2015 Thai Hypertension Guideline

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I. Epidemiology of hypertension

According to the 4th National Health Exam Survey[1], between 2008-2009, carried out among population age ≥ 15 years, the prevalence of hypertension in Thailand was 21.4%. Approximately half of hypertensive patients were undiagnosed and 8.6% were diagnosed but not treated. Around 40% of them were treated and half of those treated patients, normalization of blood pressure (< 140/90 mmHg) was achieved. The Guidelines on the treatment of hypertension published by the Thai Hypertension Society came out in 2012[2], It was then updated in 2015[3].

II. Blood pressure (BP) measurements

Blood pressure (BP) measurements had to be performed correctly. In practice, office BP was still used to diagnose hypertension and to classify the severity of high BP (Table 1)

Home BP is needed in the diagnosis of white coat hypertension (WCH) and masked hypertension (MH). Ambulatory BP was indicated to confirm WCH, MH, to detect BP variability and in particular, dipping status since night-time BP can be measured.

III. Stratification of total cardiovascular (CV) risk (10 year-risk of CV mortality)

Information on CV risk factors (Table 2), subclinical organ damage (Table 3), diabetes mellitus (Table 4) and established CV or renal disease (Table 5) have to be collected by history taking, physical examination and laboratory tests before total CV risk stratification can be done (Table 6) and for secondary hypertension detection.

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Table 1 Definitions and classification of office blood pressure levels (mmHg) in adults aged ≥ 18 years

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

SBP – systolic blood pressure, DBP – diastolic blood pressure.

The higher levels of SBP or DBP should be applied.

Table 2 Cardiovascular risk factors

2.1	Severity of high BP (SBP and DBP)
2.2	Pulse pressure > 60 mmHg
2.3	Male ≥ 55 years, female ≥ 65 years
2.4	Cigarette smoking
2.5	Dyslipidemia 2.5.1 Total cholesterol > 200 mg/dl and/or 2.5.2 LDL-C > 130 mg/dl and/or 2.5.3 HDL-C < 40 mg/dl (male), < 50 mg/dl (female) and/or 2.5.4 Triglyceride > 150 mg/dl
2.6	FPG 100-125 mg/dl
2.7	Abnormal oral glucose tolerance test (OGTT)
2.8	Premature CV events in parents or siblings: male < 55 years, female < 65 years
2.9	Abdominal obesity (waist circumference): ≥ 90 cm in males, ≥ 80 cm in females

Table 3 Subclinical organ damage

3.1	EKG to detect left ventricular hypertrophy (LVH) 3.1.1 Sokolow-Lyon voltage criteria: SV1+RV5 or RV6 $\geq$ 3.5 mV 3.1.2 Cornell voltage criteria: SV3+RaVL > 2.8 mV (male), > 2.0 mV (female) 3.1.3 Cornell product: Cornell voltage x QRS width > 244 mV-msec
3.2	Echocardiography to detect LVH: LVMI $\geq$ 115 gm/m^2 (male), $\geq$ 95 gm/m^2 (female)
3.3	Carotid wall thickness: intima-media thickness (IMT) > 0.9 mm or arterial plaque
3.4	Carotid-femoral pulse wave velocity (PWV) > 10 m/sec
3.5	Ankle-brachial BP index (ABI) < 0.9
3.6	Serum creatinine (SCr): male 1.3-1.5 mg/dl, female 1.2-1.4 mg/dl
3.7	eGFR 30-60 ml/min/1.73 m^2 (CKD-EPI)
3.8	Urine albumin/creatinine ratio 30-300 mg/g creatinine

Table 4 Diabetes mellitus (DM)

4.1	Symptomatic DM e.g. polyuria, polydipsia, weight loss + random plasma glucose $\geq$ 200 mg/dl and/or
4.2	FPG $\geq$ 126 mg/dl, confirmation is needed and/or
4.3	OGTT, plasma glucose after 2 hr $\geq$ 200 mg/dl and/or
4.4	HbA_{1c} $\geq$ 6.5%

Table 5 Established CV or renal disease

5.1	Cerebrovascular disease: ischemic stroke, cerebral hemorrhage, transient ischemic attack
5.2	Cardiovascular disease (CVD): myocardial infarction, angina, coronary revascularization, congestive heart failure
5.3	Renal disease: diabetic nephropathy, chronic kidney disease (CKD), albuminuria > 300 mg/d or proteinuria > 500 mg/d
5.4	Peripheral vascular diseases
5.5	Retinopathy: hemorrhage, exudate, papilledema

Table 6 Stratification of total CV risk (CV mortality risk over 10 years)

	Total CV mortality risk over 10 years			
BP level / RF, TOD, CVD, CKD	High normal SBP 130-139 or DBP 85-89	Grade 1 HT SBP 140-159 or DBP 90-99	Grade 2 HT SBP 160-179 or DBP 100-109	Grade 3 HT SBP ≥ 180 or DBP ≥ 110
No CV risk		Low	Moderate	High
1-2 CV risk	Low	Moderate	Moderate-High	High
≥ 3 CV risk	Low-Moderate	Moderate-High	High	High
TOD, CKD stage 3 or DM	Moderate-High	High	High	High-Very High
Symptomatic CVD, CKD stage ≥ 4 or DM with TOD/RFs	Very High	Very High	Very High	Very High

BP = blood pressure; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; DBP = diastolic blood pressure; HT = hypertension; TOD = target organ damage; RF = risk factor; SBP = systolic blood pressure. Total CV mortality risk over 10 years; low < 1%, moderate 1 - < 5%, high 5 - < 10%, very high ≥ 10%.

IV. Treatment of hypertension

1. Lifestyle modification has to be pursued in all potential and established hypertensive patients (Table 7) to prevent hypertension and to reduce BP, respectively.

Table 7 Efficacy of lifestyle modification in BP reduction

Tasks	Efficacy in BP reduction
Weight reduction (BMI ≥ 25 Kg/m^2)	↓ SBP 5-20 mmHg (10 kg BW reduction)
DASH diet	↓ SBP 8-14 mmHg
Sodium intake restriction < 2,300 mg/d	↓ SBP 2-8 mmHg
Regular aerobic exercise	↓ SBP 4 mmHg, ↓ DBP 2-5 mmHg
Alcohol restriction	↓ SBP 2-4 mmHg

BMI – body mass index, DASH – Dietary Approaches to Stop Hypertension.

2. Pharmacological therapy

Pharmacological therapy is not needed in those with high normal BP no matter what level of total CV risk. Those patients with low to moderate risk, lifestyle modification should be adopted first for 2-4 months or 2-4 weeks, respectively. Lastly, those patients with high to very high risk, pharmacological therapy has to be initiated promptly with lifestyle modification (Table 8)

Table 8 Initiation of lifestyle changes and antihypertensive drug treatment

BP level / RF, TOD, CVD, CKD	High normal SBP 130-139 or DBP 85-89	Grade 1 HT SBP 140-159 or DBP 90-99	Grade 2 HT SBP 160-179 or DBP 100-109	Grade 3 HT SBP ≥ 180 or DBP ≥ 110
No CV risk	▪ No BP intervention	▪ Lifestyle changes for 2-4 ms. ▪ Then add BP drugs if BP ≥ 140/90	▪ Lifestyle changes for 2-4 wks ▪ Then add BP drugs if BP ≥ 140/90	▪ Lifestyle changes ▪ Immediate BP drugs
1-2 CV risk	▪ Lifestyle changes ▪ No BP intervention	▪ Lifestyle changes for 2-4 wks ▪ Then add BP drugs if BP ≥ 140/90	▪ Lifestyle changes for 2-4 wks ▪ Then add BP drugs if BP ≥ 140/90	▪ Lifestyle changes ▪ Immediate BP drugs
≥ 3 CV risk	▪ Lifestyle changes ▪ No BP intervention	▪ Lifestyle changes for 2-4 wks ▪ Then add BP drugs if BP ≥ 140/90	▪ Lifestyle changes ▪ Immediate BP drugs	▪ Lifestyle changes ▪ Immediate BP drugs
TOD, CKD stage 3 or DM	▪ Lifestyle changes ▪ No BP intervention	▪ Lifestyle changes ▪ Immediate BP drugs	▪ Lifestyle changes ▪ Immediate BP drugs	▪ Lifestyle changes ▪ Immediate BP drugs
Symptomatic CVD, CKD stage ≥ 4 or DM with TOD/RFs	▪ Lifestyle changes ▪ No BP intervention	▪ Lifestyle changes ▪ Immediate BP drugs	▪ Lifestyle changes ▪ Immediate BP drugs	▪ Lifestyle changes ▪ Immediate BP drugs

BP = blood pressure; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; DBP = diastolic blood pressure; HT = hypertension; TOD = target organ damage; RF = risk factor; SBP = systolic blood pressure.

Four groups of antihypertensive drugs, i.e. thiazide-type diuretic, calcium channel blockers (CCBs), angiotensin converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) can be used as initial and maintenance therapy according to compelling indications (Table 9). Monotherapy or combination therapy depending on the severity of high

BP and level to total CV risk (Diagram 1). Recommended combination drug therapy was given (Diagram 2).

Table 9 Compelling indications of antihypertensive drugs

Condition	Drug
Asymptomatic organ damage	
LVH	ACEIs, CCBs, ARBs
Asymptomatic atherosclerosis	CCBs, ACEIs
Albuminuria (30-300 mg/g)	ACEIs, ARBs
Renal dysfunction	ACEIs, ARBs
Cardiovascular disease	
Previous stroke	ACEIs, thiazide-type diuretics
Previous myocardial infarction	BBs, ACEIs, ARBs
Angina pectoris	BBs, CCBs
Heart failure	Diuretics, BBs, ACEIs, ARBs, MRAs
Aortic aneurysm	BBs
Atrial fibrillation, prevention	ARBs, ACEIs, BBs or MRAs
Atrial fibrillation, ventricular rate control	BBs, non-DHP CCBs
CKD/proteinuria (> 300 mg/g)	ACEIs, ARBs
Peripheral artery disease	ACEIs, CCBs
Others	
ISH (elderly)	Diuretic, CCBs
Metabolic syndrome	ACEIs, ARBs, CCBs
Diabetes mellitus	ACEIs, ARBs
Pregnancy	Methyldopa, BBs, CCBs

LVH – left ventricular hypertrophy, BBs – beta-blockers, non-DHP CCBs – non-dihydropyridine calcium channel blockers, MRAs – mineralocorticoid receptor antagonists.

Remarks were given for α-blockers, not suitable for initial therapy except those patients with benign prostate hypertrophy; β-blockers, suitable as initial therapy in hypertensive patients with coronary artery disease, acute coronary syndrome, high sympathetic drive and pregnant women. β-blockers for those with congestive heart failure was specified to be bisoprolol, carvedilol, metoprolol succinate or nebivolol. Finally, combination of ACEIs and ARBs is contraindicated.

Diagram 1 Strategies of monotherapy vs drug combination to achieve target BP

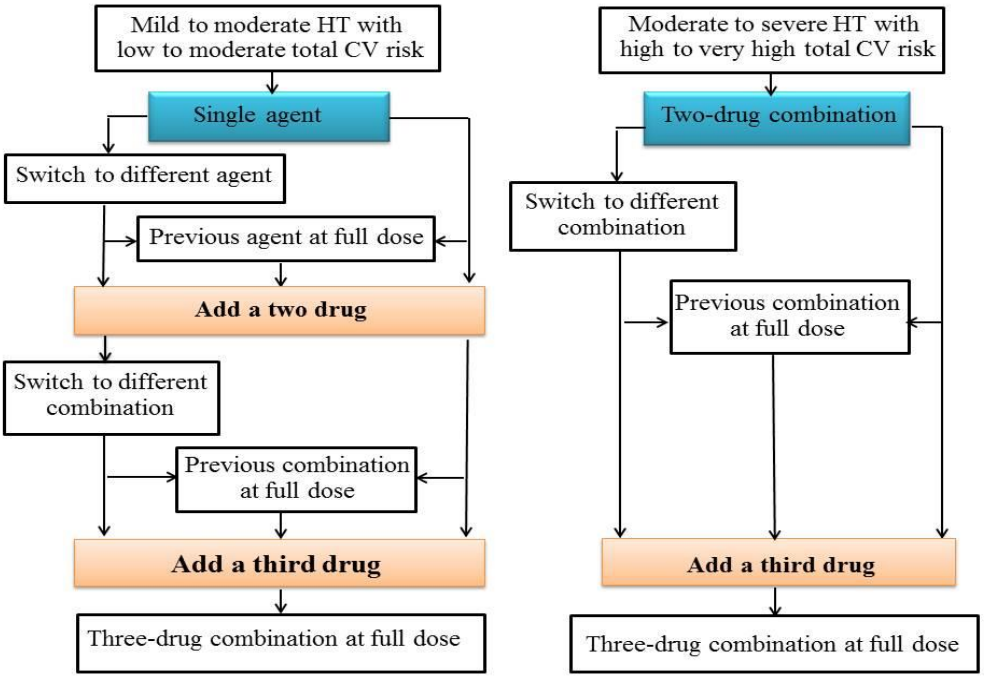
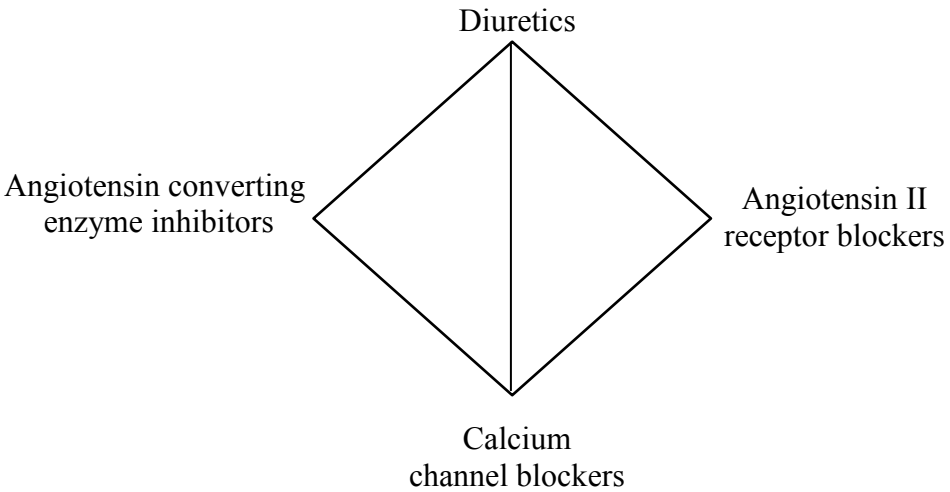


Diagram 2 Recommended combination drug therapy



3. Target BP

3.1 In general, BP < 140/90 mmHg

3.2 Elderly patients (60 > age < 80 years), BP < 140-150/90 mmHg

3.3 Very elderly patients (age > 80 years), BP < 150/90 mmHg

3.4 Non-elderly (age < 50 years), BP < 130/80 mmHg

3.5 Diabetic patients, BP < 140/90 mmHg

3.6 CKD patients without albuminuria, BP < 140/90 mmHg

3.7 CKD patients with micro-and macro-albuminuria, BP < 130/80 mmHg

3.8 Established CVD patients, BP < 140/90 mmHg

V. Blood pressure monitoring

After initial assessment of BP, subsequent BP monitoring and appropriate care should be undertaken depending on BP levels (Table 10)

Table 10 Recommendations for followup based on initial blood pressure

Initial BP (mmHg)		**Followup recommendations**
SBP	**DBP**	
< 140	< 90	Recheck BP in 1 year
140-159	90-99	Confirm within 2 months
160-179	100-109	Evaluate or refer to source of case within 1 month
≥ 180	≥ 110	Evaluate or refer to source of care immediately or within a week depending on clinical situation

For therapeutic success, attention should be paid on patient- and drug-compliance, promotion of lifestyle modification, cooperation from their relatives or care-givers

VI. Treatment of hypertension in special conditions

1. Elderly patients

Be aware of BP variability, WCH, white coat effect, orthostatic and post-prandial hypotension. Therefore, proper home BP measurement should be endorsed if available. CCBs and diuretics are drugs of choice, either alone or in combination. ACEIs/ARBs, α-blockers and direct vasodilators can be added sequentially if needed.

2. Coronary artery disease patients

SBP and DBP should not be lowered than 115 mmHg and 60 mmHg, respectively. BBs, ACEIs/ARBS are drugs of choice. If there is contraindication to use BBs, non-dihydropyridine CCBs are recommended. Loop diuretics and mineralocorticoid receptor antagonists should be used in the presence of congestive heart failure.

3. Stroke patients

For those patient with acute ischemic stroke who reach physicians within 4.5 hrs. and whose BP < 180/105 mmHg, tissue plasminogen activator (t-PA) should be administered. In patients with initial BP > 220/120 mmHg, BP should be lowered 10-15% within 30-60 min. and controlled around 160/100 mmHg within 2 hrs. by using intravenous nicardipine or labetalol. Sodium nitroprusside should be considered of DBP > 140 mmHg.

For those patients with acute hemorrhage stroke, BP should be lowered similarly if SBP > 200 mmHg. Recent data showed that it in beneficial to lower BP < 140/90 mmHg. ACEIs and thiazide-like diuretics should be used for those stable post-stroke patients.

4. Diabetic patients

BP target of < 140/90 mmHg is recommended except in those young diabetic patients or those patients with albuminuria (> 30 mg/day). ACEIs/ARBs should be started initially, followed by CCBs if BP is still not controlled. Combination of ACEIs and ARBs is contraindicated.

5. CKD patients

Target BP in CKD patients with normoalbuminuria (< 30 mg/day) and those with albuminuria (> 30 mg/day) is < 140/90 mmHg and < 130/80 mmHg, respectively.

ACEIs/ARBS should be started initially followed by CCBs if needed. Dosages of antihypertensive drugs should be adjusted according to eGFR. Similarly, ACEIs should not be given with ARBs.

6. Pregnant patients

Methyldopa and/or nifedipine should be administered in those pregnant women with severe hypertension (BP $\geq$ 160/100 mmHg). Blockades of renin-angiotensin system are contraindicated. In severe pre-eclampsia, labetalol or hydralazine intravenously or sublingual nifedipine should be given. In those patients whose BP's are difficult to control, intravenous sodium nitroprusside or nitroglycerine can be given. Magnesium sulfate should also be considered to prevent convulsion.

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