

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

HIPERTENSI

**Oleh : Bagian Ilmu Penyakit Dalam
FK Universitas Sultan Agung Semarang**

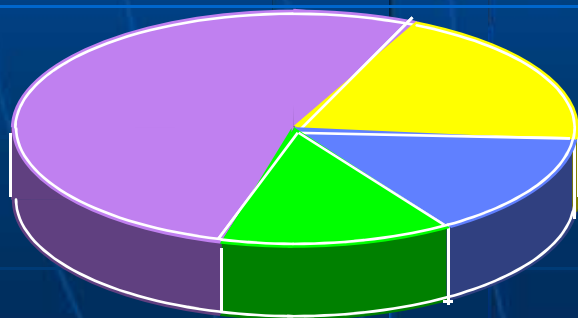
2015

The 'rule of halves' – the need for effective diagnosis and treatment of hypertension

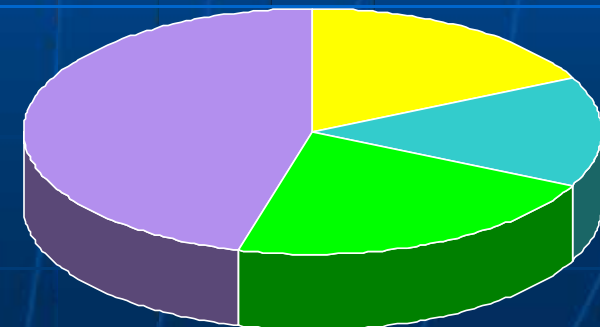
Proportions of the general population who have undiagnosed hypertension ($\geq 160/95$ mmHg) or who are untreated or inadequately treated (Scotland, 1984-1986)

- Undiagnosed hypertension
- Diagnosed but untreated
- Treated but uncontrolled
- Treated and controlled

Men (n=1262)



Women (n=1061)



Smith et al (1990)

Blood Pressure Classification JNC-VII 2003

BP Classification	SBP mmHg		DBP mmHg
Normal	<120	and	<80
Prehypertension	120–139	or	80–89
Stage 1 Hypertension	140–159	or	90–99
Stage 2 Hypertension	\geq 160	or	\geq 100

Table 3 Definitions and classification of office blood pressure levels (mmHg)^a

Category	Systolic		Diastolic
Optimal	<120	and	<80
Normal	120–129	and/or	80–84
High normal	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	160–179	and/or	100–109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension	≥140	and	<90

^aThe blood pressure (BP) category is defined by the highest level of BP, whether systolic or diastolic. Isolated systolic hypertension should be graded 1, 2, or 3 according to systolic BP values in the ranges indicated.

Table 5 Office blood pressure measurement

When measuring BP in the office, care should be taken:
<ul style="list-style-type: none">• To allow the patients to sit for 3–5 minutes before beginning BP measurements.
<ul style="list-style-type: none">• To take at least two BP measurements, in the sitting position, spaced 1–2 min apart, and additional measurements if the first two are quite different. Consider the average BP if deemed appropriate.
<ul style="list-style-type: none">• To take repeated measurements of BP to improve accuracy in patients with arrhythmias, such as atrial fibrillation.
<ul style="list-style-type: none">• To use a standard bladder (12–13 cm wide and 35 cm long), but have a larger and a smaller bladder available for large (arm circumference >32 cm) and thin arms, respectively.
<ul style="list-style-type: none">• To have the cuff at the heart level, whatever the position of the patient.
<ul style="list-style-type: none">• When adopting the auscultatory method, use phase I and V (disappearance) Korotkoff sounds to identify systolic and diastolic BP, respectively.
<ul style="list-style-type: none">• To measure BP in both arms at first visit to detect possible differences. In this instance, take the arm with the higher value as the reference.
<ul style="list-style-type: none">• To measure at the first visit, BP 1 and 3 min after assumption of the standing position in elderly subjects, diabetic patients, and in other conditions in which orthostatic hypotension may be frequent or suspected.
<ul style="list-style-type: none">• To measure, in case of conventional BP measurement, heart rate by pulse palpation (at least 30 s) after the second measurement in the sitting position.

BP = blood pressure.

Other risk factors, asymptomatic organ damage or disease	Blood Pressure (mmHg)			
	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP ≥180 or DBP ≥110
No other RF		Low risk	Moderate risk	High risk
1–2 RF	Low risk	Moderate risk	Moderate to high risk	High risk
≥3 RF	Low to Moderate risk	Moderate to high risk	High Risk	High risk
OD, CKD stage 3 or diabetes	Moderate to high risk	High risk	High risk	High to very high risk
Symptomatic CVD, CKD stage ≥4 or diabetes with OD/RFs	Very high risk	Very high risk	Very high risk	Very high risk

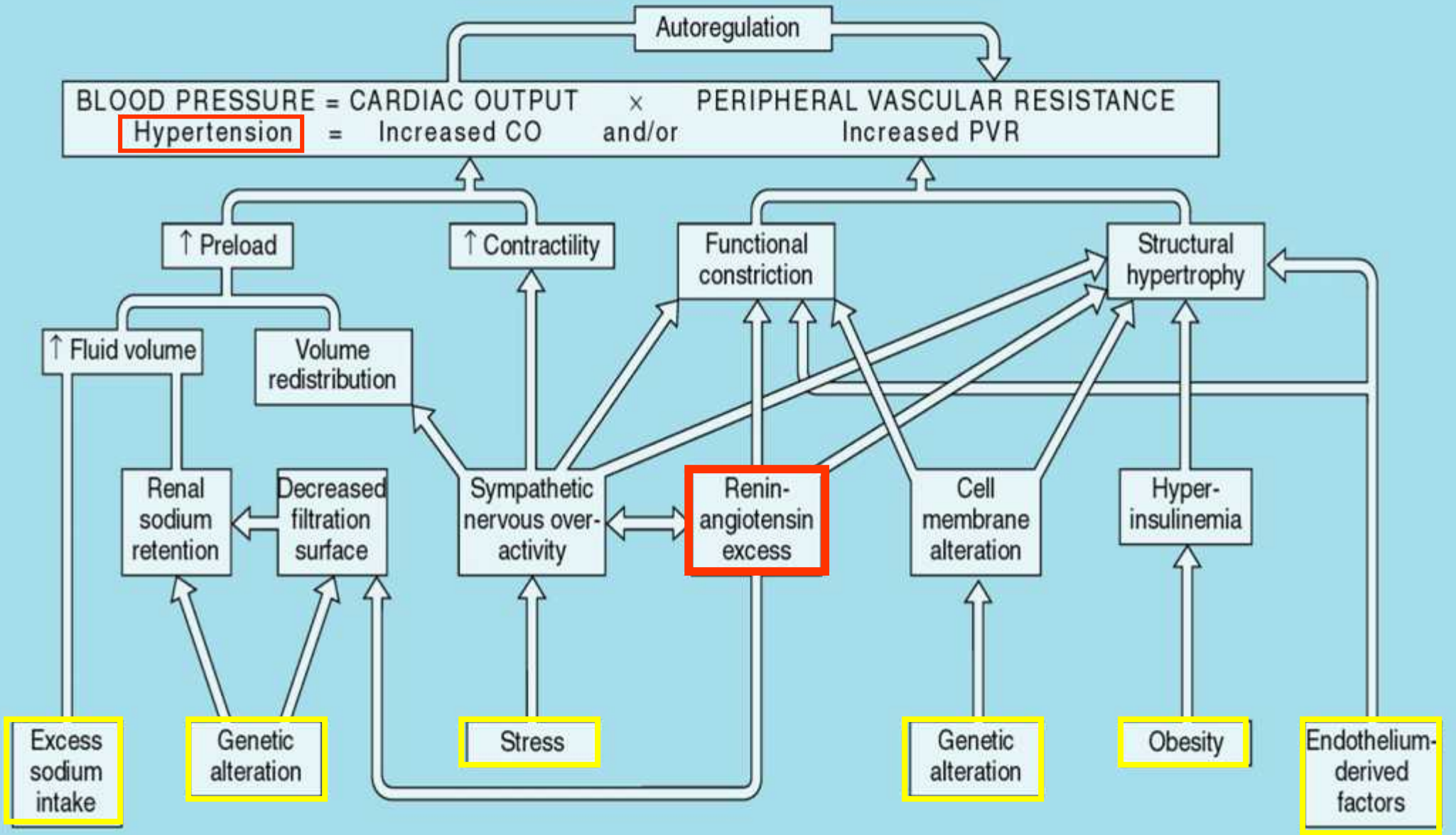
BP = blood pressure; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; DBP = diastolic blood pressure; HT = hypertension; OD = organ damage; RF = risk factor; SBP = systolic blood pressure.

Figure 1 Stratification of total CV risk in categories of low, moderate, high and very high risk according to SBP and DBP and prevalence of RFs, asymptomatic OD, diabetes, CKD stage or symptomatic CVD. Subjects with a high normal office but a raised out-of-office BP (masked hypertension) have a CV risk in the hypertension range. Subjects with a high office BP but normal out-of-office BP (white-coat hypertension), particularly if there is no diabetes, OD, CVD or CKD, have lower risk than sustained hypertension for the same office BP.

Types of hypertension

- **Essential Hypertension**
hypertension with no apparent cause 90-95%
- **Secondary Hypertension**
hypertension of known cause
 - chronic renal diseases 2.5-5%
 - Renovascular diseases 0.5-4%
 - Oral contraceptive pills 0.2-1%
 - Coarctation of the Aorta 0.1-1%
 - Primary aldosteronism 0.1-0.5%
 - Pheochromocytoma 0.1-0.2%

Pathogenesis of hypertension



Risk Factors

- Age
- Gender
- Race
- Genetic factors
- other:
 - obesity
 - high alcohol intake
 - high Na intake
 - abnormal renin values
 - high stress level
 - low birth weight
 - drugs

Table 4 Factors—other than office BP—influencing prognosis; used for stratification of total CV risk in Figure 1

Risk factors
Male sex
Age (men ≥ 55 years; women ≥ 65 years)
Smoking
Dyslipidaemia
Total cholesterol > 4.9 mmol/L (190 mg/dL), and/or
Low-density lipoprotein cholesterol > 3.0 mmol/L (115 mg/dL), and/or
High-density lipoprotein cholesterol: men < 1.0 mmol/L (40 mg/dL), women < 1.2 mmol/L (46 mg/dL), and/or
Triglycerides > 1.7 mmol/L (150 mg/dL)
Fasting plasma glucose 5.6–6.9 mmol/L (102–125 mg/dL)
Abnormal glucose tolerance test
Obesity [BMI ≥ 30 kg/m ² (height ²)]
Abdominal obesity (waist circumference: men ≥ 102 cm; women ≥ 88 cm) (in Caucasians)
Family history of premature CVD (men aged < 55 years; women aged < 65 years)
Asymptomatic organ damage
Pulse pressure (in the elderly) ≥ 60 mmHg
Electrocardiographic LVH (Sokolow–Lyon index > 3.5 mV; RaVL > 1.1 mV; Cornell voltage duration product > 244 mV*ms), or
Echocardiographic LVH [LVM index: men > 115 g/m ² ; women > 95 g/m ² (BSA)] ^a
Carotid wall thickening (IMT > 0.9 mm) or plaque
Carotid–femoral PWV > 10 m/s
Ankle-brachial index < 0.9
CKD with eGFR 30–60 ml/min/1.73 m ² (BSA)
Microalbuminuria (30–300 mg/24 h), or albumin–creatinine ratio (30–300 mg/g; 3.4–34 mg/mmol) (preferentially on morning spot urine)

Diabetes mellitus

Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dL) on two repeated measurements, and/or

HbA_{1c} $> 7\%$ (53 mmol/mol), and/or

Post-load plasma glucose > 11.0 mmol/L (198 mg/dL)

Established CV or renal disease

Cerebrovascular disease: ischaemic stroke; cerebral haemorrhage; transient ischaemic attack

CHD: myocardial infarction; angina; myocardial revascularization with PCI or CABG

Heart failure, including heart failure with preserved EF

Symptomatic lower extremities peripheral artery disease

CKD with eGFR < 30 mL/min/1.73m² (BSA); proteinuria (> 300 mg/24 h).

Advanced retinopathy: haemorrhages or exudates, papilloedema

BMI = body mass index; BP = blood pressure; BSA = body surface area; CABG = coronary artery bypass graft; CHD = coronary heart disease; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; EF = ejection fraction; eGFR = estimated glomerular filtration rate; HbA_{1c} = glycated haemoglobin; IMT = intima-media thickness; LVH = left ventricular hypertrophy; LVM = left ventricular mass; PCI = percutaneous coronary intervention; PWV = pulse wave velocity.

^aRisk maximal for concentric LVH: increased LVM index with a wall thickness/radius ratio of > 0.42 .

Table 10 Laboratory investigations

Routine tests

- Haemoglobin and/or haematocrit.
- Fasting plasma glucose.
- Serum total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol.
- Fasting serum triglycerides.
- Serum potassium and sodium.
- Serum uric acid.
- Serum creatinine (with estimation of GFR).
- Urine analysis: microscopic examination; urinary protein by dipstick test; test for microalbuminuria.
- 12-lead ECG.

Additional tests, based on history, physical examination, and findings from routine laboratory tests

- Haemoglobin A_{1c} (if fasting plasma glucose is >5.6 mmol/L (102 mg/dL) or previous diagnosis of diabetes).
- Quantitative proteinuria (if dipstick test is positive); urinary potassium and sodium concentration and their ratio.
- Home and 24-h ambulatory BP monitoring.
- Echocardiogram.
- Holter monitoring in case of arrhythmias.
- Carotid ultrasound.
- Peripheral artery/abdominal ultrasound.
- Pulse wave velocity.
- Ankle-brachial index.
- Fundoscopy.

Extended evaluation (mostly domain of the specialist)

- Further search for cerebral, cardiac, renal, and vascular damage, mandatory in resistant and complicated hypertension.
- Search for secondary hypertension when suggested by history, physical examination, or routine and additional tests.

BP = blood pressure; ECG = electrocardiogram; GFR = glomerular filtration rate.

Complications of HTN

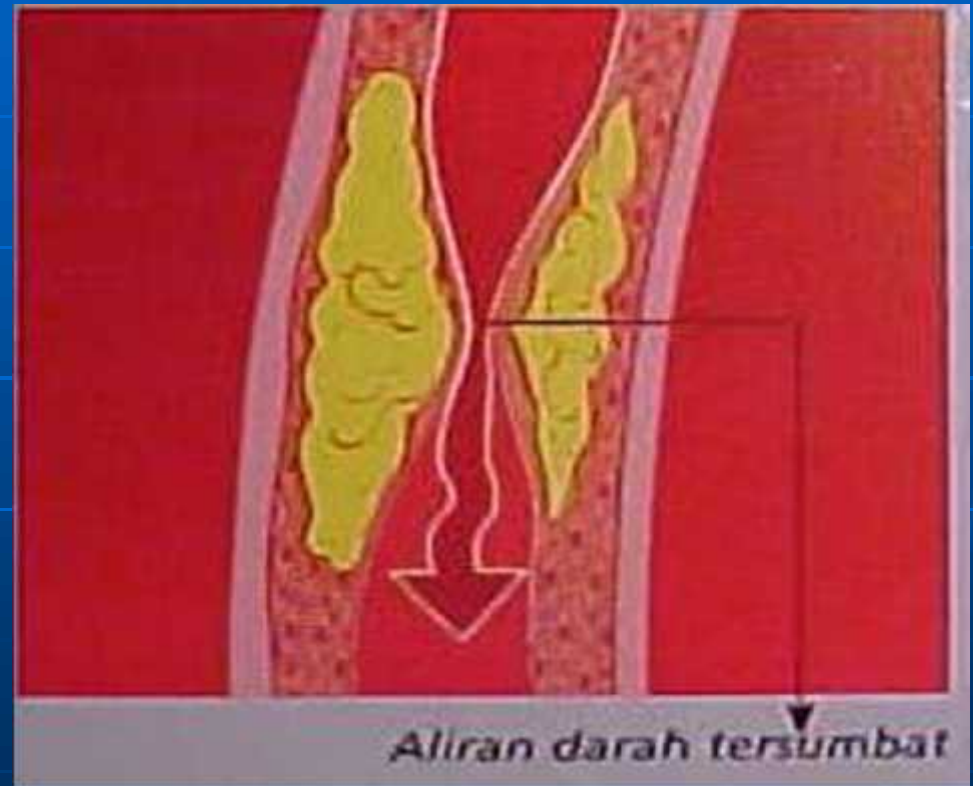
- 1 Vascular
- 2 Retinal
- 3 Cardiac
- 4 CNS
- 5 Renal



Vascular Complications

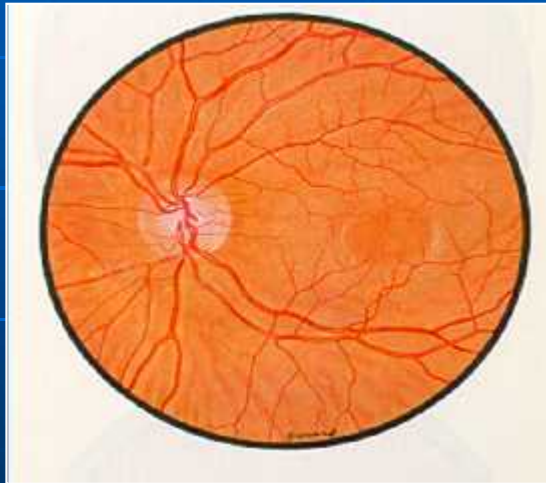
Komplikasi pada pembuluh darah

- Arteriosclerolosis
 - ↑ wall:lumen ratio
 - remodeling
- Atherosclerosis
 - Plaque
 - Fibrous cap
 - necrotic center
- Fibrinoid necrosis.
- Aortic dissection.



Retinal complications

■ Hypertensive retinopathy

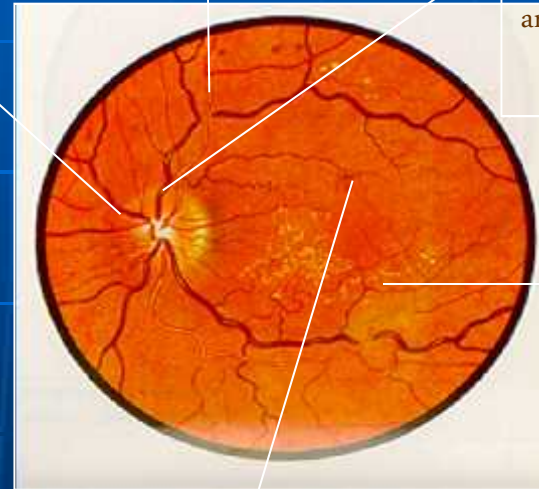


Normal

Blurred optic disc

Venous tapering

Increased light reflexes from arterioles



Punctate hard exudate

hemorrhage

KW : I - IV

Cardiac complications

Left ventricular myocardium
(myocardial factor)

Hypertrophy

Dilatation

Decrease in contractility

Impairment in LV function

Heart failure

Coronary vascular bed
(coronary factor)

CAD

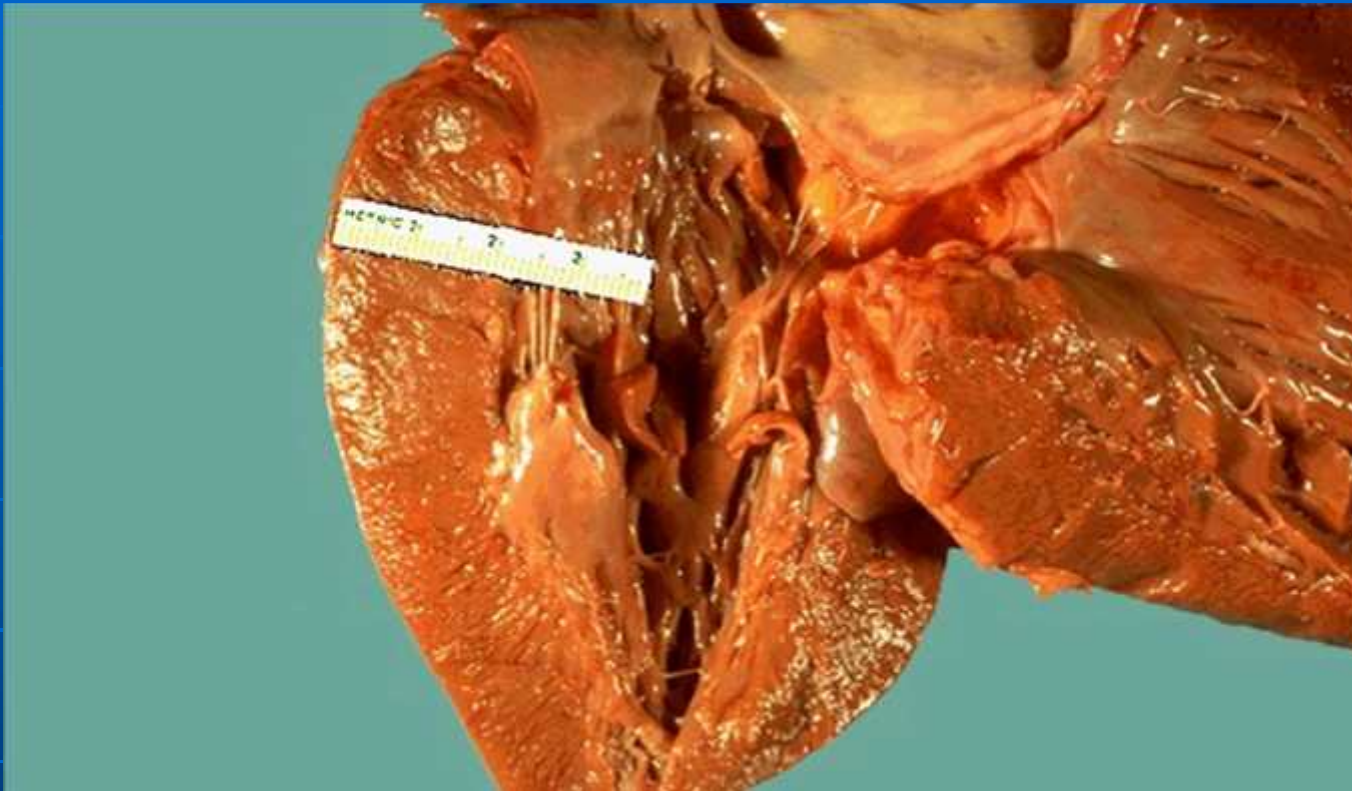
Coronary
Microangiopathy

Abnormal increase in c. resistance

Impairment of O₂ availability

Coronary insufficiency, MI

Heart failure



This left ventricle is very thickened (slightly over 2 cm in thickness), but the rest of the heart is not greatly enlarged. This is typical for hypertensive heart disease. The hypertension creates a greater pressure load on the heart to induce the hypertrophy.

CNS Complications

- Hypertensive encephalopathy
- Cerebral hemorrhage
- Ischemic stroke
- TIAs

Renal Complications

- Benign arteriolar Nephrosclerosis
- Malignant arteriolar Nephrosclerosis
- Chronic Renal Failure

Search for asymptomatic organ damage, cardiovascular disease, and chronic kidney disease

Recommendations	Class ^a	Level ^b	Ref. ^c
Heart			
An ECG is recommended in all hypertensive patients to detect LVH, left atrial dilatation, arrhythmias, or concomitant heart disease.	I	B	149, 150, 151, 154
In all patients with a history or physical examination suggestive of major arrhythmias, long-term ECG monitoring, and, in case of suspected exercise-induced arrhythmias, a stress ECG test should be considered.	IIa	C	-
An echocardiogram should be considered to refine CV risk, and confirm ECG diagnosis of LVH, left atrial dilatation or suspected concomitant heart disease, when these are suspected.	IIa	B	156, 158, 160, 163, 164
Whenever history suggests myocardial ischaemia, a stress ECG test is recommended, and, if positive or ambiguous, an imaging stress test (stress echocardiography, stress cardiac magnetic resonance or nuclear scintigraphy) is recommended.	I	C	-
Arteries			
Ultrasound scanning of carotid arteries should be considered to detect vascular hypertrophy or asymptomatic atherosclerosis, particularly in the elderly.	IIa	B	51, 183–185, 188
Carotid–femoral PWV should be considered to detect large artery stiffening.	IIa	B	51, 138, 192–195
Ankle–brachial index should be considered to detect PAD.	IIa	B	198, 199

Kidney			
Measurement of serum creatinine and estimation of GFR is recommended in all hypertensive patients. ^d	I	B	228, 231, 233
Assessment of urinary protein is recommended in all hypertensive patients by dipstick.	I	B	203, 210
Assessment of microalbuminuria is recommended in spot urine and related to urinary creatinine excretion.	I	B	222, 223, 225, 228
Fundoscopy			
Examination of the retina should be considered in difficult to control or resistant hypertensive patients to detect haemorrhages, exudates, and papilloedema, which are associated with increased CV risk.	IIa	C	-
Examination of the retina is not recommended in mild-to-moderate hypertensive patients without diabetes, except in young patients.	III	C	-
Brain			
In hypertensive patients with cognitive decline, brain magnetic resonance imaging or computed tomography may be considered for detecting silent brain infarctions, lacunar infarctions, microbleeds, and white matter lesions.	IIb	C	-

CV = cardiovascular; ECG = electrocardiogram; GFR = glomerular filtration rate; LVH = left ventricular hypertrophy; MRI = magnetic resonance imaging; PAD = peripheral artery disease; PWV = pulse wave velocity.

^aClass of recommendation.

^bLevel of evidence.

^cReference(s) supporting levels of evidence.

^dThe MDRD formula is currently recommended but new methods such as the CKD-EPI method aim to improve the accuracy of the measurement.

Goal of Hypertension Prevention and Management

- To reduce morbidity and mortality by the least intrusive means possible. This may be accomplished by achieving and maintaining:
 - SBP < 140 mm Hg
 - DBP < 90 mm Hg
 - controlling other cardiovascular risk factors

Blood pressure goals in hypertensive patients

Recommendations	Class ^a	Level ^b	Ref. ^c
A SBP goal <140 mmHg:			
a) is recommended in patients at low–moderate CV risk;	I	B	266, 269, 270
b) is recommended in patients with diabetes;	I	A	270, 275, 276
c) should be considered in patients with previous stroke or TIA;	IIa	B	296, 297
d) should be considered in patients with CHD;	IIa	B	141, 265
e) should be considered in patients with diabetic or non-diabetic CKD.	IIa	B	312, 313
In elderly hypertensives less than 80 years old with SBP ≥160 mmHg there is solid evidence to recommend reducing SBP to between 150 and 140 mmHg.	I	A	265
In fit elderly patients less than 80 years old SBP values <140 mmHg may be considered, whereas in the fragile elderly population SBP goals should be adapted to individual tolerability.	IIb	C	-
In individuals older than 80 years and with initial SBP ≥160 mmHg, it is recommended to reduce SBP to between 150 and 140 mmHg provided they are in good physical and mental conditions.	I	B	287
A DBP target of <90 mmHg is always recommended, except in patients with diabetes, in whom values <85 mmHg are recommended. It should nevertheless be considered that DBP values between 80 and 85 mmHg are safe and well tolerated.	I	A	269, 290, 293

CHD = coronary heart disease; CKD = chronic kidney disease; CV = cardiovascular; DBP = diastolic blood pressure; SBP = systolic blood pressure; TIA = transient ischaemic attack.

^aClass of recommendation.

^bLevel of evidence.

^cReference(s) supporting levels of evidence.

STEPS TO ACTION

Blood Pressure

=

Cardiac Output

X

Total Peripheral Resistance

b-Blockers

CCBs*

Diuretics

ACE Inhibitors
AT₁ Blockers
a-Blockers
a₂-Agonists
CCBs
DA₁ Agonists
Diuretics
Sympatholytics
Vasodilators

* = non-dihydropyridine CCBs

Classification and Management of BP for adults (JNC-VII 2003)

BP classification	SBP* mmHg	DBP* mmHg	Lifestyle modification	Initial drug therapy	
				Without compelling indication	With compelling indications
Normal	<120	and <80	Encourage		
Prehypertension	120-139	or 80-89	Yes	No antihypertensive drug indicated.	Drug(s) for compelling indications. †
Stage 1 Hypertension	140-159	or 90-99	Yes	Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination.	Drug(s) for the compelling indications. † Other antihypertensive drugs
Stage 2 Hypertension	≥160	or ≥100	Yes	Two-drug combination for most† (usually thiazide-type diuretic and ACEI or ARB or BB or CCB).	(diuretics, ACEI, ARB, BB, CCB) as needed.

*Treatment determined by highest BP category.

†Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension.

‡Treat patients with chronic kidney disease or diabetes to BP goal of <130/80 mmHg.

Treatment of Hypertension

Background

- Hypertension is the **major risk factor for coronary heart disease and congestive heart failure**
- Hypertension is **second** only to diabetes as **the cause of renal failure**
- In a recent meta analysis, treating hypertension reduced the incidence of **stroke by 38%** and **coronary heart disease by 16%**
- In a US survey, **only 21%** of hypertensive patients had their blood pressure controlled at **<140/90 mmHg**

Initiation of lifestyle changes and antihypertensive drug treatment

Other risk factors, asymptomatic organ damage or disease	Blood pressure (mmHg)			
	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP 180 or DBP 110
No other RF	• No BP intervention	• Lifestyle changes for several months • Then add BP drugs targeting <140/90	• Lifestyle changes for several weeks • Then add BP drugs targeting <140/90	• Lifestyle changes • Immediate BP drugs targeting <140/90
1–2 RF	• Lifestyle changes • No BP intervention	• Lifestyle changes for several weeks • Then add BP drugs targeting <140/90	• Lifestyle changes for several weeks • Then add BP drugs targeting <140/90	• Lifestyle changes • Immediate BP drugs targeting <140/90
3 RF	• Lifestyle changes • No BP intervention	• Lifestyle changes for several weeks • Then add BP drugs targeting <140/90	• Lifestyle changes • BP drugs targeting <140/90	• Lifestyle changes • Immediate BP drugs targeting <140/90
OD, CKD stage 3 or diabetes	• Lifestyle changes • No BP intervention	• Lifestyle changes • BP drugs targeting <140/90	• Lifestyle changes • BP drugs targeting <140/90	• Lifestyle changes • Immediate BP drugs targeting <140/90
Symptomatic CVD, CKD stage 4 or diabetes with OD/RFs	• Lifestyle changes • No BP intervention	• Lifestyle changes • BP drugs targeting <140/90	• Lifestyle changes • BP drugs targeting <140/90	• Lifestyle changes • Immediate BP drugs targeting <140/90

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

Lifestyle changes for hypertensive patients

Recommendations to reduce BP and/or CV risk factors	
Salt intake	Restrict 5-6 g/day
Moderate alcohol intake	Limit to 20-30 g/day men, 10-20 g/day women
Increase vegetable, fruit, low-fat dairy intake	
BMI goal	25 kg/m ²
Waist circumference goal	Men: <102 cm (40 in.)* Women: <88 cm (34 in.)*
Exercise goals	30 min/day, 5-7 days/week (moderate, dynamic exercise)
Quit smoking	

* Unless contraindicated. BMI, body mass index.

Algorithm for Treatment of Hypertension

Begin or Continue Lifestyle Modifications

- Lose weight
- Limit alcohol
- Increase physical activity
- Reduce Sodium
- Maintain potassium
- Maintain calcium and magnesium
- Stop smoking
- Reduce saturated fat, cholesterol

Not at Goal Blood Pressure

Algorithm for Treatment of hypertension

Lifestyle Modifications

Not at Goal BP (<140/ 90 mmHg or <130/80 mmHg for those with diabetes or chronic kidney disease)

Initial Drug Choices

Hypertension without Compelling Indication

Hypertension with Compelling Indication

Stage 1 Hypertension
(Systolic BP 140-159 mmHg or diastolic BP 90-99 mmHg)
Thiazide , ACE-I , ARB, B-Blocker, CCB, or combination

Stage 2 Hypertension
(Systolic BP \geq 160 mmHg or diastolic BP \geq 100 mmHg)
2 drug combination (Thiazide and ACE-I or ARB or B-Blocker or CCB)

Drug for the compelling indication
Other AH drug (Diuretic ACE-I , ARB, B-Blocker, CCB) as needed

Not at Goal BP

Optimize dosages or Add Drugs Until Goal BP is Achieved
Consider Consultation With hypertension Specialist

Hypertension (continued)

Initial Drug Choices*



Uncomplicated

- Diuretics
- β -blockers

*Based on randomized controlled trials.

HYPERTENSION (continued)

Initial Drug Choices*

Compelling Indications

- Heart failure
 - ACE inhibitors
 - Diuretics
- Myocardial infarction
 - β -blockers (non-ISA)
 - ACE inhibitors (with systolic dysfunction)
- Diabetes mellitus (type 2) with proteinuria
 - ACE inhibitors
- Isolated systolic hypertension (older persons)
 - Diuretics preferred
 - Long-acting dihydropyridine calcium antagonists

*Based on randomized controlled trials.

Table 15 Drugs to be preferred in specific conditions

Condition	Drug
Asymptomatic organ damage	
LVH	ACE inhibitor, calcium antagonist, ARB
Asymptomatic atherosclerosis	Calcium antagonist, ACE inhibitor
Microalbuminuria	ACE inhibitor, ARB
Renal dysfunction	ACE inhibitor, ARB
Clinical CV event	
Previous stroke	Any agent effectively lowering BP
Previous myocardial infarction	BB, ACE inhibitor, ARB
Angina pectoris	BB, calcium antagonist
Heart failure	Diuretic, BB, ACE inhibitor, ARB, mineralocorticoid receptor antagonists
Aortic aneurysm	BB
Atrial fibrillation, prevention	Consider ARB, ACE inhibitor, BB or mineralocorticoid receptor antagonist
Atrial fibrillation, ventricular rate control	BB, non-dihydropyridine calcium antagonist
ESRD/proteinuria	ACE inhibitor, ARB
Peripheral artery disease	ACE inhibitor, calcium antagonist
Other	
ISH (elderly)	Diuretic, calcium antagonist
Metabolic syndrome	ACE inhibitor, ARB, calcium antagonist
Diabetes mellitus	ACE inhibitor, ARB
Pregnancy	Methyldopa, BB, calcium antagonist
Blacks	Diuretic, calcium antagonist

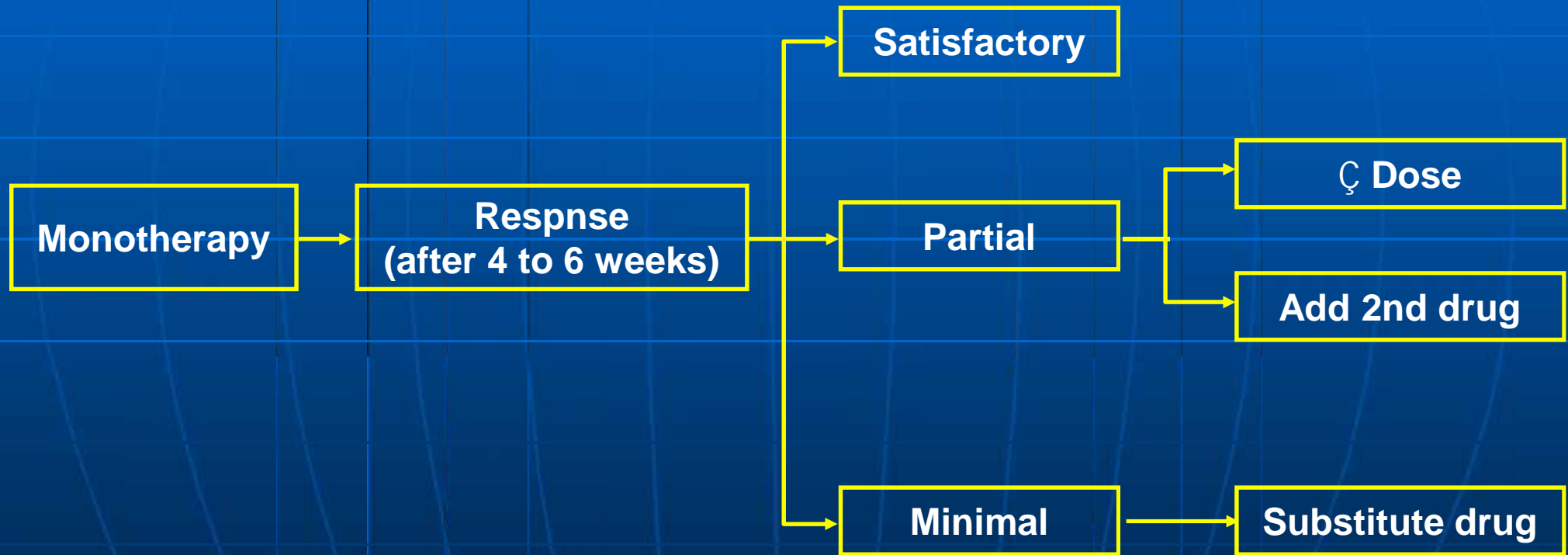
ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; BB = beta-blocker; BP = blood pressure; CV = cardiovascular; ESRD = end-stage renal disease; ISH = isolated systolic hypertension; LVH = left ventricular hypertrophy.

Compelling indications for hypertension treatment

Class	Contraindications	
	Compelling	Possible
Diuretics (thiazides)	Gout	Metabolic syndrome Glucose intolerance Pregnancy Hypercalcemia Hypokalaemia
Beta-blockers	Asthma A–V block (grade 2 or 3)	Metabolic syndrome Glucose intolerance Athletes and physically active patients COPD (except for vasodilator beta-blockers)
Calcium antagonists (dihydropyridines)		Tachyarrhythmia Heart failure
Calcium antagonists (verapamil, diltiazem)	A–V block (grade 2 or 3, trifascicular block) Severe LV dysfunction Heart failure	
ACE inhibitors	Pregnancy Angioneurotic oedema Hyperkalaemia Bilateral renal artery stenosis	Women with child bearing potential
Angiotensin receptor blockers	Pregnancy Hyperkalaemia Bilateral renal artery stenosis	Women with child bearing potential
Mineralocorticoid receptor antagonists	Acute or severe renal failure (eGFR <30 mL/min) Hyperkalaemia	

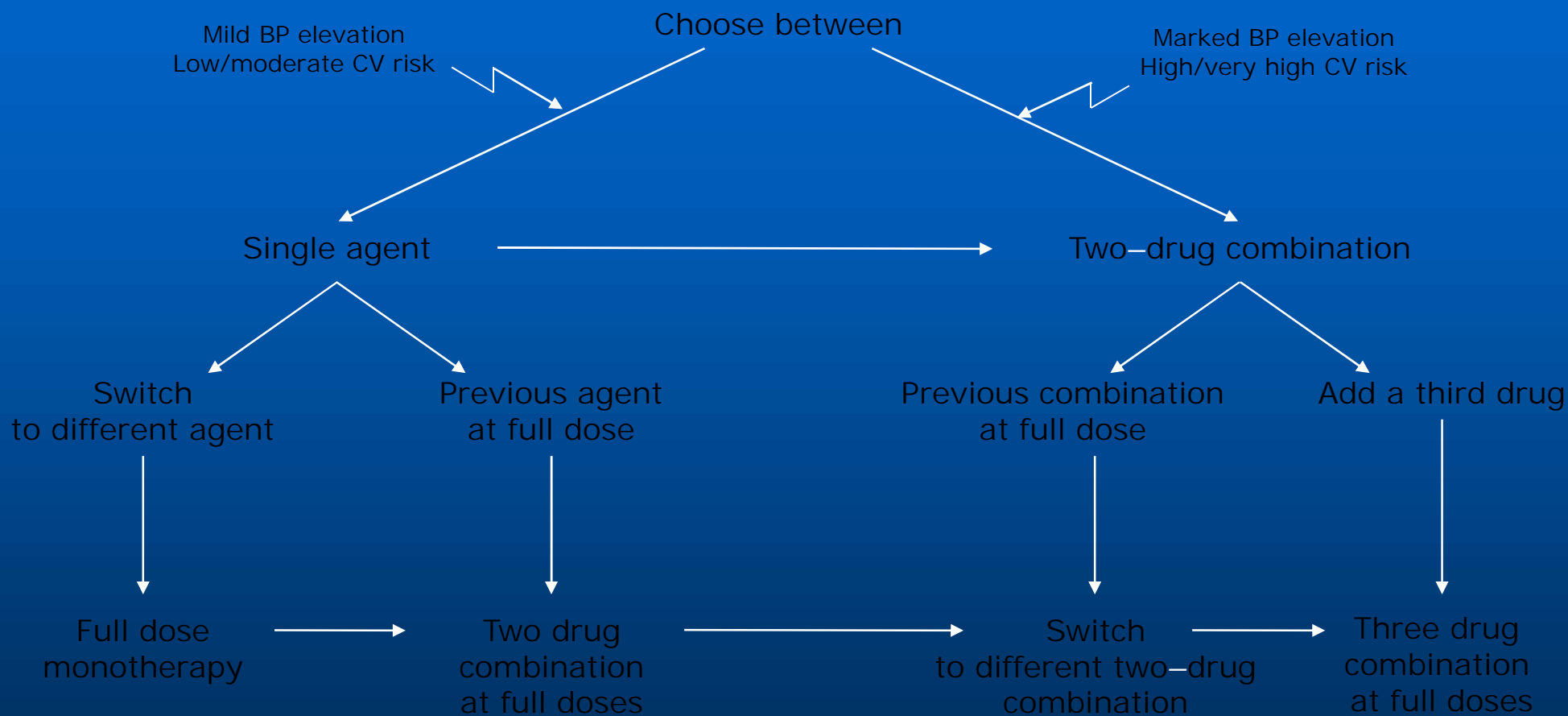
A-V, atrio-ventricular; COPD, chronic obstructive pulmonary disease; eGFR, estimated glomerular filtration rate; LV, left ventricular.

Individualized approach to treating hypertension



Menard (1992); Materson (1995)

Monotherapy vs. drug combination strategies to achieve target BP



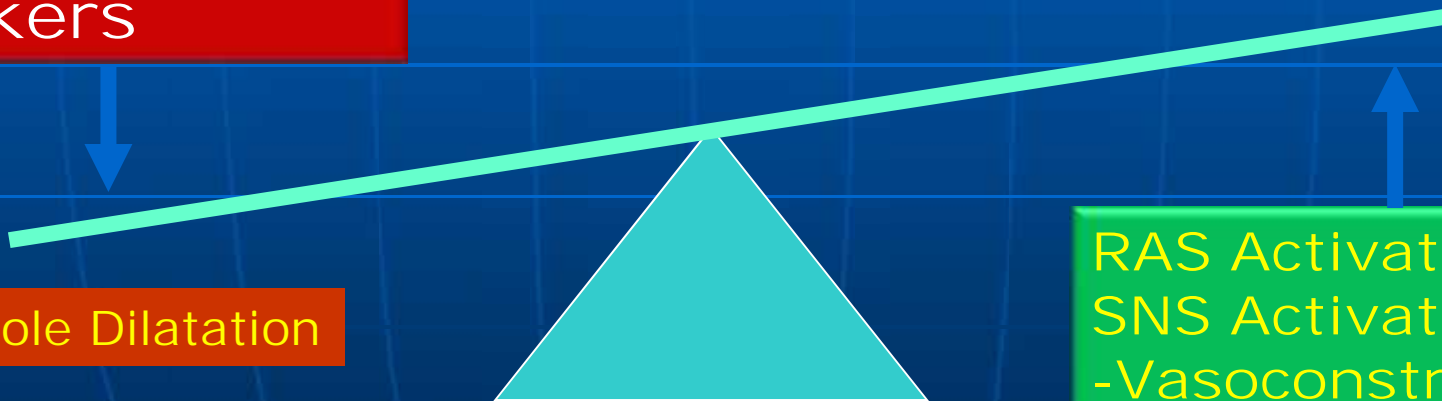
Moving from a less intensive to a more intensive therapeutic strategy should be done whenever BP target is not achieved.

BP, blood pressure; CV, cardiovascular.

Combination Therapy ARB/ACE-I and CCB

Concept of Counteregulation

Calcium Channel
Blockers



Arteriole Dilatation

RAS Activation
SNS Activation
-Vasoconstriction

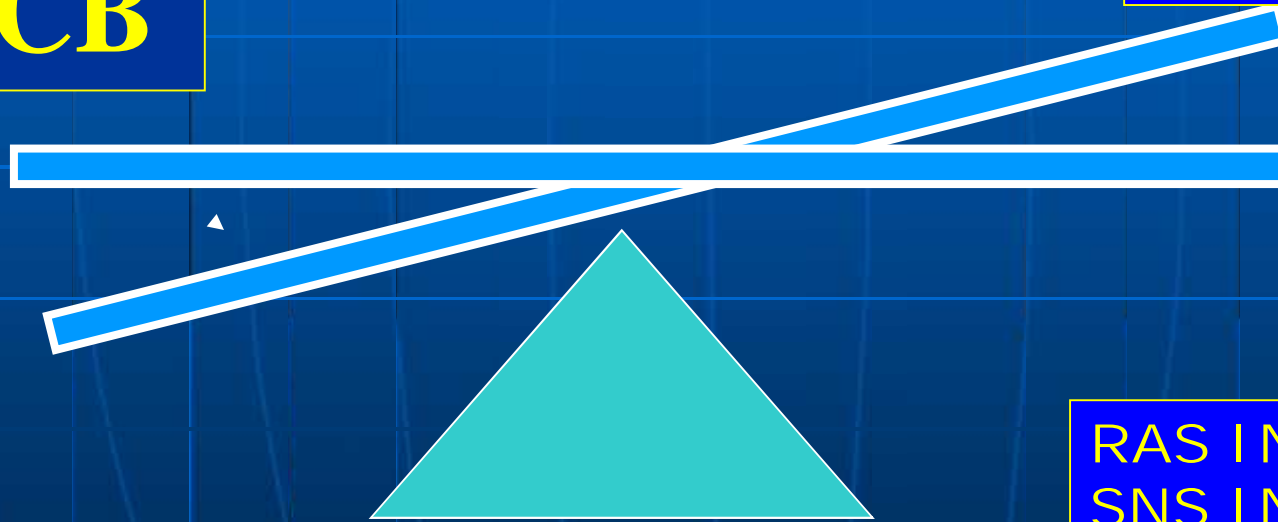
RAS = renin-angiotensin system
SNS = sympathetic nervous system

Combination Therapy for Hypertension

Concept of Counterregulation

CCB

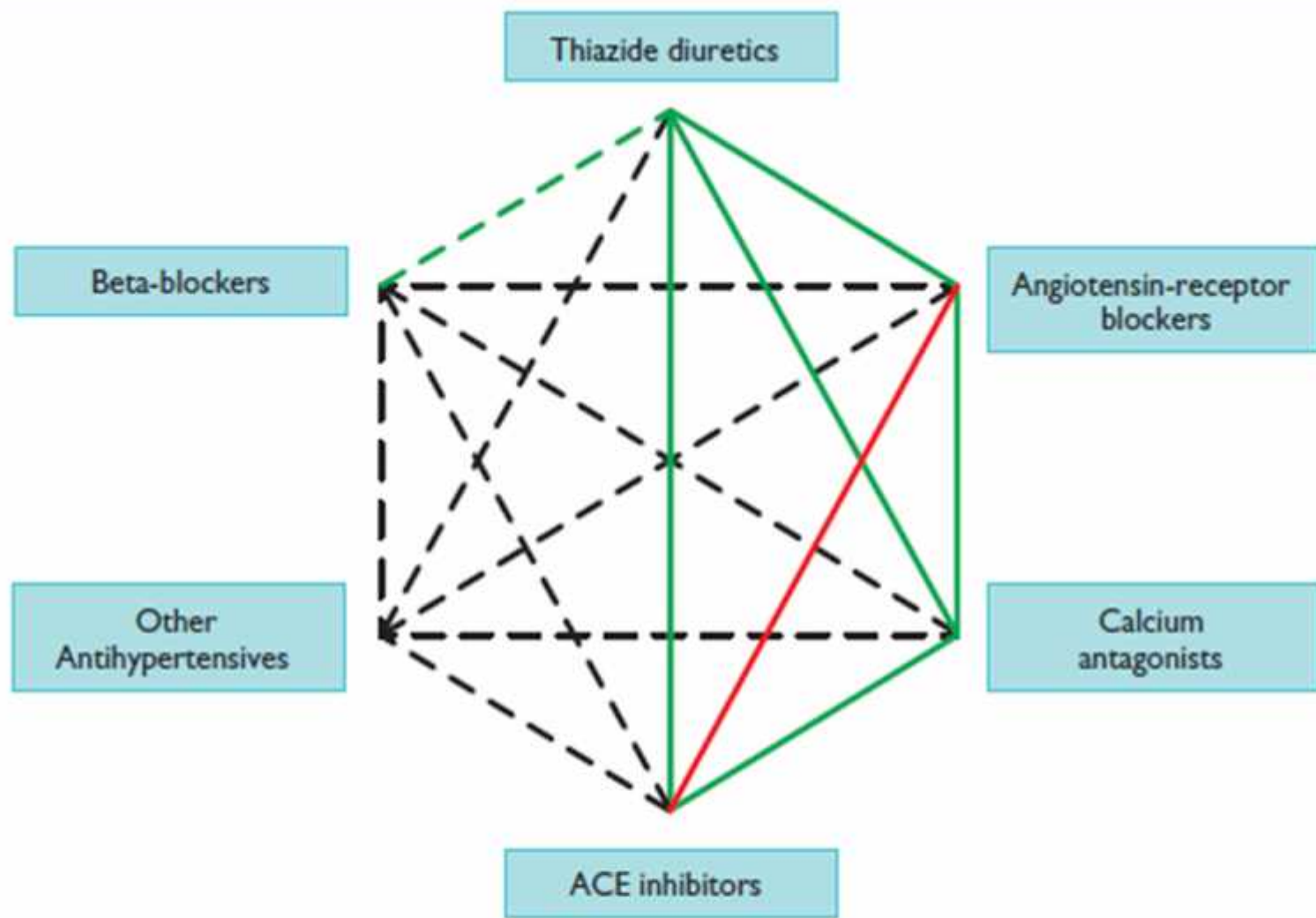
ACE-I or ARB



**RAS IN-Activation
SNS IN-Activation
-Veno- artery dilatation**

Classification of Calcium Channel Blockers

Group (specificity)	First generation	Second generation New active principles and/or novel formulations	Third generation
Dihydropyridine	Nifedipine Nicardipine	Nifedipine GITS Felodipine ER Nicardipine SR	Benidipine Isradipine Manidipine Nilvadipine Nimodipine Nisoldipine Nitrendipine
Benzothiazepine	Diltiazem	Diltiazem SR/CD	
Phenylalkylamine	Verapamil	Verapamil SR Gallopamil	



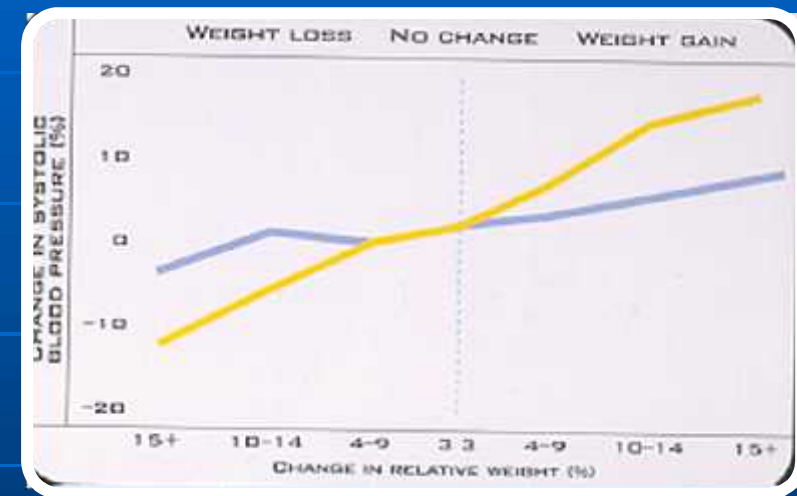
ACE = angiotensin-converting enzyme.

Figure 4 Possible combinations of classes of antihypertensive drugs. Green continuous lines: preferred combinations; green dashed line: useful combination (with some limitations); black dashed lines: possible but less well-tested combinations; red continuous line: not recommended combination. Although verapamil and diltiazem are sometimes used with a beta-blocker to improve ventricular rate control in permanent atrial fibrillation, only dihydropyridine calcium antagonists should normally be combined with beta-blockers.

Obesity Weight reduction

Weight reduction will lead to a fall in BP of a rate of 2-3 mmHg/Kg for SBP and 2 mmHg/Kg for DBP.

- Reduces the risk of CAD, cerebrovascular and peripheral vascular disorders.
- Weight reduction → decreased insulin and adrenaline levels → decreased sympathetic activity → reduction in BP.



Pregnant Women

- Chronic hypertension is high blood pressure present before pregnancy or diagnosed before 20 week of gestation.
- Preeclampsia is increased blood pressure that occurs in pregnancy (generally after the 20th week) and is accompanied by edema, proteinuria, or both.
- ACE inhibitors and angiotensin II receptor blockers are contraindicated for pregnant women.
- Methyldopa, α 1 blockers and Ca Antagonists recommended for women diagnosed during pregnancy.

Renal Disease

- Hypertension may result from renal disease that reduces functioning nephrons.
- Evidence shows a clear relationship between high blood pressure and end-stage renal disease.
- Blood pressure should be controlled to $< 130/85$ mm Hg or lower ($< 125/75$ mm Hg) in patients with proteinuria in excess of 1 gram per 24 hours.
- ACE inhibitors work well to control blood pressure and slow progression of renal failure.

Hypertension treatment in the elderly

Clinical scenario	Recommendations
Elderly patients with SBP 160 mmHg	<ul style="list-style-type: none"> Reduce SBP to 140-150 mmHg
Fit elderly patients aged <80 years with initial SBP 140 mmHg	<ul style="list-style-type: none"> Consider antihypertensive treatment Target SBP: <140 mmHg
Elderly >80 years with initial SBP 160 mmHg	<ul style="list-style-type: none"> Reduce SBP to 140-150 mmHg <i>providing in good physical and mental condition</i>
Frail elderly	<ul style="list-style-type: none"> Hypertension treatment decision at discretion of treating clinician, based on monitoring of treatment clinical effects
Continuation of well- tolerated hypertension treatment	<ul style="list-style-type: none"> Consider when patients become octogenarians
All hypertension treatment agents are recommended and may be used in elderly	<ul style="list-style-type: none"> Diuretics, CCBs, preferred for isolated systolic hypertension

SBP, systolic blood pressure; CCB, calcium channel blockers.

Hypertension treatment for people with diabetes

Recommendations	Additional considerations
Mandatory: initiate drug treatment in patients with SBP 160 mmHg	<ul style="list-style-type: none"> Strongly recommended: start drug treatment when SBP 140 mmHg
SBP goals for patients with diabetes: <140 mmHg	
DBP goals for patients with diabetes: <85 mmHg	
All hypertension treatment agents are recommended and may be used in patients with diabetes	<ul style="list-style-type: none"> RAS blockers may be preferred <i>Especially in presence of preteinuria or microalbuminuria</i>
Choice of hypertension treatment must take comorbidities into account	
Coadministration of RAS blockers <i>not recommended</i>	<ul style="list-style-type: none"> <i>Avoid in patients with diabetes</i>

SBP, systolic blood pressure; DBP, diastolic blood pressure; RAS, renin–angiotensin system.

Hypertension treatment for people with metabolic syndrome

Recommendations	Additional considerations
Lifestyle changes for all	<ul style="list-style-type: none"> • Especially weight loss and physical activity • <i>Improve BP and components of metabolic syndrome, delay diabetes onset</i>
Antihypertensive agents that potentially improve – or not worsen – insulin sensitivity are recommended	<ul style="list-style-type: none"> • RAS blockers • CCBs
BBs and diuretics only as additional drugs	<ul style="list-style-type: none"> • Preferably in combination with a potassium-sparing agent
Prescribe antihypertensive drugs with particular care in patients with metabolic disturbances when...	<ul style="list-style-type: none"> • BP 140/90 mmHg after lifestyle changes to maintain BP <140/90 mmHg
No drug treatment in patients with metabolic syndrome and high normal BP	

BP, blood pressure; BB, beta blockers; CCB, calcium channel blockers; RAS, renin–angiotensin system.

Hypertension treatment for people with nephropathy

Recommendations	Additional considerations
Consider lowering SBP to <140 mmHg	
Consider SBP <130 mmHg with overt proteinuria	<ul style="list-style-type: none"> • Monitor changes in eGFR
RAS blockers more effective to reduce albuminuria than other agents	<ul style="list-style-type: none"> • Indicated in presence of microalbuminuria or overt proteinuria
Combination therapy usually required to reach BP goals	<ul style="list-style-type: none"> • Combine RAS blockers with other agents
Combination of two RAS blockers	<ul style="list-style-type: none"> • <i>Not recommended</i>
Aldosterone antagonist <i>not recommended in CKD</i>	<ul style="list-style-type: none"> • Especially in combination with a RAS blocker • Risk of excessive reduction in renal function, hyperkalemia

SBP, systolic blood pressure; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; RAS, renin–angiotensin system.

Hypertension treatment for people with cerebrovascular disease

Recommendations	Additional considerations
Do not introduce antihypertensive treatment during first week after acute stroke	<ul style="list-style-type: none"> • Irrespective of BP level • <i>Use clinical judgment with very high SBP</i>
Introduce antihypertensive treatment in patients with history of stroke or TIA	<ul style="list-style-type: none"> • Even when initial SBP is 140-159 mmHg
SBP goals for hypertensive patients with history of stroke or TIA: <140 mmHg	
Consider higher SBP goal in elderly with previous stroke or TIA	
All drug regimens recommended for stroke prevention	<ul style="list-style-type: none"> • Provided BP is effectively reduced

TIA, transient ischaemic attack; SBP, systolic blood pressure; BP, blood pressure.

Hypertension treatment for people with heart disease

Recommendations	Additional considerations
SBP goals for hypertensive patients with CHD: <140 mmHg	
BBs for hypertensive patients with recent MI	<ul style="list-style-type: none"> • Other CHD: other antihypertensive agents can be used; BBs, CCBs preferred
Diuretics, BBs, ACE-I, ARBs, and/or mineralcorticoid receptor antagonist for patients with heart failure or severe LV dysfunction	<ul style="list-style-type: none"> • Reduce mortality and hospitalization
No evidence that any hypertension drug beneficial for patients with heart failure and preserved EF	<ul style="list-style-type: none"> • However, in these patients and patients with hypertension and systolic dysfunction: consider lowering SBP to ~ 140 mmHg • Guide treatment by symptom relief
Consider ACE-I and ARBs (and BBs and mineralcorticoid receptor antagonist in coexisting heart failure) in patients at risk of new or recurrent AF	
Antihypertensive therapy in all patients with LVH	<ul style="list-style-type: none"> • Initiate treatment with an agent with greater ability to regress LVH (ACE-I, ARBs, CCBs)

SBP, systolic blood pressure; BB, beta-blocker; MI, myocardial infarction; ACE-I, angiotensin-converting-enzyme inhibitor; ARB, angiotensin receptor blocker; LV, left ventricular; EF, ejection fraction; CHD, coronary heart disease; CCB, calcium channel blockers; AF, atrial fibrillation; LVH, left ventricular hypertrophy.

Much Thanks~~

今後也請大家多多指教！！c

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