



REVIEW PAPER

2020 Consensus summary on the management of hypertension in Asia from the HOPE Asia Network

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Abstract

Hypertension professionals from Asia have been meeting together for the last decade to discuss how to improve the management of hypertension. Based on these education and research activities, the Hypertension, brain, cardiovascular and renal Outcome Prevention and Evidence in Asia (HOPE Asia) Network was officially established in June 2018 and includes experts from 12 countries/regions across Asia. Among the numerous research and review papers published by members of the HOPE Asia Network since 2017, publications in three key areas provide important guidance on the management of hypertension in Asia. This article highlights key consensus documents, which relate to the Asian characteristics of hypertension, home blood pressure monitoring (HBPM), and ambulatory blood pressure monitoring (ABPM). Hypertension and hypertension-related diseases are common in Asia, and their characteristics differ from those in other populations. It is essential that these are taken into consideration to provide the best opportunity for achieving “perfect 24-hour blood pressure control”, guided by out-of-office (home and ambulatory) blood pressure monitoring. These region-specific consensus documents should contribute to optimizing individual and population-based hypertension management strategies in Asian country. In addition, the HOPE Asia Network model provides a good example of the local interpretation, modification, and dissemination of international best practice to benefit specific populations.

1 | INTRODUCTION

The last decade has seen multiple face-to-face meetings between hypertension professionals from Asia. The consolidation of these activities resulted in the official establishment of the Hypertension, brain, cardiovascular and renal Outcome Prevention and Evidence in Asia (HOPE Asia) Network in June 2018. The Network includes experts from 12 countries/regions in Asia (Japan, Korea, Malaysia, Thailand, Taiwan, Philippines, Pakistan, Indonesia, India, Singapore, China, and Vietnam). The efforts of this group, and others, have resulted in the publication of a growing body of literature specifically focused on the management of hypertension in Asia.

This article provides an overview of publications and recommendations in three key areas for hypertension in the region: Asian characteristics, home blood pressure monitoring (HBPM), and ambulatory blood pressure monitoring (ABPM) (Table 1).¹⁻⁵

2 | CONSENSUS ON THE ASIAN CHARACTERISTICS OF HYPERTENSION

The first key publication focused on taking Asia-specific characteristics into account to optimize the management of hypertension in the region.¹ Key findings are summarized in Table 2.

Important features of hypertension in Asia include the high prevalence of stroke (especially hemorrhagic stroke) and nonischemic heart failure as complications of hypertension, a strong association

between increasing blood pressure (BP) and rates of cardiovascular disease, and high salt sensitivity.^{1,6,7}

Use of out-of-office BP measurement is recommended, and specific information on ABPM and HBPM is provided by separate consensus documents (see below).²⁻⁵

Morning hypertension is a particularly important target for the management of hypertension in Asia.^{1,8} Although not yet completely understood, Japanese patients have been shown to have a much greater morning surge in BP and higher morning BP than those from Europe.⁹ Potential mechanisms for these differences include sympathetic nervous system activation or higher dietary sodium

TABLE 1 Key Asia-specific consensus recommendation documents

Author, Year	Document Focus
Kario et al, 2018 ¹	Improving the management of hypertension based on specific Asian characteristics
Park et al, 2018 ⁵	Expert consensus recommendations on HBPM in Asia
Kario et al, 2018 ³	HBPM: practical implementation
Kario et al, 2019 ⁴	Expert consensus recommendations on ABPM in Asia
Kario et al, 2020 ²	ABPM: practical implementation (in preparation)

Abbreviations: ABPM, ambulatory blood pressure monitoring; HBPM, home blood pressure monitoring.

TABLE 2 Consensus summary of hypertension management in Asia (HOPE Asia Network) (adapted and reproduced, with permission, from Kario et al.)¹

<p>1. Asian characteristics of hypertension and cardiovascular disease</p> <p>Stroke, especially hemorrhagic stroke, and nonischemic heart failure are common outcomes of hypertension-related cardiovascular disease in Asia</p> <p>The association between blood pressure (BP) and cardiovascular disease is stronger in Asia than in the West</p> <p>Higher salt sensitivity, even with mild obesity and higher salt intake, is an Asian characteristic of hypertension</p>
<p>2. Out-of-office BP</p> <p>Out-of-office BP measurement is recommended for the detection of white-coat hypertension</p> <p>It is important to accurately detect and manage masked (or masked uncontrolled) hypertension</p> <p>Masked hypertension, such as nocturnal hypertension and/or morning hypertension, is more common in Asia than in the West</p> <p>The initial focus should be on morning BP, then nocturnal BP, in Asian populations</p>
<p>3. Elderly</p> <p>The recommended BP target for the older hypertensive population is <140/90 mm Hg</p> <p>However, when patients have an increased risk of hypotensive or renal side effects, or electrolyte abnormalities, a goal of <150/90 mm Hg may be considered</p> <p>To achieve BP goal and to prevent stroke and HF in the older population, calcium channel blockers (CCBs), renin-angiotensin system (RAS) blockers, and diuretics are recommended</p>
<p>4. Type 2 diabetes mellitus</p> <p>In Asians, a treatment goal of BP <130/80 mm Hg can be considered in hypertensive subjects with type 2 diabetes mellitus</p>
<p>5. Chronic kidney disease (CKD)</p> <p>The prevalence of CKD is higher in hypertensive patients than in the general population, and the prevalence of CKD associated with hypertension in Asian populations is increasing</p> <p>Hypertensive patients require more intensive out-of-office BP evaluation and comprehensive cardiovascular evaluation in the presence of CKD</p> <p>Intensive BP control is required for patients with CKD to preserve renal function and to prevent cardiovascular events</p>
<p>6. Atrial fibrillation</p> <p>In hypertensive subjects with atrial fibrillation undergoing anticoagulation, a target systolic BP of <130 mm Hg can be considered to minimize the risk of hemorrhagic stroke</p>
<p>7. Secondary prevention of stroke</p> <p>Stroke is among the leading causes of death and represents a large disease burden in East Asian countries, and it may be related to high sodium intake</p> <p>The relationship between BP reduction and the risk of recurrent stroke is less pronounced than in primary prevention, but BP reduction still substantially benefits patients who survive stroke events</p> <p>Evidence from randomized, controlled trials supports the use of diuretic-based treatment, especially when combined with an angiotensin-converting enzyme inhibitor, for the secondary prevention of stroke and vascular events in poststroke patients</p> <p>High BP and increased BP variability are associated with worse outcomes in patients after stroke. CCBs, with their superior effectiveness for the control of BP variability, can be considered in the management of poststroke hypertension</p>

(Continues)

TABLE 2 (Continued)

<p>8. Antihypertensive treatment</p> <p>Strict BP control for the 24-h period is important, especially in Asia</p> <p>A home BP-guided approach is the first practical step for strict BP control on the individual level</p> <p>Use of a long-acting and potent CCB and RAS inhibitor, with or without a diuretic, to control BP is preferable</p>

intake.^{10,11} Alternatively, suboptimal treatment of hypertension, including inadequate drug dosing, and/or under-usage of long-acting antihypertensive agents or combination therapies could be responsible for uncontrolled morning hypertension in Asia.¹² A comprehensive consensus statement on managing morning hypertension in Asia is available to guide clinical practice.¹³

Other important factors in hypertension management in Asia include the aging population demographic, vascular aging, and comorbid type 2 diabetes mellitus, chronic kidney disease (CKD) or atrial fibrillation (AF). The importance of controlling BP to target in the elderly is highlighted by data showing that the rate of cardiovascular events in older adults with hypertension is two to three times higher than that in younger patients with the same BP levels.¹⁴ Vascular aging is characterized by increased arterial stiffness and wave reflection, and is an important risk factor for hypertension, especially in older individuals.¹⁵ It is expected to become the dominant phenotype of hypertension, particularly in Asia.¹ Asia-specific risk factors for vascular aging include increased central aortic pulse pressure due to the relatively larger diameter and thinner media at the proximal aorta that modulates the interaction between ventricular ejection and arterial load, higher central pulse pressure, and greater wall stress at the proximal aorta.^{1,16,17} A target systolic blood pressure (SBP) of 130 mm Hg has been suggested as appropriate in Asian patients with hypertension and comorbid type 2 diabetes mellitus, CKD or AF.^{1,18} Strict control of BP is important in these patients due the increased risk attributable to the presence of the comorbidity and the documented benefits of BP reduction.¹⁹⁻²⁵

Regarding antihypertensive therapy, the need for strict BP control throughout each 24-hour period is important, particularly in Asia.^{1,26} This can be facilitated by the use of HBPM (see below for more details), and use of long-acting antihypertensive agents (eg, calcium channel blockers and renin-angiotensin system blockers) is recommended.¹ The benefits of BP lowering in Asian patients may be even greater than those in Western populations because the effect of reducing BP on stroke and heart failure are greater than on coronary artery disease.²⁷

3 | CONSENSUS ON THE PRACTICAL USE OF HOME BLOOD PRESSURE MONITORING

The HOPE Asia Network has produced two key publications on HBPM: detailed consensus recommendations⁵ and a practical guidance document (Table 3).³ HBPM is an essential component

TABLE 3 Consensus recommendations for home blood pressure monitoring (HBPM) in Asia (HOPE Asia Network) (reproduced, with permission, from Park et al.)⁵

Recommendation	Class of recommendation	Level of evidence
1. HBPM is an accurate adjunct for diagnosing hypertension when a validated device is used, and the measurement is performed correctly	I	B
2. Method of measuring home blood pressure (BP): <ul style="list-style-type: none"> • Sitting BP after 2 min rest • Wearing light clothes while taking the reading is allowed • At least 2 readings, with a 1-min interval, twice daily, for at least 3 days, but preferably 7 days • Morning: within 1 h after waking, after urination, before breakfast, and before drug intake • Evening: before going to bed • Elevated BP = mean reading of $\geq 135/85$ mm Hg 	I	B
3a. HBPM is a better predictor of cardiovascular outcome than office BP. When there is a discrepancy of diagnosis between office and home BP, a home BP-based diagnosis should have priority and, when possible, be confirmed by ambulatory BP monitoring (ABPM)	I	B
3b. Morning hypertension is a better predictor of prognosis than office BP	I	B
4a. Antihypertensive treatment strategies should target a home BP level of $<135/85$ mm Hg	I	B
4b. Strict antihypertensive treatment targeting a home systolic BP level of <125 mm Hg may have benefit in high-risk Asian hypertensive patients, especially those with diabetes or chronic kidney disease, and/or cardiovascular disease	Ila	B
5a. The diagnosis and treatment of hypertension should still be guided by office BP readings where HBPM is not readily available. However, HBPM can improve compliance when combined with active intervention, and thus improve BP control compared with current standard care alone	I	B
5b. Self-monitoring and self-titration may be feasible if carefully monitored by healthcare professionals and help to improve BP control. However, local policies must be adhered to because self-titration is not recommended in certain countries	IIb	B
6. Titration should be based on targeting a mean home BP of $<135/85$ mm Hg. However, in cases of high morning BP and normal evening BP, up-titration of drug treatment should be considered even if mean home BP is $<135/85$ mm Hg. HBPM may aid chronotherapy of hypertension by helping identify those patients who experience isolated morning hypertension	Ila	B
7. HBPM may be incorporated into local clinical hypertension guidelines	Ila	C
8. Information and communication technology-based HBPM may be beneficial, especially for patients who live in remote Asian geographical locations. The expert panel agreed that that telemonitoring of home BP, which requires active participation by patients, may have an important role in clinical practice in the near future in Asia	IIb	B
9. A validated brachial BP measuring oscillometric device should be used for measuring home BP	I	C
Where this is not feasible, the brachial BP measuring oscillometric device of choice should be calibrated every 6-12 months	IIb	C

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); Class Ila = Weight of evidence/opinion is in favor of usefulness/efficacy (should be considered); Class IIb = Usefulness/efficacy is less well established by evidence/opinion (may be considered); B = Data derived from a single randomized clinical trial or large nonrandomized studies; C = Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

TABLE 4 Home blood pressure (BP) values (mm Hg) corresponding to office measurements

Office BP	Home BP			
	Morning	Evening	Nighttime	ME Average
120/80	120/80	120/80	100/65	120/80
130/80	130/80	130/80	110/65	130/80
140/90 ^a	135/85 ^a	135/85 ^a	120/70 ^a	135/85 ^a
160/100	145/90	145/90	140/85	145/90

Note: ME average = average of morning and evening BP values.

^aDiagnostic threshold of hypertension.

TABLE 5 Key home blood pressure monitoring (HBPM) practice points^{3,5}

HBPM essentials
<ul style="list-style-type: none"> • Use HBPM to provide a good indication of cardiovascular risk in patients with hypertension • HBPM provides useful information for the diagnosis of hypertension • Provide patients with detailed information on how to use HBPM • Monitor antihypertensive therapy with HBPM (morning and evening SBP; morning-evening difference) • Use information from HBPM to control BP to target

TABLE 6 Consensus on advantages and limitations of ambulatory blood pressure monitoring (ABPM) vs office blood pressure (BP) and home blood pressure monitoring (HBPM) in Asia (HOPE Asia Network) (reproduced, with permission, from Kario et al.)⁴

Recommendation	Class of recommendation	Level of evidence
1. ABPM is the gold standard to assess 24-h BP, sleep BP, and diurnal BP variability	I	A
2. Cuff inflation-related problems can occur during clinical use of ABPM	Ila	C
3. ABPM and HBPM could be used as complementary, rather than alternative, tools	I	B
4. ABPM is useful for detecting ambulatory cardiovascular risk (isolated daytime hypertension, isolated nocturnal hypertension) that cannot be detected using office BP and HBPM	Ila	B
5. ABPM is useful for evaluating the 24-h BP-lowering effect of antihypertensive treatments, and for detecting masked uncontrolled hypertension, even when office and home BP are well controlled	I	A
6. ABPM would be useful for detecting ambulatory hypotensive episodes (antihypertensive medication-related, postprandial, due to autonomic dysfunction, etc) in patients with hypotensive symptoms (fainting, weakness, sleepiness)	I	A
7. Optimal 24-h BP control (24-h BP <130/80 mm Hg, and restoration of normal nocturnal BP and BP variability) is particularly important for reducing the risk of cardiovascular events in Asia	I	B
8. Asians are likely to have masked hypertension, including isolated nocturnal hypertension, morning hypertension and exaggerated morning BP surge	I	B

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); Class Ila = Weight of evidence/opinion is in favor of usefulness/efficacy (should be considered); A = Data derived from multiple randomized clinical trials or meta-analyses; B = Data derived from a single randomized clinical trial or large nonrandomized studies; C = Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

TABLE 7 Consensus clinical indications for ambulatory blood pressure monitoring (ABPM) in addition to home blood pressure monitoring (HBPM) in Asia (HOPE Asia Network) (reproduced, with permission)⁴

1. Increased home blood pressure (BP) variability and abnormal 24-h BP patterns	Detected by determination of standard deviation, coefficient of variation, average real variability, morning-evening difference, or peak home BP
2. Advanced target organ damage	Including left ventricular hypertrophy, advanced vascular disease, heart failure with preserved ejection fraction, chronic kidney disease, cognitive dysfunction
3. Suspected masked hypertension	Nocturnal hypertension (related to obstructive sleep apnea, diabetes and/or chronic kidney disease) or daytime hypertension (related to stress or smoking habit)
4. Suspected white-coat hypertension	To exclude the presence of persistent hypertension and avoid unnecessary treatment
5. Secondary hypertension	Related to other conditions, including obstructive sleep apnea, chronic kidney disease, renovascular hypertension, primary aldosteronism, etc
6. Monitoring antihypertensive therapy	Assessment of 24-h BP control and identification of treatment resistance
7. Drug-resistant hypertension	Persistent hypertension despite treatment with three or more antihypertensive drugs

of any hypertension management plan because home BP has been shown to provide better prognostic information than office BP measurements.^{9,28-31} In addition, high SBP on HBPM significantly increases the risk of major cardiovascular events.²⁹ HBPM is also an important tool to facilitate the detection of white-coat hypertension and masked hypertension.³² Identification of white-coat hypertension prevents patients being exposed to unnecessary antihypertensive therapy, while masked hypertension needs to be managed effectively aggressively to reduce cardiovascular risk.³³ In addition, HBPM plays a central role in managing high-risk patients with hypertension who have additional cardiovascular risk factors (eg, diabetes, obesity, CKD or other target organ damage, obstructive sleep apnea, and a previous cardiovascular event).^{3,5}

Key HBPM parameters include morning SBP, evening SBP, and the morning-evening difference.^{3,5} Table 4 summarizes HBPM values for these parameters as they relate to office BP. Optimal HBPM data can be obtained by educating patients about how to use HBPM, including the importance of sitting for at least 2 minutes prior to taking readings, taking at least two measurements each time on at least 3 consecutive days, and taking measurements in the morning and in the evening (just before going to bed) (Table 3).^{3,5} Use of a validated device is also essential.²⁹

HBPM-based antihypertensive therapy should target a home BP of <135/85 mm Hg.^{3,5} Lower BP targets may be necessary for individuals with high morning BP, and in those with comorbidities such as diabetes, CKD or existing cardiovascular disease.^{3,5} A morning home SBP target of <125 mm Hg may be appropriate to minimize cardiovascular risk.^{3,5} Use of HBPM allows morning and evening BP to be determined and targeted, facilitating the achievement of 24-hour BP control, an essential aim of antihypertensive therapy.^{3,5}

These provide physicians with the information and tools necessary to implement HBPM techniques into their clinical practice. Effective and widespread use of HBPM using the recommended methods should contribute to improving control of hypertension in Asia. Key practice points for HBPM are summarized in Table 5.

4 | CONSENSUS ON THE PRACTICAL USE OF AMBULATORY BLOOD PRESSURE MONITORING

More recently, the HOPE Asia Network has published consensus recommendations for the use of ABPM in Asia (Tables 6-12),⁴ and the associated practical guidance document is being prepared for journal submission.² ABPM is the gold standard method for diagnosing hypertension and monitoring antihypertensive therapy. In clinical practice, it is recommended that ABPM be used in conjunction with HBPM because each provides complementary data.^{32,34,35} Like HBPM, ABPM is a useful tool for detecting white-coat and masked hypertension. In addition, ABPM is the only method of BP measurement that allows BP to be determined during sleep, calculation of mean 24-hour BP, and assessment of short-term BP variability. Determination of BP variability is important because greater variability in SBP has been shown to be an independent predictor of mortality.^{36,37} Furthermore, ABPM provides good predictive information about the risk and occurrence of target organ damage, and cardiovascular morbidity and mortality.^{34,38-55} In fact, in patients with hypertension, ABPM measures show better correlation with the cardiovascular event rate than office BP.^{38,39,56-59} Therefore, ABPM provides essential information on which to base cardiovascular risk management decisions.

Recommendation	Class of recommendation	Level of evidence
1. ABPM should be performed every 15-30 min during the daytime (awake) period and every 30-60 min during nighttime (sleep) period	I	A
2. Quality of ABPM is considered good when the 24-h recording includes ≥70% of expected measurements, or ≥20 valid daytime and ≥7 valid nighttime measurements are recorded	I	A
3. Diary-based assessment is superior to 24-h clock-based assessment for evaluation of the 24-h blood pressure (BP) profile in an individual patient	I	A
4. 24-h BP is defined as the averaged BP values for 24 h; daytime BP is the averaged daytime (awake) BP values, nighttime BP is the averaged nighttime (sleep) BP values, and morning BP is the averaged morning BP values taken in the 2 h after rising	I	A

TABLE 8 Consensus on measurement schedule for ambulatory blood pressure monitoring (ABPM) in Asia (HOPE Asia Network) (reproduced, with permission, from)⁴

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); A = Data derived from multiple randomized clinical trials or meta-analyses.

TABLE 9 Consensus on ambulatory blood pressure monitoring (ABPM)-based definitions of hypertension and target blood pressure (BP) values in Asia (HOPE Asia Network) (reproduced, with permission)⁴

Recommendation	Class of recommendation	Level of evidence
1. ABPM diagnosis of hypertension is based on one of the following: <ul style="list-style-type: none"> • $\geq 130/80$ mm Hg for average 24-h BP (sustained hypertension) • $\geq 135/85$ mm Hg for average daytime BP (daytime hypertension) • $\geq 120/70$ mm Hg for average nighttime BP (nocturnal hypertension) • $\geq 135/85$ mm Hg for average morning BP (morning hypertension) 	I	A
2. Strict ABPM thresholds for hypertension: <ul style="list-style-type: none"> • $\geq 125/75$ mm Hg for average 24-h BP (hypertension) • $\geq 130/80$ mm Hg for average daytime BP (daytime hypertension) • $\geq 110/65$ mm Hg for average nighttime BP (nocturnal hypertension) • $\geq 130/80$ mm Hg for average morning BP (morning hypertension) 	IIa	C
3. White-coat hypertension is defined as <ul style="list-style-type: none"> • Office BP $\geq 140/90$ mm Hg AND • ABPM values: 24-h BP $< 130/80$ mm Hg, daytime BP $< 135/85$ mm Hg, nighttime BP $< 120/70$ mm Hg, and morning BP $< 135/85$ mm Hg 	I	A
4. Masked hypertension is defined as <ul style="list-style-type: none"> • Office BP $< 140/90$ mm Hg AND • ABPM values: 24-h BP $\geq 130/80$ mm Hg, daytime BP $\geq 135/85$ mm Hg (masked daytime hypertension), nighttime BP $\geq 120/70$ mm Hg (masked nocturnal hypertension), and/or morning BP $\geq 135/85$ mm Hg (masked morning hypertension) 	I	A
5. Masked uncontrolled hypertension is defined as masked hypertension (as per the above definitions) in patients receiving antihypertensive therapy	I	A
6. Conventional goal BP thresholds are as follows: <ul style="list-style-type: none"> • $< 130/80$ mm Hg for average 24-h BP • $< 135/85$ mm Hg for average daytime BP • $< 120/70$ mm Hg for average nighttime BP • $< 135/85$ mm Hg for average morning BP 	IIa	C
7. Strict goal BP thresholds are as follows: <ul style="list-style-type: none"> • $< 125/75$ mm Hg for average 24-h BP • $< 130/80$ mm Hg for average daytime BP • $< 110/65$ mm Hg for average nighttime BP • $< 130/80$ mm Hg for average morning BP 	IIa	C
8. The ideal 24-h BP profile includes the following three components: 24-h BP, adequate diurnal rhythm (dipper-type), and adequate BP variability	IIa	B

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); Class IIa = Weight of evidence/opinion is in favor of usefulness/efficacy (should be considered); A = Data derived from multiple randomized clinical trials or meta-analyses; B = Data derived from a single randomized clinical trial or large nonrandomized studies; C = Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

Recommendation	Class of recommendation	Level of evidence
1. Non-dipper pattern is defined as a nighttime systolic BP (SBP)/daytime SBP ratio of >0.9 , and dipper pattern is defined when this ratio is <0.9	I	A
2. More precisely, riser pattern is defined as a nighttime SBP/daytime SBP ratio >1.0 , non-dipper pattern as nighttime SBP/daytime SBP ratio >0.9 and <1.0 , dipper pattern as nighttime SBP/daytime SBP ratio >0.8 and <0.9 , and extreme dipper pattern as nighttime SBP/daytime SBP ratio <0.8	I	A
3. Morning BP surge is calculated as the morning SBP (average of morning SBP values in the 2 h after arising) minus the 1-h average of the lowest nighttime SBP for the sleep-trough surge, and as morning SBP minus the 2-h pre-awakening nighttime BP values for pre-awakening BP surge	I	A
4. Pathological sleep-trough morning SBP surge ranges from ≈ 35 mm Hg for community-based samples to ≈ 55 mm Hg for hypertensive patients	IIa	B
5. Short-term BPV parameters include standard deviation (SD), coefficient of variation (CV), average real variability (ARV), variability independent of the mean (VIM) for daytime BP, nighttime BP, weighted SD of 24-h BP values, and peak and trough values for daytime and nighttime BP	IIa	B

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); Class IIa = Weight of evidence/opinion is in favor of usefulness/efficacy (should be considered); A = Data derived from multiple randomized clinical trials or meta-analyses; B = Data derived from a single randomized clinical trial or large nonrandomized studies.

TABLE 10 Consensus on assessment and definition of disrupted diurnal blood pressure (BP) rhythm, morning BP surge, and BP variability in Asia (HOPE Asia Network) (reproduced, with permission)⁴

Recommendation	Class of recommendation	Level of evidence
1. The risk of CV disease (stroke, coronary artery disease, and/or heart failure) is more closely associated with elevated 24-h, daytime, nighttime and/or morning BP on ABPM than with office BP	I	A
2. Masked hypertension is associated with a higher risk of CV disease than normotension or white-coat hypertension	I	A
3. Uncomplicated white-coat hypertension does not increase CV risk, but white-coat hypertension in the presence of risk factors and/or target organ damage may be associated with greater risk of CV events compared with normotension	I	A
4. Nocturnal hypertension and non-dipper/riser patterns are associated with increased risk of CV disease, including heart failure, while exaggerated morning surge and extreme dipping are likely to be associated with atherosclerotic CV disease	I	A
5. Short-term ambulatory BP variability is associated with increased CV risk	IIa	B

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); Class IIa = Weight of evidence/opinion is in favor of usefulness/efficacy (should be considered); A = Data derived from multiple randomized clinical trials or meta-analyses; B = Data derived from a single randomized clinical trial or large nonrandomized studies.

TABLE 11 Consensus on evidence of ambulatory blood pressure parameters and prediction of cardiovascular (CV) outcomes in Asia (HOPE Asia Network) (reproduced, with permission)⁴

TABLE 12 Consensus on antihypertensive treatment assessed using ambulatory blood pressure monitoring (ABPM) in Asia (HOPE Asia Network) (reproduced, with permission)⁴

Recommendation	Class of recommendation	Level of evidence
1. ABPM can be used to assess the effects of life-style modification, antihypertensive medication, and device treatment on the 24-h blood pressure (BP) profile	I	A
2. Lifestyle modifications such as diet (salt restriction, fish, vegetables, nuts, etc), regular exercise, good sleeping and housing conditions (temperature, humidity, etc) improve the 24-h BP profile	I	A
3. Seasonal variation in the 24-h BP profile (increased morning BP in winter and increased nighttime BP in summer) should be considered in the assessment of 24-h BP control	Ila	B
4. Long-acting antihypertensive drugs and the combination therapy are useful for reducing 24-h BP	I	A
5. ABPM is useful for detecting uncontrolled morning and nocturnal hypertension during antihypertensive therapy	I	A
6. Antihypertensive interventions that reduce circulating volume (eg, salt restriction, diuretics, angiotensin receptor and neprilysin inhibitors and sodium-glucose cotransporter-2 inhibitors) are the preferred approach to reducing nocturnal BP. Long-acting calcium channel blockers effectively reduce daytime BP variability and morning BP surge	Ila	B
7. Bedtime antihypertensive drug dosing effectively reduces nocturnal and morning uncontrolled hypertension without excessive daytime hypotensive episodes	I	B
8. Renal denervation is effective at reducing 24-h BP, including nocturnal and morning BP	I	A

Note: Class I = Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective (is recommended/is indicated); Class Ila = Weight of evidence/opinion is in favor of usefulness/efficacy (should be considered); A = Data derived from multiple randomized clinical trials or meta-analyses; B = Data derived from a single randomized clinical trial or large nonrandomized studies.

Use of ABPM in Asia is important because the prevalence of masked hypertension in the region is high, and Asian characteristics of hypertension include disrupted BP variability, with an increased morning BP surge and nocturnal hypertension.^{60–66} However, the current use of ABPM in the region is variable. Although devices are widely available in most HOPE Asia Network countries, uptake of ABPM is influenced by a number of other factors, including physician knowledge and attitude, training and education of patients and physicians, cost/reimbursement, health-care systems, and availability of appropriately skilled healthcare professionals. As is the case for HBPM, a validated device should always be used for ABPM, and prescription of ABPM should be accompanied by comprehensive usage instructions to ensure the reliability of measurements obtained.^{2,4,34}

Diagnostic thresholds for hypertension using ABPM are as follows: average 24-hour BP of $\geq 130/80$ mm Hg; average daytime BP of $\geq 135/85$ mm Hg; average nighttime BP of $\geq 120/70$ mm Hg; and

average morning BP of $\geq 135/85$ mm Hg.⁶⁷ Table 13 summarizes ABPM values for these parameters as they relate to office BP. In addition to facilitating the diagnosis of hypertension, ABPM is useful for monitoring antihypertensive therapy. It can detect BP variability during treatment, poor control of BP, and true vs white-coat resistance. Conventional BP targets using ABPM during antihypertensive therapy are $<130/80$ mm Hg (average 24-hour BP), $<135/85$ mm Hg (average daytime BP), $<120/70$ mm Hg (average nighttime BP), and $<135/85$ mm Hg (average morning BP).⁶⁷ (Table 13).

ABPM also provides good information on control of BP throughout the 24-hour period, and about an individual's BP in their usual daily environment and routine, meaning that any influence of emotional or environmental factors can be detected and managed appropriately.^{34,68} Key practice points for ABPM are summarized in Table 14.

New information and communication technology-based solutions are being developed that not only automatically monitor BP

TABLE 13 Ambulatory blood pressure (BP) values (mm Hg) corresponding to office measurements (reproduced, with permission)⁴

Office BP	Ambulatory BP			
	Daytime	Nighttime	24-Hour	Morning
120/80	120/80	100/65	115/75	120/80
130/80	130/80	110/65	125/75	130/80
140/90 ^a	135/85 ^a	120/70 ^a	130/80 ^a	135/85 ^a
160/100	145/90	140/85	145/90	145/90

^aDiagnostic threshold of hypertension.**TABLE 14** Key ambulatory blood pressure monitoring (ABPM) practice points^{2,4}

ABPM essentials
<ul style="list-style-type: none"> • ABPM is the gold standard for diagnosing hypertension • ABPM should be used in conjunction with HBPM • Use good ABPM techniques and instruct patients accordingly • Use ABPM to identify and target BP variability • Use information from ABPM to control BP to target throughout the 24-h period

but also determine environmental factors (eg, temperature, stress, and exercise). Data obtained from these novel out-of-office monitoring devices could be used to anticipate the occurrence of cardiovascular events, allowing initiation of appropriate interventions to prevent the onset of these events. Such an approach is referred to as “anticipation medicine” for zero cardiovascular events.⁶⁹

5 | CONCLUSION

Based on a growing body of Asia-specific evidence, there are now a number of robust consensus recommendation documents to guide management of hypertension in Asia.¹⁻⁵ Taking the region-specific characteristics of hypertension and associated complications into account, and effective use of out-of-office BP monitoring techniques should facilitate more effective prevention of cardiovascular disease, cerebrovascular disease, and target organ damage. The goal is to reduce the rate of these adverse outcomes in Asia to zero. Expert groups such as the HOPE Asia Network play an important role in education, research, and guidelines for the region.

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CONFLICT OF INTEREST










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