

These guidelines have been withdrawn

MOH clinical practice guidelines are considered withdrawn five years after publication unless otherwise specified in individual guidelines. Users should keep in mind that evidence-based guidelines are only as current as the evidence that supports them and new evidence can supersede recommendations made in the guidelines.

CLINICAL PRACTICE GUIDELINES

Hypertension



Academy of
Medicine



Ministry
of Health



College of Family
Physicians Singapore



Singapore Cardiac
Society

National
Committee
On Cardiac Care

Jun 2005

MOH Clinical Practice Guidelines 2/2005

CLINICAL PRACTICE GUIDELINES

Hypertension

MOH Clinical Practice Guidelines 2/2005

Published by Ministry of Health, Singapore
16 College Road,
College of Medicine Building
Singapore 169854

Printed by Golden City Colour Printing Co. (Pte.) Ltd.

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ISBN 981-05-3103-6

Available on the MOH website: <http://www.moh.gov.sg/cpg>

Statement of Intent

These guidelines are not intended to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge advances and patterns of care evolve.

The contents of this publication are guidelines to clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care. Each physician is ultimately responsible for the management of his/her unique patient in the light of the clinical data presented by the patient and the diagnostic and treatment options available.

Foreword

Hypertension is a chronic disease that is a major risk factor for coronary artery disease, cardiac failure, stroke and renal failure, and is estimated to cause 4.5% of the current global disease burden.

Hypertension is as prevalent in many developing countries, as in the developed world. In Singapore, the recent 2004 National Health Survey showed decreasing trend in the crude prevalence of hypertension among Singapore residents aged between 30 and 69, from 27.3% in 1998 to 24.9% in 2004.

This review of the first edition of the guidelines on hypertension addresses important issues in diagnosing and managing hypertension according to individual patient's co-existing risk factors for cardiovascular disease. Recommendations have been updated to incorporate a simplified classification of blood pressure and the corresponding treatment decisions. The addition of a new section on the treatment of hypertension in the elderly is timely given the ageing of our population. The age-specific prevalence of hypertension has been shown to rise markedly from 40 years onwards.

It is hoped that this set of guidelines will assist doctors in managing patients with hypertension cost-effectively, with maximal benefits and minimal risks, to further reduce the prevalence of hypertension in Singapore.

PROFESSOR K SATKU
DIRECTOR OF MEDICAL SERVICES

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Executive summary of recommendations

Details of recommendations can be found in the main text at the pages indicated.

Definition of high blood pressure

C Grade hypertension according to systolic and diastolic BP levels. (pg 13)

Grade C, Level IV

Evaluation of high blood pressure

C Use the following procedures when recording BP:

- allow the patient to sit or lie down for several minutes before measuring the BP
- the patient should refrain from smoking or ingesting caffeine during the 30 minutes preceding the measurement
- use a cuff with a bladder that is 12-13 cm x 35 cm in size, with a larger bladder for fat arms. The bladder within the cuff should encircle at least 80% of the arm.
- use the disappearance of phase V Korotkoff sounds to measure the diastolic BP
- measure the BP in both arms at the first visit
- take 2 or more readings separated by 2 minutes. Average these 2 values. If the first 2 readings differ by more than 5 mmHg, additional readings should be obtained and averaged
- measure the BP in both the standing and supine position for elderly subjects and diabetic patients
- place the sphygmomanometer cuff at heart level, whatever the position of the patient

(pg 14-15)

Grade C, Level IV

C Persons with an average BP of more than 135/85 mmHg measured at home may be considered to be hypertensive. (pg 15)

Grade C, Level IV

C Routine clinical evaluation includes:

- clinical and family history
- full standard physical examination
- laboratory investigations, including:
 - urinalysis for blood, protein, glucose and microscopy
 - blood chemistry for electrolytes, creatinine, urea, fasting glucose and lipids
- electrocardiography (ECG)

(pg 15)

Grade C, Level IV

Prognostic factors of hypertension

B Decisions about the management of patients with hypertension should not be made based on their BP levels alone, but also on the presence of other risk factors, target organ damage, concomitant disease such as diabetes and cardiovascular or renal disease, as well as other aspects of the patient's individual and medical circumstances. (pg 17)

Grade B, Level III

Management of hypertension

A Assess the overall risk profile as a guide to management. (pg 19)

Grade A, Level Ia

If high risk

A Institute immediate drug treatment for hypertension and other risk factors or conditions present. (pg 19)

Grade A, Level Ia

If medium risk

A Monitor BP and other risk factors for several weeks and obtain further information before deciding whether to institute drug treatment. (pg 19)

Grade A, Level Ib

If low risk

A Observe the patient over a significant period of time before deciding whether to institute drug treatment. (pg 19)

Grade A, Level Ib

B Lifestyle modifications and non-pharmacological measures should be instituted wherever appropriate in all hypertensive patients, including those who require drug treatment or those within the high normal BP range. (pg 19)

Grade B, Level IIa

Treatment goals and follow up

A In diabetic subjects and those with chronic renal disease, the target BP should be a “normal” BP (i.e. <130/80 mmHg). In elderly patients, the target BP should be at least “high-normal” BP (i.e. <140/90 mmHg), provided no orthostatic hypotension occurs. (pg 21)

Grade A, Level Ia

Principles of drug treatment

A Use appropriate drug combinations to achieve target BP levels if this cannot be achieved by one single antihypertensive agent. (pg 23)

Grade A, Level Ib

A Use of appropriate drug combinations enables BP lowering efficacy to be maximized while minimizing side effects. In most patients, appropriate combination therapy produces BP reductions that are twice as great as those obtained with monotherapy (e.g. reductions in BP increasing from 12 to 22 mmHg systolic BP and from 7 to 14 mmHg diastolic BP in patients with an initial BP of 160/100 mmHg). (pg 23)

Grade A, Level Ib

A In patients whose pretreatment BP is moderately elevated (e.g. BP \geq 160/100 mmHg) or especially if it is severely elevated (e.g. BP \geq 180/110 mmHg), it may be appropriate to begin with combination therapy, because many such patients will require 2 or even 3 drugs for adequate BP control. (pg 23)

Grade A, Level Ib

A Use long-acting drugs providing 24-hour efficacy on a once daily basis. (pg 24)

Grade A, Level Ib

Cost-effectiveness and choice of antihypertensive drugs

A Consider any compelling indications and contraindications for an antihypertensive agent when prescribing its use. (Table 6, pg 27).

(pg 25)

Grade A, Level Ib

A In hypertensive patients who do not have compelling indications or contraindications for any particular drug, any of the 5 main classes of drugs can be considered as the initial therapy. (pg 25)

Grade A, Level Ib

C The cost of therapy should be considered in the choice of antihypertensive medication. (pg 25)

Grade C, Level IV

C Generic formulations usually cost less than nongeneric newer drugs and are acceptable if they meet prescribed standards of quality. (pg 26)

Grade C, Level IV

B Diuretics and beta-blockers may be selected as initial therapy in patients with uncomplicated hypertension if there are no compelling indications for a particular class of antihypertensive agents. (pg 26)

Grade B, Level III

A Diuretics and beta-blockers should be used with caution in patients at risk of developing diabetes. (pg 26)

Grade A, Level Ib

A Effective drug combinations to treat hypertension are:

- Diuretic and beta-blocker
- Diuretic and angiotensin converting enzyme (ACE) inhibitor or angiotensin II receptor blocker
- Diuretic and calcium channel blocker
- Calcium channel blocker (dihydropyridine) and beta-blocker
- Calcium channel blocker and ACE inhibitor or angiotensin II receptor blocker

(pg 28)

Grade A, Level Ib

A Although effective for lowering BP, the combination of a diuretic and a beta-blocker may increase the risk of developing diabetes mellitus. Therefore, it should be used with caution in patients who already have risk factors for diabetes mellitus, such as obesity or the metabolic syndrome. (pg 28)

Grade A, Level Ib

A Consider the use of other drugs that reduce cardiovascular risk, such as lipid lowering agents and antiplatelet agents, in patients with concomitant risk factors and increased cardiovascular risk. (pg 28)

Grade A, Level Ib

C Process Indicators and Recommended Frequency

Performance Parameter	Recommended review frequency
Risk level* - Normal risk - Low and medium risk - High risk	Annually 6 monthly 3 monthly
Weight Fasting blood glucose Fasting lipid profile Serum electrolyte, urea and creatinine Urinalysis	Annually or more frequently according to individual risk factor profile
ECG	Annually or more frequently according to cardiac status
Patient education* - Normal risk - Low and medium risk - High risk	At diagnosis and regular intervals according to risk level Annually 6 monthly 3 monthly

* Goal blood pressure achieved. (pg 31)

Grade C, Level IV

Treatment of hypertension in Type 2 diabetes

A People with diabetes who are hypertensive should be treated to target BP of <130/<80 mmHg. (pg 33)

Grade A, Level Ia

A There is inadequate evidence to recommend a specific initial antihypertensive agent for the treatment of hypertension in patients with diabetes. However, in those patients with incipient or overt nephropathy, the use of an agent which inhibits the renin-angiotensin-aldosterone axis should be considered. (pg 33)

Grade A, Level Ia

Treatment of hypertension during pregnancy

C BP levels of >170/110 mmHg should be lowered to protect the mother against the risk of stroke or to permit possible prolongation of the pregnancy and thereby improve fetal maturity. Opinion is divided on the need for drug treatment for BP readings below this level. (pg 34)

Grade C, Level IV

B Drugs that should be **avoided** during pregnancy include: ACE inhibitors (associated with possible adverse foetal effects) and angiotensin receptor blockers, the effects of which may be similar to those of ACE inhibitors. Diuretics are also used infrequently because of concerns about reduction of the already compromised plasma volume. (pg 35)

Grade B, Level IIb

Treatment of hypertension in the elderly

A In general the treatment of hypertension in the elderly should follow the same general guidelines but drug therapy should be instituted gradually especially in the frail elderly. On initiating drug therapy the patients' associated clinical conditions should be taken into consideration. (pg 36)

Grade A, Level Ia

B All 5 classes of drugs (diuretics, beta-blockers, calcium channel blockers, ACE inhibitors and angiotensin II receptor blockers) have been shown in trials to be efficacious and beneficial in the elderly. In isolated systolic hypertension, diuretics, calcium channel blockers, ACE inhibitors and angiotensin II receptor blockers are all useful, and may be used. (pg 36)

Grade B, Level IIa

GPP Monitoring of BP in the elderly should include frequent measurements in the erect position to assess postural drop. Care should also be taken to avoid fluid depletion and electrolyte imbalance in the elderly. (pg 37)

GPP

1 Guideline development and objectives

1.1 Guideline development

The first edition of the guidelines on hypertension provided recommendations that were adapted from other international guidelines on hypertension such as the 1999 World Health Organisation (WHO) – International Society of Hypertension (ISH) Guidelines, the US Joint National Committee VI Report and the 1999 British Hypertension Society Guidelines and were modified to suit the local situation. An outline of the guidelines was presented at the 1999 Singapore Cardiac Society Annual Scientific Meeting and subsequently further modified and elaborated upon by the workgroup.

In this second edition of the guidelines, recommendations have been updated and adapted from recently published international guidelines on hypertension and modified to suit the local situation. International guidelines used as references for this edition include the US Joint National Committee VII Report, the 2003 European Society of Hypertension-European Society of Cardiology guidelines for the management of hypertension, the 2004 British Hypertension Society Guidelines and the 2003 WHO/ISH statement on management of hypertension.

These guidelines are based on the best available current evidence and expert judgement.

1.2 Objectives

The main aim of these guidelines is to assist physicians in clinical decision making by providing well-balanced information on the management of patients with hypertension, without restricting the physician's individual clinical judgement.

1.3 Target Group

These guidelines are developed for all health care professionals, in particular primary care physicians, who are involved in the care of the hypertensive patient. As such, these guidelines do not address the problem of hypertensive emergencies, such as hypertensive cerebral haemorrhage, which are better managed in specialized facilities by the appropriate specialists.

1.4 What's new in the revised guidelines

The following is a list of major changes or additions to the guidelines:

- The ranking of evidence and recommendations has been changed from a format adapted from the American College of Cardiology/American Heart Association to the format based on the Scottish Intercollegiate Guidelines Network that has been adopted in all Ministry of Health Clinical Practice Guidelines.
- Section 3 on definition of high blood pressure has been amended to simplify the classification of blood pressure.
- Section 5 on prognostic factors has been amended to include BMI (body mass index) and microalbuminuria.
- Section 6 on management of hypertension has been amended to correspond to the new classification of hypertension and simplifies treatment decisions.
- Section 8 on principles of drug treatment and section 9 on selection of antihypertensive drugs have been amended to take into account recent clinical trial evidence of the efficacy as well as specific indications of angiotensin converting enzyme inhibitors and angiotensin receptor blockers.
- Annex 1 on treatment of hypertension in diabetes mellitus and Annex 2 on treatment of hypertension in pregnancy have been updated.
- A new Annex 3 on treatment of hypertension in the elderly has been added.
- A new section on self-assessment containing 10 multiple-choice questions has been added.

- The references have been updated to include recent important clinical trial reports.

1.5 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 supercede recommendations in these guidelines. The workgroup advises that these guidelines be scheduled for review three years after publication, or if new evidence appears that requires substantive changes to the recommendations.

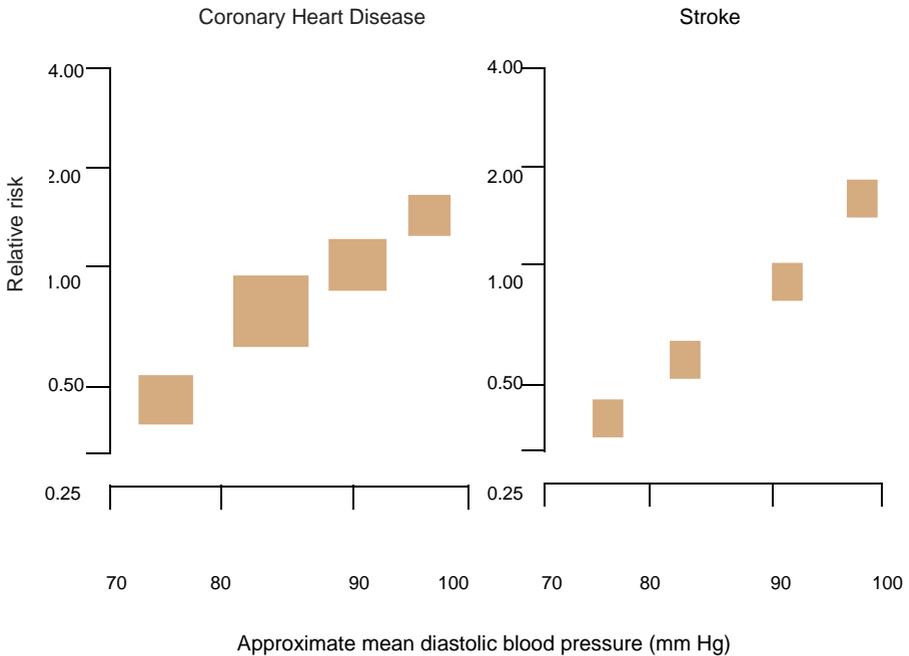
2 Significance of high blood pressure

Blood Pressure (BP) levels are continuously related to the risk of cardiovascular disease (CVD) as shown in Figure 1 below. The definition of hypertension or raised BP is therefore arbitrary.

Even within the normotensive range, people with the lowest levels of BP have the lowest rates of CVD.

Figure 1 Relative risk of CVD in relation to patients' usual diastolic BP (square sizes proportional to numbers of events)

Based on MacMahon et al.¹



2.1 Epidemiology

The Singapore National Health Survey (NHS)² of 2004 showed that the crude prevalence of hypertension (defined as a blood pressure of $\geq 140/90$ mmHg) among Singapore residents aged 30 to 69 years was 24.9% as compared to 22.2% in 1992 and 27.3% in 1998. Of those aged between 18 to 69 years old approximately 1 in 5 (20.1%) had hypertension in 2004.

Chinese had the highest prevalence of hypertension followed by the Malays and Indians. Hypertension was more common among males (29.5%) than females (20.4%). The highest prevalence of hypertension among Singapore residents aged 30 to 69 years was in Chinese males (31.1%).

The age-specific prevalence for hypertension rises markedly from age 40 years onwards. The age-specific prevalence of hypertension amongst those aged 60 to 69 years was 56.1% as compared to 8.8% in those aged 30 to 39 years.

Although infrequent, hypertension also occurs in younger individuals and children, many of whom have secondary hypertension, in contrast to the majority of adult hypertension patients who have primary hypertension (i.e. without any secondary causes). The NHS 2004 found that 4.2% of Singapore residents aged 18 to 29 years had hypertension as compared to 5.3% in 1998.

The NHS 2004 also found that the proportion of known hypertensives with good blood pressure control (BP $< 140/90$ mmHg) was 49.5%, while the proportion among those on treatment was 52.9%. In addition, 38.5% of those found to have hypertension in the NHS had not been previously diagnosed.

Table 1 Prevalence (%) of hypertension, by gender and ethnic group, 1992, 1998 & 2004²

Gender/ Ethnic Group	Crude Prevalence			Age-Standardized Prevalence			Difference in age- standardized prevalence	
	1992	1998	2004	1992	1998	2004	[98-92]	[04-98]
Total	22.2	27.3	24.9	24.0	28.0	24.0	4.0*	-4.0*
Gender								
Males	25.7	30.5	29.5	27.9	31.7	28.7	3.8 [†]	-3.0
Females	18.7	24.0	20.4	20.1	24.4	19.3	4.3 ^{††}	-5.1*
Ethnic Group								
Chinese	22.1	26.9	25.6	23.9	27.4	24.3	3.5 [†]	-3.1 [†]
Malay	24.0	31.5	22.7	26.6	34.4	23.0	7.8 ^{††}	-11.4*
Indian	21.2	24.6	21.6	21.3	25.2	22.5	3.9	-2.7
* $p < 0.001$ † $0.01 < p < 0.05$ †† $0.001 < p < 0.01$								

The age-standardized prevalence rates for the years 1992 and 1998 shown in this table differ from those shown in the first edition of the hypertension guidelines, which were calculated using the 1990 population census. The more recent 2000 population census has been used in the NHS 2004.

3 Definition of high blood pressure

Blood Pressure (BP) is characterised by large spontaneous variations. Hence, the diagnosis of hypertension should be based on multiple BP measurements taken on several separate occasions.

Definitions are given in Table 2 for subjects who are not taking antihypertensive medication and not acutely ill.³⁻⁶

Table 2 Definitions and classification of BP levels for adults aged 18 years and older

Category	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal BP	<130	<80
High-Normal BP	130-139	80-89
Grade 1 Hypertension	140-159*	90-99
Grade 2 Hypertension	≥160*	≥100
Isolated Systolic Hypertension*	≥140	<90

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

C Grade hypertension according to systolic and diastolic BP levels.

Grade C, Level IV

When the systolic and diastolic BP fall into different categories, the higher category should apply. For example, a BP of 162/92 mmHg should be Grade 2 Hypertension.⁷

In some patients, office (or clinic) BP is persistently elevated whereas daytime BP outside the clinic environment is normal. There is continuing debate as to whether “isolated” office hypertension (“white coat hypertension”) is an innocent phenomenon or whether it carries an increased burden of cardiovascular risk.⁸⁻¹⁰

4 Evaluation of high blood pressure

4.1 Aims of evaluation

The clinical and laboratory evaluation of the hypertensive patient should be conducted with the following four aims:

- to confirm the presence of chronic elevation of BP and determine the BP level
- to exclude or identify secondary causes of hypertension
- to determine the presence of target organ damage and quantify its extent
- to search for other cardiovascular risk factors and clinical conditions that may influence the prognosis and treatment

4.2 Clinical blood pressure measurement

BP should be measured several times on several occasions with the patient in a supine or sitting position using a mercury sphygmomanometer or other non-invasive device. Ensure that non-mercury devices are accurate by periodic calibration with values obtained simultaneously from a mercury sphygmomanometer.

C Use the following procedures when recording BP:^{3,7,11}

- allow the patient to sit or lie down for several minutes before measuring the BP
- the patient should refrain from smoking or ingesting caffeine during the 30 minutes preceding the measurement
- use a cuff with a bladder that is 12-13 cm x 35 cm in size, with a larger bladder for fat arms. The bladder within the cuff should encircle at least 80% of the arm.
- use the disappearance of phase V Korotkoff sounds to measure the diastolic BP
- measure the BP in both arms at the first visit
- take 2 or more readings separated by 2 minutes. Average these 2 values. If the first 2 readings differ by more than 5 mmHg, additional readings should be obtained and averaged.

- measure the BP in both the standing and supine position for elderly subjects and diabetic patients
- place the sphygmomanometer cuff at heart level, whatever the position of the patient

Grade C, Level IV

4.3 Home and ambulatory BP measurement

BP values obtained by home measurement or by ambulatory monitoring are usually several mmHg lower than those obtained by office measurement.¹²

C Persons with an average BP of more than 135/85 mmHg measured at home may be considered to be hypertensive.¹³

Grade C, Level IV

Reliable information about the long-term prognostic value of ambulatory and home BP monitoring is awaited.

Situations in which ambulatory BP monitoring should be considered:

- Unusual variability of BP over the same or different visits
- Office (“white coat”) hypertension in subjects with low cardiovascular risk
- Symptoms suggesting hypotensive episodes
- Hypertension apparently resistant to drug treatment

4.4 Clinical evaluation

C Routine clinical evaluation includes:^{3,5,7}

- clinical and family history
- full standard physical examination
- laboratory investigations, including:
 - urinalysis for blood, protein, glucose and microscopy
 - blood chemistry for electrolytes, creatinine, urea, fasting glucose and lipids
- electrocardiography (ECG)

Grade C, Level IV

Further investigations should be guided by the history, examination and results of routine investigations. These investigations aim to seek secondary causes of hypertension or to obtain results that may significantly influence the management of the patient. Such investigations include tests for creatinine clearance, microalbuminuria, 24-hour urine protein and catecholamines, blood uric acid, calcium, thyroid function indices, plasma renin and aldosterone.

A limited echocardiography may be performed to determine the presence of left ventricular hypertrophy and vascular ultrasonography to detect aortic, carotid and peripheral arterial disease.

5 Prognostic factors of hypertension

B Decisions about the management of patients with hypertension should not be made based on their BP levels alone, but also on the presence of other risk factors, target organ damage, concomitant disease such as diabetes and cardiovascular or renal disease, as well as other aspects of the patient's individual and medical circumstances.^{14,15}

Grade B Level III

Table 3 Factors influencing prognosis^{6,7}

Risk Factors for Cardiovascular Disease	
<ul style="list-style-type: none"> Levels of systolic and diastolic BP (Grades 1-2) Age (Men > 55 years; Women > 65 years) Smoking Family history of premature cardiovascular disease (Men ≤ 55 years; Women ≤ 65 years) 	<ul style="list-style-type: none"> Total cholesterol > 6.2 mmol/L (240 mg/dl) Reduced HDL cholesterol < 1.0 mmol/L (40 mg/dl) Raised LDL cholesterol > 4.1 mmol/L (160 mg/dl) Diabetes mellitus Obesity (BMI ≥ 30 kg/m²) (BMI ≥ 27.5 kg/m²)*
Target Organ Damage (TOD)/Associated Clinical Condition (ACC)	
Cerebrovascular disease <ul style="list-style-type: none"> Ischaemic stroke Cerebral haemorrhage Transient ischaemic attack 	Renal disease <ul style="list-style-type: none"> Microalbuminuria (microalbumin-creatinine ratio > 30 mg/g) or Proteinuria (> 0.5 g/24 hrs) Renal impairment [plasma creatinine concentration > 132 mmol/L (> 1.5 mg/dl)] Diabetic nephropathy
Heart Disease <ul style="list-style-type: none"> Left ventricular hypertrophy (ECG, echocardiogram or chest X-ray) Myocardial infarction Angina pectoris Coronary revascularization Congestive heart failure 	Retinopathy <ul style="list-style-type: none"> Generalised or focal narrowing of the retinal arteries Haemorrhages or exudates Papilloedema
Vascular disease <ul style="list-style-type: none"> Dissecting aneurysm Symptomatic arterial disease 	Atherosclerosis <ul style="list-style-type: none"> Ultrasound or radiological evidence of atherosclerotic plaque (carotid, iliac, femoral and peripheral arteries, aorta)

* Commensurate Asian Body Mass Index (BMI) cut-point for action.

As an example, a man aged 65 years with diabetes, a history of transient ischaemic attacks and a BP of 145/90 mmHg will have an annual risk of a major cardiovascular event that is more than 20 times greater than that of a man aged 40 years with the same BP but without diabetes or CVD.⁷

In contrast, a man aged 40 years with a BP of 170/105 mmHg will have a risk of a major cardiovascular event that is about 2-3 times greater than that of a man of the same age with a BP of 145/90 mmHg and similar risk factor levels.⁷

6 Management of hypertension

6.1 Overall strategy

A Assess the overall risk profile as a guide to management.^{14,16-20}

Grade A, Level Ia

Refer to Table 4 (page 20) to assess if the patient is at low, medium or high risk.^{6,7}

- *If high risk*

A Institute immediate drug treatment for hypertension and other risk factors or conditions present.²¹

Grade A, Level Ia

- *If medium risk*

A Monitor BP and other risk factors for several weeks and obtain further information before deciding whether to institute drug treatment.²²

Grade A, Level Ib

- *If low risk*

A Observe the patient over a significant period of time before deciding whether to institute drug treatment.²²

Grade A, Level Ib

6.2 Lifestyle modifications/Non-pharmacological therapy

B Lifestyle modifications and non-pharmacological measures should be instituted wherever appropriate in all hypertensive patients, including those who require drug treatment or those within the high normal BP range.

Grade B, Level IIa

These modifications include:

- Smoking cessation²³⁻²⁵
- Weight reduction²⁶⁻²⁸
- Moderation of alcohol consumption^{29,30}
- Reduction of intake of salt^{27,28,31-36}
- Reduction of intake of cholesterol and saturated fats^{37,8}
- Maintenance of adequate intake of dietary potassium³⁴
- Increased physical activity³⁹⁻⁴⁴

6.3 Risk assessment

Besides the level of BP, it is also important to assess the overall cardiovascular risk of a patient prior to definitive therapy in order to optimize risk-benefit ratio. Adding the numbers of traditional, documented risk factors in a person is one such way. The use of well tested and accepted risk tables, charts or formulae to estimate a patient's absolute risk is encouraged. In individuals such as those with known or established coronary heart disease (CHD), atherosclerotic disease, diabetes mellitus, familial hypercholesterolemia or malignant hypertension, the overall cardiovascular risk assessment may not be necessary as the risk is already high and treatment should be started as soon as the diagnosis of hypertension is confirmed.

Table 4 Risk stratification and treatment plan^{3,6,7}

BP Category (mm Hg)	Risk Group A (No risk factors)	Risk Group B (1 - 2 risk factors)	Risk Group C (≥3 risk factors or Diabetes Mellitus or TOD/ACC)
Systolic BP 130-139 mmHg/ Diastolic BP 80-89mmHg	LM	LM	LM+Rx
Systolic BP 140-159 mmHg/ Diastolic BP 90-99mmHg	LM+Rx*	LM+Rx	LM+Rx
Systolic BP ≥160 mmHg/ Diastolic BP ≥100 mmHg	LM+Rx	LM+Rx	LM+Rx

* if BP control inadequate with LM alone

TOD = Target Organ Disease

ACC = Associated Clinical Condition

LM = Lifestyle Modification

Rx = Drug Therapy



Low risk



Moderate risk



High risk

7 Treatment goals and follow up

7.1 Treatment goals

The primary treatment goal of a patient with hypertension is to achieve the maximum reduction in the total risk of CVD. This requires identification and treatment of all reversible risk factors, such as smoking, raised cholesterol and diabetes, management of associated clinical conditions and treatment of the raised BP per se.

Since the relationship between cardiovascular risk and BP is a continuous one, the goal of antihypertensive therapy should be to reduce BP to <140/90 mmHg.

Effective blood pressure control is especially important for patients with diabetes mellitus as shown in the Hypertension Optimal Treatment Trial²² and the United Kingdom Prospective Diabetes Study⁴⁵ as well as for those with chronic renal disease.

A In diabetic subjects and those with chronic renal disease, the target BP should be a “normal” BP (i.e. <130/80 mmHg). In elderly patients, the target BP should be at least “high-normal” BP (i.e. <140/90 mmHg), provided no orthostatic hypotension occurs.^{22,45}

Grade A, Level Ia

7.2 Follow-up

Follow-up during evaluation and stabilization of treatment should be sufficiently frequent to monitor BP and other risk factors (Table 4, page 20).

Patients with the following problems should be referred to a hypertension specialist or clinic:

- Emergency or urgent treatment indicated e.g. malignant hypertension, hypertensive cardiac failure or other impending complications
- Hypertension difficult to manage e.g. unusually labile BP, hypertension refractory to multiple drug regimens

- Secondary hypertension i.e. hypertension due to an underlying cause, such as hyperaldosteronism
- Hypertension in special circumstances e.g. pregnancy, young children

7.3 Patient education

Good communication between the physician and the patient lies at the core of the successful management of hypertension. Since the treatment of hypertension is for life, it is essential that the physician establishes a good professional relationship with the patient, provides the patient with information (both verbal and written forms) and answers any questions the patient may have.

Adequate information on the following is essential for satisfactory life-long control of hypertension:

- BP and hypertension,
- risks involved and prognosis,
- target BP level,
- expected benefits as well as the risks and side effects of treatment, and
- lifestyle modification.

Lifestyle modifications should be applied to all patients regardless of whether the patient is on medical treatment. Non-pharmacological measures may sometimes be sufficiently effective to reduce the need for antihypertensive drugs. These include smoking cessation, weight reduction, moderation of alcohol consumption, increased physical activity, reduction of salt intake and maintenance of adequate intake of dietary potassium.

8 Principles of drug treatment

Recent studies have shown that the most important issue in the treatment of hypertension is achieving goal BP levels expeditiously.

There is a general agreement on the principles governing the use of antihypertensive drugs to lower BP that is independent of the choice of any particular drug. These principles include:

- Use of low doses of drugs to initiate therapy, beginning with the lowest available dose of the particular drug, with the aim of reducing adverse effects. If there is a significant response to a low dose of a single drug but the BP is still above target level, we could either increase the dose of the same drug, provided that this is well tolerated, or add a low dose of a second drug from a different class.
- There are advantages of adding a low dose of a second drug rather than increasing the dose of the original drug. This allows both the first and the second drug to be used in the low dose range that is more likely to be free of side effects. In this context, the use of fixed low dose combinations that are available may be considered.

A Use appropriate drug combinations to achieve target BP levels if this cannot be achieved by one single antihypertensive agent.^{46,47}

Grade A, Level Ib

A Use of appropriate drug combinations enables BP lowering efficacy to be maximized while minimizing side effects. In most patients, appropriate combination therapy produces BP reductions that are twice as great as those obtained with monotherapy (e.g. reductions in BP increasing from 12 to 22 mmHg systolic BP and from 7 to 14 mmHg diastolic BP in patients with an initial BP of 160/100 mmHg).^{46,47}

Grade A, Level Ib

A In patients whose pretreatment BP is moderately elevated (e.g. BP \geq 160/100 mmHg) or especially if it is severely elevated (e.g. BP \geq 180/110 mmHg), it may be appropriate to begin with combination therapy, because many such patients will require 2 or even 3 drugs for adequate BP control.⁴⁶⁻⁴⁸

Grade A, Level Ib

- Change to a different drug class altogether if there is very little response or poor tolerability to the first drug, before prescribing a higher dose of the first drug or adding a second one.
- The advantages of long-acting drugs include improvement in adherence to therapy and minimization of BP variability as a consequence of smoother and more consistent BP control. This may provide greater protection against the risk of major cardiovascular events and the development of target organ damage.

A Use long-acting drugs providing 24-hour efficacy on a once daily basis.⁴⁹

Grade A, Level Ib

9 Cost-effectiveness and choice of antihypertensive drugs

9.1 Choice of antihypertensive drugs

A Consider any compelling indications and contraindications for an antihypertensive agent when prescribing its use. (Table 6, page 27).

Grade A, Level Ib

There are five main classes of antihypertensive agents available in Singapore. They are:

- (a) diuretics (D)
- (b) beta-blockers (BB)
- (c) calcium channel blockers (CCB)
- (d) angiotensin converting enzyme inhibitors (ACEI)
- (e) angiotensin II receptor blockers (ARB)

There are other classes of drugs which are uncommonly used, such as the alpha-blockers, hydralazine and methyl dopa.

A In hypertensive patients who do not have compelling indications or contraindications for any particular drug, any of the above 5 classes of drugs can be considered as the initial therapy.⁵⁰⁻⁵²

Grade A, Level Ib

C The cost of therapy should be considered in the choice of antihypertensive medication.⁴

Grade C, Level IV

Table 5 Average selling prices of common medications from each of the 5 classes for private patients in NHG

Antihypertensive drug	Average selling price per tablet excluding GST (S\$)
hydrochlorothiazide 25mg	0.05
atenolol 100mg	0.05
enalapril 20mg	0.05
nifedipine (long-acting) 30mg	0.32
losartan 100mg*	0.91

*The price for losartan is for the nongeneric formulation. The prices of the other drugs above are for their generic formulations.

(Source: National Healthcare Group⁵³)

C Generic formulations usually cost less than nongeneric newer drugs and are acceptable if they meet prescribed standards of quality.⁵⁴

Grade C, Level IV

Some combination preparations may also cost less than the total cost of their separate components.

Differences in cost and dosing frequencies among drugs in the same class should also be taken into consideration.

The choice of antihypertensive drug should be tailored to the individual patient, taking the following factors into consideration, in addition to risk profile and cost:⁴

- Side effects
- Drug interactions
- Patient preference

B Diuretics and beta-blockers may be selected as initial therapy in patients with uncomplicated hypertension if there are no compelling indications for a particular class of antihypertensive agents.⁵⁵

Grade B, Level III

A Diuretics and beta-blockers should be used with caution in patients at risk of developing diabetes.⁵⁶

Grade A, Level Ib

Some studies suggest diuretic or beta-blocker based treatment regimes are the most cost effective choice of antihypertensive.⁵⁵ However, recent data indicate that the combination of a diuretic and a beta-blocker may predispose to metabolic changes which increase the risk of developing diabetes mellitus.⁵⁶

Table 6 Guidelines for selecting drug treatment of hypertension

Concomitant Conditions	Recommended Drugs	Contraindicated Drugs
Heart Failure	<ul style="list-style-type: none"> • diuretics⁵⁷ • ACE inhibitors⁵⁸ • angiotensin II receptor blockers⁵⁹ 	<ul style="list-style-type: none"> • calcium channel blockers*⁶⁰
Angina	<ul style="list-style-type: none"> • beta-blockers⁶¹ • calcium channel blockers⁶¹ 	
Post Myocardial Infarction	<ul style="list-style-type: none"> • beta-blockers⁶² • ACE inhibitors⁶³ • angiotensin II receptor blockers⁶⁴ 	
Isolated Systolic Hypertension	<ul style="list-style-type: none"> • diuretic⁶⁵ • calcium channel blockers⁶⁶ • ACE inhibitors⁶⁷ • angiotensin II receptor blockers⁶⁸ 	
Diabetes Mellitus with Proteinuria (micro or Macroalbuminuria)	<ul style="list-style-type: none"> • ACE inhibitors⁶⁹ • angiotensin II receptor blockers⁷⁰⁻⁷² 	
Diabetes Mellitus	<ul style="list-style-type: none"> • ACE inhibitors⁷³ • angiotensin II receptor blockers⁷⁴ • calcium channel blockers⁷⁵ • diuretics⁷⁵ • beta-blockers⁷³ 	
Post-Stroke	<ul style="list-style-type: none"> • diuretics⁷⁶ • ACE inhibitors⁷⁶ 	
Asthma & Chronic Obstructive Pulmonary Disease		<ul style="list-style-type: none"> • beta-blockers⁵⁷
Heart Block		<ul style="list-style-type: none"> • beta-blockers⁵⁷ • calcium channel blockers*⁵⁷
Gout		<ul style="list-style-type: none"> • diuretics⁵⁷
Bilateral Renal Artery Stenosis		<ul style="list-style-type: none"> • ACE inhibitors⁵⁷ • angiotensin II receptor blockers⁵⁷

* verapamil or diltiazem

9.2 Effective drug combinations

A Effective drug combinations to treat hypertension are:⁴⁶

- Diuretic and beta-blocker⁴⁶
- Diuretic and ACE inhibitor⁴⁶ or angiotensin II receptor blocker⁵¹
- Diuretic and calcium channel blocker⁷⁷
- Calcium channel blocker (dihydropyridine) and beta-blocker⁷⁸
- Calcium channel blocker and ACE inhibitor⁷⁹ or angiotensin II receptor blocker⁴⁷

Grade A, Level Ib

The combination of beta-blocker and ACE inhibitor or angiotensin II receptor blocker has not been shown to have synergistic effects.

A Although effective for lowering BP, the combination of a diuretic and a beta-blocker may increase the risk of developing diabetes mellitus. Therefore, it should be used with caution in patients who already have risk factors for diabetes mellitus, such as obesity or the metabolic syndrome.⁵⁶

Grade A, Level Ib

9.3 Cholesterol lowering and antiplatelet therapy

A Consider the use of other drugs that reduce cardiovascular risk, such as lipid lowering agents and antiplatelet agents, in patients with concomitant risk factors and increased cardiovascular risk.^{22,80}

Grade A, Level Ib

In patients with high cholesterol, the benefits of cholesterol lowering therapy appear to be similar in those with or without high BP. Therefore, the use of cholesterol lowering therapy can be recommended for hypertensive patients who have elevated cholesterol levels.⁵

In patients with a history of CHD or cerebrovascular disease, there is evidence that aspirin and some other antiplatelet agents (ticlopidine, clopidogrel) can reduce cardiovascular risks.^{3,22} Antiplatelet therapy should also be considered in some patients in the high risk categories (Table 4, page 20) who have satisfactory blood pressure control (i.e. <140/<90 mmHg).

10 Benefits of treatment of hypertension

The randomised trials conducted to date have shown clear evidence of a lower incidence of major CVD events after high BP was treated with antihypertensive drugs. There is as yet no evidence that the main benefit of treating hypertension is due to a particular drug property rather than to lowering BP per se.^{81,82}

From the results of randomised controlled trials, it appears that each reduction of 10-14 mmHg in systolic BP and 5-6 mmHg in diastolic BP confers about two-fifths reduction in stroke, one-sixth reduction in coronary heart disease and, in Western populations, one-third reduction in major cardiovascular events.^{6,7,83-85}

There are no data which suggest that this effect of lowering BP is significantly different in Asian populations.

In patients with Grade 1 hypertension, monotherapy with most agents will produce reductions in systolic/diastolic BP of about 10/5 mmHg. In patients with higher grades of hypertension, it is possible to achieve sustained blood pressure reductions of 20/10 mmHg or more, particularly if combination drug therapy is used.

The 1999 WHO/ISH guidelines⁷ estimates that the absolute effects of such blood pressure reductions on CVD risks (fatal plus nonfatal stroke or myocardial infarction) are shown in Table 7 below.

Table 7 Effects of antihypertensive treatment

Patient group	Absolute risk of CVD events over 10 years	Absolute treatment effects (CVD events prevented per 1000 patient-years)	
		10/5 mmHg	20/10 mmHg
Low risk patients	<15%	<5	<9
Medium risk patients	15-20%	5-7	8-11
High risk patients	20-30%	7-10	11-17
Very high risk patients	>30%	>10	>17

Between these strata, the estimated absolute treatment benefits will range from less than 5 events prevented per thousand patient-years of treatment (low risk) to more than 17 events prevented per thousand patient-years of treatment (very high risk).

The absolute benefits for stroke and coronary heart disease are greater than the absolute benefits for congestive heart failure and renal disease.

These estimates of benefits are based on relative risk reductions observed in trials of about 5 years duration. Long-term treatment over decades could produce larger risk reductions.

11 Quality indicators for hypertension management

The target BP treatment levels are

- BP <140/<90 mmHg in all patients, except
- BP <130/<80 mmHg in patients with diabetes or chronic renal disease

C Table 8 Process indicators and recommended frequency^{3,4,5,7}

Performance Parameter	Recommended review frequency
Risk level* - Normal risk - Low and medium risk - High risk	Annually 6 monthly 3 monthly
Weight Fasting blood glucose Fasting lipid profile Serum electrolyte, urea and creatinine Urinalysis	} Annually or more frequently according to individual risk factor profile
ECG	Annually or more frequently according to cardiac status
Patient education* - Normal risk - Low and medium risk - High risk	At diagnosis and regular intervals according to risk level Annually 6 monthly 3 monthly

* Goal blood pressure achieved.

Grade C, Level IV

It should be emphasized that the ultimate objective of treatment of hypertension is not to lower BP per se but to reduce overall morbidity and mortality risk, which is also influenced by other concomitant risk factors. The greater the risk profile, the more rigorous should the BP control be.

However, BP level attainable with treatment may also be influenced by medication side effects and other co-morbidities, such as cerebrovascular disease. Good clinical judgement should be exercised in every individual situation.

Annex 1 Treatment of hypertension in Type 2 diabetes

Hypertension is a common co-morbidity in people with disorders of glucose metabolism. Individuals with type 2 diabetes mellitus (which is more common than type 1 diabetes mellitus by about 20-fold) often have the metabolic syndrome of which hypertension is one of the defining features.⁸⁶ Prevalence of hypertension in patients with type 2 diabetes increases further with the development of nephropathy.⁸⁷ In patients with type 1 diabetes, hypertension is often associated with the onset of nephropathy.⁸⁸

The presence of hypertension in individuals with diabetes is associated with higher rates of cardiovascular complications as well as microvascular complications (such as nephropathy and retinopathy).^{89,90} Intensive hypertension treatment has been shown to reduce adverse cardiovascular outcomes (similar to those without diabetes) as well as adverse microvascular outcomes.⁴⁵

The target for BP control in individuals with diabetes has been recommended by several guidelines to be 130/80 mmHg. The rationale for this target is the improvement in outcomes in clinical trials with more intensive BP lowering.^{22,45} The achieved BP in the intensive BP control arm of the UKPDS – Hypertension in Diabetes Study was 144/82 mmHg. The HOT study demonstrated differences in outcome between the group with highest achieved diastolic BP of 85 mmHg and the group with lowest achieved diastolic BP of 81 mmHg.

The basis for the systolic BP target is supported by an observational analysis of UKPDS subjects which showed that there was a significant continuous increase in both macrovascular and microvascular complications with systolic BP of >120 mmHg.⁹⁰ The recently published Kidney Disease Outcomes Quality Initiative (K/DOQI) Clinical Practice Guidelines on Hypertension and Antihypertensive Agents in Chronic Kidney Disease has also accepted a hypertension treatment goal of 130/80 mmHg for patients with diabetic kidney disease.⁹¹

In addition, a systolic BP goal of even <130 mmHg should be considered in patients with urine total protein of >0.5g/24 hours but systolic BP levels of <110 mmHg should be avoided.

There is evidence that blockade of the renin-angiotensin-aldosterone axis may have beneficial outcomes in hypertensive patients with type 2 diabetes mellitus.⁷⁴ However, not all studies on hypertensive people with type 2 diabetes mellitus show similar results. The UKPDS – Hypertension in Diabetes Study did not demonstrate major advantages of an ACE inhibitor when compared to a beta- blocker.⁷⁰ The ALLHAT study (in which about 36% of subjects had type 2 diabetes mellitus) also did not report major differences in cardiovascular outcomes amongst the three groups using a diuretic, ACE inhibitor and dihydropyridine calcium channel blocker.⁷²

Hence, there is inadequate evidence for recommendation of any specific initial pharmacological agent in the treatment of hypertension in diabetic patients. In any case it has been shown in many recent clinical trials that multiple agents from different classes of antihypertensive agents are required to achieve target BP control.^{45,70,91}

However in patients with diabetes and microalbuminuria as well as more advanced degrees of nephropathy, blockade of the renin-angiotensin-aldosterone axis has been shown to retard progression of renal disease.⁶⁶⁻⁶⁹ In such patients with hypertension, there is reason to choose an agent which inhibits the renin-angiotensin-aldosterone axis such as an ACE inhibitor or an angiotensin receptor blocker as the initial agent. Eplerenone, a new, relatively selective aldosterone receptor antagonist (as yet unavailable in Singapore at time of writing) has also been shown in small studies to reduce microalbuminuria in hypertensive patients with type 2 diabetes mellitus but more data is needed before it can be recommended for use as an agent for retardation of renal disease.⁹²

A People with diabetes who are hypertensive should be treated to target BP of <130/<80 mmHg.

Grade A, Level Ia

A There is inadequate evidence to recommend a specific initial antihypertensive agent for the treatment of hypertension in patients with diabetes. However, in those patients with incipient or overt nephropathy, the use of an agent, which inhibits the renin-angiotensin-aldosterone axis, should be considered.

Grade A, Level Ia

Annex 2 Treatment of hypertension during pregnancy

Hypertension in pregnancy is usually defined by an absolute level of BP (e.g. $\geq 140/90$ mmHg). Hypertension in pregnancy is typically classified as:⁹³

- Pre-existing chronic hypertension
- Preeclampsia-eclampsia
- Gestational hypertension
 - a) Transient hypertension of pregnancy, if there is no preeclampsia at delivery, and BP becomes normal by 3 months post-partum
 - b) Chronic hypertension if elevation of BP persists beyond 3 months post-partum
- Preeclampsia superimposed on chronic hypertension

C BP levels of $>170/110$ mmHg should be lowered to protect the mother against the risk of stroke or to permit possible prolongation of the pregnancy and thereby improve fetal maturity. Opinion is divided on the need for drug treatment for BP readings below this level.⁹³

Grade C, Level IV

Drugs most widely used to lower BP **acutely** in pregnancy include:

- labetalol
- nifedipine
- hydralazine

Drugs most widely used for **chronic** treatment of raised BP in pregnancy include:

- methyldopa
- beta-blockers, in particular labetalol, pindolol, acebutolol and oxprenolol. However, atenolol is associated with foetal growth retardation when used long-term throughout pregnancy.
- prazosin, hydralazine, nifedipine and isradipine

B Drugs that should be **avoided** during pregnancy include: ACE inhibitors (associated with possible adverse foetal effects) and angiotensin receptor blockers, the effects of which may be similar to those of ACE inhibitors. Diuretics are also used infrequently due to concern about reduction of the already compromised plasma volume.^{94,95}

Grade B, Level IIb

Lowering BP is only one of the aspects of the management of pre-eclampsia that ideally involves a multidisciplinary team approach, including an early and timely delivery.

Antihypertensive medications considered compatible with breastfeeding include methyldopa, labetalol, propranolol, nifedipine, verapamil and hydralazine. Drugs which should be used with caution include atenolol, nadolol, sotalol and diltiazem (due to significant accumulation in breast milk).

Annex 3 Treatment of hypertension in the elderly

Elevated systolic hypertension is a common finding in the elderly and is termed isolated systolic hypertension. As age advances, arterial compliance decreases and this results in a gradual rise in systolic pressure and a fall in diastolic pressure. A wide pulse pressure correlates well with increased cardiovascular and cerebro-vascular events^{83,96} as well as congestive heart failure.⁹⁷

Randomised trials have clearly shown the benefits of treating systolic hypertension across a wide age range.⁹⁸ In patients over the age of 80 years, a recent meta-analysis of treatment of patients concluded that combined fatal and non-fatal events were significantly reduced but all cause mortality was not.⁹⁹

A In general the treatment of hypertension in the elderly should follow the same general guidelines but drug therapy should be instituted gradually especially in the frail elderly. On initiating drug therapy the patients' associated clinical conditions should be taken into consideration.^{72,75,100-102}

Grade A, Level Ia

B All 5 classes of drugs (diuretics, beta-blockers, calcium channel blockers, ACE inhibitors and angiotensin II receptor blockers) have been shown in trials to be efficacious and beneficial in the elderly.^{72,75,100-103} In isolated systolic hypertension, diuretics, calcium channel blockers, ACE inhibitors and angiotensin II receptor blockers, are all useful, and may be used.

Grade B, Level IIa

Further information will be forthcoming when more trials are completed e.g. HYVET Hypertension in the Very Old Trial.

As in other patients, many elderly patients also require two or more anti-hypertensive drugs to achieve good BP control. Control of the diastolic pressure is difficult to regulate and the optimum range of the diastolic pressure needs further clarification. The current impression is that the diastolic pressure should not be allowed to fall below 60 mmHg especially in those with known coronary artery disease as this may increase the risk of coronary events.

GPP Monitoring of BP in the elderly should include frequent measurements in the erect position to assess postural drop. Care should also be taken to avoid fluid depletion and electrolyte imbalance in the elderly.

GPP

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Self-assessment (MCQs)

After reading the Clinical Practice Guidelines, you can claim one CME point under Category III (Self-Study) of the SMC Online CME System. Before you login to claim the CME point, we encourage you to evaluate whether you have mastered the key points in the Guidelines by completing this set of MCQs. This is an extension of the learning process and is not intended to “judge” your knowledge and is not compulsory. The answers can be found at the end of the questionnaire.

Instruction: Choose the most appropriate answer.

1. Normal blood pressure (BP) is defined as a BP level of
 - A. <120/80 mmHg
 - B. <130/80 mmHg
 - C. <135/85 mmHg
 - D. <140/90 mmHg

2. The initial antihypertensive medication recommended for patients who have no compelling indications or contraindications is
 - A. a thiazide diuretic
 - B. betablocker
 - C. calcium channel blocker
 - D. an angiotensin converting enzyme inhibitor
 - E. an angiotensin receptor blocking agent
 - F. any of the above

3. The absolute risk of cardiovascular events over 10 years in high risk patients is
 - A. 5-10%
 - B. 10-20%
 - C. 20-30%
 - D. >30%

4. The target for blood pressure control in patients with type 2 diabetes mellitus is
 - A. <160/<90 mmHg
 - B. <140/<90 mmHg
 - C. <140/<80 mmHg
 - D. <130/<80 mmHg

5. The initial antihypertensive agent for hypertensive patients with type 2 diabetes who have microalbuminuria is
 - A. angiotensin receptor blocker
 - B. dihydropyridine calcium channel blocker
 - C. beta blocker
 - D. diuretic

6. Factors indicative of high cardiovascular risk, include the following EXCEPT
 - A. elevated uric acid level
 - B. diabetes mellitus
 - C. atherosclerotic stroke
 - D. peripheral arterial disease

7. In pregnancy antihypertensive therapy is indicated for BP levels above
 - A. 140/90 mmHg
 - B. 150/90mmHg
 - C. 160/90 mmHg
 - D. 170/110 mmHg

8. The following medications can be used in pregnancy, EXCEPT
 - A. methyl dopa
 - B. labetalol
 - C. angiotensin receptor blocker
 - D. hydralazine
 - E. nifedipine

9. The following antihypertensive drug combinations are effective, EXCEPT
- A. Diuretics and beta blockers
 - B. Beta blockers and dihydropyridine calcium antagonists
 - C. Diuretics and angiotensin converting enzyme inhibitors (ACEI)/angiotensin receptor blocker (ARB)
 - D. Angiotensin converting enzyme inhibitors (ACEI)/angiotensin receptor blocker (ARB) and calcium antagonists
 - E. Beta blockers and angiotensin converting enzyme inhibitors (ACEI)/angiotensin receptor blocker (ARB)
10. In the elderly antihypertensive therapy is indicated only if the systolic BP is above
- A. 140 mmHg
 - B. 150 mmHg
 - C. 160 mmHg
 - D. 170 mmHg

Answers

1. B (pg 13)
2. F (pg 25)
3. C (pg 29)
4. D (pg 33)
5. A (pg 33)
6. A (pg 17)
7. D (pg 34)
8. C (pg 35)
9. E (pg 28)
10. A (pg 21)

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Executive summary of recommendations

Details of recommendations can be found in the main text at the pages indicated.

Definition of high blood pressure

C Grade hypertension according to systolic and diastolic BP levels. (pg 13)

Grade C, Level IV

Evaluation of high blood pressure

C Use the following procedures when recording BP:

- allow the patient to sit or lie down for several minutes before measuring the BP
- the patient should refrain from smoking or ingesting caffeine during the 30 minutes preceding the measurement
- use a cuff with a bladder that is 12-13 cm x 35 cm in size, with a larger bladder for fat arms. The bladder within the cuff should encircle at least 80% of the arm.
- use the disappearance of phase V Korotkoff sounds to measure the diastolic BP
- measure the BP in both arms at the first visit
- take 2 or more readings separated by 2 minutes. Average these 2 values. If the first 2 readings differ by more than 5 mmHg, additional readings should be obtained and averaged.

- measure the BP in both the standing and supine position for elderly subjects and diabetic patients
- place the sphygmomanometer cuff at heart level, whatever the position of the patient

(pg 14-15)

Grade C, Level IV

C Persons with an average BP of more than 135/85 mmHg measured at home may be considered to be hypertensive. (pg 15)

Grade C, Level IV

C Routine clinical evaluation includes:

- clinical and family history
- full standard physical examination
- laboratory investigations, including:
 - urinalysis for blood, protein, glucose and microscopy
 - blood chemistry for electrolytes, creatinine, urea, fasting glucose and lipids
- electrocardiography (ECG)

(pg 15)

Grade C, Level IV

Prognostic factors of hypertension

B Decisions about the management of patients with hypertension should not be made based on their BP levels alone, but also on the presence of other risk factors, target organ damage, concomitant disease such as diabetes and cardiovascular or renal disease, as well as other aspects of the patient's individual and medical circumstances. (pg 17)

Grade B, Level III

Management of hypertension

A Assess the overall risk profile as a guide to management. (pg 19)

Grade A, Level Ia

If high risk

A Institute immediate drug treatment for hypertension and other risk factors or conditions present. (pg 19)

Grade A, Level Ia

If medium risk

A Monitor BP and other risk factors for several weeks and obtain further information before deciding whether to institute drug treatment. (pg 19)

Grade A, Level Ib

If low risk

A Observe the patient over a significant period of time before deciding whether to institute drug treatment. (pg 19)

Grade A, Level Ib

B Lifestyle modifications and non-pharmacological measures should be instituted wherever appropriate in all hypertensive patients, including those who require drug treatment or those within the high normal BP range. (pg 19)

Grade B, Level IIa

Treatment goals and follow up

A In diabetic subjects and those with chronic renal disease, the target BP should be a “normal” BP (i.e. <130/80 mmHg). In elderly patients, the target BP should be at least “high-normal” BP (i.e. <140/90 mmHg), provided no orthostatic hypotension occurs. (pg 21)

Grade A, Level Ia

Principles of drug treatment

A Use appropriate drug combinations to achieve target BP levels if this cannot be achieved by one single antihypertensive agent. (pg 23)

Grade A, Level Ib

A Use of appropriate drug combinations enables BP lowering efficacy to be maximized while minimizing side effects. In most patients, appropriate combination therapy produces BP reductions that are twice as great as those obtained with monotherapy (e.g. reductions in BP increasing from 12 to 22 mmHg systolic BP and from 7 to 14 mmHg diastolic BP in patients with an initial BP of 160/100 mmHg). (pg 23)

Grade A, Level Ib

A In patients whose pretreatment BP is moderately elevated (e.g. BP \geq 160/100 mmHg) or especially if it is severely elevated (e.g. BP \geq 180/110 mmHg), it may be appropriate to begin with combination therapy, because many such patients will require 2 or even 3 drugs for adequate BP control. (pg 23)

Grade A, Level Ib

A Use long-acting drugs providing 24-hour efficacy on a once daily basis. (pg 24)

Grade A, Level Ib

Cost-effectiveness and choice of antihypertensive drugs

A Consider any compelling indications and contraindications for an antihypertensive agent when prescribing its use. (Table 6, page 27). (pg 25)

Grade A, Level Ib

A In hypertensive patients who do not have compelling indications or contraindications for any particular drug, any of the 5 main classes of drugs can be considered as the initial therapy. (pg 25)

Grade A, Level Ib

C The cost of therapy should be considered in the choice of antihypertensive medication. (pg 25)

Grade C, Level IV

C Generic formulations usually cost less than nongeneric newer drugs and are acceptable if they meet prescribed standards of quality. (pg 26)

Grade C, Level IV

B Diuretics and beta-blockers may be selected as initial therapy in patients with uncomplicated hypertension if there are no compelling indications for a particular class of antihypertensive agents. (pg 26)

Grade B, Level III

A Diuretics and beta-blockers should be used with caution in patients at risk of developing diabetes. (pg 26)

Grade A, Level Ib

A Effective drug combinations to treat hypertension are:

- Diuretic and beta-blocker
- Diuretic and angiotensin converting enzyme (ACE) inhibitor or angiotensin II receptor blocker
- Diuretic and calcium channel blocker
- Calcium channel blocker (dihydropyridine) and beta-blocker
- Calcium channel blocker and ACE inhibitor or angiotensin II receptor blocker

(pg 28)

Grade A, Level Ib

A Although effective for lowering BP, the combination of a diuretic and a beta-blocker may increase the risk of developing diabetes mellitus. Therefore, it should be used with caution in patients who already have risk factors for diabetes mellitus, such as obesity or the metabolic syndrome. (pg 28)

Grade A, Level Ib

A Consider the use of other drugs that reduce cardiovascular risk, such as lipid lowering agents and antiplatelet agents, in patients with concomitant risk factors and increased cardiovascular risk. (pg 28)

Grade A, Level Ib

C Process Indicators and Recommended Frequency

Performance Parameter	Recommended review frequency
Risk level* - Normal risk - Low and medium risk - High risk	Annually 6 monthly 3 monthly
Weight Fasting blood glucose Fasting lipid profile Serum electrolyte, urea and creatinine Urinalysis	} Annually or more frequently } according to individual risk factor profile
ECG	Annually or more frequently according to cardiac status
Patient education* - Normal risk - Low and medium risk - High risk	At diagnosis and regular intervals according to risk level Annually 6 monthly 3 monthly

* Goal blood pressure achieved.
(pg 31)

Grade C, Level IV

Treatment of hypertension in Type 2 diabetes

A People with diabetes who are hypertensive should be treated to target BP of <130/<80 mmHg. (pg 33)

Grade A, Level Ia

A There is inadequate evidence to recommend a specific initial antihypertensive agent for the treatment of hypertension in patients with diabetes. However, in those patients with incipient or overt nephropathy, the use of an agent which inhibits the renin-angiotensin-aldosterone axis should be considered. (pg 33)

Grade A, Level Ia

Treatment of hypertension during pregnancy

C BP levels of >170/110 mmHg should be lowered to protect the mother against the risk of stroke or to permit possible prolongation of the pregnancy and thereby improve fetal maturity. Opinion is divided on the need for drug treatment for BP readings below this level. (pg 34)

Grade C, Level IV

B Drugs that should be **avoided** during pregnancy include: ACE inhibitors (associated with possible adverse foetal effects) and angiotensin receptor blockers, the effects of which may be similar to those of ACE inhibitors. Diuretics are also used infrequently because of concerns about reduction of the already compromised plasma volume. (pg 35)

Grade B, Level IIb

Treatment of hypertension in the elderly

A In general the treatment of hypertension in the elderly should follow the same general guidelines but drug therapy should be instituted gradually especially in the frail elderly. On initiating drug therapy the patients' associated clinical conditions should be taken into consideration. (pg 36)

Grade A, Level Ia

B All 5 classes of drugs (diuretics, beta-blockers, calcium channel blockers, ACE inhibitors and angiotensin II receptor blockers) have been shown in trials to be efficacious and beneficial in the elderly. In isolated systolic hypertension, diuretics, calcium channel blockers, ACE inhibitors and angiotensin II receptor blockers are all useful, and may be used. (pg 36)

Grade B, Level IIa

GPP Monitoring of BP in the elderly should include frequent measurements in the erect position to assess postural drop. Care should also be taken to avoid fluid depletion and electrolyte imbalance in the elderly. (pg 37)

GPP

Risk stratification and treatment plan

BP Category (mm Hg)	Risk Group A (No risk factors)	Risk Group B (1 - 2 risk factors)	Risk Group C (≥3 risk factors or Diabetes Mellitus or TOD/ACC)
Systolic BP 130-139 mmHg/ Diastolic BP 80-89mmHg	LM	LM	LM+Rx
Systolic BP 140-159 mmHg/ Diastolic BP 90-99mmHg	LM+Rx*	LM+Rx	LM+Rx
Systolic BP ≥160 mmHg/ Diastolic BP ≥100 mmHg	LM+Rx	LM+Rx	LM+Rx

* if BP control inadequate with LM alone

TOD = Target Organ Disease

ACC = Associated Clinical Condition

LM = Lifestyle Modification

Rx = Drug Therapy



Low risk



Moderate risk



High risk

Guidelines for selecting drug treatment of hypertension

Concomitant Conditions	Recommended Drugs	Contraindicated Drugs
Heart Failure	<ul style="list-style-type: none"> • diuretics • ACE inhibitors • angiotensin II receptor blockers 	<ul style="list-style-type: none"> • calcium channel blockers*
Angina	<ul style="list-style-type: none"> • beta-blockers • calcium channel blockers 	
Post Myocardial Infarction	<ul style="list-style-type: none"> • beta-blockers • ACE inhibitors • angiotensin II receptor blockers 	
Isolated Systolic Hypertension	<ul style="list-style-type: none"> • diuretic • calcium channel blockers • ACE inhibitors • angiotensin II receptor blockers 	
Diabetes Mellitus with Proteinuria (micro or Macroalbuminuria)	<ul style="list-style-type: none"> • ACE inhibitors • angiotensin II receptor blockers 	
Diabetes Mellitus	<ul style="list-style-type: none"> • ACE inhibitors • angiotensin II receptor blockers • calcium channel blockers • diuretics • beta-blockers 	
Post-Stroke	<ul style="list-style-type: none"> • diuretics • ACE inhibitors 	
Asthma & Chronic Obstructive Pulmonary Disease		<ul style="list-style-type: none"> • beta-blockers
Heart Block		<ul style="list-style-type: none"> • beta-blockers • calcium channel blockers*
Gout		<ul style="list-style-type: none"> • diuretics
Bilateral Renal Artery Stenosis		<ul style="list-style-type: none"> • ACE inhibitors • angiotensin II receptor blockers

* *verapamil or diltiazem*