2019 Thai Guidelines on the Treatment of Hypertension: Executive Summary

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The revision committee of the 2019 Thai Guidelines on the Treatment of Hypertension has reviewed new developments in the body of knowledge, together with the expertise in real-life clinical practice and evidence collected from clinical studies worldwide. The guidelines consist of newly highlighted key topics to ensure the guidelines remain up to date, user friendly, and suitable for the country's context. The guidelines still maintain the current office blood pressure (BP) cut-off point of 140/90 mmHg for the diagnosis of hypertension. The use of out-of-office BP measurements, including home BP monitoring (HBPM) or ambulatory BP monitoring (ABPM), is also advocated to confirm the diagnosis of hypertension. Target BP levels depend on the age of the patients, such as 120 to 130/70 to 79 mmHg for patients aged 18 to 65 years old, or 130 to 139/70 to 79 mmHg for patients over 65 years of age. There are five main groups of antihypertensive medication, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, beta-blockers, calcium-channel blockers, and thiazides or thiazide-like diuretics. Two types of medications should be started for most patients, except for frail elderly patients, patients with a relatively low initial BP of 140 to 149/90 to 99 mmHg, and low-risk patients, in which only one type of starting medication should be selected. Medication that involves a combination of two types in one pill should ideally be selected.

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Hypertension is a leading cause of death for a substantial number of Thai people each year. The major hypertension-control barrier in Thailand is the current general unawareness of the individuals who have this condition. On the other hand, even those who realize they have a problem may not take hypertension seriously enough and may not receive continuous treatment.

The revision committee for revising the 2019 Thai Guidelines on the Treatment of Hypertension has reviewed new developments in the body of knowledge, together with the expertise in real-life clinical practice and evidence collected from clinical studies worldwide. The committee also considered such evidence in line with the major problems in the country and have tried to distil all the relevant and appropriate information into the revised guidelines.

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Table 1. Strengths of the recommendations

Levels of recommendations	Suggested wording	Definition
Level I	"Should be practiced"	The recommendation is highly reliable, beneficial to patients, and worthwhile.
Level IIa	"Could be practiced"	The recommendation is moderately reliable, likely beneficial to patients, and probably worthwhile.
Level IIb	"May be practiced"	The recommendation is not reliable enough, is without adequate proof that it is beneficial to patients, and is probably not worthwhile, but it will not cause any harm to patients.
Level III	"Should not be practiced" or "Must not be practiced"	The recommendation is not beneficial and will probably cause harm to patients.

Table 2. Quality of evidence

Level of quality of evidence	Definition
A	Evidence derived from various high-quality randomized controlled trials or from meta-analysis
B	Evidence derived from at least one high-quality randomized controlled trial or from a large-scale non-randomized study with definitive outcomes on the advantages or disadvantages
C	Evidence derived from other types of high-quality study, a retrospective descriptive study, registry study, or agreement from a group of medical specialists based on their clinical experiences

Therefore, the revised guidelines now incorporate the newly highlighted key topics to ensure the guidelines can be kept up to date, user friendly, and suitable for the country's context.

The revision committee comprised of experts from various specialties who play a major role in treating hypertensive patients. The revised guidelines are expected to be used extensively by the physicians and medical personnel, which suggests considering them as a set of academic, evidence-based recommendations, not as cardinal principles. Therefore, physicians need to carefully integrate the guidelines into their practices alongside their case-by-case judgement and according to their work environment.

Strengths of the recommendations and quality of evidence are described in Table 1 and 2.

Introduction

According to the National Health Exam Survey, it was found that the average systolic blood pressure (SBP) of Thais increased from 115.3 mmHg in 1992 to 121.8 mmHg in 2014. One of the major problems of treating hypertension in Thailand is that hypertensive patients may be unaware of their condition and so do not take action to lower their blood pressure (BP) to be within the recommended criteria range. In 2015, the Ministry of Public Health of Thailand reported 18,922 deaths from coronary artery disease (CAD) in Thailand or 28.9 persons per 100,000 population, and 27,884 deaths from cerebrovascular disease or 42.6 persons per 100,000 population. If hypertension in Thailand could be controlled better, it is certain that the number of deaths from cardiovascular disease (CVD) would decline.

Blood pressure measurement

Clinic (Office) BP measurement remains fundamental for assessing BP levels, establishing a diagnosis of hypertension, and evaluating the efficacy of treatment. Meanwhile, out-of-office BP measurements, including home BP monitoring (HBPM) or ambulatory BP monitoring (ABPM), are also advocated to confirm the diagnosis of hypertension, identify white-coat hypertension or masked hypertension, evaluate BP variation, and to assess antihypertensive treatment efficacy. The standard recommendation for preparing the patient for BP measurement is shown in Figure 1.

Definition and classification of hypertension

The 2017 U.S. hypertension guidelines[1] changed the definition of hypertension from the generally accepted cut-off point of 140/90 mmHg to 130/80 mmHg. However, since the awareness, treatment, and control rate of hypertension in Thailand are still low, changing the threshold for the diagnosis of hypertension to 130/80 mmHg would dramatically increase the disease burden and raise the costs related to the expanded medical expenditure needed to meet this increased burden. However, this new hypertension definition has not been endorsed by

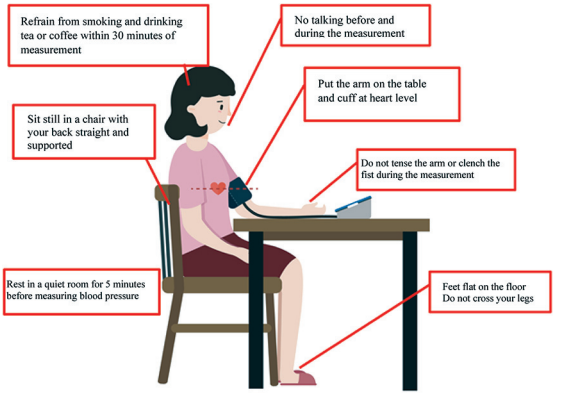

Figure 1. Recommendations on how to prepare the patient before and during blood pressure measurement (source: Thai Hypertension Society).

most of the major international hypertension societies in their guidelines, including the later released 2018 European hypertension guidelines[2], the 2018 Chinese hypertension guidelines[3], the 2018 Korean hypertension guidelines[4], and the 2019 Japanese Hypertension Society guidelines[5]. In addition, in line with these latter guidelines, the 2019 Thai guidelines still maintain the current cut-off point of 140/90 mmHg for hypertension diagnosis.

Classification of the severity of hypertension is determined based on the BP measured principally in clinics, hospitals, or public health centers (Table 3).

Table 3. Classification of the severity of hypertension in adults aged 18 years and older

Category	SBP (mmHg)		DBP (mmHg)
Optimal	<120	and	<80
Normal	120 to 129	and/or	80 to 84
High normal	130 to 139	and/or	85 to 89
Grade 1 hypertension	140 to 159	and/or	90 to 99
Grade 2 hypertension	160 to 179	and/or	100 to 109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension (ISH)	≥140	and	<90

SBP=systolic blood pressure; DBP=diastolic blood pressure

Out-of-office BP measurement

A summary of the recommendations for HBPM is shown in Table 4[6-10]. ABPM is more useful than HBPM in the way that ABPM enables monitoring a person's BP while the person is sleeping and as it can assess BP variability as well as the morning BP surge better than HBPM. However, since ABPM devices are currently expensive and available exclusively in some medical schools or major hospitals, their use is presently suitable only for research or with certain patients with special requirements.

The criteria for a hypertension diagnosis from HBPM and ABPM values are different from those for office BP and are described in Table 5.

Isolated office hypertension or white-coat hypertension means the office BP is high with a SBP of 140 mmHg or greater or a diastolic blood pressure (DBP) of 90 mmHg or greater , whereas the home BP is normal with a SBP of less than 135 mmHg and DBP of less than 85 mmHg.

Masked hypertension means the office BP is normal with a SBP of less than 140 mmHg and a DBP of less than 90 mmHg, whereas the home BP is high with a SBP of 135 mmHg or more or a DBP of 85 mmHg or more.

The diagnosis of hypertension should be made

Table 4. Summary of the recommendations for home blood pressure monitoring

Recommendations	Strength of recommendations	Quality of evidence
Measurement methods	I	B
A. Measure BP in a seated position, with both feet placed on the ground and start measuring after at least a 2-minute sit-down.		
B. Measure BP for two episodes per day, e.g., in the morning and in the evening. Measure BP twice in each episode, each time 1 minute apart. The measurement should be done for 7 consecutive days or at least 3 days per week[6].		
C. For the morning episode, one should measure BP within 1 hour after waking up and after the subject has urinated. This is preferably done before the subject has had breakfast and before taking any antihypertensive drug (if any).		
D. For the night episode, BP should be measured before bedtime.		
High home blood pressure is ≥135/85 mmHg	I	B
Since HBPM can predict CVD complications better than office BP measurements[7-10], the readings from HBPM are to be prioritized if they conflict with readings from office BP. Additional ABPM can be considered when necessary	I	B

BP=blood pressure; CVD=cardiovascular disease; HBPM=home blood pressure monitoring; ABPM=ambulatory blood pressure monitoring

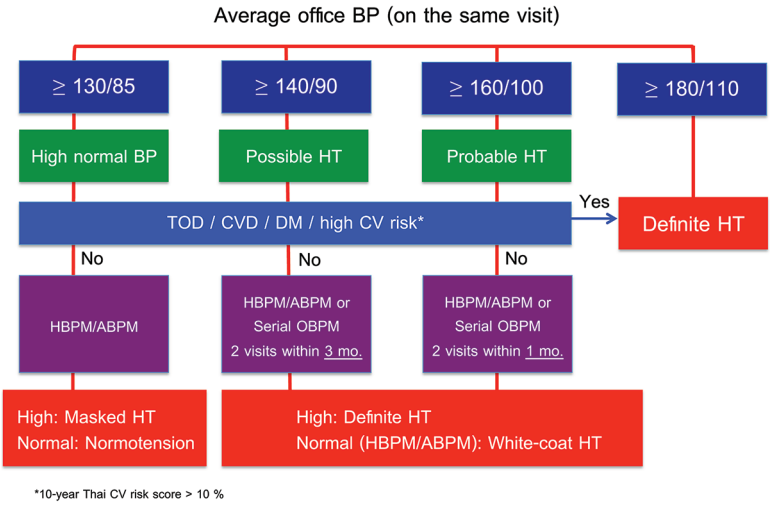

Figure 2. Hypertension diagnostic algorithms.

Table 5. Criteria for a hypertension diagnosis in different measurement methods

Measurement method	SBP (mmHg)		DBP (mmHg)
Office BP	≥140	and/or	≥90
HBPM	≥135	and/or	≥85
ABPM			
Average of daytime BP	≥135	and/or	≥85
Average of nighttime BP	≥120	and/or	≥70
Average of BP over 24 hours	≥130	and/or	≥80

BP=blood pressure; SBP=systolic blood pressure; DBP=diastolic blood pressure; HBPM=home blood pressure monitoring; ABPM=ambulatory blood pressure monitoring

according to the algorithm shown in Figure 2.

Assessment of hypertensive patients

There are four important issues to be covered while obtaining the medical history from patients with hypertension:

1. Hypertension risk factors: Patients should be asked about their history of alcohol consumption, smoking, consuming high-sodium food, renal diseases, history of snoring, family members with hypertension, and hypertension during pregnancy.

2. Medical history regarding TOD, CVD, DM, and renal diseases: The patients' history of congestive heart failure, angina, numbness of limbs or hemiparesis, temporary blurry vision, or nocturia should be routinely taken.

3. Medical history that may indicate secondary hypertension: The following aspects of medical history should be taken such as an abnormally high BP of SBP of 160 mmHg or more and a DBP of 100 mmHg or more, measured since the patient was less than 40 years old, a sudden rise or surge in BP, renal diseases or urinary tract conditions, hypokalemia or periodic muscle weakness, periodic sweating, palpitations, headache, thyrotoxicosis, snoring, and the use of medicines and substances that can cause high BP, such as corticosteroid, non-steroidal anti-inflammatory drugs (NSAIDs), erythropoietin, contraceptive pills, cocaine, amphetamine, licorice, as well as some herbs.

4. Medical history regarding antihypertensive drugs: Patients should be asked about the types and number of antihypertensive drugs they used, their efficacy, and any side effects for previous medicines, as well as medication adherence.

Laboratory testing

The recommended laboratory tests are complete blood count for hemoglobin or hematocrit, serum creatinine and estimated glomerular filtration rate (eGFR), potassium, sodium, and fasting plasma glucose, hemoglobinA1C, lipid profile, uric acid, urine analysis, and a test for albuminuria. In addition, an electrocardiogram and chest X-rays are also advisable.

A summary of the recommendations for additional medical investigations on patients with hypertension are in Table 6.

Treatment of hypertension

Essentially, the treatments for hypertension comprise lifestyle modification and medication

Table 6. Recommendations for additional investigations on patients with hypertension

Recommendations	Strength of recommendations	Quality of evidence
Heart		
12-lead electrocardiogram in every patient	I	B
Echocardiogram		
For patients whose electrocardiogram is abnormal or in cases with suspected heart disease	I	B
For patients who are suspected of having left ventricular hypertrophy	IIb	B
Arteries		
Carotid artery ultrasound is recommended for patients whose carotid bruit can be heard, those with cerebrovascular disease, or patients with artery diseases in other parts of the body	IIb	B
Pulse wave velocity (PWV)	IIb	B
Ankle brachial index (ABI)	IIb	B
Kidneys		
Creatinine and estimated glomerular filtration rate (eGFR)	I	B
Measurement of urine albumin	I	B
Microalbumin level in urine for patients with DM	I	A
Kidney ultrasound and Doppler in patients with kidney disease, with albumin in the urine or suspected of hypertension from renal artery stenosis	IIa	C
Eyes		
Retina examination in patients with very high BP (SBP ≥ 180 mmHg or DBP ≥110 mmHg) or those with DM	I	C
Brain		
CT scan or MRI of the brain for patients with neurological symptoms or cognitive disorders	IIa	B

DM=diabetes mellitus; BP=blood pressure; SBP=systolic blood pressure; DBP=diastolic blood pressure; CT=computed tomography; MRI=magnetic resonance imaging

Table 7. Recommendations for lifestyle modifications

Recommendations	Strength of recommendations	Quality of evidence
Weight reduction in overweight and obese individuals	I	A
Regular modification for the consumption of healthy foods	I	A
Limiting the amount of salt and sodium in food	I	A
Increasing regular physical activity and/or aerobic exercise	I	A
Limiting alcoholic beverages	I	A

treatment. The recommendations for lifestyle modifications to control hypertension are summarized in Table 7.

Medication treatment of hypertension

Studies showed that reducing BP using antihypertensive agents that can lower SBP by 10 mmHg or DBP by 5 mmHg can reduce CVD by 20%, reduce mortality from all causes by 15%, reduce stroke by 35%, reduce CAD by 20%, and reduce heart failure by 40%[11]. Lowering BP can also prevent kidney deterioration, with clear results in hypertensive patients with diabetes mellitus (DM) or chronic renal diseases[12-14].

Starting antihypertensive medication

The decision to start antihypertensive medication in patients with hypertension is based on four key consideration factors, the average office BP measurement, the individual's CVD risk level, any comorbidity present in the individual, especially CVD, and the target organ damage (TOD). Physicians should consider the course of actions shown in Figure 3.

Treatment consideration in elderly patients aged between 65 to 79 years involves the same considerations as in patients under 65. However, for patients over 80 years old, physicians should consider starting antihypertensive medication when the SBP

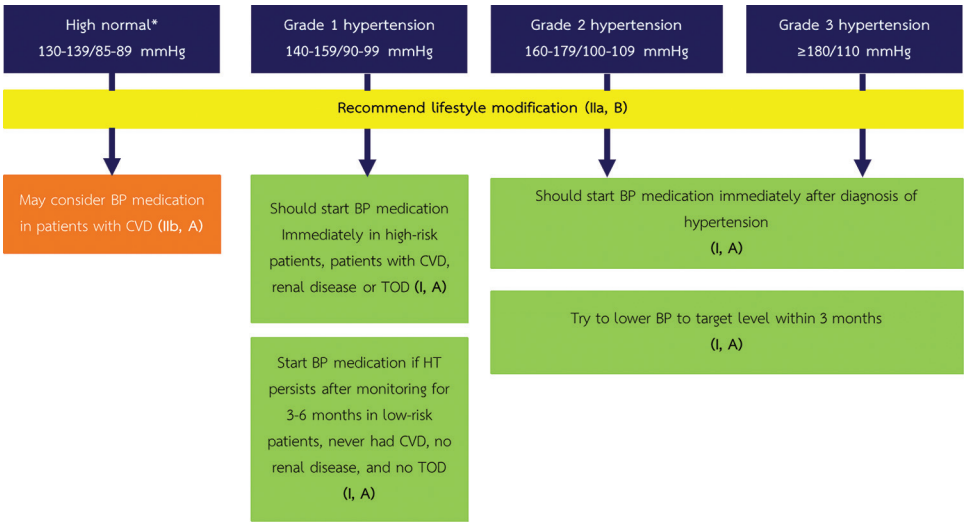

Figure 3. Hypertension treatment guideline based on the average office blood pressure measurement.

CVD=cardiovascular disease; TOD=target organ damage

* This treatment guideline is for patients with high normal blood pressure levels and patients that have been diagnosed using the diagnostic algorithm in Figure 2 and diagnosed by their physician as having definite hypertension.

Table 8. Target blood pressure levels*

Age group	Hypertension only	with DM	with CKD	with CVD	Previous stroke/TIA
18 to 65 years	120 to 130/70 to 79	120 to 130/70 to 79	120 to 130/70 to 79	120 to 130/70 to 79	120 to 130/70 to 79
65 to 79 years	130 to 139/70 to 79	130 to 139/70 to 79	130 to 139/70 to 79	130 to 139/70 to 79	130 to 139/70 to 79
≥80 years	130 to 139/70 to 79	130 to 139/70 to 79	130 to 139/70 to 79	130 to 139/70 to 79	130 to 139/70 to 79

DM=diabetes mellitus; CKD=chronic kidney disease; CVD=cardiovascular disease; TIA=transient ischemic attack

* Average office BP measurement in mmHg

is at or over 160 mmHg or the DBP is at or over 90 mmHg. Nevertheless, in high-risk patients with existing CVD, whether CAD, stroke, or transient ischemic attack (TIA), and who are over 80 years old, it is possible to consider starting BP medication when the SBP is at or over 140 mmHg. The patient's physical condition, treatment tolerance, any comorbidity, and other readiness factors for continued medication should also be considered.

Target blood pressure level

The latest clinical research and meta-analysis show that lowering the SBP to under 130 mmHg may help reduce CVD complications as well as reduce mortality[14-18]. Therefore, it is recommended that most patients' BP be lowered to 130/80 mmHg or lower. Nevertheless, there are two points of caution to note, as follows:

First, the patient's BP should initially be lowered to under 140/90 mmHg and if the patient showed good tolerance to treatment, then it should be further treated to be 130 or less/80 mmHg or less (strength of recommendation I, quality of evidence A).

Second, there exist data that show that over-prescribing BP medication can be detrimental, especially for elderly and high-risk patients, such as those with existing CVD or comorbidity. Therefore, it is recommended that SBP should not be lowered to under 120 mmHg, and a suitable DBP is between 70 to 79 mmHg[19].

Nevertheless, the main consideration is the SBP, while it is fine even if the DBP is slightly under 70 mmHg. This is because the DBP in most elderly patients is often naturally lower than normal even before taking BP medication (strength of recommendation IIa, quality of evidence C).

Target BP level recommendations in hypertensive patients are summarized in Table 8.

In prescribing antihypertensive medication, if the HBPM can be monitored, it is recommended

Table 9. Antihypertensive medication recommendations

Recommendations	Strength of recommendations	Quality of evidence
Medication to start the treatment of hypertension should be selected from the five main groups: angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), beta-blockers, calcium-channel blockers (CCBs), and diuretics (thiazides and thiazide-like diuretics)	I	A
Two types of medications should be started for most patients, such as renin angiotensin system blockers (ACEIs or ARBs) to be taken with diuretics or CCBs; however other combination of medication groups can be selected as appropriate. For weak elderly patients, patients with a relatively low starting blood pressure (BP) (140 to 149/90 to 99 mmHg), and low-risk patients, only one type of starting medication should be selected.	I	A
Medication that is a combination of two types in one pill should be selected	I	B
If two types of medications cannot control BP, then three types of medications should be used. One of the three types should be a diuretic (thiazides or thiazide-like diuretics)	I	A
Spironolactone, or beta-blocker, or alpha-blocker, should be added one type at a time in that order if the three types of medications cannot control BP and if none of these three medications have been taken prior	I	B
ACEIs should not be co-administered with ARBs	III	A

to set a target average home BP of under 135 over 85 mmHg (strength of recommendation I, quality of evidence B). For a stricter lowering of the BP in patients with DM or CVD or in high-risk patients, the SBP should be maintained at a target level of under 125 mmHg (strength of recommendation IIa, quality of evidence B).

For patients over 65 and patients with a history of stroke, it is similarly recommended to set a target average home BP of under 135/85 mmHg, except for elderly patients over 80 years old, in which it is acceptable to set a target of under 140/85 mmHg.

Selection of antihypertensive medication

There are five main groups of antihypertensive medication, angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), beta-blockers, calcium-channel blockers (CCBs), and diuretics (thiazides and thiazide-like diuretics, such as chlorthalidone and indapamide).

Selecting a medication from these five groups will have similar effectiveness on lowering BP and reducing CVD despite some differences. For example, beta-blockers may do less to reduce CVD than the other groups[20] and CCBs may not be as effective at preventing heart failure[11]. However, their overall effectiveness in preventing CVD is the same[11,21]. Therefore, if selecting a single type of medication to start treatment for hypertension, any of the five groups could be selected as appropriate (strength of recommendation I, quality of evidence A).

To select the appropriate antihypertensive medication, the patient's existing comorbidity outside of hypertension should be considered, as well as the contraindications of each type of medication. It is recommended to follow the recommendations for antihypertensive medication in Table 9.

Treatment of white-coat hypertension

Patients with white-coat hypertension are at risk of developing type 2 DM and sustained hypertension in the future[22]. This group of patients should be assessed for cardiovascular (CV) risk and periodic, detailed tests for TOD should be conducted, and their BP should be regularly monitored at home and in-office at least once per year. During this time, patients should be recommended to modify their lifestyle to reduce the CV risk (strength of recommendation I, quality of evidence C).

Physicians may consider prescribing BP medication to white-coat hypertension patients in cases where there is a high or very high risk of CVD or where TOD is identified (strength of recommendation IIb, quality of evidence C), but not all white-coat hypertension cases should be prescribed antihypertensive medication (strength of recommendation III, quality of evidence C).

The target BP level for white-coat hypertension may be to maintain an average office BP under 140/90 mmHg. If the patients showed good tolerance to treatment and their home BP is not too low or should not be less than 120/80 mmHg, then it may be possible to adjust medication to achieve an office BP under 130/80 mmHg (strength of recommendation IIb, quality of evidence C).

Treatment of masked hypertension

Patients with masked hypertension are at risk of sustained hypertension in the future. Moreover, there is a higher chance of developing type 2 DM and the

Table 10. Recommendations for reducing cardiovascular risk in hypertensive patients

Recommendations	Strength of recommendations	Quality of evidence
Patients should receive risk assessment using the Thai CV Risk Score	I	C
Patients with ≥3 risk factors* or more should receive statins	I	A
Patients who smoke should be advised or prescribed medication to stop smoking	I	A
Patients with a calculated Thai CV Risk Score ≥10% (using the blood results) can be considered to receive statins	IIa	C
Aspirin should not be used as the primary prevention for every hypertensive patient	III	A

CV=cardiovascular

* Risk factors consist of male gender, over 55 years of age, smoking, left ventricular hypertrophy, a history of premature CVD in the family, albuminuria, diabetic, or artery disease in other areas, or a proportion of total cholesterol/HDL-C from 6 upwards.

presence of TOD. Masked hypertension patients are at similar risk of CVD in the future as patients with sustained hypertension[22].

Masked hypertension patients should be assessed for their CV risk in combination with detailed TOD tests. Efforts should be made to ensure the patient avoids the factors that will cause hypertension and CVD, such as smoking and excessive alcohol drinking. At the same time, patients should be recommended to modify various behaviors to reduce the risk of CVD (strength of recommendation I, quality of evidence C).

Physicians could consider prescribing BP medication to patients with a high risk of masked hypertension, which comprise most of the patients in this group (strength of recommendation IIa, quality of evidence C), and could adjust the level of BP medication according to achieving an HBPM of an average of less than 135/85 mmHg. If the patient showed good tolerance to treatment, then it may be possible to adjust their BP medication to achieve an HBPM of less than 130/80 mmHg, while their office BP should not be too low or less than 120/70 mmHg) (strength of recommendation IIb, quality of evidence C).

Reducing the cardiovascular risk in hypertensive patients

Patients with hypertension are at risk of CAD and cerebrovascular diseases as well as atherosclerosis. Therefore, apart from controlling BP to target levels, it is also important to control other risk factors too. Some types of medication will help reduce the risk of CVD, such as statins and aspirin, while other types may increase the risk, such as NSAIDs. Studies of hypertensive patients with other risk factors have shown that statins can reduce CV events despite the patient not having a very high initial LDL-C level[23,24]. Therefore, hypertensive patients with many risk factors or who have a high risk as calculated using the Thai CV Risk Score from 10% upwards could be given statins to reduce CV events.

Aspirin can prevent myocardial infarction in hypertensive patients, but also increases the risk of bleeding, especially of the digestive tract, and may, therefore, not be beneficial overall[25-29].

A summary of the recommendations for reducing CV risk in hypertensive patients is listed in Table 10.

What is already known on this topic?

Hypertension is a leading cause of death for a substantial number of Thais each year. Many practice guidelines from many organizations worldwide, including from the Thai Hypertension Society, have been published previously. The major aim of all the guidelines is to achieve better hypertension control and to reduce CVD morbidity and mortality.

What this study adds?

The revision committee for revising the 2019 Thai Guidelines on the Treatment of Hypertension has reviewed new developments in the body of knowledge, together with the expertise in real-life clinical practice and evidence collected from clinical studies worldwide. The committee also considered the evidence in parallel with the major problems in the country and distilled all the information into the revised guidelines. The guidelines consist of newly highlighted key topics to ensure the guidelines are kept up to date, user friendly, and suitable for the country's context.

Conflicts of interest

The authors declare no conflict of interest.

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