

**CLINICAL GUIDELINES
FOR THE MANAGEMENT
OF
HYPERTENSION**

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Introduction

This guideline has been developed for the management of hypertension at primary health care level as part of the Ministry of Health's endeavour to improve and standardise the diagnosis, management and follow up of patients suffering from non-communicable diseases. The guideline has drawn on a number of reknown publications, a list of which appears at the end of the document. The development of this guideline is the combined efforts of physicians, cardiologists, Public Health Physicians, Health Educators, nutritionists, nurses and paramedical health care providers in association with the Mauritius Institute of Health. The authors have made special efforts to have evidence based information to support their recommendations and to adapt these to realities of health care facilities available at PHC level viz. availability of drugs, diagnostic facilities and staffing.

1. Definition of hypertension

Hypertension is defined as a systolic blood pressure of 140 mm Hg or greater and/or a diastolic pressure of 90 mm Hg or greater in subjects who are not taking antihypertensive medication.

High blood pressure contributes to the risk of coronary heart disease, stroke (thromboembolic and haemorrhagic) and damage to the heart, brain, kidneys and retina. The levels of systolic and diastolic blood pressure used to define hypertension are arbitrary. There are no thresholds of risk for the sequelae of hypertension: the higher the blood pressure the higher the risk. However, thresholds can be defined based on evidence of the effectiveness of pharmacological interventions at different blood pressure levels. For essential hypertension, we have adopted such thresholds.

Classification of Blood Pressure for Adults Age 18 and Older

CATEGORY	SYSTOLIC (mm Hg)		DIASTOLIC (mm Hg)
Optimal #	<120	and	<80
Normal	<130	and	<85
High-normal	130-139	Or	85-89
Hypertension #			
Grade 1	140 – 159	Or	90 –99
Grade 2	160 – 179	Or	100 – 109
Grade 3	≥ 180	Or	≥ 110
Systolic borderline hypertension	≥ 140	Or	≤90
# Optimal blood pressure with respect to cardiovascular risk is below 120 / 80 mm Hg. However, unusually low readings should be evaluated for clinical significance. Based on the average of two or more readings taken at each of two or more visits after an initial screening.			

Gestational Hypertension

Hypertension in pregnancy is usually defined as either a blood pressure of 140/90 mm Hg or greater or a rise in blood pressure from pre-conception or first trimester levels (e.g systolic B.P rise ≥ 25 mm Hg or a Diastolic BP rise ≥ 15 mm Hg).

Hypertension in special groups

For patients with diabetes and other causes of increased cardiovascular risk, a 5-year risk of cardiovascular event greater than 10% is the threshold for treatment. (This corresponds to a need to treat 25 patients for 5 years to prevent a single stroke or myocardial infarction).

The aim of investigation and treatment for hypertension is to identify those individuals who will benefit from blood pressure reduction and through appropriate measures (non-pharmacological and pharmacological) achieve target blood pressure levels.

2. Measurement of blood pressure

The accurate measurement of blood pressure is not easy. Three key elements are:

- training staff to ensure quality when measuring BP
- use and maintenance of equipment
- preparation of the patient.

2.1 Training

All health workers must be trained in correct measurement of blood pressure and must be able to demonstrate that they can follow the standard procedures recommended for BP measurement as they appear at 2.4 below. Doctors at Area Health Centres should ensure that all health personnel, i.e, nurses, community based rehabilitation workers, community health workers etc are able to take blood pressure correctly.

2.2 Equipment

Blood pressure is measured using a vertical mercury column sphygmomanometer. The bladder size of the cuff routinely used is 12.5 by 32 cm. Each day that a sphygmomanometer is used, check that the cuff and connecting tubes are not worn out, the inflation valve functions, the manometer tubes are clean, and the mercury column stands vertical with the mercury level at zero when the cuff is uninflated. These checks take only a few seconds. Any defects should be reported immediately.

2.3 Preparation of the patient

Explanation

The observer briefly explains the procedure to the patient, which is particularly important in a patient who has not had his blood pressure measured before and who may become alarmed as the cuff becomes tighter around the arm. The patient should also be told that it may be necessary to take more than one reading.

□ Posture of patient and position of arm

The patient is allowed to sit or lie for at least three minutes before the blood pressure is measured. The arm should be horizontal and supported with the antecubital fossa at the level of the midsternum. If the arm is above or below this level, under- and over-estimation respectively of diastolic and systolic blood pressure by around 10 mm Hg can occur.

□ Application of the cuff

Tight or restrictive clothing should be removed from the arm, and a cuff with a long enough bladder to go at least 80% of the way around the arm is placed with the centre of the bladder over the brachial artery. The cuff is placed with the tubing pointing to the shoulder so that it does not interfere with taking the reading. The lower edge to the bladder is placed 2-3 cm above the point of maximal pulsation of the brachial artery i.e. where the reading will be taken.

□ Position of manometer

The mercury column manometer is positioned so that it is vertical, not more than one metre away and at the eye level of observer.

□ Inflation of the cuff and reading of systolic and diastolic blood pressure

The observer palpates the radial or brachial pulse of the subject and rapidly inflates the cuff to 30 mm Hg above where the pulsation disappears. The stethoscope is placed gently over the position of the brachial artery and the cuff deflated at a rate of 2-3 mm Hg per second. The point at which clear repetitive (at least two consecutive beats) tapping sounds first appear gives the systolic pressure, and where they finally disappear (so called phase 5) gives the diastolic blood pressure. Both measurements are taken to the nearest 2 mm Hg. In some people, such as in pregnant women and elderly people, the tapping sounds may continue to, or close to, the zero point. In such cases the diastolic blood pressure is recorded at the point where the sounds become muffled (phase 4) and this is indicated in the patient record otherwise the reading is assumed to have been at phase 5.

3. Diagnosis of hypertension

The diagnosis of hypertension should be based on multiple blood pressure measurements, taken on separate occasions on different days.

When measuring blood pressure, particular care should be taken to:

- allow the patient to sit for at least 15 minutes in a quiet room.
- use an appropriate cuff size and the bladder should encircle at least 80 percent of the arm. Use a larger bladder for fat arms and a smaller bladder for children.
- use phase V Korotkoff sounds (disappearance of sound) to measure diastolic blood pressure

- measure the blood pressure in both arms during the first visit if there is evidence of peripheral vascular disease.
- measure the blood pressure in standing position in elderly subjects, diabetic patients and in other conditions in whom orthostatic hypotension is common.
- place the sphygmomanometer cuff at heart level, whatever the position of the patient.

Note: Self-measurement of blood pressure helps in distinguishing sustained hypertension from 'white-coat hypertension' and assessing response to antihypertensive medication while improving patient adherence to treatment.

4. Clinical History and Examination

4.1 Risk Estimation

As there is a strong relationship between the level of blood pressure and the risk of cardiovascular events, medical history and physical examination of the patient together with laboratory tests would identify other cardiovascular risk factors or target organ damage. This estimation will define the strategy in management of the hypertensive patient. Causes of hypertension would also be identified if initial assessment of the patient suggests a secondary hypertension especially if initially blood pressure is 180/110 mm Hg or greater and if the hypertension is resistant to treatment in spite of combination of 3 different drugs including a diuretic.

This personalized estimation of cardiovascular risk will help in defining management strategies in order to reduce cardiovascular morbidity and mortality.

4.2 Aims of clinical assessment and investigations

1. To detect cases of secondary hypertension
2. To detect the presence of certain risk factors e.g. diabetes mellitus, smoking, obesity, dyslipidaemia and alcohol abuse.
3. To detect target organ damage (TOD) e.g. kidney, heart, brain, eyes.

4.3 History

It should include:

- Family history of hypertension, diabetes, dyslipidaemia, coronary heart disease, stroke, or renal disease.
- Duration and previous levels of high blood pressure and drugs used
- Any other associated illnesses including heart failure, peripheral vascular disease, renal disease, cerebrovascular diseases
- Symptoms suggestive of secondary causes of hypertension.
- Lifestyle factors including dietary intake of fat, sodium and alcohol, quantitation of smoking and physical activity.
- Personal, psychosocial and environmental factors.
- Diabetes

4.4 Physical Examination

- measurement of height and weight and calculation of body mass index $Wt (kg)/[Ht (m)^2]$ and comparison with ideal weight (kilogrammes) $[height (in cm) - 100]$ e.g. an individual of height 1m60, the ideal weight is $160 - 100 = 60$ kg.
- measurement of waist comparison with norms
- Examination of the cardiovascular system, particularly for heart size, for evidence of heart failure, arterial disease in the carotid, renal and peripheral arteries and for coarctation of the aorta.
- examination of the lungs for wheezes and crackles and of the abdomen for bruits, enlarged kidneys and other masses.
- Examination of the optic fundi and of the nervous system for evidence of hypertensive retinopathy.

5. Investigations

5.1 Laboratory investigations

- Urine analysis for blood, protein, glucose and microscopic examination of urine.
- Blood chemistry should include measurements of potassium, creatinine, fasting glucose, cholesterol with HDL and LDL levels, triglycerides and uric acid.

5.2 Electrocardiogram

An electrocardiogram should be performed whenever clinical assessment reveals the presence of target-organ damage or suggests the possibility of left ventricular hypertrophy or of other cardiovascular disease.

5.3 Renal ultrasonography

Renal ultra sonography should be performed if renal disease is suspected. All patients with hypertension and protein in the urine should have a urine microscopy, culture and sensitivity done to exclude infection. (If infection is excluded and protein persists in the urine, the patient should be referred to the physician).

6. Management

6.1 Aims of treatment

1. To maintain normal blood pressure
2. To control all associated modifiable risk factors e.g. smoking, obesity, dyslipidaemia etc...
3. To treat end organ damage if present – e.g. kidney, heart, brain etc...

Antihypertensive treatment should be given in order to restore blood pressure to levels defined as ‘normal’ or optimal.

In order to achieve this, patients require:-

- Monitoring of blood pressure and other risk factors.
- Lifestyle measures
- Drug treatment

Lifestyle measures include the use of counselling and monitoring by appropriate health professionals such as nurses, dieticians as well as the physicians.

6.2 **Factors influencing treatment strategies**

Stratification of patients in terms of the total cardiovascular risk is not only useful for determining the threshold for initiating antihypertensive drug treatment; it is also useful for setting the goal blood pressure that should be achieved.

Table 1

Risk Factors for Cardiovascular Diseases	Target Organ Damage (TOD)	Clinical cardiovascular disease (CCD)
Major risk factors: <ul style="list-style-type: none"> • Smoking • Dyslipidemia • Diabetes mellitus • Age older than 55 years • Sex (men and postmenopausal women) • Family history of cardiovascular disease: women under age 65 or men under age 55 	<ul style="list-style-type: none"> • Left ventricular hypertrophy • (electrocardiogram, echocardiogram or radiogram) • Proteinuria and /or slight elevation of plasma creatinine concentration normal (1.2 – 2.0 mg/dl) • Ultrasound or radiological evidence of atherosclerotic plaque (carotid, iliac and femoral arteries, aorta) • Generalised or focal narrowing of the retinal arteries 	Cerebrovascular disease <ul style="list-style-type: none"> • Ischaemic stroke • Cerebral haemorrhage • Transient ischaemic attack Heart disease <ul style="list-style-type: none"> • Myocardial infarction • Angina • Coronary revascularisation • Congestive heart failure Renal disease <ul style="list-style-type: none"> • Diabetic nephropathy • Renal failure (plasma creatinine concentration > 2.0 mg/dl) Vascular disease <ul style="list-style-type: none"> • Dissecting aneurysm • Symptomatic arterial disease Advanced hypertensive retinopathy <ul style="list-style-type: none"> • Haemorrhages or exudates • Papilloedema

Table 2

RISK STRATIFICATION AND TREATMENT *			
Blood pressure stages (mm Hg)	Risk Group A (No Risk Factors No TOD/CCD)#	Risk Group B (At least 1 Risk Factor, Not including diabetes: No TOD/CCD)	Risk Group C (TOD/CCD and/or Diabetes, With or Without Other Risk Factors)
High-normal (130-139/85-89)	Lifestyle Modification	Lifestyle Modification	Drug therapy @
Grade 1 (140-159/90-99)	Lifestyle Modification (up to 12 months)	Lifestyle Modification \$ (up to 6 months)	Drug therapy
Grades 2 and 3 (≥ 160/≥ 100)	Drug therapy	Drug therapy	Drug therapy
<p>* Lifestyle modification should be adjunctive therapy for all patients recommended for pharmacologic therapy.</p> <p># TOD/CCD indicates target organ damage/clinical cardiovascular disease</p> <p>\$ For patients with multiple risk factors, clinicians should consider drugs as initial therapy plus lifestyle modifications</p> <p>@ For those with heart failure, renal insufficiency or diabetes</p>			

6.3 Non-pharmacological management

The following measures apply to all patients with hypertension, and to those patients identified as having ‘borderline hypertension’ i.e. systolic blood pressure 140 – 159 mm Hg or diastolic blood pressure 90 – 94 mm Hg.

- **Smoking**

The benefits to be gained from cessation of smoking tobacco are at least as great as those to be gained from the treatment of mild to moderate hypertension. Smokers with hypertension have a 2-3 times greater risk of stroke and coronary heart disease than hypertensive non-smokers. Stopping smoking rapidly reduces this risk. All patients who smoke are advised on each visit of the benefits of smoking cessation.

- **Obesity**
In patients with hypertension, a fall in weight of one kilogramme is associated with a fall in BP of one mm Hg. All patients above ideal weight are advised to reduce calorie intake to lose weight. Fresh fruit and vegetables should be encouraged as part of the diet.
- **Salt consumption**
A reduction in salt consumption gives 5/3 mm Hg reduction in blood pressure in hypertensive subjects. All patients are advised not to add salt at the dining table, and to avoid eating salty foods.
- **Alcohol consumption**
An 85% decrease in intake among drinkers consuming moderate amounts of alcohol results in a reduction of 5/3 mm Hg in hypertensives and 4/1 mm Hg in normotensives. A history of current alcohol consumption is taken. Men are advised to drink less than 21 units of alcohol a week and women less than 14 units.
- **Exercise**
Regular dynamic exercise has been shown to lower systolic and diastolic BP by 5-10 mm Hg. A history of current exercise levels is taken for each patient. The aim is to encourage them to take at least 30 minutes episodes of aerobic physical activities (such as brisk walking, swimming, cycling) on most days of the week.

6.4 **Pharmacological management**

6.4.1 *Blood pressure thresholds for the introduction of medication*

The decision of whether or not to introduce blood pressure lowering medication is dependent on three factors:

- The level of blood pressure
- The presence of absence of other cardiovascular disease risk factors
- The presence or absence of end organ damage

6.4.2 *Drug Treatment*

The six main drug classes used for blood pressure lowering are:

- Diuretics
- Beta-blockers
- Calcium Antagonists
- ACE Inhibitors
- Angiotensin II Antagonists
- Alpha-Adrenergic Blockers.

Sometimes methyl dopa and hydrallazine are also used.

All classes of antihypertensive drugs have specific advantages and disadvantages for particular patient groups.

Always begin with the lowest available dose of a particular agent in an effort to reduce adverse effects and consider the use of appropriate drug combinations to maximise hypertensive efficacy while minimising side effects.

Change to a different drug class if there is very little response or poor tolerability to the first drug used.

The use of long acting drugs provides 24-hour efficacy on a once-daily basis and this may provide greater protection against the risk of major cardiovascular events and the development of target organ damage and better compliance.

Treatment of hypertension is for life and it requires a good communication between the physician and the patient.

Compliance with therapy is improved with the participation of nurses, dieticians and trained counsellors.

Refractory hypertension occurs when lifestyle measures and combination drug therapy has failed to lower blood pressure below 140/90 mm Hg in patients with classical essential hypertension, or below 140 mm Hg systolic in patients with isolated systolic hypertension.

6.4.3 *Stepped care approach*

The approach taken is to start with a single drug and to introduce others if this fails to adequately control the blood pressure.

- First step: Hydrochlorothiazide, starting at 12.5 mg a day and increasing to 25 mg daily. If inadequate response, add atenolol 25 mg once daily increasing up to 100 mg daily if required.
- Second step: Combination of hydrochlorothiazide and atenolol. If atenolol contraindicated combine hydrochlorothiazide and nifedipine, or if hydrochlorothiazide is contraindicated, atenolol and enalapril maleate.
- Third step: if hydrochlorothiazide and atenolol or nifedipine combination in the second step then add enalapril maleate used in second step i.e. in combination with hydrochlorothiazide or atenolol then add methyldopa (initially 250 mg, twice daily, up to a maximum dose of 1000 mg daily in two or three divided doses)

6.4.4 *Target blood pressure levels*

The aims of treatment is to achieve a systolic blood pressure of less than 140 mm Hg and a diastolic blood pressure of less than 90 mm Hg in patients with essential hypertension. (less than 135/85 mm Hg in diabetics). If adequate blood pressure control is not achieved with the stepped care approach, and this is thought not to be due to non-compliance, then the question arises as to whether the patient should be referred for further investigation.

In pregnancy, the drugs that are widely used to lower blood pressure acutely are: labetalol and hydralazine. The drugs used for chronic treatment of hypertension in pregnancy are: Beta-Blockers (atenolol), Labetalol, Methyldopa, Hydralazine, Nifedipine and Isradipine.

The following drugs must be avoided during pregnancy: ACE Inhibitors, Angiotensin II Receptor Antagonists. Diuretics are infrequently used.

In presence of diabetes the drug of choice for the treatment of hypertension is ACE inhibitors especially long acting e.g. enalapril.

If they have vascular disease as well, they should not use COC's.

Guidelines for selecting drug treatment of hypertension

Class of drug	Mechanism of action	Principal unwanted effects	Compelling Indications	Possible Indications	Compelling Contraindications	Possible Contraindications
Diuretics Hydrochlorthiazide	Increased renal excretion of sodium and water, and direct action on vascular smooth muscle	Hypokalaemia Hyperglycaemia Hyperuricaemia Impotence Rashes	Heart Failure Elderly patients Systolic hypertension Chronic renal failure	Diabetes (in low doses)	Gout	Dyslipidaemia
Beta-Blockers Atenolol	Antagonism of catecholamines on β receptors leading to reduction in cardiac output, and renin	Fatigue Bronchospasm Cold hands and feet Heart failure Vivid dreams Impotence	Angina After myocardial infarction Tachyarrhythmias	Heart failure Pregnancy Diabetes	Asthma and chronic obstructive pulmonary disease Heart Block ^a	Dyslipidaemia Athletes and physically active patients Peripheral vascular disease Sexually active males
ACE Inhibitors enalapril maleate	Inhibits production of Angiotensin (potent vasoconstrictor)	Dry cough	Heart failure Left ventricular dysfunction After myocardial infarct Diabetic nephropathy	Heart failure Diabetes	Pregnancy Hyperkalaemia	Bilateral renal artery stenosis
Calcium Antagonists Nifedipin Amlodipin	Vasodilatation Mild diuretic effect	Flushing Headache Nausea Ankle oedema	Angina Elderly patients Systolic Hypertension	Peripheral vascular disease	Heart block ^b	Congestive heart failure ^c
Alpha-Blockers Prasocin	Acts on α_2 receptors in brain stem to reduce sympathetic tone	Drowsiness Impotence Postural hypotension Drug induced hepatitis	Prostatic Hypertrophy	Glucose intolerance Dyslipidaemia		Orthostatic hypotension
Angiotensin II Antagonists	Inhibits production of Angiotensin II		ACE Inhibitor cough	Heart failure	Pregnancy Bilateral renal artery stenosis Hyperkalaemia	
a Grade 2 or 3 atrioventricular block b Grade 2 or 3 atrioventricular block with verapamil or diltiazem c Verapamil or diltiazem						

(In diabetics who are hypertensive the drug of choice is an ACE inhibitor. If contraindicated use long acting calcium antagonist.

7. Indications for referral to specialist

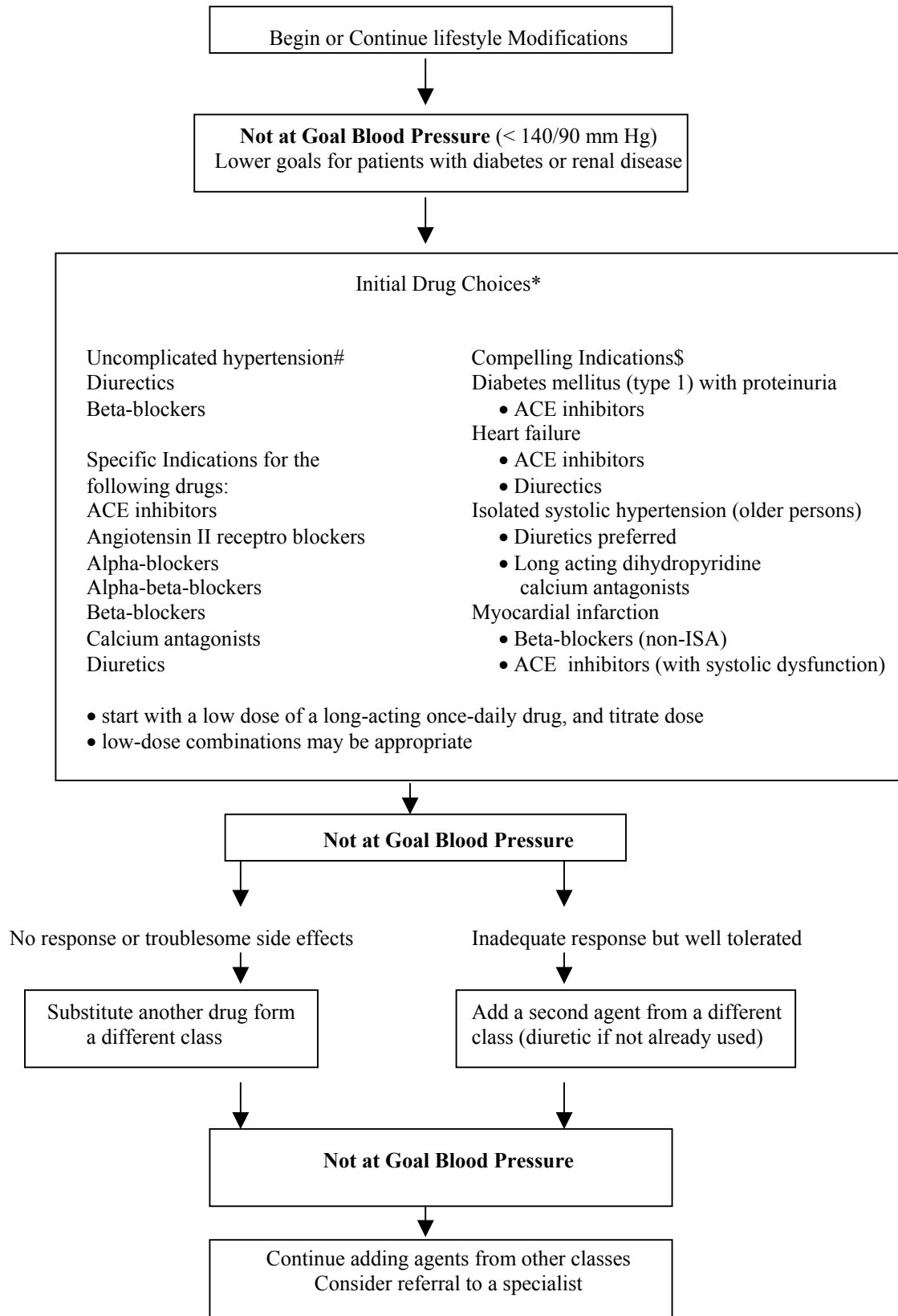
7.1 New cases

- If indications of secondary hypertension are present, refer to physician.
- If cardiac hypertrophy or coronary artery disease present, refer to cardiologist
- If malignant hypertension is present, refer to cardiologist
- If creatinine > 200 µmol/l, refer to physician

7.2 Follow up

- If cardiac disease develops, refer to cardiologist
- If cerebrovascular insufficiency/accidents develop, refer to physician
- If creatinine > 200 µmol/l, refer to physician

ALGORITHM FOR THE TREATMENT OF HYPERTENSION



* unless contraindicated. ACE indicates angiotensin-converting enzyme; ISA, Intrinsic sympathomimetic activity
 # Based on randomised controlled trials

CAUSES OF INADEQUATE RESPONSIVENESS TO THERAPY

Pseudoresistance

- 'White-coat hypertension' or office elevations
- Pseudohypertension in older patients
- Use of regular cuff on very obese arm

Nonadherence to therapy

Volume overload

- Excess salt intake
- Progressive renal damage (nephrosclerosis)
- Fluid retention from reduction of blood pressure
- Inadequate diuretics therapy

Drug-related causes

- Doses too low
- Wrong type of diuretic
- Inappropriate combinations
- Rapid inactivation (e.g. hydralazine)
- Drug actions and interactions
 - Sympathomimetics
 - Nasal decongestants
 - Appetite suppressants
 - Cocaine and other illicit drugs
 - Caffeine
 - Oral contraceptives
 - Adrenal steroids
 - Liquorice (as may be found in chewing tobacco)
 - Cyclosporine, tacrolimus
 - Erythropoetin
 - Nonsteroidal anti-inflammatory drugs

Associated conditions

- Smoking
- Increasing obesity
- Sleep apnea
- Insulin resistance/hyper insulinemia
- Ethanol intake of more than 1 oz (30 ml) per day
- Anxiety-induced hyperventilation or panic attacks
- Chronic pain
- Intense vasoconstriction (arteritis)
- Organic brain syndrome (e.g. memory deficit)

Identifiable causes of hypertension.

GENERAL GUIDELINES TO IMPROVE PATIENT ADHERENCE TO ANTIHYPERTENSIVE THERAPY

- Be aware of signs of patient nonadherence to antihypertensive therapy
- Establish the goal of therapy: to reduce blood pressure to nonhypertensive levels with minimal or no adverse effects.
- Educate patients about the disease, and involve them and their families in its treatment.
- Have them measure blood pressure at home.
- Maintain contact with patients, consider telecommunication
- Keep care inexpensive and simple
- Encourage lifestyle modifications
- Integrate pill-taking into routine activities of daily living
- Prescribe medications according to pharmacologic principles, favoring long-acting formulations.
- Be willing to stop unsuccessful therapy and try a different approach
- Anticipate adverse effects, and adjust therapy to prevent, minimise, or ameliorate side effects.
- Continue to add effective and tolerated drugs, stepwise, in sufficient doses to achieve the goal of therapy.
- Encourage a positive attitude about achieving therapeutic goals.
- Consider using nurse case management.

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