Hong Kong Reference Framework for Hypertension Care for Adults in Primary Care Settings

Revised Edition 2021

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Content

Preface to the First Edition

Enhancing primary care is one of the proposals put forward in the Healthcare Reform Consultation Document "Your Health, Your Life" and has received broad public support during the first stage of public consultation conducted in 2008. In recognition of the broad support for the proposals, the Working Group on Primary Care (Working Group) under the Health and Medical Development Advisory Committee chaired by the Secretary for Food and Health was reconvened to discuss and provide strategic recommendations on enhancing and developing primary care in Hong Kong.

Four Task Forces have been established to study specific proposals set out in the Healthcare Reform Consultation Document. One of them is the Task Force on Conceptual Model and Preventive Protocols (Task Force). The Task Force makes recommendations to the Working Group on conceptual models that are evidence based with associated reference frameworks for use in the local primary care settings. The Task Force is also responsible for promulgating, maintaining and revising the models and frameworks, and the strategies to promote their adoption.

After a series of discussions with stakeholders, the Task Force has developed a basic conceptual model for the management of chronic disease using a population approach across life-course. It is based on the recognition that we need a comprehensive and continuous approach to care focused on the person to meet their needs and address their risks. The reference frameworks cover primary prevention and lifestyle changes, assessment of high risk groups, early detection and management of diseases as well as ensuring the quality of care for more complicated conditions or disabilities within the community. The need to coordinate inputs from multi-disciplinary teams, engage patients and interface with the community and other sectors is also highlighted.

To date, two reference frameworks, one on diabetes and the other on hypertension, have been developed. These reference frameworks consist of a core document supplemented by a series of different modules addressing various aspects of disease management which aim to -

(a) provide a common reference to guide and co-ordinate care to patients from all healthcare professionals across different sectors in Hong Kong for the provision of continuous, comprehensive and evidence-based care for diabetes and hypertension in the community;
(b) empower patients and their carers; and
(c) raise public's awareness on the importance of preventing and properly managing these two major chronic diseases.

Drawing on international experience and best evidence, these frameworks provide general reference for practice in primary care settings to support the policy of promoting primary care within Hong Kong. However, since clinical practice and patient engagement need to keep pace with scientific advancements, in order to ensure the latest medical developments and evidence are reflected in the frameworks to provide reference for best practice, two Clinical Advisory Groups under the Task Force have been established to review and update the reference frameworks on a regular basis. The Clinical Advisory Groups are composed of experts from academia, professional organisations, private and public primary care sector and patient groups who are members of the groups in their own right, not representing organisations.

To facilitate the promulgation and adoption of the reference frameworks, support and endorsement from healthcare professionals across different sectors in Hong Kong has been and will continue to be very important. We hope that the adoption of the reference frameworks will improve patient care by facilitating co-ordination of their care, strengthen management continuity, promote evidence based effective and efficient practice, empower patients and their carers as well as enhancing public awareness about the prevention and management of these two major chronic diseases in our community.

Professor Sian GRIFFITHS
Convenor
Task Force on Conceptual Model and Preventive Protocols

Key To Evidence Statements And Grades Of Recommendations [#]

Levels of Evidence

1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well conducted meta-analysis, 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, bias, or chance and a high probability that the relationship is causal
2+	Well conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

[#] Scottish Intercollegiate Guidelines Network (SIGN) classification.

Grades of Recommendation

A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or A systematic review of RCTs 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+

Statement Of Intent

The framework is constructed from global evidence of best practice. As with all guidance it aims to support decision making, recognising that all patients are unique and have their own needs. The Task Force endeavours to provide accurate and up-to-date information. The frameworks provide support for decision making and as such are not mandatory. They should not be construed as within any legal framework, rather as guidance for professional practice. Standards of care for individual patients are determined on the basis of all the facts and circumstances involved in a particular case. They are subject to change as scientific knowledge and technology advances and patterns of care evolve. Management of diseases must be made by the appropriate primary care practitioners responsible for clinical decisions regarding a particular treatment procedure or care plan. The responsible primary care practitioners should only arrive at a particular treatment procedure or care plan following discussion with the patient on the diagnostic and treatment choices available.

Chapter 1. Epidemiology

Hypertension means high blood pressure. Systolic blood pressure ≥ 140mm Hg or diastolic blood pressure ≥ 90mm Hg is considered high[1]. If hypertension is not well controlled and treated, it will increase the risk of cardiac failure, coronary heart disease, renal failure and stroke.

Hypertension is prevalent in Hong Kong. The Population Health Survey 2014 - 15 of the Department of Health revealed that around 27% of the population aged 15 or above had increased blood pressure[2]. The prevalence increased with advancing age, with 4.5% among those aged 15 to 24 and up to 64.8% for those aged 65 to 84 (Table 1). Moreover, among those 27% with increased blood pressure, around half (13.2%) were unaware of their condition, only found to have their blood pressure raised during the survey.

Table 1: Prevalence of hypertension in Hong Kong by age groups[2]

Age Group (Years)	Self-reported, doctor diagnosed hypertension (%)	Undiagnosed but measured (%)	Total (%)
15-24	1.0	3.4	4.5
25-34	0.4	5.2	5.6
35-44	3.9	11.3	15.2
45-54	10.5	16.2	26.7
55-64	27.0	19.4	46.4
65-84	43.8	20.9	64.8
All age groups	14.6	13.2	27.7

Chapter 2. Population-based Intervention And Life Course Approach

Hypertension, like other chronic health conditions, poses a formidable challenge to the healthcare delivery system. Traditional care services organised to respond to acute patient problems cannot adequately serve the needs of persons with chronic diseases such as hypertension. A more systematic approach to care is required. In addition, a multidisciplinary team approach has consistently shown to be effective in achieving blood pressure control of patients, as reported in clinical trials and many practice settings. In recent years, population-based approach in the control and management of chronic diseases is emphasised. This approach seeks to embrace the whole spectrum of the problem from health promotion, disease prevention and treatment to rehabilitation. To achieve this overarching goal, a proactive approach covering primary, secondary and tertiary levels of prevention is adopted. This involves promotion of healthy behaviours to reduce disease risk, early disease detection, and quality management with the ultimate goal to reduce the incidence of complications and associated morbidities and mortality in the population.

The risks of developing chronic diseases including hypertension and cardiovascular diseases are influenced by factors acting at all stages of life. The effects of these modifiable risk factors accumulate with increasing age, especially in predisposed individuals. Major chronic diseases often share common risk factors e.g. undesirable environmental conditions, social deprivation, unhealthy dietary habit, physical inactivity, alcohol misuse and smoking. Thus, it is necessary and advantageous to adopt an integrated and life course approach in the prevention and control of chronic diseases based on the needs and risks of different population sub-groups to prevent the onset of diseases and reduce the rate of disease progression. Module 1 summarises a comprehensive approach that involves different hypertension prevention or proactive management strategies that are most relevant for the different stages of the life course.

Chapter 3. Role Of Primary Care In The Management Of Hypertension

Primary care is the first point of contact in the healthcare system and is easily accessible to the majority of the population. With support and training, primary care practitioners form an invaluable workforce in the community to deliver coordinated care to hypertensive patients, especially those with clinically stable conditions and to identify high risk subjects for referral to other experts. By applying the principles of family medicine and working in partnership with other healthcare professionals such as dietitians, nurses, occupational therapists, optometrists, pharmacists and physiotherapists, primary care practitioners are in a prime position to provide patient-centered, continuing and comprehensive care taking into account individual patients' needs and values.

In the management of chronic diseases such as hypertension, it is desirable for primary care practitioners to provide ongoing education to reduce risks, diagnose disease early, assess patients' needs, monitor treatment responses and adherence, and identify treatment barriers such as patients' concerns and misperceptions. Furthermore, they could provide holistic care by treating concurrent illnesses and co-morbidities, addressing their patients' psychosocial concerns, empowering them to change behaviour and enabling them to develop coping skills for special occasions, e.g. marriage, pregnancy, travelling and sick day management. Due to the large scope of services involved in the primary, secondary and tertiary prevention of hypertension and associated complications, multidisciplinary care targeting at interfaces between different sectors is essential. Therefore, close collaboration and coordination between primary and secondary care teams are required.

Chapter 4. Patient Education

Patient education is the cornerstone of hypertension management where patients (and their carers) are empowered with appropriate knowledge and skills to live with the disease. Patients with hypertension must be given basic knowledge about the nature, consequences and treatment of the disease as well as their rights and responsibilities in terms of access to care, adherence to recommended treatment and self-management. Primary care practitioners and other care professionals should help dispel misconceptions and address patients' concerns about the disease and its treatment, e.g. fear for long-term medication, and emphasise the positive aspects of the disease in terms of risk awareness, adoption of a healthy lifestyle and regular surveillance by a health care team[3].

Chapter 5. Aim Of The Framework

The Reference Framework for Hypertension Care in Adults in Primary Care Setting provides an updated evidence-based approach and recommends core interventions to influence current practice with a view to reducing the burden of long-term complications, including cardiovascular diseases. The Framework also aims to provide adults with or at risk of developing hypertension with a reference for better self-management and proactive disease control.

The Framework has adopted the levels of evidence and grades of recommendations proposed by the Scottish Intercollegiate Guidelines Network (SIGN). In general, grade A recommendation is supported by level 1 evidence, whilst levels 2 and 3 evidence are considered as fair evidence.

Chapter 6. Component 1: Prevention Of Hypertension Adoption Of A Healthy Lifestyle

There are two complementary approaches to reducing the incidence of hypertension in the population:

- The 'population approach', the aim of this approach is to reduce the average level of risk for developing hypertension across the entire population. The interventions required include:
  - » increasing physical activity levels,
  - » improving diet and nutrition,
  - » preventing excess dietary salt intake, and
  - » preventing and reducing overweight and obesity.

- The 'individual-based/high-risk approach', which aims to identify those at increased risk of developing hypertension, offer them appropriate advice on how to reduce the risk, and support them to lose weight and increase their physical activity levels. People with multiple risk factors for developing hypertension should also be given advice and support opportunistically to minimise their risk.

Recommendations

Advise individuals at increased risk of developing hypertension and patients with hypertension to maintain optimal body weight, restrict dietary salt intake, abstain from smoking and practise healthy lifestyles.	**A**

Supporting evidence

• Individuals with above-optimal blood pressure, including stage 1 hypertension (refer to Table 1), can make multiple lifestyle changes such as weight loss, sodium reduction, increased physical activity and dietary changes, to help lower their blood pressure and reduce cardiovascular risk[4].	1+

Chapter 7. Component 2: Early Identification Of People With Hypertension

Routine blood pressure measurement is of value in detecting hypertension and also provides a useful record of baseline blood pressure in normotensive patients. Classification of blood pressure and recommendations on the frequency of blood pressure screening are depicted in Table 2. For accurate blood pressure measurement, please refer to Module 2.

Recommendations

Blood pressure measurement in all adults from 18 years of age at least every 2 years[5]. **A**

Table 2. Classification of office blood pressure [Note 1] with reference to statement from World Health Organization [1a] and guideline from European Society of Cardiology / European Society of Hypertension [1b], and recommendation for corresponding frequency of blood pressure review and action.

Blood pressure classification	Initial Blood Pressure (mmHg) [Note 2, Note 4]		Recommended minimum review period [Note 3]	Action
	Systolic	Diastolic		
Optimal	<120	<80	Recheck in 2 years	Encourage to adopt healthy lifestyle
Normal	120-129	80-84	Recheck in 1 year	Lifestyle modification
High normal	130-139	85-89	Recheck in 6 months	Lifestyle modification
Grade 1 hypertension	140-159	90-99	Confirm within 2 months	Lifestyle modification
Grade 2 hypertension	160-179	100-109	Evaluate within 1 month	• Treat within 1 month • Lifestyle modification
Grade 3 hypertension	≥180	≥110	Further evaluation within 1 week	• If high blood pressure is confirmed, drug treatment should be commenced [Note 5] • May warrant urgent referral if patient presents features suggestive of malignant hypertension (Refer to Box 2) • Lifestyle modification

Note 1. The classification is based on the seated clinic BP. If systolic and diastolic blood pressures fall into different categories, the higher category should be used to classify blood pressure level. Three seated clinic BP measurements should be recorded, 1-2 min apart, and additional measurements only if the first two readings differ by >10 mmHg. BP is recorded as the average of the last two BP readings. The diagnosis of hypertension should not be based on a single set of BP readings at a single office visit, unless the BP is substantially increased (e.g. grade 3 hypertension) and there is clear evidence of hypertension-mediated organ damage.[1b] Use an average of ≥2 readings obtained on ≥2 occasions to estimate the individual's BP.[6]

Note 2. If systolic and diastolic categories are different, follow recommendations for shorter review period.

Note 3. Modify review period according to reliable information about past blood pressure measurements, other cardiovascular risk factors, or target organ diseases.

Note 4. When considering a diagnosis of hypertension, measure blood pressure in both arms[7]:

- If the difference in readings between arms is more than 15 mmHg, repeat the measurements.
- If the difference in readings between arms remains more than 15 mmHg on the second measurement, measure subsequent blood pressure in the arm with the higher reading.
- A difference in systolic BP of 15 mm Hg or more between arms could identify patients at high risk of asymptomatic peripheral vascular disease, such as subclavian stenosis, and mortality who might benefit from further assessment.[7a]

Note 5. For grade 3 hypertension, the diagnosis of hypertension is confirmed at a single clinic visit if there is clear evidence of hypertension-mediated organ damage (e.g. hypertensive retinopathy with exudates and haemorrhages, left ventricular hypertrophy, or vascular or renal damage).[1b]

Chapter 8. Component 3: Clinical Care Of Adults With Hypertension

Effective treatment of hypertension can prevent or delay many of its complications, especially cardiovascular and renal complications. Medication for the control of blood pressure also plays an important role. More importantly, the management of hypertension depends on the commitment of the patient to participate proactively in self-management, adopting healthy lifestyle practices, and prompt detection and treatment of emerging cardiovascular risk factors and complications.

8.1 Initial assessment and investigation of patient with hypertension

Upon diagnosis, primary care practitioners should perform comprehensive assessment to assess co-existing cardiovascular risk factors or other problems that may affect prognosis and treatment (Box 1). Module 3 denotes the findings suspicious of secondary hypertension. Module 4 provides details regarding the assessment and investigations for individual newly diagnosed with hypertension.

Box 1 Cardiovascular risk factors[1]

- Cigarette smoking
- Obesity
- Physical inactivity
- Dyslipidaemia
- Diabetes mellitus
- Microalbuminuria or estimated GFR < 60 ml/min
- Age (older than 55 for men, 65 for women)
- Family history of essential hypertension and premature cardiovascular disease (men under 55 or women under 65)

8.2 Treatment of adults with hypertension

The aim of the treatment is to obtain maximal reduction in overall cardiovascular risk which requires:

- Correcting risk factors e.g. lifestyle modification, smoking cessation
- Maintaining good blood pressure control, and
- Monitoring potential complications and timely referral to specialist care when indicated.

8.2.1 Lifestyle modification

Adoption of a healthy lifestyle is critical for the prevention of high blood pressure and is an indispensable part of the management of those with hypertension[8]. Lifestyle modifications including healthy eating, dietary salt restriction, regular physical activity and stress management can reduce blood pressure, enhance antihypertensive drug efficacy, and reduce cardiovascular risk.

8.2.1.1 Weight control

Recommendations

Encourage overweight and obese[a] hypertensive patients to lose weight.	**A**

a According to the BMI classification for Chinese adults adopted by the Department of Health, overweight is defined as BMI from 23.0 kg/m^2 to less than 25.0 kg/m^2, while obesity is defined as BMI 25.0 kg/m^2 or above.

Supporting evidence

• A study showed that weight loss of 9.5 lbs (4.3 kg) among overweight adults reduced systolic blood pressure by 3.7 mmHg and diastolic blood pressure by 2.7 mm Hg at six months[9]. Another study showed that an 18-month weight loss intervention program was significantly associated with a 77% long term reduction in the incidence of hypertension among subjects with blood pressure in the high normal range[10].	1+

8.2.1.2 Healthy eating

Recommendations

Increase consumption of fruits and vegetables to five portions per day, and reduce total and saturated fat consumption.	**A**

Supporting evidence

• Patient with high blood pressure is benefited by adoption of the Dietary Approaches to Stop Hypertension (DASH) eating plan[11] which is a diet rich in fruits, vegetables, and low in fat dairy products with a reduced content of dietary cholesterol as well as saturated and total fat. (Module 5)	1+

8.2.1.3 Dietary sodium restriction

Recommendations

Encourage all hypertensive patients to reduce salt intake to less than five grams (around one teaspoon of table salt) per day and not to use added salt.	**A**

Supporting evidence

• Systolic and diastolic blood pressure could be lowered by 6.7mmHg and 3.5mmHg respectively through decreasing daily dietary salt intake from 9 grams to 3 grams among a group of adults with blood pressure exceeding 120/80mmHg[11,12,13]. (Module 5)	1+

8.2.1.4 Physical activity

Recommendations

Advise hypertensive patients to increase level of physical activity and take regular exercises.	**A**

Supporting evidence

• Regular aerobic exercises among hypertensive individuals were associated with 4.94mmHg reduction of systolic blood pressure and 3.73mmHg reduction of diastolic blood pressure[14]. (Module 6)	1+

8.2.1.5 Alcohol consumption

Recommendations

Reduce alcohol intake in hypertensive patients to no more than two standard drinks per day[b] for men and one standard drink per day for women.	**A**

Supporting evidence

• Alcohol reduction was associated with a significant reduction in mean systolic and diastolic blood pressure. A dose-response relationship was found between the mean percentage of alcohol consumption and mean blood pressure reduction[15].	1++
• In large population-based studies, the incidence of hypertension is increased among those who drink more than 3 drinks per day, either in a linear dose-response relationship or with a threshold wherein smaller quantities are associated with a modest decrease. Chronically, the incidence of hypertension is increased among women who drink more than two drinks per day and among men who drink more than three per day[16,17]. The cessation of heavy drinking is usually followed by significant fall in blood pressure[18].	1++

For more information on alcohol screening and brief intervention, please visit the following web page from the Department of Health https://www.change4health.gov.hk/en/alcoholfails/

b Each standard drink contains 10 grams of pure alcohol. Defining one standard drink as 10 grams of pure alcohol, it equates to about 250 ml of regular beer at 5% of alcohol content, one small glass (100 ml) of wine at 12% alcohol content, or one pub measure (30ml) of hard liquor at 40% of alcohol content.

8.2.1.6 Stop smoking

Recommendations

Encourage all hypertensive patients to stop smoking.	A

Supporting evidence

• Smoking cessation is the most effective, immediate way to reduce cardiovascular risk. The pressor effect of smoking could be partly responsible for the major increase in stroke and coronary disease among smokers, as well as for the apparent resistance to antihypertensive therapy[19,20].	1++
• Smoking exerts a major pressor effect on ambulatory blood pressure monitoring[21]. The use of smokeless tobacco and cigars may also raise blood pressure[22]. Smoking cessation could reduce the overall cardiovascular risk as there was a clear dose-response relationship between the number of cigarettes smoked per day and risk of developing both coronary heart disease and stroke[23].	1++ 2++

If assistance is needed, please refer to Appendix 1 for more information on smoking cessation services.

For details regarding the practical approach to help patients quit smoking, please refer to the Module on Smoking Cessation in Primary Care Settings available at https://www.healthbureau.gov.hk/pho/rfs/english/pdf_viewer.html?file=download66&title=string81&titletext=string53&htmltext=string53&resources=11_en_Module_on_Smoking_Cessation

8.2.2 Drug treatment

Therapy begins with lifestyle modification, and if blood pressure goal is not achieved, drug treatment must often be considered in addition. The choice of drug treatment should take into account the specific indications and contraindications. (Module 7)

Recommendations

Consider to start drug treatment in patients with sustained systolic blood pressures ≥ 140mmHg or diastolic blood pressures ≥ 90mmHg despite lifestyle modification for 6 months or if target organ damage is present.	A

Supporting evidence

• The Hypertension Optimal Treatment (HOT) randomised trial showed that intensive lowering of blood pressure in patients with hypertension was associated with a low rate of cardiovascular events[24].	1++

8.3 Target values for blood pressure lowering

The relationship between blood pressure and cardiovascular risk is continuous. In general, the higher the risk of the individual patient, the more aggressive blood pressure lowering is indicated.

8.3.1 Individual with uncomplicated hypertension

Recommendations

The initial goal of therapy for uncomplicated hypertensive patients is blood pressure below 140/90mmHg; and for individuals who can tolerate, the blood pressure should be targeted to 130/80mmHg or lower.[c]	**A**

Supporting evidence

• Lowering systolic blood pressure to <140 mmHg reduced the relative risk of all major cardiovascular outcomes (including mortality); similar benefits were seen when systolic blood pressure was lowered to <130 mmHg. The latter was still true when the achieved systolic blood pressure in the comparator group was 130 - 139 mmHg. Achieved diastolic blood pressure to either 89 - 80 mmHg or <80 mmHg showed a reduction in all types of cardiovascular outcomes compared with higher diastolic blood pressure values.[24a]	1++

8.3.2 Patient with hypertension and diabetes

Recommendations

Target blood pressure is below 130/80 mmHg.	**A**

Supporting evidence

• Patients with hypertension and type 2 diabetes in the tighter blood pressure control group had far fewer cardiovascular system (CVS) events than those at the less tight control group[25].	1++
• The subgroup of diabetes patients randomised to lowest diastolic blood pressure group (<80 mmHg) had the most significant reductions in CVS events[25]. An even lower diastolic BP was found to be beneficial in diabetes patients	1++

c Lower blood pressure is advisable for young or overweight/obese patients, smokers and patients with other cardiovascular risk factors.

8.3.3 Patient with hypertension and chronic kidney diseases

Recommendations

Target blood pressure is below 130/80 mmHg.	**A**

Supporting evidence

• Patients with chronic kidney disease in the low target blood pressure group had a significantly slower reduction in glomerular filtration rate (GFR) decline compared with patients assigned to the high target blood pressure group[26].	1++
• The risks for kidney failure and the composite outcome of kidney failure and all-cause mortality were significantly lower in the low target blood pressure group[27].	1++
• Systolic blood pressure range of 110-129 mmHg was associated with the lowest risk of kidney disease progression in patients with urine protein excretion > 1g/day[28].	1++

8.4 Follow up and monitoring

After initiating antihypertensive drug treatment, most patients should be followed up within 2 weeks until the blood pressure goal is achieved. More frequent visits may be indicated for patients with systolic blood pressure ≥ 160mmHg or diastolic blood pressure ≥ 100mmHg or with complications.

Once the blood pressure goal is achieved, the follow-up interval may be extended to 6-12 weeks depending on the patient's condition and the doctor's assessment.

To help monitor patient progress, it is recommended to have a clinical data base to capture key criteria such as:

- blood pressure,
- risk profile status and trend
- drug regimen,
- compliance,
- side effect,
- end organ assessment result, and
- specialist care.

In addition to routine follow-up, annual assessment is recommended for all patients under antihypertensive treatment. Module 8 provides details regarding annual assessment for people with hypertension.

8.5 Referral

Most patients with uncomplicated hypertension can be managed by their primary care practitioners. However, certain situations may warrant referral to specialists for assessment (Box 2).

Box 2. Referral to Specialists

Immediate referral to hospital setting
● Malignant hypertension » DBP > 130mmHg » Heavy proteinuria » Papilloedema » Encephalopathy ● Accelerated hypertension: DBP > 130mmHg and retinal hemorrhage ● Persistent BP > 220/120mmHg despite rest or drug treatment ● Pregnancy: » BP ≥ 140/90mmHg and > 20 weeks gestation » Signs and symptoms of pre-eclampsia (headache, proteinuria, oedema)

Referral to specialist
● Suspected secondary hypertension ● Patients aged 30 or below ● Hypertension in pregnancy of less than 20 weeks gestation without signs and symptoms of pre-eclampsia ● Patients with progressive complications e.g. target organ damage ● Medication problems for example: » severe drug reaction » treatment resistance » multiple drug intolerance » multiple drug contraindication ● Pregnancy

Chapter 9. Component 4: Patient Empowerment

Empowerment of patient requires an increase of their awareness about what they can do to prevent diseases occurrences in the first instance such as living healthier lifestyles, the need for regular health checks and also the need for self-maintenance, thereby sharing with their doctors the management of their chronic diseases such as diabetes and hypertension. Certainly, the healthcare professional needs to develop a working alliance with their patients to enhance and support their capacity for self-maintenance and self-care.

Patients should understand the nature of hypertension, the need for long-term medication and healthy lifestyle maintenance, the consequence of poor blood pressure control, and treatment options. They should also be informed of the possible side effects of drugs and to seek medical advice should they occur. The aim of patient education is to empower patients with the necessary knowledge and skills so that they can take charge of their own health, to adopt a healthy lifestyle and have better adherence to the management protocols (Box 3).

Written information should be given to patients if available e.g. pamphlets on healthy eating, techniques for taking blood pressure.

Box 3. Patient's Knowledge, Skill and Behaviour Checklist

Patient with hypertension should know and practise:
● Know the nature of the disorder
● Understand hypertension can be asymptomatic
● Know the risk of complications and, in particular, the importance of blood pressure monitoring
● Set individual target of treatment
● Know individual lifestyle requirements
● Know importance of exercise in treatment and practise regularly
● Know self-monitoring of blood pressure, and the meaning of blood pressure readings, as well as what action needs to be taken
● Know the possible side effects of drugs they are taking and seek doctor's advice promptly should they occur
● Need to regularly follow up with your doctors

Chapter 10. Future Direction

Through developing and promoting the various reference frameworks, coupled with other system changes to the service delivery model for primary care, it is hoped to bring about a paradigm shift that would put a much greater emphasis on preventive care.

The reference framework is an evolving entity that will be extended and updated over time. The key to the usefulness of this reference framework is its adaptability to local structures, environments and needs. To achieve the goal of providing preventive services most effectively requires a multidisciplinary approach with concerted effort from all the stakeholders in primary care. It also involves a system adopting a more proactive approach that comprises the whole spectrum of primary, secondary and tertiary levels of prevention. It is hoped that the reference frameworks would:

1) Promote the family doctor concept which emphasises continuity of care, holistic care and patient-centred care.
2) Put greater emphasis on prevention of diseases and illnesses.
3) Facilitate primary care professionals to collaborate with other professionals to provide co-ordinated services.
4) Achieve collaboration and interfacing of service providers in the community through an integrated system.

Appendix 1. Smoking Cessation Services

Service	Organisation	Telephone number
Integrated Smoking Cessation Hotline of the Department of Health	Department of Health	1833 183 (Press 1)
Smoking Counselling and Cessation Hotline	Hospital Authority	1833 183 (Press 3), 2300 7272
HKU Youth Quitline	The University of Hong Kong	1833 183 (Press 5), 2855 9557
Tung Wah Smoking Cessation Hotline	Tung Wah Group of Hospitals	1833 183 (Press 2), 2332 8977
Pok Oi Smoking Cessation Service using Traditional Chinese Medicine	Pok Oi Hospital	1833 183 (Press 4), 2607 1222

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Age group	Lifestyle advice	Risk assessment	Screening	Disease management	Complication monitoring	Rehabilitation care
Antenatal	• A balanced diet • Regular intake of carbohydrates • Lower in fat • Plenty of fruits and vegetables • Physically active	• Monitor weight gain	• Watch out for pre-eclampsia	• Early antenatal care • Blood pressure and lipid control • Self-care	• Monitor fetal growth • Obstetric complications in women	
Infancy	• Breast feeding • Avoid obesity • Regular exercise • Adequate sleep	• Monitor weight gain				
Childhood	• Abstain from smoking • Regular exercise • Healthy eating habit • Limit sodium intake	• Monitor BMI	• Watch out for secondary hypertension	• Treat secondary hypertension • Monitor growth and development • Carer education and support	• Growth and development • Malignant hypertensions • Hypotension	
Adulthood	• Abstain from smoking • Smoking cessation for smokers • Healthy eating habit • Limit sodium intake • Weight management • Regular exercise • Limit alcohol consumption	• Monitor BMI • Monitor abdominal circumference • Family history of diabetes	• Measure blood pressure for all individuals aged ≥ 18 every 2 years[1] • More frequent blood pressure measurement for individuals with moderate or high risk of vascular disease[1] • Opportunistic measurement of blood pressure at all clinic visits	• Blood pressure and lipid control • Monitor the adverse effect of drug treatment • Self-care	• Target organ damage, e.g. nephropathy, neuropathy, cardiovascular complicationss • Hypotension • Malignant hypertension	

Age group	Lifestyle advice	Risk assessment	Screening	Disease management	Complication monitoring	Rehabilitation care
Elderly	• Abstain from smoking • Smoking cessation for smokers • Healthy eating habit • Limit sodium intake • Weight management • Regular exercise	• Monitor BMI • Monitor abdominal circumference • Diabetes	• Measure blood pressure as above-mentioned	• Blood pressure and lipid control • Beware of increased risk of hypotension in elderly • Monitor the adverse effect of drug treatment • Self-care • Carer education and support	• Hypotension • Malignant hypertension • Target organ damage: nephropathy, neuropathy, cardiovascular complications	• Optimise patient's potential to cope with hypertension and its complications. Example: myocardial infarction, cerebrovascular disease, nephropathy, etc. • Provide support to carer and loved ones • Multidisciplinary approach in rehabilitation for stroke and renal failure

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1. Equipment for recording blood pressure

1.1 Sphygmomanometer

i. Mercury sphygmomanometer – the most reliable type of instrument for recording blood pressure. However, mercury is being gradually phased out due to health and environmental hazard[1]. WHO recommends that mercury sphygmomanometers be retained for calibration purposes in designated laboratories[2].

ii. Electronic devices – can also be used, but periodic calibration should be done to ensure its accuracy.

iii. Electronic devices that record the pressure in the fingers or the wrist should be avoided.

1.2 Checking of mercury sphygmomanometer

i. The column of the manometer is in the intended position (vertical).

ii. Mercury level is at zero when cuff is deflated.

iii. No blockage of the air venting system at the top of the manometer

iv. A sluggish response or bouncing of the mercury column during inflation and deflation usually indicates a blocked vent.

v. No leakage from rubber tubing, hand pump and control valve:

   a. Roll a cloth cuff into its own tail.

   b. Pump up to 200 mmHg and wait for 10 seconds.

   c. Mercury should fall < 2 mmHg in 10 seconds.

   d. If fall > 2 mmHg, clamp circuit in sections to locate the leakage or replace the control valve.

1.3 Checking of electronic devices

i. Routine checks - compare the reading with mercury sphygmomanometer.

ii. Periodic calibration is needed.

iii. If consistent discrepancies of more than 5 mmHg persist, refer to service manual or send the monitor to a trained technician for calibration.

2. Blood pressure measurement and recording techniques

i. The client should be advised to be seated for at least 5 minutes before the recording is taken.
ii. Arrange client in sitting position.
iii. Remove any constrictive clothing from the arm.
iv. Support client's arm with the antecubital fossa at heart level.
v. Use an appropriate sized blood pressure cuff. The cuff should be wide enough to cover two thirds of the upper arm and its length should be long enough to encircle the whole arm.
vi. Advise client to relax and not to talk during blood pressure recording.
vii. Check blood pressure initially by palpation prior to auscultation.
    a. palpate the radial artery with your fingertips.
    b. inflate the cuff while simultaneously palpating the artery.
    c. note the point on the manometer at which the radial artery pulsation is no longer palpable. (This is the estimated systolic pressure.)
    d. deflate the cuff.
viii. Wait 30-60 seconds before reinflating.
ix. Place the stethoscope gently over the brachial artery and steadily inflate the cuff to the level of 30 mmHg above the estimated level of systolic pressure checked by palpation.
x. Deflate the blood pressure cuff by 2 mmHg per second.
xi. Record the first Korotkoff sound (the regular appearance of sound) as the systolic pressure.
xii. Record the last (5th) Korotkoff sound (the disappearance of sound) as the diastolic pressure. If sounds persist to zero, or close to zero, use the muffling sounds (4th Korotkoff sound) to indicate diastolic pressure.
xiii. Allow 1-2 minutes between blood pressure recordings.[3]
xiv. Three BP measurements should be recorded and additional measurements only if the first two readings differ by >10 mmHg. BP is recorded as the average of the last two BP readings.[3]
xv. In older people, people with diabetes, or people with other causes of orthostatic hypotension, BP should also be measured 1 minute and 3 minutes after standing. Orthostatic hypotension is defined as a reduction in SBP of ≥ 20 mmHg or in DBP of ≥ 10 mmHg within 3 min of standing.[3]
xvi. Before using an electronic device, check for pulse irregularity. If pulse irregularity is present, measure blood pressure manually using direct auscultation over the brachial artery[4].

xvii. The diagnosis of hypertension is confirmed if BP is substantially increased (e.g. grade 3 hypertension) and there is clear evidence of hypertension-mediated organ damage (e.g. hypertensive retinopathy with exudates and haemorrhages, LVH, or vascular or renal damage), or repeat office visits confirm a persistent elevation in BP. The number of visits and the time interval between visits varies according to the severity of the hypertension, and is inversely related to the severity of hypertension.[3]

3. Precautions about blood pressure recording

3.1 Recorder's precautions

i. Read at eye level.
ii. Avoid digital preference. The blood pressure reading should be corrected to the nearest 2 mmHg.
iii. Choose the correct cuff size (see 2 v).
iv. Consistent use of the 4th or 5th Korotkoff sounds for recording (see 2 xii).
v. Correct arm positioning
    a. blood pressure changes 8-10 mmHg for every 10 cm that the antecubital fossa is above or below the heart level.
    b. arm well supported (diastolic pressure may be raised by as much as 10%).
vi. Deflate the cuff not too rapidly or too slowly (see 2 x).
vii. Avoid venous congestion due to repeated measurement.
viii. Adopt a unified standard in recording routinely to avoid variation among recorders.

3.2 Patient's factors

i. Emotional factors including white coat hypertension: 24-hour ambulatory blood pressure monitoring and self BP monitoring at home can be used to address the white coat effect.
ii. Physical exertion: blood pressure will increase during exertion.
iii. After exercise, decrease in blood pressure may persist for more than one hour.
iv. After meals: blood pressure may decrease following meals; recording is not recommended within half an hour of eating.
v. Smoking and caffeine: should be avoided within 30 minutes prior to BP recording[5].
vi. Alcohol.
vii. Temperature extremes.
viii. Bladder and bowel distension.
ix. Pain.

4. Home/ self BP monitoring

4.1 Potential advantages and disadvantages of home monitoring

Advantages	*Disadvantages*
➢ Providing information on response to antihypertensive medication ➢ Improving patient adherence with therapy[6] ➢ Can identify white-coat and masked hypertension	➢ Reporting bias ➢ Unsupervised alteration of medication

4.2 Self-measurement of BP

- Persons with an average BP 135/85 mmHg measured at home are generally considered to be hypertensive[3,7].
- Two consecutive measurements are taken, at least 1-2 minutes apart and with the person seated and blood pressure is recorded twice daily[4].
- Initial assessment or the assessment of treatment effects should be for a 7-day period, with recordings performed in the morning and evening[3]. The average of the readings is taken as the home BP level.
- Home measurement devices should be checked regularly.

5. Ambulatory blood pressure

i. ABPM provides the average of BP readings over a defined period, usually 24 hours.
ii. It is typically programmed to record BP at 15 - 30 min intervals, and average BP values are usually provided for daytime, night-time, and 24 hours.[3]
iii. It can identify BP patterns (i.e. sustained, white-coat, masked, and nocturnal hypertension, and non-dipping or reverse-dipping BP).[8]
iv. For each period (daytime, nighttime, and 24 h), the average of all readings should be calculated to determine mean daytime BP, mean nighttime BP, and mean 24-h BP, respectively, and other BP measures (e.g. dipping).[8]
v. The values are, on average, lower than office BP values, and the diagnostic threshold for hypertension is ≥ 130/80 mmHg over 24 h, ≥ 135/85 mmHg for the daytime average, and ≥ 120/70 for the night time average (all equivalent to office BP ≥ 140/90 mmHg).[3,7]
vi. BP normally decreases during sleep. An arbitrary cut-off has been proposed to define patients as 'dippers' if their nocturnal BP falls by >10% of the daytime average BP value.

vii. Recognised causes for an absence of nocturnal BP dipping are sleep disturbance, obstructive sleep apnoea, obesity, high salt intake in salt-sensitive subjects, orthostatic hypotension, autonomic dysfunction, chronic kidney disease, diabetic neuropathy, and old age.[3]

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Table 1. Identifiable causes of hypertension (the ABCDE mnemonic)

A	• **A**ccuracy of diagnosis • obstructive sleep **A**pnea
B	• renal artery **B**ruits (renovascular disease noise) • **B**ad kidneys (renal parenchymal disease)
C	• excess **C**atecholamines • **C**oarctation of the aorta • **C**ushing's syndrome
D	• **D**rugs (immunosuppressive agents, NSAID, COX-2 inhibitors, estrogens / oral contraceptive, weight-loss agents, stimulants, mineralocorticoids, antiparkinsonian, monoamine oxidase inhibitors, anabolic steroids, sympathomimetics) • **D**iet (high salt intake, excessive alcohol intake, obesity)
E	• excess **E**rythropoietin • **E**ndocrine disorders (phaeochromocytoma, primary and secondary hyperaldosteronism, hyper- or hypothyroidism, parathyroid disease, Cushing syndrome)

Table 2. Findings suggestive of secondary hypertension

Findings	**Disorder suspected**
Snoring, daytime somnolence, obesity	Obstructive sleep apnea
Hypernatremia, hypokalemia, increased urinary excretion of potassium	Hyperaldosteronism
Renal artery bruits, renal insufficiency, atherosclerotic cardiovascular disease, oedema, elevated blood urea nitrogen and creatinine levels, proteinuria	Renal parenchymal disease
Systolic/diastolic abdominal bruit	Renovascular disease
Use of sympathomimetics, perioperative setting, acute stress, tachycardia	Excess catecholamines
Decreased or delayed femoral pulses, abnormal chest radiograph	Coarctation of aorta

Findings	Disorder suspected
Weight gain, fatigue, weakness, hirsutism, amenorrhea, moon facies, dorsal hump, purple striae, truncal obesity, hypokalemia	Cushing's syndrome
Use of drug (immunosuppressive agents, NSAID, COX-2 inhibitors, estrogens / oral contraceptive, weight-loss agents, stimulants, mineralocorticoids, antiparkinsonian, monoamine oxidase inhibitors, anabolic steroids, sympathomimetics)	Side effects of drugs
High salt intake, excessive alcohol intake, obesity	Unhealthy diet
Erythropoietin use in renal disease, polycythemia in chronic obstructive pulmonary disease (COPD)	Erythropoietin side effect
Paroxysmal hypertension, headaches, diaphoresis, palpitations, tachycardia	Phaeochromocytoma
Fatigue, weight gain, hair loss, diastolic hypertension, muscle weakness	Hypothyroidism
Heat intolerance, weight loss, palpitation, systolic hypertension, exophthalmos, tremor, tachycardia	Hyperthyroidism
Kidney stones, osteoporosis, depression, lethargy, muscle weakness	Hyperparathyroidism
Headaches, fatigue, visual problems, enlargement of hands, feet, tongue	Acromegaly

Reference:

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The aims of the evaluation are:

- to assess lifestyle and identify cardiovascular risk factors that may affect prognosis and guide treatment,
- to reveal identifiable causes of high blood pressure, and
- to assess the presence or absence of target organ damage and cardiovascular disease. (Box 1)

Box 1 Target organ damage[2]

- Heart: Left ventricular hypertrophy (ECG / Echocardiogram)
- Renal: Albuminuria and / or elevation of plasma creatinine (>110 µmol/L)
- Vessel: USG or radiological evidence of atherosclerotic plaque (carotid, iliac, femoral or aorta), generalised or focal narrowing of the retinal arteries
  - Angina or prior myocardial infarction
  - Prior coronary revascularisation
  - Heart failure
- Brain:
  - Stroke or transient ischaemic attack
  - Dementia
- Chronic renal disease
- Peripheral arterial disease
- Retinopathy: Hemorrhages or exudates, Papilloedema

History

- Symptoms suggestive of secondary causes
- Symptoms (present or past history) of cardiovascular risk factors: age>55 for men and age>65 for women/ smoking/ raised total cholesterol/ diabetes mellitus/ family history of premature cardiovascular disease (men under age 55 or women under age 65)
- Target organ damage: retinopathy/ left ventricular hypertrophy/ heart failure/ coronary heart disease (CHD)/ proteinuria or renal disease like renal failure / peripheral vascular disease (PVD)/ cerebrovascular accident (CVA)
- Factors that affect choice of drug treatment like gout, bronchospasm.
- Assessment of lifestyle: exercise, diet, alcohol
- Drug history
- Psychosocial factors
- Family history: hypertension (HT), diabetes, stroke, renal disease, myocardial infarction and other cardiovascular system (CVS) risk factors

Physical examination

- Body weight, height, Body Mass Index
- Features of Cushing's syndrome / Acromegaly (endocrine case of HT)
- Skin stigmata of neurofibromatosis (phaeochromocytoma)
- Radial/brachial femoral delay, precordial or chest murmurs (aortic coarctation or aortic disease)
- Abdominal examination: enlarged kidney, abdominal bruit
- Signs of organ damage: peripheral arterial disease, fundi abnormalities, carotid bruit, neurological defects, CVS examination

Routine laboratory investigation

Recommended Tests	***Justification***
General	
Urine analysis	• Detection of hypertensive nephropathy • Look for red blood cells, casts, glucose and protein
Fasting glucose level	• Detection of concomitant impaired glucose tolerance and diabetes
Renal function test	
Sodium, Potassium, Urea, Creatinine	• Baseline level of electrolytes to aid adjustment of future pharmacotherapy (e.g. thiazide, beta-blockers, Angiotensin-converting enzyme inhibitors • Detection of hypertensive nephropathy • Detection of electrolytes disturbance associated with endocrine disorders
Lipid profile	
Total Cholesterol Triglyceride HDL-Cholesterol LDL-Cholesterol	• Detection of concomitant cardiovascular risk factors • Guidance for antihypertensive and lipid-lowering pharmacotherapy
ECG	
12-lead electrocardiogram	• Detection of cardiac complication as possible end-organ damage (left ventricular hypertrophy; cardiac ischemia)

Reference:

1. U.S. Department of Health and Human Services. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. [Internet]. Bethesda, MD: U.S. Department of Health and Human Services; c2004 [cited 24 May 2011]. Available from: http://www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.pdf

2. The Royal Australian College of General Practitioners. Guidelines for preventive activities in general practice 7th edition. [Internet]. South Melbourne (Australia): The Royal Australian College of General Practitioners; c2009 [cited 24 May 2011]. Available from: http://www.racgp.org.au/redbook/index

The Dietary Advice to Stop Hypertension eating plan[1]

The Dietary Advice to Stop Hypertension (DASH) eating plan, developed by United States National Institute of Health, features plenty of fruits, vegetables, whole grains, and other foods that are heart healthy and lower in salt/ sodium. It is recommended for people with high blood pressure. Please refer to Table 1 for DASH eating plan.

The DASH eating plan has the following characteristics:

1. Rich in fruits, vegetables
2. Rich in potassium, magnesium and calcium
3. Low in cholesterol, saturated and total fat
4. Low in sodium
5. Low in sweets and added sugars

Table 1. The DASH eating plan shown below is based on 2000 calories a day. The number of daily servings in a food group one requires may vary from those listed, depending on the caloric needs.

Food Group	**Daily Servings**	**Examples of Serving Sizes**
Grain and grain products	6-8	1 slice bread 1 cup[Note] ready-to-eat cereal 1/2 cup cooked rice, pasta, or cereal
Vegetables	4-5	1 cup raw leafy vegetables 1/2 cup cooked vegetables 1/2 cup vegetable juice
Fruits	4-5	1 medium fruit 1/4 cup dried fruit 1/2 cup fresh, frozen, or canned fruit 1//2 cup fruit juice
Low fat or fat free dairy products	2-3	1 cup milk 1 cup yoghurt 1 1/2 ounce cheese
Lean meats, poultry, and fish	6 or less	1 ounce (28 grams) cooked lean meat, skinless poultry, or fish

Food Group	Daily Servings	Examples of Serving Sizes
Nuts, seeds, and dry beans	4-5 per week	1/3 cup or 1 1/2 ounces nuts 1 tablespoon or 1/2 ounces seeds
Fats and oils	2-3	1 teaspoon soft margarine 1 tablespoon low-fat mayonnaise 2 tablespoons light salad dressing 1 teaspoon vegetable oil
Sweets	5 or less per week	1 tablespoon sugar 1 tablespoon jelly or jam 1 cup lemonade

Note: Volume of cup = 240 ml

Specific instructions on dietary intervention (adapted from DASH eating plan)

Salt

Restrict salt intake to less than 5 grams of table salt per day (around 1 teaspoon), as sodium is a main dietary factor for elevated blood pressure. The 5 grams includes all salt and sodium consumed, including that used in cooking and at the table. Please refer to table 2 for practical advice.

Tips to reduce salt and sodium

- Compare nutrition labels and choose prepackaged foods that are lower in sodium.
- Use fresh poultry, fish, lean meat and vegetables. Limit consumption of foods that are high in salt content such as sauces, preserved meat and vegetables, and canned and processed foods like luncheon meat and sausages.
- Cut down on convenient and instant foods, canned soups or broths as they often contain a lot of sodium.
- Cook food with less salt. Use spices instead of salt in cooking and at the table. Limit condiments, such as mustard, ketchup, pickles and soy sauce.
- Use more natural low-sodium seasoning, such as ginger, green onions, garlic, pepper powder, lemon juice, etc. to replace salt or soy sauce in cooking.

Salt substitutes

- A potassium-rich diet may help to reduce blood pressure.
- Potassium should be from food sources, not from supplements.
- Many fruits and vegetables e.g. potato, spinach, tomato, lettuce, banana, orange, apple and some dairy products e.g. yoghurt, and fish are rich sources of potassium.
- However, potassium-rich diet should be avoided in patients with chronic renal failure or taking potassium-sparing diuretics.

Table 2. Practical advice for low salt diet

Meals and foods
Breakfast • 1 cup oatmeal • 2 slice whole wheat bread • 2 teaspoons of soft margarine • 1 cup low fat or skimmed milk • 1 medium fruit
Lunch • 2 cups cooked rice or pasta • 3 ounces (84 grams) of cooked meat, fish or poultry • 1/8 teaspoon of salt in cooking, or equivalent • 1 teaspoon vegetable oil • 1 cup cooked vegetable • 1 medium fruit
Dinner • 1 medium baked potato • 1 teaspoon of sour cream • 3 ounces (84 grams) of cooked meat, fish or poultry • 1/8 teaspoon of salt in cooking, or equivalent • 1 teaspoon vegetable oil • 1 cup cooked vegetable • 1 medium fruit

Meals and foods
Snack • 1 medium fruit • 1 slice whole wheat bread • 1.5 ounces reduced fat cheddar cheese, low sodium • 1 cup low fat yoghurt
Total salt used per day: 1/4 teaspoon of salt

Note : Salt exchange list: 1/8 teaspoon of salt = 1/2 teaspoon of soya sauce
= 1 oyster sauce
= 1 tablespoon of Ketchup

Carbohydrate intake[2]

- Carbohydrate should provide half of the total energy intake.
- Meals should contain mostly complex carbohydrates with an emphasis on high-fibre foods such as vegetables, whole grain cereals and fruits.
- Simple sugar including sugar sweetened beverages (e.g. soft drinks, fruit juice) and snacks with high sugar content (e.g. cakes) should provide no more than 10% of total energy intake.

Fruit and Vegetables

- Include 4-5 servings of fruit a day.
- Eat at least 4-5 servings of vegetables a day.
- Choose fruit more often than juice.
- Choose a wide variety of fruit and vegetables.

Protein[2]

- Protein should provide 15-20% of total energy intake.
- Good sources of protein are fish, seafood, lean meat, chicken, low fat dairy products, nuts and soy bean products which have not been deep-fried.

Fat[2]

- No more than 30% of total energy intake should come from fat.
- Cut down on foods with high saturated fat.
  - High-fat meat and meat products, such as bacon, spare ribs, sausages, and canned meat like luncheon meat.
  - High-fat poultry parts, such as chicken skin and chicken wings.
  - High-fat dairy products, such as ice-cream, whole milk and cheese made from whole milk.
  - Fat and oil, such as butter, cream, lard and chicken fat.
  - High-fat foods from plants: Palm oil, coconut, and coconut products, such as coconut oil and coconut milk.
- Cut Down on Foods High in Cholesterol. Foods high in cholesterol include:
  - Offal, such as brain, liver and kidney.
  - Seafood, such as octopus, squid, fish head, and roe of shrimp and crab.
  - Egg yolk is high in cholesterol but also rich in nutrients and can be part of a healthy diet. If a person has an egg for breakfast, he/she might want to substitute some vegetarian choices for their other meals of the day.
- Cut Down on Foods that Contain Trans Fat. Foods high in Trans Fat: Hard margarine, cookies, cakes, croissants, French fries, potato chips and doughnuts.
- Use vegetable oil such as canola oil and peanut oil for cooking instead of animal fat.

Alcohol Consumption

- Consumption should be limited to less than 2 standard drinks for men and less than 1 standard drink for women every day.
- Each standard drink contains 10 grams of pure alcohol. Defining one standard drink as 10 grams of pure alcohol, it equates to about 250 ml of regular beer at 5% of alcohol content, one small glass (100 ml) of wine at 12% alcohol content, or one pub measure (30ml) of hard liquor at 40% of alcohol content.

For more information on alcohol screening and brief intervention, please visit the following web page from the Department of Health https://www.change4health.gov.hk/en/alcoholfails/

Reference:

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1. Effect of Exercise

Epidemiological studies suggest that regular physical activity may be beneficial for both prevention and treatment of hypertension, to enable weight loss, for functional health status, and to diminish all-cause mortality and risk of cardiovascular disease. Cross-sectional studies of select populations from China and other Eastern populations have confirmed the presence of a strong association between physical inactivity and an adverse heart disease risk factor profile. In Japanese men, duration of walk-to-work and leisure-time physical activity was significantly associated with a reduction in the risk for incident hypertension. A meta-analysis of randomized controlled trials concluded that dynamic aerobic endurance training reduces resting systolic and diastolic blood pressures by 3.0/2.4 mmHg, and daytime ambulatory blood pressure by 3.3/3.5 mmHg. The reduction in resting blood pressure was more pronounced in the hypertensive group (-6.9/ -4.9 mmHg) than in the normotensive group (-1.9/-1.6 mmHg). Even moderate levels of exercise lowered blood pressure, and this type of exercise also reduced body weight, body fat and waist circumference. Dynamic resistance exercise can also decrease resting blood pressure by 3.5/3.2 mmHg.

2. Recommendations for Exercise Prescription

The following table summarises the exercise prescription that is recommended for patients with hypertension in general.

Regular physical activity of even lower intensity and duration, however, has been shown to be associated with about a 20% decrease in mortality in cohort studies. Individuals engaging in resistance exercise should seek guidance by a trained professional, for appropriate machine adjustment, selection of specific exercises, appropriate initial exercise prescription, and subsequent exercise progression. Resistive isotonic activities, when done as the only form of exercise training, are not recommended for lowering blood pressure in hypertensive patients. An exercise prescription for achieving and maintaining flexibility, such as proper stretching for all the major joints, may be advised after a thorough warm-up and during the cool-down period.

Physical Activity Profile	Recommendations*
Frequency	• Perform aerobic exercise preferably all days of the week. • Supplemented by resistance exercise twice to thrice weekly on nonconsecutive days.
Intensity	• Aerobic exercise should be at least at moderate intensity (e.g. brisk walking), corresponding approximately to 40-60% of maximal aerobic capacity (VO2max). Relatively, moderate-intensity activity could be expressed as a level of effort of 5 or 6 on a scale of 0 to 10 (where 0 is the level of effort of sitting, and 10 is maximal effort) or 50–70% of maximum heart rate. • Resistance exercise should be at moderate intensity, which could be expressed as 50-70% of 1-repetition maximum (1-RM– maximum amount of weight one can lift in a single repetition for a given exercise).
Time	• Perform 30 to 60 mins per day of aerobic exercise continuously or intermittently in bouts of at least 10 mins accumulated to total of at least 30 mins per day. • Each session of resistance exercise should minimally include 8–10 exercises and should consist of at least 1 set of 8–12 repetitions per exercise.
Type	• Emphasis on aerobic exercises such as walking, jogging, cycling and swimming. Rope skipping is also a very good option that can be performed every day, requires little equipment and learning, and involves a lot of muscle group. However, any activity that uses large muscle groups, can be maintained continuously, and is rhythmical and aerobic in nature is recommended as the primary modality for those with hypertension. • Resistance exercise should involve the major muscle groups (legs, hips, chest, back, abdomen, shoulders, and arms). Either machine weights or free weights might be used while the former is likely the safest approach. Resistance exercise performed should be alternating between upper- body and lower-body works to allow for adequate rest between exercises. Some examples of resistance exercise include chest press, shoulder press, triceps extension, biceps curl, pull-down (upper back), lower-back extension, abdominal crunch/curl-up, quadriceps extension or leg press, leg curls (hamstrings), and calf raise.

* Given that many patients may present with comorbidities, it may be necessary to tailor the exercise prescription accordingly.

3. Rate of Progression

In November 2010, the American College of Sports Medicine and the American Diabetes Association published a joint position statement on exercise recommendations for patients with Type 2 diabetes mellitus which covers rate of progression. Their general principles, as outlined below, can also be applied to patients with hypertension:

- To avoid injury, progression of frequency and intensity of resistance exercise should occur slowly.
- Gradual progression of intensity of aerobic exercise is also advisable to enhance compliance.

4. Evaluation of patient with hypertension before recommending an exercise programme

The need for and scope of pre-exercise evaluation of the cardiovascular status will depend on the extent of the envisaged exercise and on the patient's symptoms and signs, total cardiovascular risk and associated clinical conditions. The risk of cardiovascular disease in patients with hypertension is determined not only by the level of blood pressure, but also by the presence or absence of target organ damage and other risk factors such as smoking, dyslipidaemia and diabetes, as shown in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. These factors independently modify the risk for subsequent cardiovascular disease, and their presence or absence is determined during the routine evaluation of patients with hypertension (i.e., history, physical examination, and/or laboratory tests). High-intensity resistance training should not be initiated for persons without prior exposure to more moderate resistance exercise independently of age, health status, or fitness level. Therefore, patients with hypertension should consult a primary care practitioner prior to any substantive increase in physical activity, particularly vigorous-intensity activity.

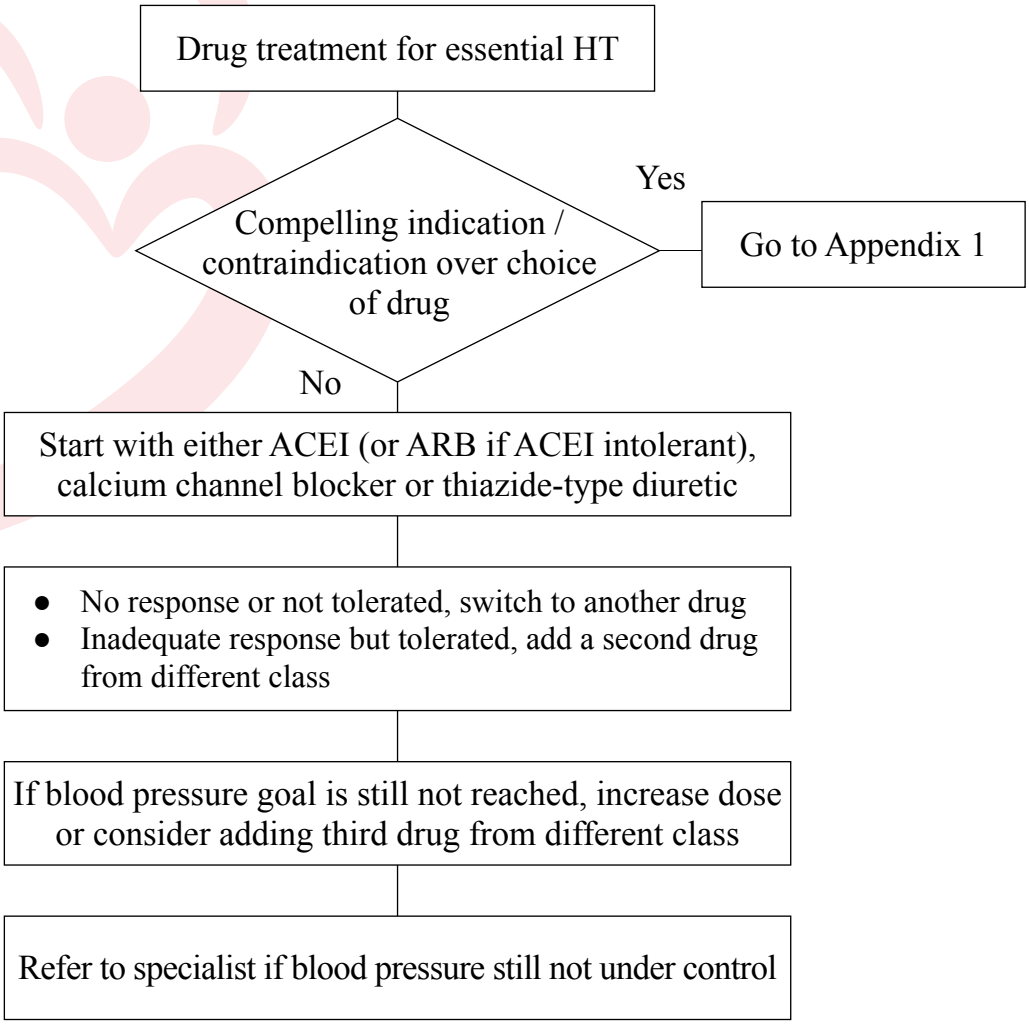
5. Special Precautions

1. Intensive isometric exercise such as heavy weight lifting can have a marked pressor effect and should be avoided.
2. If hypertension is poorly controlled, heavy physical exercise as well as maximal exercise testing should be discouraged or postponed until appropriate drug treatment has been instituted and blood pressure lowered. When exercising, it appears prudent to maintain systolic blood pressures at ≤220 mmHg and/or diastolic blood pressures ≤105 mmHg.
3. β-blockers and diuretics may adversely affect thermoregulatory function and cause hypoglycaemia in some individuals. In these situations, educate patients about the sign and symptoms of heat intolerance and hypoglycaemia, and the precautions that should be taken to avoid these situations.
4. Antihypertensive medications such as calcium channel blockers, α-blockers and vasodilators may lead to sudden reductions in post-exercise blood pressure. Extend and monitor the cool-down period carefully in these situations.
5. β-blockers, particularly the non-selective types, may reduce sub-maximal and maximal exercise capacity primarily in patients without myocardial ischaemia. Consider using perceived exertion to monitor exercise intensity in these individuals.
6. Patients should be informed about the nature of cardiac prodromal symptoms e.g. shortness of breath, dizziness, chest discomfort or palpitation and seek prompt medical care if such symptoms develop.

Reference:

Recommendations for Prescribing Exercise to Patients with Hypertension. Chapter 7, The Exercise Prescription Doctor's Handbook (2012). Department of Health.

Treatment algorithm



Choices of antihypertensive drugs and goals of therapy

The ultimate goal of anti-hypertensive therapy is to reduce cardiovascular morbidity and mortality. There are excellent clinical outcome trial data proving that lowering blood pressure with different classes of anti-hypertensives, including angiotensin converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), beta-blockers (BBs), calcium channel blockers (CCBs), and thiazide-type diuretics, will all reduce the complications of hypertension.[4,6-11,14] It should be emphasized that the perceived risk reduction was directly proportional to blood pressure reduction rather than the drug class used to achieve it,[1] although different drug classes were recognized to have unique benefits specific to individual patient populations.[28]

It has also shown that the lower the blood pressure the better, and that this should be the primary objective of any treatment strategy.[1] Therefore it is important to treat in order to reach the target blood pressure levels whichever drug(s) is/are used[1], i.e. for uncomplicated hypertensive patients, treating SBP and DBP to targets <140/90mmHg, or to 130/80mmHg or lower if tolerable. In patients with co-morbidities of diabetes or renal disease, the blood pressure target is <130/80mmHg. While for patients with coronary artery disease, the blood pressure should be lowered slowly, and caution is advised in inducing falls of diastolic blood pressure below 60 mmHg if the patient also has diabetes mellitus or is over the age of 60 years.[25]

Within the array of available agents, the choice of drugs will be influenced by many factors, including:

1. The previous, favourable or unfavourable, experience of the individual patient with a given class of drugs.
2. The cost of drugs, either to the individual patient or to the health care provider, although cost considerations should not predominate over efficacy and tolerability in any individual patient.
3. The presence of target organ damage, renal disease, diabetes or the presence of other coexisting cardiovascular disease that may either favour or limit the use of particular classes of antihypertensive drugs. [25] Approach to patients with compelling indications is described in Appendix 1.
4. A significant number of patients require two or more anti-hypertensive drugs in order to achieve blood pressure control.[2,3] The possibility of interactions with drugs used for other conditions present in the patient.
5. There is substantial inter-individual variation in response to single drugs with large absolute falls in some patients, contrasting with little or no response in others.[26]

The family doctor should tailor the choice of drugs to the individual patient, after taking all these factors into account.

With reference to the UK and US guidelines,[5,12] the rationales on selecting different classes of drugs for uncomplicated hypertensive patients are introduced below.

Thiazide-type diuretics

Thiazide-type diuretics have been widely studied and shown to be the drug most likely to confer benefit as first-line treatment for most patients.[11,27,29] In these trials, including ALLHAT[7] thiazide-type diuretics had significantly prevent the cardiovascular complications of hypertension. Thiazide-type diuretics are generally well tolerated and have good blood pressure lowing effect in particular older patients. Thiazide-type diuretics are also more affordable than other antihypertensive agents and are recommended as the initial therapy for most patients with hypertension by US guideline.[5]

Angiotensin-converting enzyme inhibitors (ACEI)/ Angiotensin II Receptor Antagonists (ARB)

It was demonstrated that younger patients and Caucasians tend to have higher serum renin levels than those older patients and the black population, and thus should have better response to ACEI/ ARB which inhibit the renin-angiotensin system.[12,16,17,18] ACEI/ ARB is recommended by the UK guideline[12] as the initial drug choice for people aged <55. Apart from younger patients, ACEI/ ARB are also the drug of choice for patients with heart failure, left ventricular dysfunction, myocardial infarction, ischemic heart disease, diabetic nephropathy, microalbuminuria or history of stroke.

Calcium Channel Blockers (CCB)

Data showed that the blood-pressure lowering effect of CCB is good in most patients. It is well tolerated in general. Clinical trial data also proved that lowering BP with CCB reduces the complications of hypertension.[13,14] It is the most commonly used anti-hypertensive medication by private doctors in Hong Kong.[15]

Beta-blocker

The decision not to recommend Beta-blockers for first line therapy is based on evidence from head-to-head trials[19,20,21,22] that beta-blockers were less effective than the comparator drug at reducing major cardiovascular events, in particular stroke. An additional concern is the increased risk of developing diabetes, particular with the combination of thiazide-type diuretic. However, beta-blockers may be considered in younger people, particularly[24]:

- for those with an intolerance or contraindication to ACE inhibitors and angiotensin-II antagonists or
- for women of child-bearing potential or
- for patients who have previously had a heart attack, angina, heart failure or an irregular heart beat

Appendix 1 Compelling and Possible Indications and Contraindications for the Major Classes of Antihypertensive Drugs[23]

Class of Drug	Compelling Indications	Possible Indications	Compelling Contraindications	Possible Contraindications
ACE Inhibitors (ACEI)	Heart failure, Left ventricular dysfunction, Post myocardial infarction, Diabetic nephropathy	Proteinuric renal disease	Pregnancy, Bilateral renal artery stenosis, Hyperkalaemia	Renal impairment
Angiotensin II Receptor Blockers (ARB)	ACE inhibitor intolerance		Pregnancy, Bilateral renal artery stenosis, Hyperkalaemia	Renal impairment
Alpha-Blockers	Benign prostatic hypertrophy			Orthostatic hypotension
Beta-Blockers	Angina, Post myocardial infarction Tachyarrhythmias	Heart failure (low dose)	Asthma, chronic obstructive pulmonary disease, Heart block	Peripheral vascular disease
Calcium Channel Blockers (dihydropyridine)	Elderly patients, Isolated systolic hypertension	Angina, Peripheral vascular disease		Congestive heart failure
Calcium Channel Blockers (rate limiting, e.g. verapamil, diltiazem)	Angina		Heart block	Congestive heart failure, combination with beta-blockers
Thiazide/ thiazide-like Diuretics	Heart failure, Elderly patients, Isolated systolic hypertension		Gout	Dyslipidaemia, Pregnancy, Sexually active males

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Module 8 Annual Assessment

The aims of the annual assessment are:

1. to detect cardiovascular, cerebrovascular and renal complications
2. to assess patient's knowledge, attitude and compliance in respect of living with hypertension and drug treatment
3. to give appropriate advice to patient on healthy lifestyle and cardiovascular related risk factors
4. to ensure satisfactory control over the year (average of most recent three readings of <140/90 mmHg)

History:

1. New symptoms of cardiovascular complications like angina, neurological symptoms
2. Checking smoking status
3. Alcohol intake
4. Exercise
5. Family history of premature coronary heart disease
6. Assessing patient's ideas and concerns about hypertension, side effects of drugs, compliance to treatment and effect on quality of life

Physical examination[1,2,3]:

1. Measure blood pressure with a mercury sphygmomanometer or validated electronic device
2. Check body mass index
3. Cardiovascular examination including peripheral pulses, bruits

Laboratory Investigation[1]:

Recommended Tests	***Justifications***
General	
• Fasting blood glucose	• Detection of concomitant diabetes • Guidance for cardiovascular risk factor control
• Urine for protein/ albumin	• Detection of hypertensive nephropathy
• Uric acid if patient is on diuretic	• Detection of diuretic-induced hyperuricaemia
• Optional - Random spot urine albumin: creatinine ratio (ACR)	• Detection of hypertensive nephropathy
Renal function test	
• Sodium, Potassium, Urea, Creatinine	• Detection of hypertensive nephropathy • Detection of diuretic-induced electrolyte disturbance
Lipid profiles	
• Total Cholesterol • Triglyceride • HDL-Cholesterol • LDL-Cholesterol	• Detection of concomitant cardiovascular risk factors • Guidance for antihypertensive and lipid-lowering pharmacotherapy

Management:

1. Review the risk factors and blood results
2. Assess the side effects of drug treatment and manage accordingly
3. Inform and encourage patient on lifestyle modifications like salt reduction and exercise
4. Explore reasons for non-compliance
5. Ensure patient understands nature of hypertension and benefits of long-term therapy and follow-up

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Module 9 Lipid Management in Hypertensive Patients

Aims of this module

To provide recommendations on lipid management in adult hypertensive patients for primary prevention of cardiovascular disease (CVD) in primary care setting[Note].

Screening

Screening of lipid profile should be performed for all newly diagnosed hypertensive patients, and as a part of the annual assessment[1]. This information, together with information on other risk factors, is useful in determining the individual's cardiovascular risk and provides insight into the subsequent management.

Global risk assessment

In addition to hypertension and dyslipidaemia, there are other major cardiovascular risk factors, such as advancing age, male gender, cigarette smoking, obesity, physical inactivity, and family history of premature cardiovascular disease[2]. The total risk of developing CVD is determined by the combined effect of cardiovascular risk factors, which commonly coexist and act multiplicatively. An individual with several mildly raised risk factors may be at a higher total risk of CVD than someone with just one elevated risk factor[3]. Therefore, the global risk approach should be considered in every cardiovascular risk assessment including patients with hypertension. For all identified modifiable cardiovascular risk factors, they should be managed as possible. Periodic review of the cardiovascular risk is also necessary.

[Note] For lipid management in diabetic patients, please refer to Hong Kong Reference Framework for Diabetes Care for Adults in Primary Care Settings.

Cardiovascular risk assessment Tools

Background

Cardiovascular risk assessment tools aim at helping physicians to estimate the risk of cardiovascular events for individuals without known cardiovascular diseases, based on the presence of different risk factors. The predicted risk of an individual can be a useful guide for making clinical decisions on the intensity of interventions[3], which should always be individualised. These multivariate cardiovascular risk assessment tools can usually be interpreted easily by referring simplified charts or tables, or by web-based calculators, and most of them can be accessed easily on the internet. There is currently no tool specifically designed for Chinese populations.

It has to emphasise that estimation of the cardiovascular risk is ***not*** necessary for individuals with known very high or high risk conditions *(Table 1)*. Lipid lowering therapy should be considered for these individual unless contraindicated.

Table 1. Individuals at very high and high risk of developing future coronary events[4]

Risk level	**Clinical presentation of individuals**
Very high risk	(1) Individuals with established coronary artery disease, atherosclerotic cerebrovascular disease, aortic aneurysm or peripheral artery disease (2) Individuals with diabetes mellitus with chronic kidney disease (3) Individuals with familial hypercholesterolaemia
High risk	(1) Individuals with moderate to severe chronic kidney disease (estimated glomerular filtration rate [eGFR] <60ml/min/1.73 m^2) (2) Individuals with diabetes mellitus without established coronary artery disease, atherosclerotic cerebrovascular disease, aortic aneurysm, peripheral artery disease or chronic kidney disease

Examples of cardiovascular risk assessment tools *(Table 2)*

A. Tools available as paper-based tables or charts

1. *Framingham-based*
   - The original Framingham risk score (published in 1998) derived from Framingham Heart Study[5], a prospective cohort of largely Caucasian population, was widely adapted worldwide, such as in National Cholesterol Education Program (NCEP)[6] and Joint British Societies 2 (JBS2)[7].
   - The Framingham system had been recalibrated for Asian populations for different cohorts, for example,
     - Singapore-adapted Framingham Risk Score[4]: adjusted for Chinese, Malay and Indian populations in Singapore
     - Asia Pacific Cohort Studies Collaboration[8]: cohorts from Japan, Korea, Singapore and China
     - The Chinese Multi-Provincial Cohort Study[9]: Chinese cohorts from mainland China
   - It had been suggested that Framingham equation can be applied to the Hong Kong Chinese population but requires recalibration in men due to overestimation of the risk[10]. There is currently no recalibrated tool available for local use

2. *Systemic Coronary Risk Evaluation (SCORE)*[11]
   - Based on European cohorts
   - Recommended by European Society of Cardiology/ European Atherosclerosis Society (ESC/EAS)[12, 13]

B. Tools available as web-based calculators

1. *QRISK2*[14]
   - Based on patient data from England and Wales in the United Kingdom
   - Included more medical variables such as type 2 diabetes, chronic renal disease, atrial fibrillation, and rheumatoid arthritis
   - Recommended by the National Institute of Clinical Excellence (NICE)[15]

2. *JBS3 Risk Calculator*[16]
   - Based on QRISK Lifetime cardiovascular risk calculator
   - Recommended by Joint British Societies' consensus recommendations for the prevention of cardiovascular disease (JBS3)[17]

3. *Pooled Cohort Equations*[18]
   - Derived from Whites and African Americans cohorts
   - Recommended by American College of Cardiology/ American Heart Association (ACC/AHA)[19]
   - Study had questioned its validity in Hong Kong Chinese due to poor discrimination power and calibration when applied to the Chinese population in Hong Kong[10]

Table 2. Examples of the cardiovascular risk assessment tools

Risk estimation system	Recommending guideline	Variables	Endpoint	Remarks
Paper-based tables or charts				
Framingham-based	● NCEP guidelines[6] ● JBS2 guidelines[7] ● Singapore guideline[4]	Sex, age, total cholesterol, HDL-C, SBP, smoking status, DM, HT treatment	10-year risk of CAD events (in original version)	NCEP and JBS2 guidelines are commonly used as reference in public sectors
SCORE[11]	● ESC/EAS Guidelines for the management of dyslipidaemias[12] ● European Guidelines on cardiovascular disease prevention in clinical practice[13]	Sex, age, total cholesterol or total cholesterol/HDL-C ratio, SBP, smoking status	10-year risk of CVD mortality	Web-based interactive tool (HeartScore) is available
Web-based calculators				
QRISK2[14]	● NICE guidelines on lipid modification: cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease[15]	Sex, age, race, total cholesterol/HDL-C ratio, SBP, smoking status, DM, HT treatment, family history, BMI, chronic disease	10-year risk of CVD events	
JBS3 isk calculator[16]	● Joint British Societies' consensus recommendations for the prevention of cardiovascular disease (JBS3)[17]	Sex, age, race, non-fasting total cholesterol and HDL-C, SBP, smoking status, DM, HT treatment, family history, BMI, chronic disease	10-year and lifetime risk of CVD events	
Pooled Cohort Equations[18]	● 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ ADA/AGS/APhA/ASPC/NLA/PCNA guideline on the management of blood cholesterol[19]	Sex, age, race (white or other/African American), total cholesterol, HDL-C, SBP, smoking status, DM, HT treatment	10-year risk for the first atherosclerotic CVD event	Poor Calibration for Hong Kong Chinese[10]

Abbreviations:
CVD: Cardiovascular disease
BMI: Body mass index
CAD: Coronary artery disease
HT: Hypertension
DM: Diabetes mellitus
HDL-C: High-density lipoprotein cholesterol
LDL-C: Low-density lipoprotein cholesterol
SBP: Systolic blood pressure

Treatment targets

The treatment target should be individualised for different patients. In general, the higher the cardiovascular risk, the more worthwhile to start lipid lowering therapy. For patients who have very high risk or high risk conditions (*Table 1*), lipid lowering therapy should be considered unless contraindicated. Many of the guidelines recommend different treatment goals for patients who have been stratified under different risk categories. There are also guidelines recommending the use of lipid lowering drugs for patients considered as high risk and do not recommend specific treatment targets. The treatment targets (if available) for primary prevention of some of the international guidelines are listed for reference in table 3.

For lipid management in diabetic patients, please refer to Hong Kong Reference Framework for Diabetes Care for Adults in Primary Care Settings.

Table 3. Treatment target levels of lipid (if available) for primary prevention in some of the international guidelines

Guideline	Risk Category	Lipid Target (if any)/ treatment strategies	Remarks
NCEP (2004)[20]	*Low*: 0-1 risk factor†	LDL-C < 4.1 mmol/L	Lipid targets are commonly used as reference in public sectors
	Moderate: ≥ 2 risk factors and 10-year CHD risk < 10%	LDL-C < 3.4 mmol/L	
	Moderately high: ≥ 2 risk factors and 10-year CHD risk 10 to 20%	LDL-C < 3.4 mmol/L (optional goal: < 2.6 mmol/L)	
	High: CHD equivalent‡ or 10-year CHD risk > 20%	LDL-C < 2.6 mmol/L (optional goal: < 1.8 mmol/L for very high risk)	
JBS2 (2005)[7]	*High:* 10-year CVD risk ≥ 20%	*Optimal targets:* LDL-C < 2.0mmol/L and TC < 4.0mmol/L, or 30% LDL-C reduction and 25% TC reduction *Audit (minimum) standard:* LDL-C < 3.0mmol/L and TC < 5.0mmol/L	Prediction charts are commonly used as reference in public sectors
JBS3 (2014)[17]	*Cholesterol lowering drug therapy is recommended in the following conditions:* • established CVD • high risk of CVD: DM age > 40 years, CKD stages 3–5, or familial hyperlipidemia • high 10-year CVD risk (threshold to be defined by NICE guidance, i.e. ≥ 10%) • high lifetime CVD risk estimated from JBS3 calculator, in whom lifestyle changes alone are considered insufficient by the physician and person concerned	Non-HDL-C of < 2.5 mmol/L (equivalent to <1.8 mmol/L for LDL-C)	A non-fasting blood sample as an estimate of the lipid profile

(Table continued on next page)

†Risk factors in NCEP guideline include cigarette smoking, hypertension, low HDL cholesterol, family history of premature CHD (CHD in male first-degree relative < 55 years of age; CHD in female first-degree relative < 65 years of age), and age (men ≥ 45 years; women ≥ 55 years).

‡CHD risk equivalents in NCEP guideline include clinical manifestations of noncoronary forms of atherosclerotic disease (peripheral arterial disease, abdominal aortic aneurysm, and carotid artery disease [transient ischemic attacks or stroke of carotid origin or > 50% obstruction of a carotid artery]), diabetes, and 2+ risk factors with 10-year risk for hard CHD > 20%.

Table 3. Treatment target levels of lipid (if available) for primary prevention in some of the international guidelines. *(Continued)*

Guideline	Risk Category	Lipid Target (if any)/ treatment strategies	Remarks
NICE (2014)[15]	10-year CVD risk ≥ 10%	Offer atorvastatin 20 mg for the primary prevention of CVD, and aim at > 40% non-HDL-C reduction	Fasting blood is not required for non-HDL-C
ESC/ EAS (2019)[12]	*Low:* • SCORE < 1%	Consider drug treatment if LDL-C ≥ 3.0 mmol/L despite of lifestyle intervention, target LDL-C < 3 mmol/L	
	Moderate: • Young patients (Type 1 DM <35 years; Type 2 DM <50 years) with DM duration <10 years, without other risk factors. • SCORE ≥ 1% to < 5%	LDL-C < 2.6 mmol/L	
	High: • markedly elevated single risk factors (e.g. TC > 8 mmol/L, LDL-C >4.9 mmol/L, BP ≥ 180/110 mmHg) or • Patients with FH without other major risk factors or • Patients with DM without target organ damage (microalbuminuria, retinopathy, or neuropathy), with DM duration≥10 years or another additional risk factor or • moderate CKD (GFR 30–59 mL/min/1.73 m2) or • SCORE ≥ 5% to < 10%	LDL-C < 1.8 mmol/L and ≥ 50% reduction on LDL-C	
	Very high: • documented ASCVD or • DM with target organ damage (microalbuminuria, retinopathy, or neuropathy), or at least three major risk factors, or early onset of Type 1 DM of long duration (>20 years) or • severe CKD (GFR < 30 mL/min/1.73 m2) or • SCORE ≥ 10% • FH with ASCVD or with another major risk factor	LDL-C < 1.4mmol/L (with and without FH) and ≥ 50% reduction on LDL-C Remark For patients with ASCVD who experience a second vascular event within 2 years (not necessarily of the same type as the first event) while taking maximally tolerated statin-based therapy, an LDL-C goal of <1.0 mmol/L (<40 mg/dL) may be considered.	

(Table continued on next page)

Table 3. Treatment target levels of lipid (if available) for primary prevention in some of the international guidelines. *(Continued)*

Guideline	Risk Category	Lipid Target (if any)/ treatment strategies	Remarks
New Zealand (2018)[21]	TC:HDL-C ratio ≥ 8	Recommend drug treatment irrespective of CVD risk	Risk based on new 5-year CVD risk prediction equations from the New Zealand PREDICT study[22] (i.e. NZ Primary Prevention Equations). However, the NZ Primary Prevention equations are currently not yet fully available for clinicians to use in practice. Clinicians can classify patients as low (5-year CVD risk <10%), intermediate (5-year CVD risk 10-20%) or high risk (5-year CVD risk ≥20%) using existing Framingham-based equations, and follow the appropriate management recommendations for the same risk category in the 2018 CVD consensus statement. Non-fasting blood is used to calculate CVD risk
	Low risk: 5-year CVD risk < 5%	Lifestyle advice (diet, weight management, physical activity, smoking cessation)	
	Intermediate risk: 5-year CVD risk 5-15%	Individualised informed decision on drug treatment. ≥ 40% LDL-C reduction is recommended if drug treatment commenced	
	High risk: 5-year CVD risk ≥ 15%	Recommend drug treatment and target LDL-C < 1.8mmol/L	
AHA/ ACC (2018)[19]	*Recommends the use of high or moderate intensity statin in different patient categories*		*Moderate-intensity statin:* 30% to < 50% LDL-C reduction (e.g. atorvastatin 10-20 mg, rosuvastatin 5-10 mg, simvastatin 20-40mg); *High-intensity statin:* ≥ 50% LDL-C reduction (e.g. atorvastatin 40-80 mg, rosuvastatin 20-40mg)
	Primary LDL-C ≥ 4.9mmol/L	High-intensity statin. Additional therapy (e.g. ezetimibe) for those achieve < 50% reduction of LDL-C and/or LDL-C ≥ 2.6 mmol/L with maximally tolerated statin therapy	
	Age 40-75 years with DM	Moderate-intensity statin. Consider high-intensity statin therapy with the aim to reduce LDL-C levels by ≥ 50% for DM patients with multiple ASCVD risk factors	
	Age 40-75 years without DM and LDL-C ≥ 1.8 to < 4.9 mmol/L		
	• *Low risk:* 10-year ASCVD risk < 5%	Emphasise lifestyle modifications	
	• *Borderline risk:* 10-year ASCVD risk 5% - < 7.5%	If risk enhancers* present, then risk discussion regarding moderate-intensity statin therapy	
	• *Intermediate risk:* 10-year ASCVD risk ≥ 7.5% - < 20%	If risk estimate with risk enhancers* favour statin, initiate moderate- intensity statin to reduce LDL-C by 30-49%	
	• *High risk:* 10-year ASCVD risk ≥ 20%	Initiate statin to reduce LDL-C ≥ 50% (high-intensity statin)	

* ASCVD risk enhancers in AHA/ACC guideline: family history of premature ASCVD, persistent elevated LDL-C ≥ 4.1 mmol/L, chronic kidney diseases, metabolic syndrome, condition specific to women (e.g. preeclampsia, premature menopause), inflammatory diseases (especially rheumatoid arthritis, psoriasis, HIV), ethnicity (e.g. South Asian ancestry), persistently elevated triglycerides (≥ 2 mmol/L)

Abbreviations:

ASCVD: Atherosclerotic cardiovascular disease
CHD: Coronary heart disease
CKD: Chronic kidney disease
CVD: Cardiovascular disease
DM: Diabetes mellitus
HDL-C: High-density lipoprotein cholesterol
HT: Hypertension
LDL-C: Low-density lipoprotein cholesterol
Non-HDL-C: Non high-density lipoprotein cholesterol
TC: Total cholesterol
TG: Triglycerides
FH : Familial hypercholesterolaemia

Management

Dyslipidaemia can be modified by dietary change, increase in physical activity and lipid lowering drugs. In case of any secondary causes of dyslipidaemia such as hypothyroidism, diabetes, liver disease, nephrotic syndrome or steroid treatment, they should be identified and treated accordingly. Lifestyle modification is recommended in all hypertensive patients with dyslipidaemia. Use of lipid lower drugs should be commenced in patients who are considered having high cardiovascular risk or when lifestyle modification alone fails.

Lifestyle modification [6, 12]

- Reduction of dietary fat intake
- Total fat <30% of total calorie/day
- Saturated fat <7%, cholesterol <200 mg
- Avoid any trans fat

Drug treatment (Figure 1)

There are some patient groups who are more likely to discontinue their lipid-lowering medications after prescription. Recent studies performed in Hong Kong found that younger subjects (<50 years), patients who paid their first clinic visit and those without any comorbidities were more likely non-adherent or discontinuing their medications[23,24]. These subjects should receive more meticulous monitoring of their medication-taking behaviour.

(1) Statins (HMG - CoA reductase inhibitors) [25-27]

- ↓ LDL-C ≥50%, if high intensity and 30-50% if moderate intensity, ↓TG 10-20%, ↑ HDL-C 1-10%[12]
- 25-55% risk reduction in cardiovascular diseases (coronary heart disease, stroke) in primary and secondary prevention studies
- Practical algorithm of statin usage is illustrated in Figure 1

(2) Fibrates [28]

- ↓ TG 50%, ↑ HDL-C ≤20%, ↓ LDL-C ≤20%[12]
- There is no strong evidence for using fibrate therapy in primary prevention of cardiovascular disease[12,28]. The use of fibrates in these patients should only be considered when statins are contraindicated.
- Combination therapy of statin and fibrate is associated with an increased risk for abnormal transaminase levels, myositis, and rhabdomyolysis. The risk of rhabdomyolysis is more common with higher doses of statins and renal insufficiency and appears to be higher when statins are combined with gemfibrozil (compared with fenofibrate)[19,28]. Hence, gemfibrozil should not be initiated in patients on statin therapy and fenofibrate is the preferred agent when used in combination with statin but should be used with cautions and under close monitoring.

(3) *Ezetimibe*

- ↓TG 8%, ↑HDL-C 3%, ↓LDL-C 15-22% if using ezetimibe alone. Adding ezetimibe to an ongoing statin reduces LDL-C levels by an additional 21-27%. In statin naive patients, combined therapy with ezetimibe and statin reduces LDL-C levels by around an additional 15%.[12]
- Can be used as an add-on drug in association with statins when the therapeutic target is not achieved at the maximum tolerated statin dose, or as an alternative to statins in patients who are intolerant of statins or with contraindications to statins[4,12]
- Life-threatening liver failure with ezetimibe as monotherapy or in combination with statins is extremely rare. The addition of ezetimibe to statin therapy does not appear to increase the incidence of elevated CK levels.[12]

(4) *Proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors*

- ↓TG 26%, ↑HDL-C 9%,↓ LDL-C 60%, depending on dose, largely independent of any background therapy[12]
- Have been approved as adjunctive therapy for patients with atherosclerotic cardiovascular disease (ASCVD) or familial hypercholesterolaemia who are receiving maximally tolerated statin therapy but require additional lowering of LDL-C[28].
- Requires subcutaneous injection
- Adverse events were minimal and tolerable[29]. Among the most frequently reported side effects are itching at the site of injection and flu-like symptoms[12].

Figure 1. Practical algorithm of statin usage

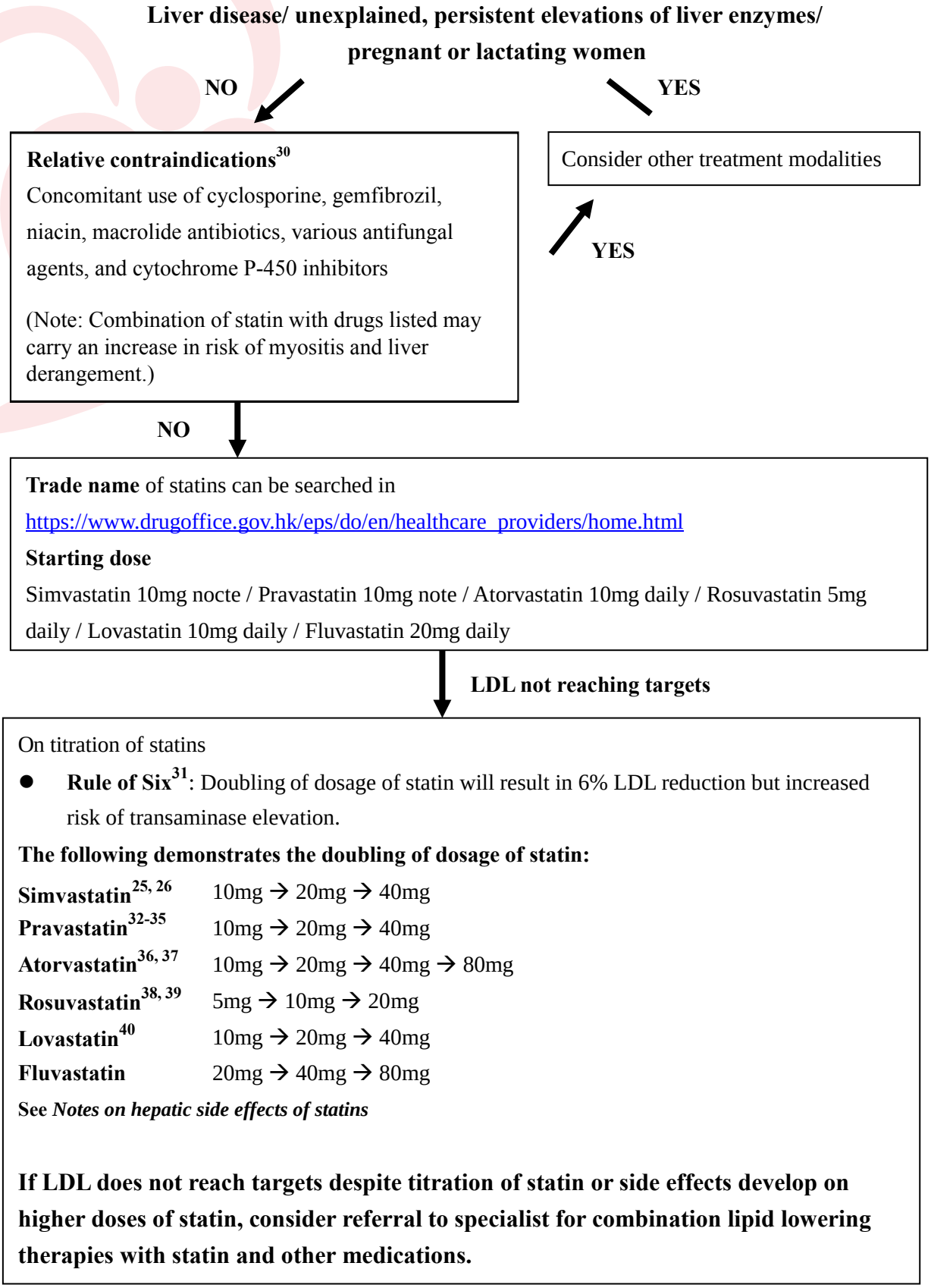

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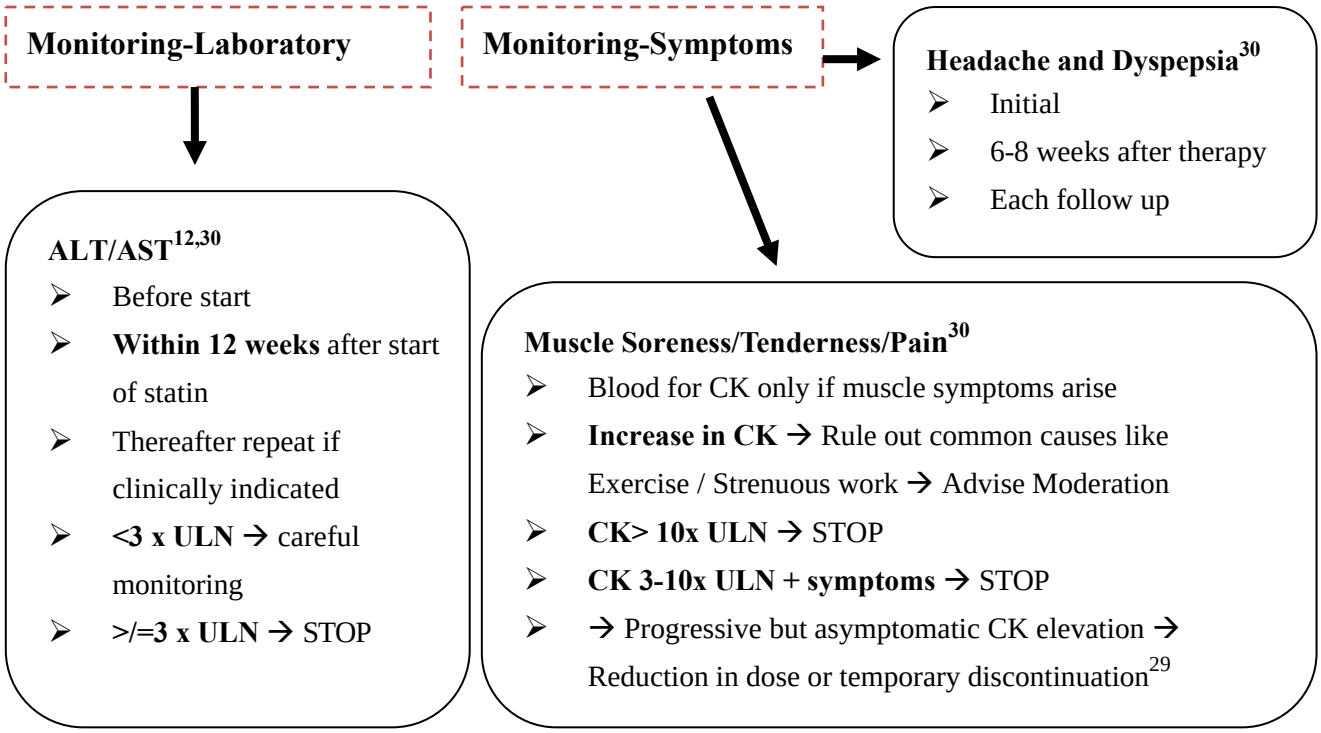
Figure 1. Practical algorithm of statin usage (Continued)



Abbreviations:

ALT: Alanine transaminase
AST: Aspartate aminotransferase
CK: Creatine kinase
ULN: Upper limit of normal

Notes on hepatic side effects of statin:

- Elevated hepatic transaminase generally occurs in 0.5%-2% of cases and is dose dependent[41, 42], with ↑ relative risk 2 – 4 fold at higher doses of statin
- Progression to liver failure specifically due to statin is exceedingly rare if ever occurs[43]
- Reversal of transaminase elevation is frequently noted with a reduction in dose, and elevations do not often recur with either re-challenge or selection of another statin[44, 45]

Simvastatin dose limitations

When used with simvastatin, the following medications can raise the levels of simvastatin in the body and increase the risk of myopathy. Taking no more than the recommended dose of simvastatin with these medications will help keep simvastatin levels in the body at a safer level.

New simvastatin label
Contraindicated with simvastatin: • Itraconazole • Ketoconazole • Posaconazole (New) • Erythromycin • Clarithromycin • Telithromycin • HIV protease inhibitors • Nefazodone • Gemfibrozil • Cyclosporine • Danazol
Do not exceed 10 mg simvastatin daily with: • Verapamil • Diltiazem
Do not exceed 20 mg simvastatin daily with: • Amiodarone • Amlodipine (New) • Ranolazine (New)
Avoid large quantities of grapefruit juice (>1 quart daily)

FDA Drug Safety Communication: New restrictions, contraindications, and dose limitations for Zocor (simvastatin) to reduce the risk of muscle injury. 15 Dec 2011.

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