guidelines of the HOPE Asia members.⁷

3.1 | Recommendations for the indications of HBPM

Indications for HBPM included: confirming the diagnosis of hypertension such as WCH, MH, resistant hypertension, uncontrolled hypertension, and monitoring of hypertension treatment for all patients, especially to improve treatment adherence in the long-term, especially for conditions that require tight BP control (high-risk patient and pregnancy). Based on out-of-office BP measurements, such as HBPM, patients treated for hypertension would be classified as controlled hypertension, WCH, masked uncontrolled hypertension and sustained uncontrolled hypertension Table 3.

3.2 | Recommendations for tensimeter and cuff

HBPM can be performed by the conventional auscultation technique; BP measurement with a mercury device was not recommended because of its complexity, is not available in the market, and may be dangerous for young children. Automatic or semi-automatic BP measurement devices were recommended for HBPM. Choose a compatible cuff and it should be wrapped around the upper arm (cuff covers 80%–100% of the upper arm) with the cuff's bottom position around 2–3 cm above the fossa cubiti and a marker placed on the mid-surface of the anterior arm (consistent to anatomical position). Cuff should be positioned at the same level as the heart. BP measurement device must be calibrated every 6–12 months to maintain accuracy. Concerning the selection of reliable devices, recently, many organizations with scientific associations have provided lists including the websites of validated BP monitors.

TABLE 3 Recommendations on home blood pressure monitoring^{4,19}

Recommendations	COR	LOE
HBPM is an accurate technique for diagnosing hypertension when a validated device is used and the measurement is performed correctly	I	B
HBPM is a better predictor of cardiovascular outcomes than office BP. When there is a discrepancy in diagnosis between the office and home BP, HBPM should have priority and, if possible, be confirmed by ABPM	I	B
Out-of-office BP (ABPM or HBPM) is specifically recommended for some clinical indications, such as identifying WCH and MH, quantifying the effects of treatment, and identifying possible causes of side effects. (e.g., symptomatic hypotension)	I	A
A brachial oscillometric sphygmomanometer which is validated should be used for HBPM	I	C
Morning hypertension is a better predictor of prognosis than office BP	I	B
Monitoring BP in patients with WCH is recommended to determine the status of the transition to sustained hypertension	Ila	C
Screen for MH is recommended if office BP is <130 mmHg/80 mmHg and HBPM \geq 135/85 mmHg	Ila	B

Abbreviations: MH, masked hypertension; WCH, white-coat hypertension.

3.3 | Recommendations for the technique of HBPM

For initial BP measurement and monitoring efficacy of antihypertensive therapy, HBPM is recommended at least 3-days, preferably 7-days before each visit to the doctor. The first day of HBPM generally should be excluded. The patient should not smoke, eat, consume caffeinated beverages, or exercise 30 min before measurement. Measurement should be done in a quiet room, and the patient should be made comfortable. It is recommended for the patient to not talk during measurement so as not to affect the result. Patient's both feet should lie flat on the floor, back-leaned, and rest arm on the table. Measurement should be done twice and done in both the morning and nighttime. The interval between the 1st and 2nd measurements is 1 min. Morning BP should be measured within 1-hr after getting up, after urinating, before taking antihypertensive medications, breakfast, and exercise. Night-time measurement should be done before sleeping in the same sitting position, after supper, and before going to bed.¹⁹⁻²³

BP results should be documented on the BP notebook immediately after measurement. Alternatively, BP results can also be documented digitally. Several digital tensimeter devices allow results documentation automatically. Measurements must be monitored so that results cannot be confused with family members using the same device. Measurement should be done on the non-dominant arm. However, in certain cases in which there is a BP difference between both arms (>10 mmHg), measurement should be done on the arm with a higher BP result. Initially, it is necessary to measure BP at least 5 days a week, but when BP is stable, monitor BP at least 3 days per week. The measurement of HBPM in treatment monitoring can be carried out for as long time as possible.

Physicians should provide information regarding benefits, procedures, and tutorials/training for HBPM. Tutorial/training should be done by direct demonstration and should provide written instructions along with a reference for more help, which patients could take home with. Patients on antihypertensive therapy should not titrate or modify their medication based on HBPM results themselves; routine evalu-

ation by physicians is still necessary. Besides the usual BP reading, the HBPM technique can give more HBPM metrics such as morning SBP, maximum morning SBP, day-by-day morning SBP variability, morning/evening difference, home morning BP surge, orthostatic morning SBP change to evaluate the BP variability as a 24-hr ABPM.^{4,19}

In practice, the morning SBP, evening SBP and morning-evening difference are used for follow-up antihypertensive therapy and the HBPM treatment target should be <135/85 mmHg, as shown in Table 4, with morning SBP <125 mmHg to minimize the cardiovascular risk.¹⁹ We are trying on to effectuate the three-step strategy for morning BP targets with HBPM during antihypertensive treatment according to the statement of the HOPE Asia Network in 2017^{19,23} for achieving the minimum cardiovascular risks.

4 | PART III: TREATMENT OF HYPERTENSION

The main purposes of hypertension treatment are to prevent CVD caused by increased BP and to reduce mortality by controlling high BP. In patients who already have established CVD, treatment aims to control BP to prevent progression or recurrence of the disease to decrease mortality and improve quality of life.^{4,5,25} Hypertension treatment provides greater benefit in patients who are at higher risk for CVD. We recommend the goals of hypertension treatment should be individualized by patient's age, comorbidities, cardiovascular risk factors, and, very important, tolerability as shown in Table 5.

4.1 | Hypertension treatment thresholds and targets

From the new evidence in recent years as the Blood Pressure Lowering Treatment Trialists' Collaboration analyzed randomized controlled trials with individual participant data ($N = 384\,854$) and found that each 5 mmHg reduction in SBP reduces the risk of major adverse cardiovas-

TABLE 4 Recommendations on treatment guiding by home blood pressure monitoring^{4, 5,19,24}

Recommendations	COR	LOE
In adults untreated for hypertension have SBP >130 but <160 mmHg or DBP >80 but <100 mmHg, screening for WCH should be done before applying medication therapy	IIa	B
Screening for white-coat effect in hypertensive patients on combination therapies is recommended if the BP result is >10 mmHg relative to the treatment target	IIb	C
Screening for masked uncontrolled hypertension when office BP is at the treatment target in high-risk patients is recommended	IIb	C
The home BP recommended target of treatment is <135/85 mmHg	I	B
A tight antihypertensive treatment that targets a home SBP level of <125 mmHg may have benefits in high-risk Asian hypertensive patients, especially those with diabetes or CKD, and/or CVD	IIa	B
In cases of high morning BP and normal evening BP, up-titration of drug treatment should be considered even if the mean home BP is <135/85 mmHg. HBPM may aid chronotherapy of hypertension by helping identify those patients who experience isolated morning hypertension	IIa	B

Abbreviations: CKD, chronic kidney disease; WCH, white-coat hypertension.

TABLE 5 The goals of hypertension treatment

Recommendations	COR	LOE
The goal of treatment for hypertension should be based on evidence-based medicine option that minimizes the long-term risk of cardiovascular morbidity and mortality, all-cause mortality, and improved quality of life	I	A
Recommend to define initiation BP threshold to be treated and BP target to achieve individually, based on: the cardiovascular risk stratification, comorbidities, toleration, and age.	I	A
Recommend to reach the BP treatment target early and maintain BP with high time in the target range (TTR) to maximize the effectiveness and safety	I	B
Recommend to control all cardiovascular risk factors and comorbidities flowing current recommendations simultaneously	I	A
Recommend to evaluate patient treatment adherence and barriers individually	I	B

cular events (MACEs) by 10%, stroke by 13%, and cardiovascular death by 5%.²⁶ Notably, there was no evidence showing an improved cardiovascular outcome, if expressed as relative risk reduction, varies by baseline BP values reduce to <120 mmHg.²⁷ Li et al. studied the Optimal Diastolic BP Among Adults With Treated Systolic BP Less Than 130 mmHg show no difference between lowering DBP 60–70 mmHg and 70–80 mmHg.²⁸ The post SPRINT (Systolic Blood Pressure Intervention Trial) showed SBP time in target range (TTR) at the intensive treatment group with SBP target range of 110–130 mmHg compared with the standard group with SBP target range of 120–140 mmHg reduced MACEs by 15%.²⁹ The STEP (Trial of Intensive Blood-Pressure Control in Older Patients with Hypertension) study noted that hypertension patients aged 60–80 years showed a baseline reduction in the SBP TTR group: 110–130 mmHg versus 130–150 mmHg is a 26% reduction in primary and secondary outcomes ($p < .0001$).³⁰ Bohm's study noted that reperfusion eliminates risk at low DBP by maintaining perfusion pressure³¹ and the next meta-analysis found no evidence for a nonlinear J- or U-shaped relationship between DBP and adverse CVD outcomes; including MI.^{32–36} Therefore, the 2021 ESC Guidelines for CVD prevention modified the therapy target range in clinical practice.³⁷ Significantly, based on Hypertension Pharmaco-

logical Treatment in Adults: A World Health Organization Guideline 2021,³ we suggest the office BP treatment initiation thresholds and on-treatment targets as shown in Figure 2. In patients with high-normal BP at low/moderate risk and without evidence of HMOD, BP-lowering medication treatment is recommended if the patient remains high-normal BP after a period of lifestyle intervention from 3–6 months.

For older patients, the BP threshold in the elderly requiring anti-hypertensive treatment is dependent on the patient's condition. Generally, 70–80 years old is $\geq 140/90$ mmHg. The BP threshold in the very old patients >80 years old is $\geq 160/90$ mmHg, provided that treatment is well tolerated. The target SBP for patients aged ≥ 70 years is often <140 mmHg and down to 130 mmHg if tolerated. This change in the BP target range for the elderly compared with the 2018 VSH guidelines is supported by evidence that these treatment targets are safely achieved in many older patients and are associated with significant reductions in the risk of a major stroke, or heart failure (HF), and cardiovascular death. It also considers that even lower SBP in the intensively treated group in SPRINT (mean 124 mmHg) probably reflects a conventional office SBP range of 130–139 mmHg.^{36,37} However, it is recognized that the evidence supporting tighter targets is

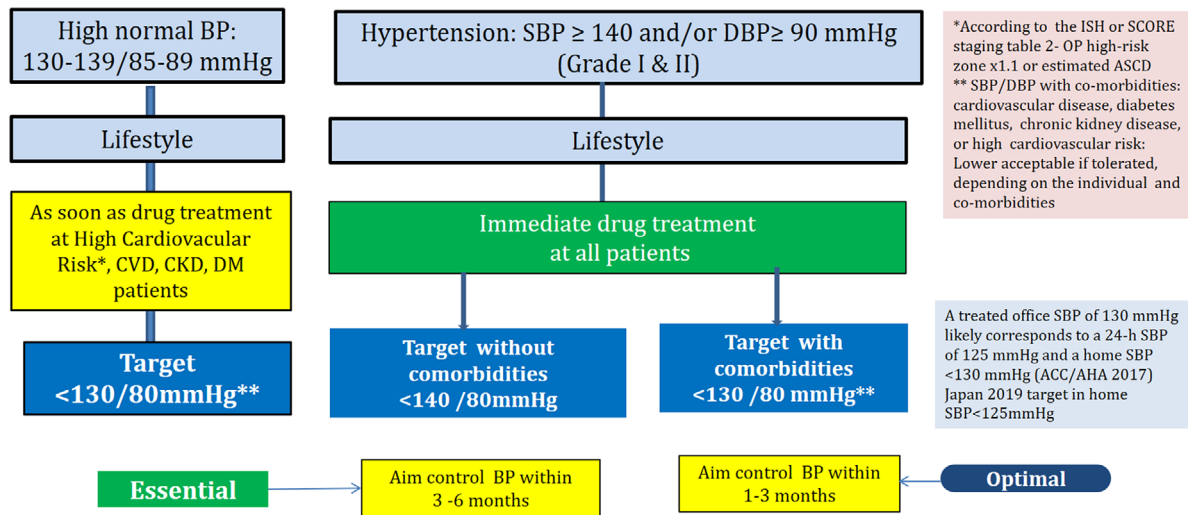


FIGURE 2 General treatment algorithm for hypertension by office blood pressure.^{2,3,26-37} CV, Cardiovascular; CVD, cardiovascular disease; CKD, chronic kidney disease; DM, diabetes mellitus; ASCVD: atherosclerotic cardiovascular disease; SBP, systolic blood pressure; DBP, diastolic blood pressure.

TABLE 6 Office blood pressure thresholds for hypertension treatment

Age group	Hypertension non-comorbidities (mmHg)	Hypertension with comorbidities (mmHg)	Office DBP treatment threshold (mmHg)*
18-69	≥140	130	≥90**
70-79	≥140	≥140	≥90
≥80	≥160	≥160	≥90
DBP (mmHg)	≥90	≥90**	

Comorbidities: Coronary artery disease, diabetes; heart failure; chronic kidney Disease.

Abbreviation: TIA, transient ischemic attack.

*Hypertension non-comorbidities

**≥ 85 mmHg for 18-69 years old in hypertension at high risk, DM, CKD, CAD, Stroke/TIA.

TABLE 7 Office blood pressure targets in hypertension treatment^{29-31,37}

Age group (years)	Office SBP treatment target ranges (mmHg)	
	Hypertension non-comorbidities	Hypertension with comorbidities
18-69	120- <140 mmHg Lower SBP is acceptable if tolerated	120- <130 mmHg
≥70	<140 mmHg, down to 130 mmHg if tolerated Lower SBP is acceptable if tolerated	
DBP treatment target (mmHg)	<80 mmHg for all treated patients*	

Comorbidities: Coronary artery disease, diabetes; heart failure; chronic kidney disease.

Abbreviation: TIA, transient ischemic attack.

*Hypertension + T2DM/CAD: The target range of DBP at >65 years old non-reperfusion is 70-79 mmHg.³²

less strong for very older people (>80 years) and those who are frail. Also, in these older and especially frail patients, it may be difficult to achieve the recommended target BP range due to poor tolerability or adverse effects. A high-quality measurement and monitoring for tolerability and adverse effects is critical in these groups.³⁷ Summary office BP threshold and targets for treatment are shown in Tables 6 and 7.

4.2 | Strategies for hypertension treatment

Essential and optimal treatment strategies are according to two flexible, simple, comprehensive diagrams, as shown in Figure 3 to allow specification of essential standards of care for low resource settings and Figure 4 to allow specification of optimal standards of care for

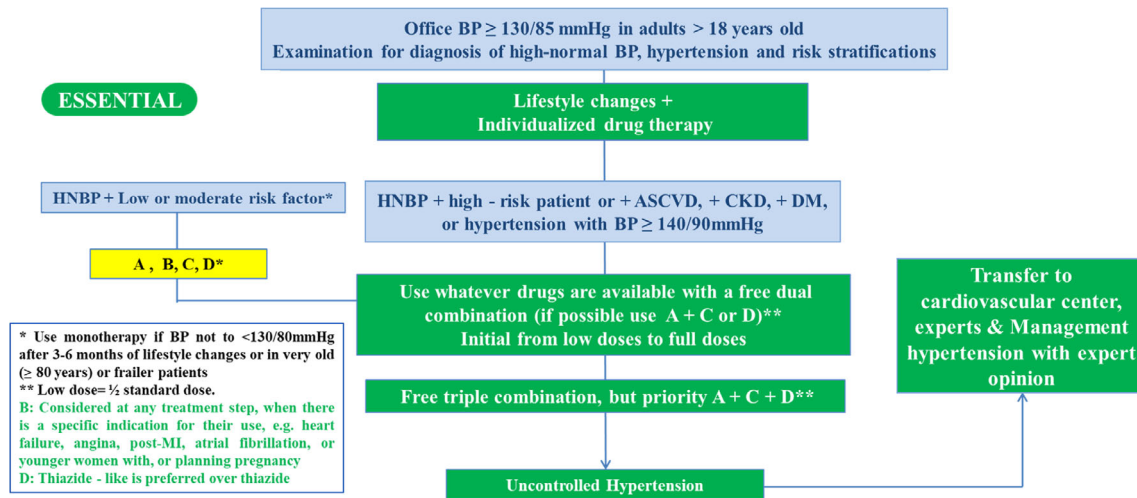


FIGURE 3 Essential standards with an evidence-based simplified treatment algorithm. ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; B, beta-blocker; C, calcium channel blocker; D, diuretic; BP, blood pressure; HNBP, high-normal blood pressure; ASCVD, atherosclerotic cardiovascular disease; CKD, chronic kidney disease; DM, diabetes mellitus.

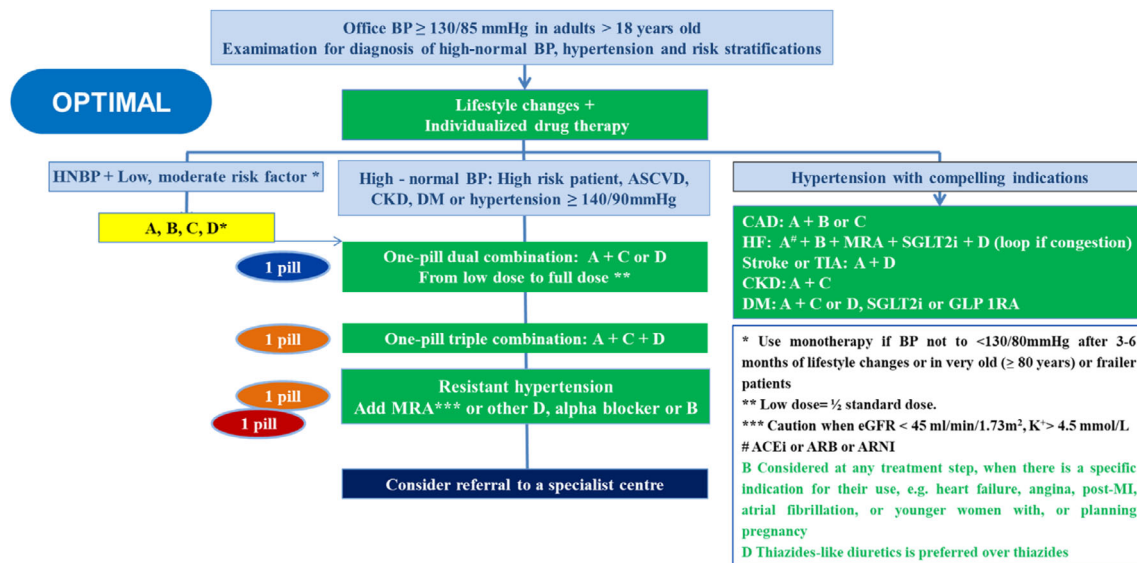


FIGURE 4 Optimal standards with an evidence-based simplified treatment algorithm. ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor-neprilysin inhibition; B, beta-blocker; C, calcium channel blocker; D, diuretic; MRA, mineralocorticoid receptor antagonist; SGLT2i, sodium-glucose cotransporter inhibitor; GLP-1 RA, glucagon-like peptide-1 receptor agonist; HNBP, high-normal blood pressure; ASCVD, atherosclerotic cardiovascular disease; CKD, chronic kidney disease; DM, diabetes mellitus; CAD, coronary artery disease; HF, heart failure; TIA, transient ischemic attack.

high resource settings. The core of both strategies is early adherence to gradually increasing low-dose drugs with fixed-dose dual or triple tablets and a strategy of exercise and diet.

4.3 | Lifestyle modification

Healthy lifestyle choices can prevent or delay the onset of hypertension and can reduce cardiovascular risk. Lifestyle management is

the cornerstone of prevention and treatment. They can also augment the effects of BP-lowering therapy, but they should never delay the initiation of drug therapy in patients with HMOD or at a high level of cardiovascular risk. Lifestyle modifications should include the six best-proven non-pharmacological recommendations for the prevention and management of hypertension such as (1) Healthy diet; (2) Weight loss; (3) Reduced sodium intake; (4) Increased dietary potassium intake; (5) Physical activity; (6) Moderation in alcohol intake.³⁸

TABLE 8 The pharmacological treatment strategies recommended for hypertension

Recommendations	COR	LOE
ACE inhibitors, ARBs, beta-blockers, CCBs, and diuretics (thiazides and thiazide-like) have demonstrated effective reduction of BP and cardiovascular events in RCTs, and thus are recommended as the basis of antihypertensive medication treatment	I	A
Combination treatment is recommended for most hypertensive patients, as initial therapy. Preferred combinations should comprise a RAS blocker (either an ACE inhibitor or an ARB) with a CCB or diuretic. Other combinations of the five major classes can be used	I	A
Beta-blockers are recommended to combine with any of the other major drug classes when there are specific clinical situations, e.g., angina, post-myocardial infarction, heart failure, or heart rate control	I	A
Recommended to initiate an antihypertensive treatment with a two-agent combination at the low dose, preferably in a single-pill combination. Exceptions are the very old (≥ 80 years) or frailer patients and those with high-normal BP at low and medium risks	I	A
If BP is not controlled with a three-agent combination, treatment should be increased with the addition of spironolactone or, if not tolerated, other diuretics such as amiloride or higher doses of other diuretics, a beta-blocker, or an alpha-blocker.	I	A
The combination of two RAS blockers is not recommended	III	A

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CCB, calcium channel blocker; RCT, randomized controlled trial; RAS, Renin-Angiotensin-system.

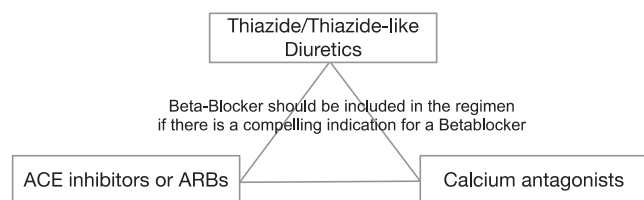


FIGURE 5 Combination regimens in the treatment of hypertension.^{2,39–41} ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker.

4.4 | Pharmacological treatment

As per the previous guidelines, five major drug classes were recommended for the treatment of hypertension: ACE inhibitors, ARBs, beta-blockers, CCBs, and diuretics (thiazides and thiazide-like diuretics such as chlorthalidone and indapamide). The pharmacological treatment strategies are recommended as shown in Table 8.^{1,3–5,25,37}

4.5 | Drug combination treatment strategies

It is recommended to initiate an antihypertensive treatment with a two-drug combination at a low dose, preferably in a fixed-dose single-pill combination (SPC).³⁹ Exceptions are the very old (≥ 80 years) or frailer patients and those with high-normal BP at low and medium risks Table 8.^{39,40}

Drug combination treatment strategies are shown in Figure 5. If target BP is not achieved with a dual-low dose combination (low dose generally refers to the half of the standard dose), either increase the dose of the initial anti-hypertensive agent to full dose or add a third anti-hypertensive Figure 5. SPC is very convenient and promotes

treatment adherence by reducing the pill burden and simplifying the treatment regimen.⁴¹

If not reach the BP target within 1 month after treatment initiation, increase the dose or move to a triple combination.

Compelling and possible contraindications to the use of specific antihypertensive drugs and dosages of commonly used antihypertensive drugs are unchanged as shown in 2018 VNHA/VSH guidelines.¹

4.6 | Specific circumstance

4.6.1 | Resistant hypertension

Hypertension be defined as resistance to treatment when:

- Optimal doses (or best-tolerated doses) of an appropriate therapeutic strategy, which should include a diuretic (typically an ACE inhibitor or an ARB with a CCB and a thiazide/thiazide-type diuretic), fails to lower office SBP and DBP values to <140 mmHg and/or 90 mmHg, respectively;
- The inadequate control of BP has been confirmed by ABPM or HBPM; and
- After exclusion of various causes of pseudo-resistant hypertension (especially poor medication adherence) and secondary hypertension.

Antihypertensive treatment has to be optimized. After an optimal single-pill triple combination (**algorithm: A + C+ D**; Figure 4), the next step may include a mineralocorticoid receptor antagonist (MRA) or if not tolerated (when the eGFR is reduced to <30 – 40 ml/min per 1.73 m², serum potassium is > 5 mmol/L) changing the diuretics such as amiloride or higher doses of other diuretics, a beta-blocker, or an alpha-blocker, as Figure 4, as well as choosing a device-based antihypertensive treatment.

The recommended treatments of resistant hypertension for the essential standard are³⁸:

- Reinforcement of lifestyle measures, especially sodium restriction.
- Addition of low-dose Spironolactone to existing treatment.
- Or the addition of further diuretic therapy if intolerant to Spironolactone, with either eplerenone, amiloride, higher dose thiazide/thiazide-like diuretic, or a loop diuretic.
- Or the addition of bisoprolol doxazosin.

With optimal standard, resistant hypertension should be managed in specialist centers with sufficient expertized, and resources necessary to diagnose and treat this condition.³⁸

4.6.2 | Catheter-based renal denervation

The rationale for catheter-based RDN is based on the knowledge of the pathophysiological role of sympathetic nervous activity in the initiation, persistence, and progression of hypertension and hypertension-mediated disease. Clinical data of the pre-drug era have improved BP and life expectancy after surgical paralumbar sympathectomy, but the adverse events were considerable. Recently, an analysis of the Global SYMPPLICITY Registry,⁴² providing the largest set of data on the efficacy and safety of RDN in patients with and resistant hypertension, showed a similar ABP reduction in patients without any difference in the safety profile of the RDN procedure. Taken together with the results of trials for RDN: RADIANCE-HTN Solo,⁴³ SPYRAL HTN-OFF MED Pivotal,⁴⁴ SYMPPLICITY HTN-3,⁴⁵ SPYRAL HTN-ON MED,⁴⁶ and RADIANCE-HTN Trio,⁴⁷ updated data are encouraging and suggest RDN as a conceivable option in patients, which is alternative or complementary to antihypertensive drug therapy, but open questions need to be answered before its use in general practice.⁴⁸

4.6.3 | Hypertension and COVID-19

ACE inhibitors/angiotensin II type 1 receptor blockers do not inhibit ACE2 because ACE and ACE2 are different enzymes. Although angiotensin II type 1 receptor blockers have been suggested to upregulate ACE2, the evidence is not fully consistent and differs per angiotensin II type 1 receptor blocker and per organ. No data are supporting that ACE inhibitors or angiotensin II type 1 receptor blockers facilitate coronavirus entry by increasing ACE2 expression. Treatment with RAS blockers is not harmful but beneficial, therefore, RAS blocker therapy should not be interrupted due to coronavirus infection.⁴⁹

4.6.4 | Hypertensive emergencies

Definition of hypertensive emergency

Hypertensive emergencies are situations in which severe hypertension is associated with acute HMOD, which is often life-threatening and

requires immediate but careful intervention to lower BP, usually with intravenous (i.v.) therapy. Patients with substantially elevated BP who lack of acute HMOD are not considered a hypertensive emergency and can typically be treated with oral antihypertensive therapy.

Clinical presentations of hypertensive emergencies

- **Malignant hypertension:** Severe BP elevation ($\geq 180/120$ mmHg) associated with advanced bilateral retinopathy (hemorrhages, cotton wool spots, papilledema).
- **Hypertensive encephalopathy:** Severe BP elevation associated with lethargy, seizures, cortical blindness, and coma in the absence of other explanations.
- **Hypertensive thrombotic microangiopathy:** Severe BP elevation associated with hemolysis and thrombocytopenia in the absence of other causes and improvement with BP-lowering therapy.

Other presentations of hypertensive emergency include severe BP elevation associated with cerebral hemorrhage, acute stroke, acute coronary syndrome, cardiogenic pulmonary edema, aortic aneurysm/dissection, severe preeclampsia, and eclampsia.

Treatment of emergency hypertension

The overall therapeutic goal in patients presenting with emergency hypertension is a controlled BP reduction to safer levels to prevent or limit further hypertensive damage while avoiding hypotension and related complications, as shown in Table 9.

4.6.5 | Hypertension in pregnancy

Hypertension is the most common medical problem encountered in pregnancy and is a leading cause of perinatal and maternal morbidity and mortality worldwide. Hypertension in pregnancy is a condition affecting 5%–10% of pregnancies worldwide. Maternal risks include placental abruption, stroke, multiple organ failure (liver, kidney), and disseminated vascular coagulation. Fetal risks include intrauterine growth retardation, preterm birth, and intrauterine death. Hypertension in pregnancy includes the following aspect:

- Mild to moderate hypertension: BP measured at least 4 hr apart with elevation occurring at least twice. SBP ≥ 140 mmHg (but < 160 mmHg) and/or DBP ≥ 90 mmHg (but < 110 mmHg).
- Severe hypertension: SBP ≥ 160 mmHg and/or DBP ≥ 110 mmHg. SBP ≥ 170 mmHg with or without DBP ≥ 110 mmHg is a medical emergency and requires urgent treatment, as shown in Tables 10 and 11.

4.6.6 | Hypertension in the older adults

Hypertension is a common modifiable risk factor for cardiovascular morbidity and mortality in older people. It is important to stress that biological age influences the diagnosis threshold and treatment target

TABLE 9 Recommended medication treatments for specific hypertensive emergencies⁵⁰

Clinical presentation	Timeline and target BP	First-line treatment	Alternative
Malignant hypertension with or without TMA or acute renal failure	Several hours, MAP –20% to –25%	Labetalol Nicardipine	Nitroprusside Urapidil
Hypertensive encephalopathy	Immediate, MAP –20% to –25%	Labetalol Nicardipine	Nitroprusside
Acute ischemic stroke and SBP > 220 mmHg or DBP > 120 mm Hg	1 hr, MAP –15%	Labetalol Nicardipine	Nitroprusside
Acute ischemic stroke with the indication for thrombolytic therapy and SBP > 185 mm Hg or DBP > 110 mmHg	1 hr, MAP –15%	Labetalol Nicardipine	Nitroprusside
Acute hemorrhagic stroke and SBP > 180 mmHg	Immediate, 130 < SBP < 180 mmHg	Labetalol Nicardipine	Urapidil
Acute coronary event	Immediate, SBP < 140 mmHg	Nitroglycerine Labetalol	Urapidil
Acute cardiogenic pulmonary edema	Immediate, SBP < 140 mmHg	Nitroprusside or nitroglycerine (with loop diuretic)	Urapidil (with loop diuretic)
Acute aortic disease	Immediate, SBP < 120 mmHg and heart rate < 60 bpm	Esmolol and nitroprusside or nitroglycerine or nicardipine	Labetalol or metoprolol
Eclampsia and severe Preeclampsia/HELLP	Immediate, SBP < 160 mmHg and DBP < 105 mmHg	Labetalol or nicardipine and magnesium sulfate	

Adapted from van den Born et al. and *the European Heart Journal - Cardiovascular Pharmacotherapy*, Oxford University Press.

Abbreviations: MAP, mean arterial pressure; TMA, thrombotic microangiopathy.

TABLE 10 Classification of gestational hypertension⁵¹

Preexisting hypertension	Starts before pregnancy or <20 weeks of gestation, and lasts >6 weeks postpartum with proteinuria
Gestational hypertension	Starts >20 weeks of gestation, and lasts <6 weeks postpartum
Preeclampsia	Hypertension with proteinuria (>300 mg/24 hr or ACR >30 mg/mmol [265 mg/g]). Predisposing factors are preexisting hypertension, hypertension during a previous pregnancy, diabetes, renal disease, first- or multiple pregnancies, and autoimmune disease (SLE) Risks are fetal growth restriction and preterm birth
Eclampsia	Hypertension in pregnancy with seizures, severe headaches, visual disturbance, abdominal pain, nausea and vomiting, low urinary output: Immediate treatment and delivery required
HELLP syndrome	Hemolysis, elevated liver enzymes, low platelets: Immediate treatment and delivery required

Abbreviations: ACR, albumin-to-creatinine ratio; SLE, systemic lupus erythematosus.

range in clinical practice, as Table 7. Management of hypertension in older adults is often complicated by the various pathologies associated with aging. There are numerous challenges, including multiple comorbidities, postural hypotension, functional and cognitive impairment, and frailty. These conditions frequently overlap. The absolute benefit of aggressive BP treatment in older adults with multiple comorbidities and frailty is not well-known.⁵² Recommendations for the management of hypertension in older adults as shown in Table 12.

4.7 | Hypertension and comorbidities

4.7.1 | Hypertension and type 2 diabetes mellitus

Type 2 diabetes mellitus (T2DM) is known to be associated with an increased risk of hypertensive, cardiovascular, and renal dis-

ease. Hypertension should be treated early in diabetes patients to prevent both microvascular and macrovascular complications and cardiovascular death. Based on new evidence, we recommend treatment strategies in hypertensive patients with T2DM, as shown in Table 13.

4.7.2 | Hypertension and coronary artery disease

About 25%–30% of the acute MI patients have a history of hypertension²; and in hypertensive patients, a reduction of 10 mmHg in SBP and 5 mmHg in DBP results in a significant reduction of the risk of CAD by approximately 20%.²⁵ This indicates that good BP control in patients at risk for CAD or who already have CAD is important for the prevention of MACEs such as acute MI. The treatment strategies for patients with CAD are shown in Table 14.

TABLE 11 Recommendations on the treatment of hypertension in pregnancy^{2,51}

Recommendation	COR	LOE
<i>Threshold and target:</i> Regardless of the hypertensive disorder of pregnancy, BP consistently at or above 140/90 mmHg in the office (or $\geq 135/85$ mmHg at home) should be treated, aiming for a target DBP of 85 mmHg in the office (and SBP of 110–140 mmHg)	I	C
<i>Prevention of Preeclampsia:</i> 75–162 mg Aspirin at weeks 12–36. Oral calcium supplementation of 1.5–2 g/day is recommended in women with low dietary intake (<600 mg/day).	I	C
<i>Management of Hypertension in Pregnancy:</i>		
<ul style="list-style-type: none"> • Mild Hypertension: First choices: methyldopa, beta-blockers (Labetalol), and dihydropyridine calcium channel blockers (Nifedipine [not capsular], Nicardipine). • Severe Hypertension: Treatment with i.v Labetalol (alternative i.v Nicardipine, Esmolol, Hydralazine, Urapidil), oral methyldopa or DHP-CCBs (Nifedipine [not capsular], Nicardipine). Add magnesium (hypertensive crisis to prevent eclampsia). In pulmonary edema: Nitroglycerin i.v infusion. Sodium nitroprusside should be avoided due to the danger of fetal cyanide poisoning with prolonged treatment. 		
<i>Delivery in GH or preeclampsia:</i> At week 37 in asymptomatic women. Expedite delivery in women with visual disturbances, and hemostatic disorders.		
<i>Postpartum care:</i>		
<ul style="list-style-type: none"> • BP postpartum: If high BP persists, any of recommended drugs except methyldopa (postpartum depression) • Breastfeeding: All antihypertensive agents are excreted into breast milk at low concentrations. Avoid Atenolol, Propranolol, and Nifedipine (high concentration in milk). Prefer long-acting CCBs. Refer to prescribing information. 		
<i>Long-term consequences of GH:</i> Increased risk of hypertension and CVD (stroke, ischemic heart disease) in later life		
Hypertension in pregnancy is a contraindication for RAS blockers including ACEi, ARB, DRI, and MRA	III	C

Abbreviations: ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CCB, calcium channel blocker; DRI, direct renin inhibitor; GH, gestational hypertension; MRA, mineralocorticoid receptor antagonist; RAS, renin-Angiotensin system.

TABLE 12 Therapeutic strategies for hypertension in older adults^{4,5}

Recommendations	COR	LOE
BP threshold in the elderly requiring antihypertensive treatment is depended on the patient's condition. Generally, 70–79 years old is $\geq 140/90$ mmHg. The BP threshold in the very old patients, ≥ 80 years old is $\geq 160/90$ mmHg	I	B
The general BP target recommend in the elderly is SBP <140 mmHg, which can be <130 mmHg if tolerated and living with family. The target range of DBP is <80–70 mmHg	I	C
Recommend to monitor closely all the side effects of the antihypertensive agents	I	C
The recommended goal of lowering BP in very old patients (>80 years old) is to choose an appropriate BP target according to preserved mental function and daily physical activities	I	C
Monotherapy might be given to elderly patients with frailty syndrome if tolerated	IIb	B
For the elderly patient with comorbidities and limited life expectancy, a clinical assessment of living conditions is necessary to prioritize care and a comprehensive risk-benefit assessment is necessary to strictly BP control and appropriate agent choice	IIa	C
All antihypertensive agents could be used in the elderly; however, in isolated systolic hypertension, thiazide-line diuretics and CCB should be preferred	I	A

Abbreviation: CCB, calcium channel blocker.

4.7.3 | Hypertension with heart failure and left ventricular hypertrophy

Hypertension is a leading risk factor for the development of heart failure (HF) with reduced ejection fraction (HFrEF), and preserved ejection fraction (HFpEF) (75%–90%).⁵³ Clinical outcome is worse and mortal-

ity is increased in hypertensive patients with HF. Hypertension also causes left ventricular hypertrophy (LVH), which impairs LV function, leading to HFpEF, then, HFrEF.⁵⁴ Treating hypertension has a major impact on reducing the risk of incident HF and HF hospitalization, especially in old and very old patients.^{54,55} In recent years, there are a great progression in the diagnosis and treatment of HF, and lifestyle changes

TABLE 13 Treatment strategies in hypertension patients with type 2 diabetes mellitus²

Recommendations	COR	LOE
Office BP-treatment threshold at hypertensive patients with type 2 diabetes mellitus is $\geq 135/85$ mmHg	IIa	A
In hypertensive patients with type 2 diabetes mellitus from 16–69 y.o, the target range of SBP is <130–120 mmHg, lower acceptable if tolerated, the target of DBP is <80 mmHg	I	A
In hypertensive patients with type 2 diabetes mellitus ≥ 70 y.o, the range target of SBP is 130–139 mmHg, lower accepted if tolerated, the range target of DBP 70–79 mmHg if diabetes with coronary artery disease no reperfusion	I	A
The treatment strategy should include a RAS inhibitor and a CCB or thiazide-like diuretic	I	A
The treatment of blood glucose-lowering with SGLT2i or GLP-1 RA is preferred when there is established ASCVD and/or high-risk patients with proven CVD benefit	I	C
The treatment should include lipid-lowering and when there are comorbidities as per current guidelines	I	A

Abbreviations: ASCVD, atherosclerotic cardiovascular disease; CVD, cardiovascular disease; GLP-1 RA, glucagon-like peptide-1 receptor agonist; SGLT2i, sodium-glucose cotransporter inhibitor.

TABLE 14 Treatment strategies in hypertensive patients with coronary artery diseases²

Recommendation	COR	LOE
In hypertensive patients, office BP $\geq 130/85$ mmHg in 18–69 y.o patients and $\geq 140/90$ mmHg in ≥ 70 y.o patients are the recommended pharmacology treating threshold	I	B
The target range of SBP in hypertensive patients is <130–120 mmHg in 18–69 y.o patients and <140–130 mmHg in 70–80 y.o patients, lower SBP is acceptable if tolerated	I	C
The target range of DBP to <80–70 mmHg if no reperfusion, if reperfusion lower DBP is acceptable if tolerated but not to <60 mmHg	I	C
BB, ACEi, or ARBs for compelling drugs (e.g., dihydropyridine CCBs, thiazide diuretics, and/or MRA) as needed to further control hypertension	I	B
In patients with prior MI, long-term oral treatment with BB should be considered to reduce all-cause and cardiovascular mortality as well as cardiovascular morbidity	IIa	B

Abbreviations: ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; BB, beta-blockers.

are recommended (diet and exercise) together with the new therapeutic strategies in hypertensive patients with HF or LVH, as shown in Table 15.^{54–57}

4.7.4 | Hypertension and chronic kidney disease

Patients with CKD should receive lifestyle advice, sodium restriction may be especially effective at aiding BP lowering in patients with CKD and also, medication treatment. Current evidence (SPRINT) suggests that in patients with CKD, BP should be lowered to <130/80 mmHg and lower acceptable if tolerated as shown in Table 16. The therapeutic strategies in hypertensive patients with CKD as shown in Table 17.^{4,5}

4.7.5 | Hypertension and stroke

Hypertension is the most important modifiable risk factor for ischemic stroke and hemorrhagic stroke and a risk factor for recurrent stroke. Although both SBP and DBP are associated with stroke, SBP is more predictive. BP management during the acute phase of hemorrhagic and ischemic stroke remains an area of uncertainty. Worldwide, 15 million

people suffer from stroke annually. Of these, 5 million die, and another 5 million are left permanently disabled.⁵⁹

Hypertension with acute intracerebral hemorrhage (ICH)

In acute ICH, an increased BP is common and is associated with a greater risk of hematoma expansion, increased risk of death, and a worse prognosis for neurological recovery. The therapeutic strategies in hypertensive patients with ICH as shown in Table 18.⁵⁹ For BP-lowering agents, during the hyper-acute phase of ICH, because of the lack of clear evidences,⁵⁹ recently, any antihypertensive drug with rapid onset and short duration of action to facilitate easy titration and sustained BP control to minimize the SBP variability seems appropriate⁶⁰ such as Nifedipine, Labetalol as shown in Table 9.

Hypertension with acute ischaemic stroke (AIS)

The beneficial effects of BP reduction are even less clear in AIS. A meta-analysis suggested that BP lowering early after AIS had a neutral effect on the prevention of death or dependency. In patients with AIS not treated with i.v. thrombolysis or mechanical thrombectomy and BP >220/120 mmHg, careful BP reduction (<15% SBP reduction in 24 hr) is reasonable and likely to be safe. No specific BP lowering

TABLE 15 The new therapeutic strategies in hypertensive patients with heart failure or left ventricular hypertrophy^{4,58}

Recommendation	COR	LOE
Office BP-treatment threshold recommend to prevent and initiate to treat in HF patients is $\geq 130/85$ mmHg	I	B
Recommended target range of SBP is $<130-120$ mmHg, lower is acceptable if tolerated and DBP treatment target <80 mmHg	I	A
In the patient with hypertension and HF _{rEF} (LVEF $<40\%$), recommend to use ACEi or ARB/ARNI and a beta-blocker (Bisoprolol, Carvedilol, Metoprolol, Nebivolol), diuretic, and/or MRA and SGLT2i (Dapagliflozin or Empagliflozin) to reduce the risk of HF hospitalization and death	I	A
Diuretic in hypertension with HF _{mrEF} as well as HF _{pEF} is recommended use to reduce signs and symptoms of HF	I	C
In patients with hypertension and HF _{mrEF} or HF _{pEF} , SGLT2i (Empagliflozin) is recommended to reduce the risk of HF hospitalization and death	IIa	B
In patients with hypertension and HF _{mrEF} , ACEi/ARB/ARNI, Beta-blocker, and MRA may be considered to reduce the risk of HF hospitalization and death	IIb	C
ARNI, MRA, ARBs are recommended for patients with hypertension and HF _{pEF} to reduce the risk of HF hospitalization	IIb	B
Dihydropyridine CCBs may be added if BP control is not achieved	IIb	C
In all patients with LVH: It is recommended to treat with a RAS blocker in combination with a CCB or diuretic	I	C

Abbreviations: ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor–neprilysin inhibition; CCB, calcium channel blocker; HF, heart failure; HF_{mrEF}, heart failure with mildly reduced ejection fraction; HF_{pEF}, heart failure with persevered ejection fraction; HF_{rEF}, heart failure with reduced ejection fraction; LVEF: Left ventricular ejection fraction; LVH: Left ventricular hypertrophy; MRA, mineralocorticoid receptor antagonist; RAS, renin-angiotensin system.

TABLE 16 Threshold and blood pressure target range in hypertension and chronic kidney disease^{4,5}

Recommendation	COR	LOE
The recommended office BP threshold in hypertensive patients with CKD requires lifestyle changes and medication treatment is $\geq 130/85$ mmHg	IIa	A
The recommended BP target range in hypertensive patients with CKD is office BP of $<130-120/79-70$ mmHg, lower is acceptable if tolerated. In 70–80 y.o patients, the recommended BP target range is $<140-120/79-70$ mmHg if tolerated	I	B
Current base evidence is unclear for CKD undergoing dialysis. The BP threshold and target treatment for hypertension should be individualized with prioritizing in optimizing volume status together with intradialytic and interdialytic BP patterns, comorbidities, and frailty	IIa	C
After renal transplantation, it is reasonable to treat patients with hypertension to a BP target of $<130/80$ mmHg	I	A
Antihypertensive drug therapy in CKD should be individualized depending on tolerability and effects on renal function and electrolytes	I	B

Abbreviation: CKD, chronic kidney disease.

TABLE 17 Therapeutic strategies in hypertension and chronic kidney disease^{4,5}

Recommendations	COR	LOE
RAS blockers are more effective at reducing albuminuria than other antihypertensive agents and are recommended as part of the treatment strategy in hypertensive patients in the presence of microalbuminuria or proteinuria	I	B
A combination of a RAS blocker with a CCB or a diuretic is recommended as initial therapy	IIa	A
Changes in BP, serum creatinine, and serum potassium should be checked within 2–4 weeks of initiation or increase in the dose of a RAS blocker, depending on the current eGFR and serum potassium. If serum creatinine rises by more than 30% within 4 weeks following initiation of treatment or an increase in the dose of RAS blocker, consider decreasing the dose or stopping the RAS blocker	IIa	A
Dihydropyridine CCB or an ARB should be used as a first-line antihypertensive agent in patients undergoing renal transplantation	I	C
A combination of two RAS blockers is not recommended	III	A

Abbreviations: CCB, calcium channel blocker; eGFR, estimated glomerular filtrate rate; RAS, renin-angiotensin system.

TABLE 18 The therapeutic strategies in hypertensive patients with intracerebral hemorrhage^{5,59}

Recommendations	COR	LOE
In adults with ICH, who present with SBP greater than 220 mmHg, it is reasonable to use continuous i.v. drug infusion and monitor BP closely	IIa	C
In patients with acute ICH (<24 hr), there is continued uncertainty over the benefits and risks of intensive BP lowering on functional outcome	IIa	B
In patients with hyperacute ICH (<6 hr), it is recommended to lower BP to <140 mmHg (and to keep it >110 mmHg) to reduce hematoma expansion	IIa	B
In patients with acute ICH, recommend to initiate antihypertensive treatment as early as possible and ideally within 2 hr of symptom onset. The decrease of SBP should not exceed 90 mmHg from the baseline value (lowering BP according to recommended levels beyond 6 hr after onset of treatment for at least 24 hr and up to 72 hr) to reduce hematoma expansion	IIa	C
In patients with acute ICH who need BP-lowering therapy to maintain BP within the recommended target range and who do not have any swallowing problems, it is recommended to continue with prior oral antihypertensive agents. In those who have dysphagia or a decreased level of consciousness, recommend to temporarily stop previous oral hypertensive therapy, and use i.v. antihypertensive therapy or using oral antihypertensive therapy through a nasogastric intubation tube	IIa	C

Abbreviation: ICH, intracerebral hemorrhage.

TABLE 19 The recommendation for management of hypertension with acute ischaemic stroke^{5,59}

Recommendations	COR	LOE
In patients with suspected ischaemic stroke, in the pre-hospital setting, no need to lower the BP routinely	IIb	C
In patients with AIS not treated with i.v. thrombolysis or mechanical thrombectomy and BP >220/120 mmHg, a careful BP lowering (<15% SBP reduction in 24 hr) is reasonable and likely to be safe	IIb	C
In hospitalized patients with AIS and BP <220/110 mmHg not treated with i.v. thrombolysis or mechanical thrombectomy, routinely antihypertensive treatment for at least the first 24 hr after symptom onset is not recommended, unless in a specific condition	III	C
In patients with AIS undergoing i.v. thrombolysis (with or without mechanical thrombectomy), BP should be maintained at <180/110 mmHg before bolus and <180/105 mmHg after bolus and for 24 hr after Alteplase infusion	IIb	C
In patients with AIS undergoing treatment with i.v. thrombolysis (with or without mechanical thrombectomy), suggests not lowering SBP to a target of 130–140 mmHg compared to <180 mmHg during the first 72 hr following symptom onset	IIb	C
In patients with AIS due to large vessel occlusion, suggest against actively reducing SBP <130 mmHg during the first 24 hr following successful mechanical thrombectomy (with or without i.v. thrombolysis)	IIb	C
In patients with AIS not treated with reperfusion therapies (i.v. thrombolysis or mechanical thrombectomy) who experience clinical deterioration, suggest against routinely use of vasopressor agents to increase BP	IIb	C

Abbreviation: AbAIS, acute ischaemic stroke.

agent can be recommended. The therapeutic strategies in hypertensive patients with AIS as shown in Table 19.^{4,5,25,59,61}

In patients with AIS who are candidates for emergency reperfusion therapy, some i.v. BP-lowering agents can be used such as Nicardipine, Labetalol, Clevidipine or Hydralazine, Enalaprilat may be considered, as shown in Table 9.⁶²

4.8 | Interventions that may improve drug adherence in hypertension

Adherence is defined as the extent to which a person's behaviors such as taking a medication, following a diet, or executing lifestyle changes

correspond with agreed recommendations from a healthcare provider. Nonadherence to antihypertensive treatment is the main barrier to controlled BP including the factors: (1) Physician training, (2) Patient's education, (3) Drug-treatment level, (4) Healthcare system, (5) Family and social level.

4.9 | Follow-up

After initiating antihypertensive drug therapy at a primary level/health insurance clinic or a private family clinic, management, and follow-up periodically every 2–4 weeks in the first 2–3 months to evaluate the effects on BP and assess possible side effects until the target of BP

is reached. Continue to detect side effects, drug adherence, and barriers if BP is still uncontrolled, or other issues, refer to a provider of hypertension expertise.

5 | CONCLUSIONS

Summary, we are using the concepts of “essential” and “optimal” flexibly in the diagnosis and care of hypertensive patients according to the socio-economic status of Vietnam, hypertension defined as an office SBP ≥ 140 and/or DBP ≥ 90 mmHg, which is equivalent to a 24 hr ABPM average of $\geq 130/80$ mmHg, or a HBPM average $\geq 135/85$ mmHg, establish an integrated hypertensive diagnostic algorithm for adults with the recommendation for the optimal option by the role of out-of-office BP measurement, especially HBPM, the threshold and target of hypertension treatment according to the individualized patient in safety range and effective evidence-based medicine, in treatment strategies for hypertension according to the essential and optimal standards of care with the evidence-based simplified treatment algorithms, in the optimal drug treatment with a single pill combination from low dose to full dose: A+C or D, A+C+D as ISH guidelines, updates for hypertension in special circumstance and comorbidities. Finally, the recommendation is only a guide, in the management of hypertensive patients, the clinical physicians must be the judge of the optimal treatment for a patient incorporating a precision/personalized medicine approach. In addition, the implementation of hypertension management according to HOPE-Asia through the statement OKINAWA 2021 for Asia members will be the orientation of the Vietnamese Society of Hypertension in the coming time.

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CONFLICT OF INTEREST

The authors have no competing interest.

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