

CMEARTICLE

Ministry of Health Clinical Practice Guidelines: Hypertension

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ABSTRACT The Ministry of Health (MOH) has updated the clinical practice guidelines on hypertension to provide doctors and patients in Singapore with evidence-based treatment for hypertension. This article reproduces the introduction and executive summary (with recommendations from the guidelines) from the MOH clinical practice guidelines on hypertension, for the information of *SMJ* readers. Chapters and page numbers mentioned in the reproduced extract refer to the full text of the guidelines, which are available from the Ministry of Health website: http://www.moh.gov.sg/content/moh_web/healthprofessionalsportal/doctors/guidelines/cpg_medical.html. The recommendations should be used with reference to the full text of the guidelines. Following this article are multiple choice questions based on the full text of the guidelines.

1.1 Objectives and scope of guideline

The second edition of the MOH clinical practice guidelines on hypertension for Singapore was published in 2005. Since then, more facts about this important condition have emerged, particularly those recommending home blood pressure monitoring (HBPM) and 24-hour ambulatory blood pressure monitoring (ABPM) as key procedures in diagnosing suspected hypertension.

1.2 Target group

The main aim of these guidelines is to help physicians make sound clinical decisions about hypertension by presenting up-to-date information about diagnosis, classification, treatment, outcomes and follow-up. These guidelines are developed for all healthcare professionals in Singapore.

1.3 Guideline development

These guidelines have been produced by an MOH-appointed committee of cardiologists, internists, general medicine practitioners, renal physicians, family physicians, and a neurologist. They were developed by adaptation of existing guidelines, critical review of relevant literature and expert clinical consensus taking local practice into consideration. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or his guardian or carer.

1.4 Review of guidelines

Evidence-based clinical practice guidelines are only as current as the evidence that supports them. Users must keep in mind

that new evidence could supersede recommendations in these guidelines. The workgroup advises that these guidelines be scheduled for review five years after publication, or earlier if new evidence appears that requires substantive changes to the recommendations.

EXECUTIVE SUMMARY OF RECOMMENDATIONS

Introduction

This is the executive summary of the MOH Clinical Practice Guidelines (CPG) on Hypertension. It is intended to be used with reference to the full version of the CPG, which is freely available on the MOH website at this link: https://www.moh.gov.sg/content/moh_web/healthprofessionalsportal/doctors/guidelines/cpg_medical.html.

Hypertension is the leading associated risk factor for cardiovascular disease. It is prevalent and increasing in many developing and developed countries. The Singapore National Health Survey (NHS) 2010 showed that the crude prevalence of hypertension (defined as BP of $\geq 140/90$ mmHg) among Singapore residents aged 30 to 69 years was 23.5%, compared to 24.9% in 2004 and 27.3% in 1998. However, the age-specific prevalence for hypertension rises markedly from age 40 years onward and, with our ageing population, we continue to face challenges in the prevention and control of hypertension.

Target audience

These guidelines are developed for all healthcare professionals in Singapore as an evidence-based resource to provide up-to date information and guidance on diagnosis, classification, treatment, outcomes and follow-up.

List of institutions in alphabetical order

Ministry of Health, Low Cardiology Clinic, National Healthcare Group Polyclinics, National Heart Centre, National Neuroscience Institute, National University Hospital, Mission Medical Clinic, SingHealth Polyclinics, Tan Tock Seng Hospital, Wu Nephrology & Medical Clinic

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How to use this document

All recommendations made in the CPG are summarised in this document. Please note the following: (a) Each recommendation has a corresponding Grade of Recommendation and Level of Evidence (refer to Appendix for details). (b) The details/ explanations of each recommendation can be found in the full CPG document using the page numbers provided. Key recommendations are highlighted in grey.

Commonly used abbreviations

The following is a list of abbreviations commonly used in this set of guidelines (arranged in alphabetical order) and a description of what they represent.

| Commonly used abbreviations | |
|-----------------------------|--------------------------------------|
| ABPM | ambulatory blood pressure monitoring |
| ACE | angiotensin-converting enzyme |
| ACR | albumin:creatinine ratio |
| ARB | angiotensin II receptor blocker |
| BMI | body mass index |
| BP | blood pressure |
| CAD | coronary artery disease |
| ECG | electrocardiography |
| eGFR | estimated glomerular filtration rate |
| HBPM | home blood pressure monitoring |
| LVH | left ventricular hypertrophy |
| NHS | National Health Survey |
| PCR | protein:creatinine ratio |
| RAAS | renin-angiotensin-aldosterone system |
| RCT | randomised controlled trial |

Classification of hypertension

D Classify hypertension according to systolic BP and diastolic BP levels. When the systolic BP and the diastolic BP fall into different categories, the higher category applies. (Grade D, Level 4, CPG pg. 18)

Definitions are given in Table 1 for subjects who are not on antihypertensive medication and not acutely ill. As BP is characterised by large spontaneous variations, the diagnosis of hypertension should be based on multiple BP measurements taken on several separate occasions.

How should BP be measured?

For clinic or office BP measurement, BP is measured at rest several times on several occasions, with the patient in a supine or sitting position.

- D** Use the following procedures when recording BP:
1. Allow the patient to sit or lie down for at least three minutes before measuring the BP.
 2. The patient should refrain from smoking or taking caffeinated drinks during the 30 minutes before measurement.
 3. Use a cuff with a bladder 12–13 cm × 35 cm in size. A cuff with a larger bladder should be used for large upper

Table 1. Definitions and classification of BP levels for adults aged 18 years and older (CPG pg. 18).

| Category | Systolic BP | Diastolic BP |
|--------------------------------|------------------|-----------------|
| Normal BP | < 130 mmHg | < 85 mmHg |
| High-normal BP | 130 to 139 mmHg | 85 to 89 mmHg |
| Grade 1 hypertension | 140 to 159 mmHg* | 90 to 99 mmHg |
| Grade 2 hypertension | 160 to 179 mmHg* | 100 to 109 mmHg |
| Grade 3 hypertension | ≥ 180 mmHg* | ≥ 110 mmHg |
| Isolated systolic hypertension | ≥ 140 mmHg* | < 90 mmHg |

*Isolated systolic hypertension is graded according to the same level of systolic BP.

- arms, while a thigh cuff should be used for extremely large arms.
4. When using the auscultatory method, use the disappearance of phase V Korotkoff sounds to measure the diastolic BP.
 5. Measure the BP in both arms at the first visit; subsequently re-measure BP on the arm with the higher reading, if applicable.
 6. Take two or more readings separated by two minutes. Average these two values. If the first two readings differ by 5 mmHg or more, further readings should be obtained and averaged.
 7. In elderly subjects and diabetic patients, measure the BP in the supine (or sitting) position and within two minutes after standing, to record any postural fall in BP.
 8. Place the manometer cuff at the level of the heart, regardless of the position of the patient. (Grade D, Level 4, CPG pg. 19)

When measuring BP in the clinic or office, the alerting response can result in exaggerated BP, leading to the diagnosis of isolated clinic ('white-coat') hypertension. Compared to clinic or office measurement, BP values obtained by HBPM or by 24-hour ABPM are usually several mmHg lower. Both HBPM and ABPM methods are valid.

- D** Wherever practicable, HBPM or ABPM (in that order) should be offered to younger patients, and to those whom target organ damage is found without a raised BP. (Grade D, Level 4, CPG pg. 20)
- C** The preferred manometer is an automated oscillometric device, with or without memory. (Grade C, Level 2+, CPG pg. 21)
- D** To ensure reliable values, the patient or carer needs training in device use, and a BP log-book (for basic devices without memory). (Grade D, Level 4, CPG pg. 21)

GPP ABPM is recommended whenever in doubt about the diagnosis, e.g. to confirm borderline hypertension or abnormal results from HBPM. (CPG pg. 21)

GPP ABPM is also indicated for older, cognitively impaired, anxious or obsessive patients, in whom HBPM might be unreliable or inappropriate. (CPG pg. 21)

The definitions of hypertension based on HBPM and ABPM are listed in Table 2.

Table 2. Definitions of hypertension in HBPM and ABPM (CPG pg. 22).

| | Systolic BP | Diastolic BP |
|-------------|-------------|--------------|
| HBPM | ≥ 135 mmHg | ≥ 85 mmHg |
| ABPM | | |
| Daytime | ≥ 135 mmHg | ≥ 85 mmHg |
| 24-hour | ≥ 130 mmHg | ≥ 80 mmHg |
| Night-time | ≥ 120 mmHg | ≥ 70 mmHg |

D Patients with an average BP ≥ 135/85 mmHg measured repeatedly at rest at home may be regarded as hypertensive. (Grade D, Level 3, CPG pg. 22)

D Patients with a 24-hour ABPM average BP ≥ 130/80 mmHg, or a daytime average BP ≥ 135/85 mmHg, or a night-time average BP ≥ 120/70 mmHg, are regarded as hypertensive. (Grade D, Level 4, CPG pg. 22)

How should hypertension be evaluated?

D Routine clinical evaluation of a patient with elevated BP includes the following: (1) Clinical and family history. (2) Full standard physical examination. (3) Laboratory investigations, including: (a) urine analysis: dipstick for haematuria/albumin, microscopic examination, and test for albuminuria; (b) measurement of serum concentrations of electrolytes, creatinine, urea, fasting glucose and fasting lipids; and (c) computation of eGFR; (4) 12-lead ECG. (Grade D, Level 4, CPG pg. 24)

The identifiable secondary causes of hypertension are listed in Table 3 below.

Table 3. Identifiable secondary causes of hypertension (CPG pg. 25).

| Identifiable secondary causes of hypertension |
|---|
| 1. Drug-related and substance-related* causes |
| 2. Chronic kidney disease |
| 3. Renal artery stenosis |
| 4. Primary hyperaldosteronism |
| 5. Hypercortisolism (Cushing’s syndrome) |
| 6. Pheochromocytoma |
| 7. Thyroid or parathyroid disease |
| 8. Coarctation of the aorta |
| 9. Obstructive sleep apnoea syndrome |
| 10. Nephropathy from Type 1 diabetes mellitus |
| 11. Rare monogenic ion transport disorders |

*Several non-prescribed and illicit substances cause hypertension, e.g. liquorice, cocaine, amphetamine, crystal methamphetamine and 3,4-methylenedioxy-methamphetamine (MDMA, ‘Ecstasy’).

Stratifying risk and approach to hypertension management

GPP Assess the overall cardiovascular risk and the patient’s BP to guide the management of high BP. (CPG pg. 26)

D Refer to the locally adapted Framingham Risk Score to estimate cardiovascular risk. (Grade D, Level 4, CPG pg. 26)

GPP Offer to start drug treatment immediately in patients with hypertension and existing high cardiovascular risk. (CPG pg. 26)

D Take the BP and other prognostic factors into account when deciding on the management of hypertensive patients. (Grade D, Level 4, CPG pg. 26)

Patients’ risk level for cardiovascular disease depends on BP and prognostic factors (Table 4).

A For high or very high risk individuals, begin immediate drug treatment for hypertension when other risk factors or conditions are present. (Grade A, Level 1++, CPG pg. 28)

B For medium risk individuals, monitor the BP and other risk factors for several weeks, and obtain further information, before deciding whether to begin drug treatment. (Grade B, Level 1+, CPG pg. 28)

B For low risk individuals, observe the patient over a significant period of time before deciding whether or not to begin drug treatment. (Grade B, Level 1+, CPG pg. 28)

Treating high blood pressure

A Wherever possible, use a team-based approach to manage a patient with hypertension, involving trained nurses and pharmacists with medical practitioners. (Grade A, Level 1+, CPG pg. 30)

Lifestyle modifications

A Recommend lifestyle changes to all hypertensive patients and in patients with high normal BP. However, drug treatment should not be delayed without reason beyond three to six months if indicated. (Grade A, Level 1+, CPG pg. 31)

Table 4. Risk stratification (CPG pg. 28).

| BP category | Prognostic factors | | | |
|---|------------------------|------------------|---|---|
| | 0–2 risk factors | ≥ 3 risk factors | Established cardiovascular or renal disease | Symptomatic cardiovascular disease, chronic kidney disease stage ≥ 4 or diabetes mellitus with organ damage or risk factors |
| Grade 1 HT SBP 140–159 mmHg/ DBP 90–99 mmHg | Low risk | | | |
| Grade 2 HT SBP 160–179 mmHg/ DBP 100–109 mmHg | | | | |
| Grade 3 HT SBP ≥ 180 mmHg/ DBP ≥ 110 mmHg | High or very high risk | | | |

DBP: diastolic blood pressure; HT: hypertension; SBP: systolic blood pressure

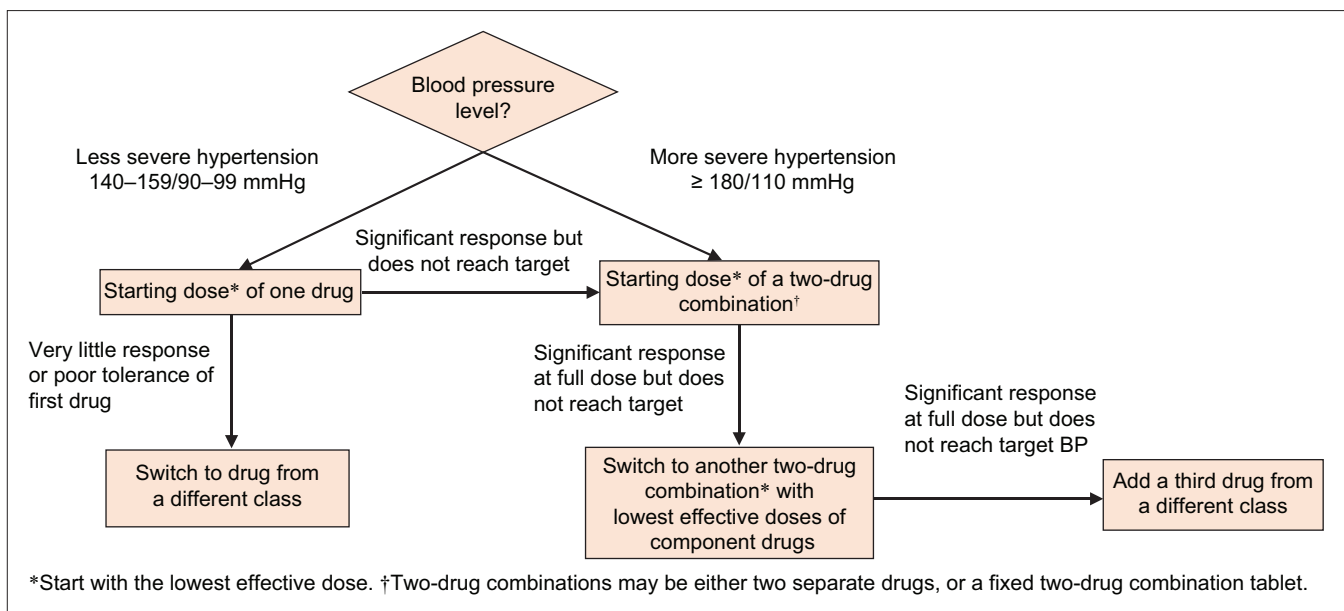


Fig. 1 Flowchart for drug treatment (CPG pg. 32).

- A** Advise patient to restrict salt intake to 5 g to 6 g per day. (Grade A, Level 1+, CPG pg. 31)
- A** Moderate alcohol consumption to no more than two standard drinks per day for men, and no more than one standard drink per day for women. (Grade A, Level 1+, CPG pg. 31)
- A** Increase the consumption of vegetables, fruits, and low-fat dairy products, and decrease the intake of saturated and total fats. (Grade A, Level 1+, CPG pg. 31)
- B** Unless contraindicated, advise patients to reduce weight to a BMI below 23 kg/m² and to a waist circumference below 90 cm in men, and below 80 cm in women (for Asians). (Grade B, Level 2+, CPG pg. 31)

- A** Advise patients to do at least 30 minutes of moderate dynamic exercise five to seven days per week. Any physical exercise above the basal level, up to about 150 minutes a week, confers incremental cardiovascular and metabolic benefits, including BP reduction. (Grade A, Level 1+, CPG pg. 31)
- A** Advise and offer assistance to all smokers to quit smoking. (Grade A, Level 1+, CPG pg. 32)

Pharmacological treatment

- B** Begin appropriate combination treatment in patients whose pretreatment BP is raised (i.e. ≥ 140/90 mmHg), and specifically in patients whose BP is severely raised (≥ 180/110 mmHg), as they will require two or more drugs for adequate BP control. (Grade B, Level 2+, CPG pg. 33)

- D** Initiate treatment at low doses, either singly or as a two-drug combination, to minimise side effects. (Grade D, Level 4, CPG pg. 33)
- A** If an adequate dose of the first drug used demonstrated limited response or was poorly tolerated, change to a different drug class instead of increasing the dose of the first drug. (Grade A, Level 1+, CPG pg. 33)
- B** Add a second drug when a single drug fails to achieve target BP. (Grade B, Level 1+, CPG pg. 34)
- B** Use long-acting drugs that provide 24-hour efficacy daily. (Grade B, Level 2+, CPG pg. 34)

Choice of antihypertensive drugs

The choice of antihypertensive drug should be tailored to the individual patient, taking into account the following factors, in addition to risk profile and cost: (1) side effects; (2) drug-drug interactions; and (3) patient preference.

Begin first-line antihypertensive treatment with any one, or an appropriate combination, of the five major drug classes available in Singapore, namely: (1) angiotensin-converting enzyme inhibitor (ACE inhibitor); (2) angiotensin II receptor blocker (ARB); (3) calcium-channel blocker (CCB); (4) diuretic (thiazide, thiazide-like, or loop); and (5) beta-blocker.

Other classes of antihypertensive drugs, such as methyl dopa, hydralazine and alpha-adrenergic receptor blockers (peripheral alpha-1 blockers, e.g. terazosin; central alpha-2 blockers, e.g. clonidine), may be used in combination treatment as third or fourth-line agents.

- B** In hypertensive patients without compelling indications or contraindications for any particular drug, consider any one, or any appropriate combination, of the five major pharmacological classes of antihypertensive drugs as the initial treatment. (Grade B, Level 2+, CPG pg. 34)
- A** Take compelling indications and contraindications into account when prescribing an antihypertensive drug. (Grade A, Level 1+, CPG pg. 34)

The guidelines for selecting drug(s) for antihypertensive treatment are shown in Table 5.

- D** Be aware of the cost of treatment in selecting antihypertensive drugs. (Grade D, Level 4, CPG pg. 37)

- D** Generic formulations, which usually cost less than newer non-generic (i.e. proprietary) drugs, are acceptable for use. (Grade D, Level 4, CPG pg. 37)
- C** Do not offer aldosterone (mineralocorticoid) antagonists (e.g. spironolactone) to patients with chronic kidney disease, particularly when combined with an ACE inhibitor or ARB. This is because of the risks of further renal function impairment, and of hyperkalaemia. An aldosterone antagonist might be considered in patients with resistant hypertension after a full work-up has excluded secondary hypertension (Table 3). (Grade C, Level 2+, CPG pg. 38)

- B** Prescribe a diuretic with caution as initial treatment in patients with uncomplicated hypertension who are at risk for diabetes mellitus, because it might cause hyperglycaemia. (Grade B, Level 2+, CPG pg. 38)

- A** Use beta-blockers with caution in patients at risk of developing diabetes mellitus, as it raises blood glucose concentrations. (Grade A, Level 1+, CPG pg. 38)

Combination therapy

- B** Use the following drug combinations to treat hypertension: (1) calcium-channel blocker (dihydropyridine type) plus ACE inhibitor or ARB; (2) calcium-channel blocker plus diuretic; (3) diuretic plus ACE inhibitor or ARB; (4) beta-blocker plus calcium-channel blocker (see caveat in Fig. 2); (5) beta-blocker plus diuretic (see caveat in Fig. 2). (Grade B, Level 2+, CPG pg. 39)

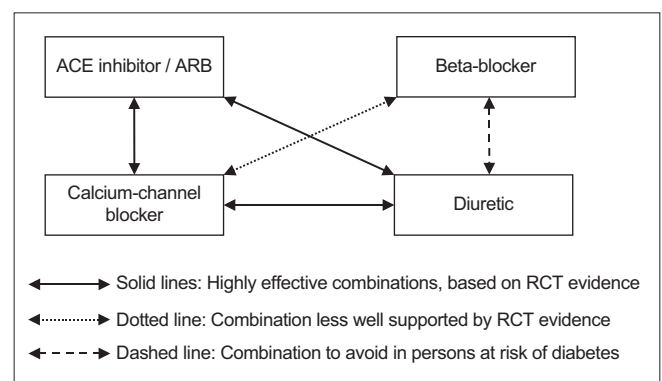


Fig. 2 Pairing the major drug classes (CPG pg. 38).

- B** Avoid treating patients with an ACE inhibitor plus ARB combination, particularly patients who have chronic kidney disease. (Grade B, Level 1+, CPG pg. 39)

Table 5. Guidelines for selecting drug(s) for antihypertensive treatment (CPG pg. 35–36).

| Concomitant condition | Status | Drugs | Grade and level |
|---|------------------------------|---|-------------------------------|
| Heart failure | Recommended | Diuretic, ACE inhibitor, ARB, aldosterone antagonist (spironolactone, eplerenone), or beta-blocker (bisoprolol, carvedilol) | Grade A, Level 1 ⁺ |
| | Supplementary treatment | Dihydropyridine calcium-channel blocker (amlodipine, felodipine) | Grade C, Level 2 ⁺ |
| | Contraindicated | Non-dihydropyridine calcium-channel blocker (verapamil, diltiazem) | Grade D, Level 4 |
| Angina pectoris | Recommended | Beta-blocker or dihydropyridine calcium-channel blocker | Grade A, Level 1 ⁺ |
| Previous myocardial infarction | Recommended | Beta-blocker, ACE inhibitor, or ARB | Grade A, Level 1 ⁺ |
| Atrial fibrillation, prevention | Recommended | Beta-blocker, ACE inhibitor, or ARB | Grade B, Level 1 ⁺ |
| Atrial fibrillation, ventricular rate control | Recommended | Beta-blocker | Grade A, Level 1 ⁺ |
| | Recommended | Non-dihydropyridine calcium-channel blocker | Grade B, Level 2 ⁺ |
| Heart block | Contraindicated [†] | Beta-blocker or non-dihydropyridine calcium-channel blocker | Grade B, Level 2 ⁺ |
| Peripheral artery disease | Recommended | ACE inhibitor or dihydropyridine calcium-channel blocker | Grade C, Level 2 ⁺ |
| Aortic aneurysm | Recommended | Beta-blocker | Grade C, Level 2 ⁺ |
| Isolated systolic hypertension | Recommended | Diuretic or dihydropyridine calcium-channel blocker | Grade A, Level 1 ⁺ |
| Diabetes mellitus | Recommended | ACE inhibitor or ARB | Grade A, Level 1 ⁺ |
| | Recommended | Dihydropyridine calcium-channel blocker | Grade B, Level 2 ⁺ |
| | Supplementary treatment | Diuretic or beta-blocker | Grade B, Level 1 ⁺ |
| Diabetes mellitus with albuminuria (moderately- or severely- increased albuminuria) | Recommended | ACE inhibitor or ARB | Grade A, Level 1 ⁺ |
| | Contraindicated | Any combination of ACE inhibitor with ARB | Grade A, Level 1 ⁺ |
| Previous stroke | Recommended | Any drug which effectively lowers the BP | Grade A, Level 1 ⁺ |
| Asthma & chronic obstructive pulmonary disease | Contraindicated [†] | Beta-blocker | Grade B, Level 2 ⁺ |
| Gout | Contraindicated [†] | Diuretic | Grade C, Level 2 ⁺ |
| Bilateral renal artery stenosis | Contraindicated [†] | ACE inhibitor or ARB | Grade B, Level 2 ⁺ |
| Chronic kidney disease stage 5 (end-stage renal failure) | Recommended | ACE inhibitor or ARB [*] | Grade A, Level 1 ⁺ |
| | Contraindicated | Aldosterone antagonist | Grade C, Level 2 ⁺ |

^{*}An ACE inhibitor should not be combined with an ARB in chronic kidney disease. [†]Consider use of other first-line antihypertensive drug classes on page 21.

B Beware of an increased risk of diabetes mellitus when offering a beta-blocker plus diuretic combination to patients with risk factors such as obesity or metabolic syndrome. (Grade B, Level 2⁺, CPG pg. 39)

A Do not offer renal sympathetic denervation for routine treatment of resistant hypertension. (Grade A, Level 1⁺, CPG pg. 40)

B Do not offer carotid-sinus baroreceptor reflex activation for routine treatment of resistant hypertension. (Grade B, Level 2⁺, CPG pg. 40)

Treatment goals and follow-up

Treatment goals

A The recommended target BP treatment levels are: (1) BP < 140/90 mmHg in patients aged under 80 years; and (2) BP < 150/90 mmHg in patients aged 80 years or

older. In fragile elderly individuals, the systolic BP goals should be adapted to individual tolerability. (Grade A, Level 1⁺, CPG pg. 41)

Fig. 3 shows the flowchart for clinic blood pressure targets.

Follow-up

Follow-up during evaluation and stabilisation of treatment should be sufficiently frequent to monitor the BP and other cardiovascular risk factors (Table 6).

D Patients with the following problems should be referred to a hypertension specialist or clinic: (1) Conditions needing emergency or urgent treatment, e.g. malignant hypertension, hypertensive heart failure, or other impending complications. (2) Hypertension that is difficult to manage, e.g. unusually labile BP, or hypertension refractory to multiple drugs in different pharmacological classes. (3) Secondary hypertension, i.e. hypertension due to an underlying cause, such

as hyperaldosteronism. (4) Hypertension in special circumstances, e.g. pregnancy, and young children. (Grade D, Level 4, CPG pg. 43)

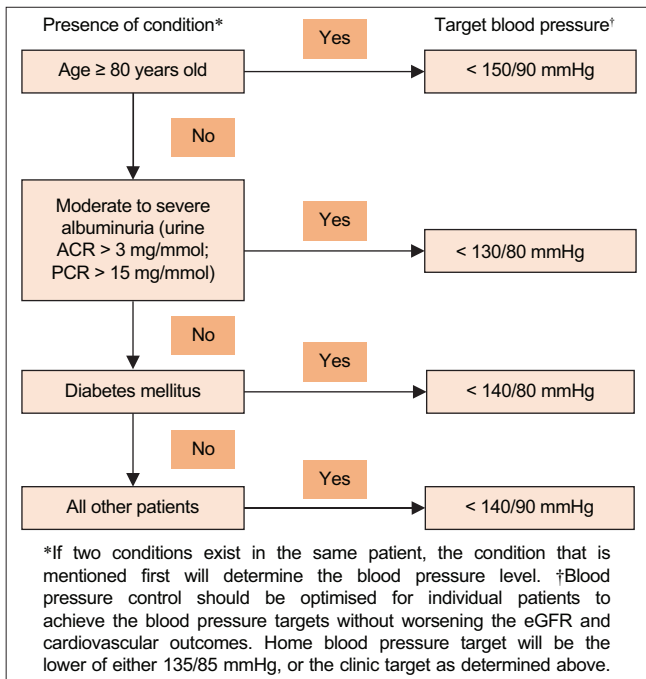


Fig. 3 Flowchart for clinic blood pressure targets (CPG pg. 42).

Table 6. Frequency of recommended tests/actions (Grade C, Level 2+, CPG pg. 43).

| Recommended test/action | Recommended frequency |
|--|---|
| BP monitoring Risk level* • Low added risk • Medium to very high risk | 6-monthly to annually 3- to 6-monthly |
| BMI Fasting glucose Fasting lipid profile Serum electrolytes, urea, creatinine Urine-albumin measurement | Annually or more frequently, as per individual risk profile |
| ECG | As per individual risk and cardiac profile |
| Patient education Lifestyle modification and medication adherence | At each visit |

*Goal BP achieved.

Treating high blood pressure in special conditions

Type 2 diabetes mellitus

B For patients with Type 2 diabetes mellitus who have hypertension, an acceptable treatment target BP is below 140/80 mmHg. (Grade B, Level 2+, CPG pg. 44)

A Use ACE inhibitor, ARB or calcium-channel blocker as first-line treatment in patients with diabetes mellitus without chronic kidney disease or proteinuria. (Grade A, Level 1+, CPG pg. 44)

A Optimised BP control is recommended to reduce the risk, or slow the progression, of diabetic nephropathy. (Grade A, Level 1+, CPG pg. 46)

A Treat patients with diabetic nephropathy to a target below 140 mmHg systolic BP. (Grade A, Level 1+, CPG pg. 46)

B If a diabetic nephropathy patient has severe albuminuria (equivalent to urinary albumin:creatinine ratio [ACR] more than 30 mg/mmol, or urinary PCR more than 50 mg/mmol), consider target below 130 mmHg systolic BP, provided GFR changes are monitored carefully. (Grade B, Level 2+, CPG pg. 47)

D Treat diabetic chronic kidney disease patients with moderate albuminuria (urinary ACR 3–30 mg/mmol, or urinary PCR between 15–50 mg/mmol) to a target BP equal to or below 130/80 mmHg. (Grade D, Level 4, CPG pg. 47)

A Use an ACE inhibitor or ARB as first-line treatment, whenever treatment with BP-lowering drugs is indicated in diabetic nephropathy. (Grade A, Level 1+, CPG pg. 48)

D In diabetic nephropathy, if one class of RAAS blocker (either ACE inhibitor or ARB) is not tolerated, replace it with the other class. (Grade D, Level 4, CPG pg. 48)

A Combination treatment with both an ACE inhibitor and an ARB should not be routine in diabetic nephropathy. (Grade A, Level 1+, CPG pg. 48)

D When ACE inhibitors, ARBs or diuretics are used in diabetic nephropathy, it is recommended to monitor the serum creatinine and potassium levels for the possible development of acute kidney injury and hyperkalaemia. (Grade D, Level 4, CPG pg. 48)

A Beta-blockers, calcium-channel blockers and thiazides are all appropriate second-line therapy in diabetic nephropathy. (Grade A, Level 1+, CPG pg. 49)

Non-diabetic chronic kidney disease

A Treat non-diabetic, non-proteinuric chronic kidney disease patients to a target BP below 140/90 mmHg. (Grade A, Level 1+, CPG pg. 50)

A Treat non-diabetic chronic kidney disease patient with severe albuminuria to a target BP equal to or below 130/80 mmHg.
(Grade A, Level 1⁺, CPG pg. 50)

D Treat non-diabetic chronic kidney disease patients with moderate albuminuria to a target BP below 130/80 mmHg.
(Grade D, Level 4, CPG pg. 50)

A Use either an ACE inhibitor or an ARB as the first-line drug whenever treatment with BP-lowering drugs is indicated in non-diabetic chronic kidney disease patients.
(Grade A, Level 1⁺, CPG pg. 50)

A Combination treatment with both an ACE inhibitor and an ARB should not be routinely prescribed in non-diabetic chronic kidney disease patients.
(Grade A, Level 1⁺, CPG pg. 50)

Stroke

A Where systolic BP is above 140 mmHg but below 220 mmHg within the first two weeks of onset of acute ischaemic stroke, lowering of high BP should be based on individual clinical judgement after careful consideration of all the contraindications.
(Grade A, Level 1⁺⁺, CPG pg. 51)

D It is reasonable to lower, with care, a markedly elevated BP (systolic BP above 220 mmHg or diastolic BP above 120 mmHg, or both) by 10% to 15% during the first 24 hours after the onset of acute ischaemic stroke.
(Grade D, Level 4, CPG pg. 52)

D After the acute phase of stroke, begin antihypertensive treatment in hypertensive patients if the systolic BP is more than 140 mmHg and diastolic BP is more than 90 mmHg.
(Grade D, Level 4, CPG pg. 52)

A Use any of the five major pharmacological classes of antihypertensive drugs for stroke prevention in patients after the acute phase of stroke, provided that the BP is effectively lowered.
(Grade A, Level 1⁺⁺, CPG pg. 53)

GPP The target BP level in patients after transient ischaemic attack and after acute phase stroke should be individualised, with careful consideration of medical comorbidities. A lower systolic BP target might benefit a patient who has small vessel disease, but might harm a patient with severe cerebrovascular stenosis.
(CPG pg. 53)

Pregnancy

D Even though the classification of mild, moderate and severe hypertension by BP level is different in pregnancy, pharmacological treatment is recommended in pregnant women with chronic hypertension who have a persistently elevated systolic BP of 150 mmHg or greater, or a diastolic BP of 100 mmHg or greater.
(Grade D, Level 4, CPG pg. 54)

GPP Avoid aggressive rates of lowering of BP in pregnant women with chronic hypertension, because of the potential risk of compromising the uteroplacental blood flow.
(CPG pg. 54)

D In pregnant women with no target organ damage, and uncomplicated chronic hypertension, aim to keep the BP below 150/100 mmHg.
(Grade D, Level 4, CPG pg. 54)

D In pregnant women with target organ damage secondary to chronic hypertension, aim to keep the BP below 140/90 mmHg.
(Grade D, Level 4, CPG pg. 54)

D In pregnant women with uncomplicated chronic hypertension, do not use drug treatment to decrease the diastolic BP to below 80 mmHg.
(Grade D, Level 4, CPG pg. 54)

D Treat pregnant women with chronic hypertension using methyldopa, labetalol, nifedipine, or a combination thereof.
(Grade D, Level 4, CPG pg. 54)

GPP Methyldopa, labetalol and nifedipine are also considered safe for use during breastfeeding postpartum.
(CPG pg. 54)

D ACE inhibitors, ARBs, direct renin inhibitors (e.g. aliskiren) and aldosterone antagonists should be avoided during pregnancy.
(Grade D, Level 4, CPG pg. 55)

Elderly

A In elderly hypertensive patients whose systolic BP is 160 mmHg or higher, the BP should be reduced to below 150/90 mmHg.
(Grade A, Level 1⁺, CPG pg. 55)

B In patients under the age of 80 years with good physical and mental status, systolic BP can be lowered to below 140 mmHg if treatment is well tolerated.
(Grade B, Level 2⁺⁺, CPG pg. 55)

A The management of hypertension in the elderly follows the same general guidelines, but begin drug treatment gradually, especially in the frail elderly. On starting drug treatment, carefully consider the patients' associated clinical conditions.

(Grade A, Level 1+, CPG pg. 56)

B In elderly patients with isolated systolic hypertension, consider using calcium-channel blockers and diuretics.

(Grade B, Level 2+, CPG pg. 56)

GPP In the elderly, measure BP often in the supine (or sitting) position and standing position to detect a postural drop in the BP. Take care to avoid fluid depletion and electrolyte imbalance in the elderly.

(CPG pg. 56)

Treatment of associated risk factors

Cholesterol lowering and antiplatelet therapy

There are benefits of decreasing cardiovascular risk in patients with high serum cholesterol levels by using lipid regulating drugs, and in patients with a history of CAD or cerebrovascular disease by using antiplatelet drugs.

A Take into account the use of other drugs that decrease cardiovascular risk, such as lipid regulating drugs and antiplatelet drugs, in hypertensive patients with concomitant risk factors and increased cardiovascular risk.

(Grade A, Level 1++, CPG pg. 57)

Clinical quality improvement

The recommended target BP levels in antihypertensive treatment are: (1) below 140/90 mmHg in patients aged under 80 years (i.e. in elderly patients aged under 80 years with good physical and mental status, if treatment is well tolerated); (2) below 150/90 mmHg in patients aged 80 years or more.

The objective of managing hypertension is ultimately to decrease the patients' overall risks of morbidity and mortality. The greater the total cardiovascular disease risk, the more rigorously the BP should be controlled.

However, the BP level attainable with antihypertensive treatment is influenced by medication side effects and other comorbidities, such as diabetes mellitus, chronic kidney disease, CAD and cerebrovascular disease. Good clinical judgement should therefore be exercised in every patient.

The schedules shown in Table 6 are recommended to allow patients and healthcare providers to optimise the quality of care.

APPENDIX

Levels of evidence and grades of recommendations

Levels of evidence

| Level | Type of Evidence |
|-----------------|---|
| 1 ⁺⁺ | High quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias |
| 1 ⁺ | Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias |
| 1 ⁻ | Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias |
| 2 ⁺⁺ | High quality systematic reviews of case control or cohort studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal |
| 2 ⁺ | Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal |
| 2 ⁻ | Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal |
| 3 | Non-analytic studies, e.g. case reports, case series |
| 4 | Expert opinion |

Grades of recommendation

| Grade | Recommendation |
|----------------------------|--|
| A | At least one meta-analysis, systematic review of RCTs, or RCT rated as 1 ⁺⁺ and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1 ⁺ , directly applicable to the target population, and demonstrating overall consistency of results |
| B | A body of evidence including studies rated as 2 ⁺⁺ , directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1 ⁺⁺ or 1 ⁺ |
| C | A body of evidence including studies rated as 2 ⁺ , directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2 ⁺⁺ |
| D | Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2 ⁺ |
| GPP (good practice points) | Recommended best practice based on the clinical experience of the guideline development group. |

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME

(Code SMJ 201801B)

These questions are based on the full text of the guidelines which may be found at http://www.moh.gov.sg/content/moh_web/healthprofessionalsportal/doctors/guidelines/cpg_medical.html.

Question 1. With regard to the diagnosis of hypertension:

- (a) Patients with a 24-hour ambulatory blood pressure (BP) monitoring are regarded as hypertensive if the average BP is $\geq 135/85$ mmHg.
- (b) It has been estimated that antihypertensive treatment, on average, reduces stroke by 35%–40%.
- (c) If BP is 165/95 mmHg, we should grade the hypertension as Grade 2.
- (d) The cardiovascular risks rise exponentially for BP between 140/90 mmHg and 220/120 mmHg; the urgency of treatment is therefore guided by the grade of measured BP.

True False

- | | |
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| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
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Question 2. With regard to the evaluation and prognostic factors of hypertension:

- (a) One of the objectives of clinical and laboratory evaluations of the hypertensive patient is to look for target organ damage.
- (b) Urine analysis should be part of routine clinical evaluation.
- (c) Central aortic pressure should be part of routine evaluation in a hypertensive patient.
- (d) Chronic sleep deprivation syndrome is a common secondary cause of hypertension.

- | | |
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| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |

Question 3. With regard to lifestyle modifications and non-pharmacotherapy:

- (a) Salt (sodium chloride) restriction up to 5–6 g a day is strongly recommended in those with hypertension.
- (b) Regular dynamic (i.e. aerobic) exercise on at least five days a week, whether as single or interrupted episodes of 30 minutes or longer, confers both cardiovascular and overall health benefits beyond a reduction in BP.
- (c) Lifestyle modifications are not required in patients whose average BP is in the high normal range of 130–139/85–89 mmHg.
- (d) Cessation of tobacco smoking confers major benefit in terms of BP reduction, as well as avoiding coronary artery disease and other serious systemic disorders.

- | | |
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| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |
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Question 4. The following two-drug antihypertensive combinations decrease the BP beyond the amount obtained by adding together the individual drug effects on the BP:

- (a) Atenolol plus lisinopril.
- (b) Amlodipine plus valsartan.
- (c) Carvedilol plus indapamide.
- (d) Enalapril plus losartan.

- | | |
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Question 5. With regard to treatment in various conditions:

- (a) In treatment of Type 2 diabetes mellitus, an acceptable treatment initiation and target BP is $< 140/80$ mmHg.
- (b) In lowering of BP for secondary prevention of stroke, the threshold for starting anti-hypertensive therapy is $> 140/90$ mmHg.
- (c) In treatment during pregnancy, initiation of pharmacological treatment is recommended for pregnant women with chronic hypertension if the BP is more than 140/90 mmHg.
- (d) Elderly patients above age 80 years with isolated systolic hypertension should have their systolic BP reduced to < 140 mmHg.

- | | |
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| <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> |

Doctor's particulars:

Name in full : _____
 MCR number : _____ Specialty: _____
 Email address : _____

SUBMISSION INSTRUCTIONS:

Visit the SMJ website: <http://www.smj.org.sg/current-issue> and select the appropriate quiz. You will be redirected to the SMA login page.

For SMA member: (1) Log in with your username and password (if you do not know your password, please click on 'Forgot your password?'). (2) Select your answers for each quiz and click 'Submit'.

For non-SMA member: (1) Create an SMJ-CME account, or login with your SMJ-CME username and password (for returning users). (2) Make payment of SGD 21.40 (inclusive of 7% GST) via PayPal to access this month's quizzes. (3) Select your answers for each quiz and click 'Submit'.

RESULTS:

(1) Answers will be published online in the SMJ March 2018 issue. (2) The MCR numbers of successful candidates will be posted online at the SMJ website by 8 March 2018. (3) Passing mark is 60%. No mark will be deducted for incorrect answers. (4) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council. (5) One CME point is awarded for successful candidates.

Deadline for submission: (January 2018 SMJ 3B CME programme): 12 noon, 1 March 2018.