



# الجديد في تشخيص وتدير ارتفاع الضغط الشرياني

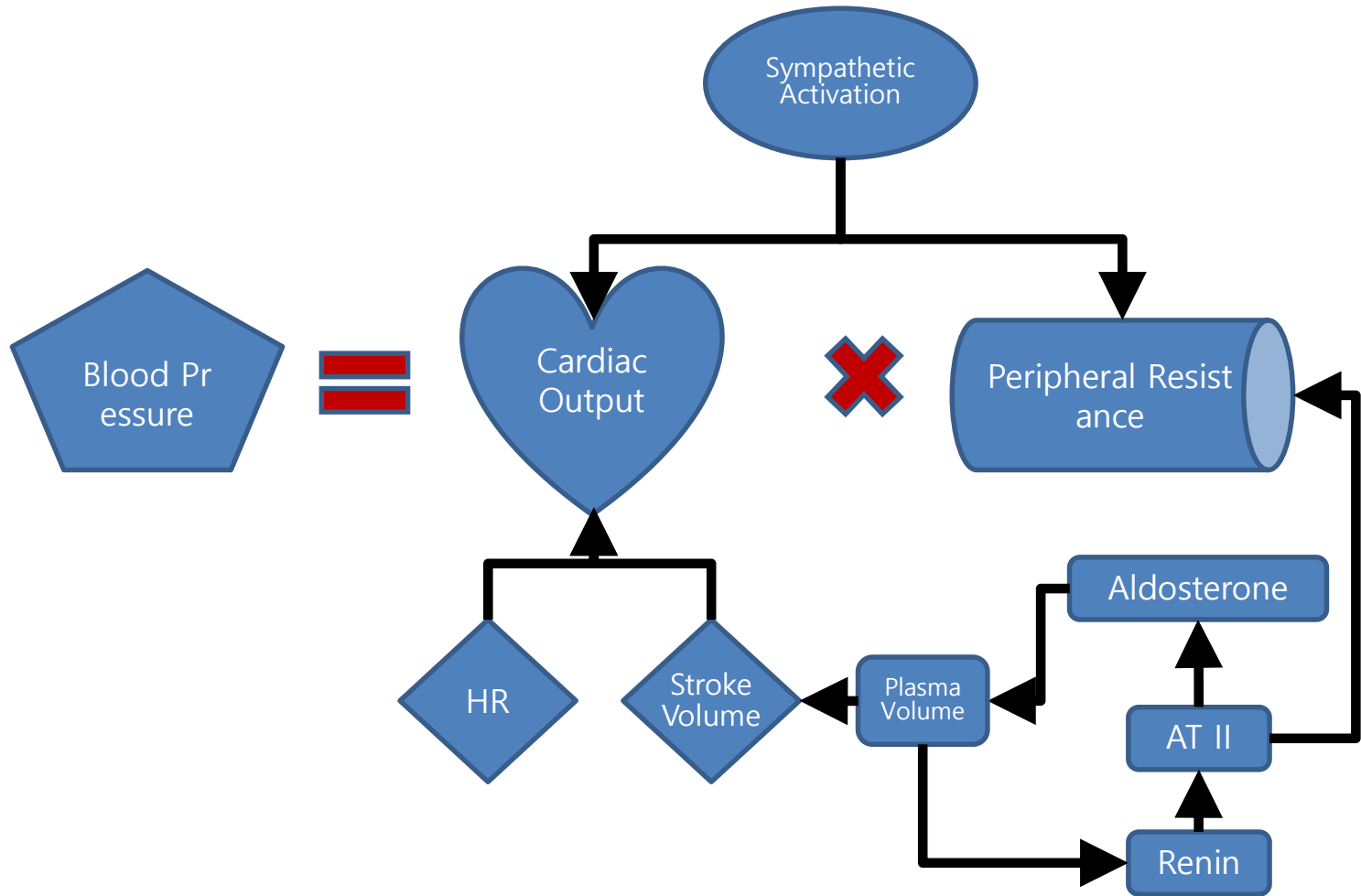
د. أسامة محمود العنان

ماجستير في أمراض الكلية وارتفاع التوتر الشرياني

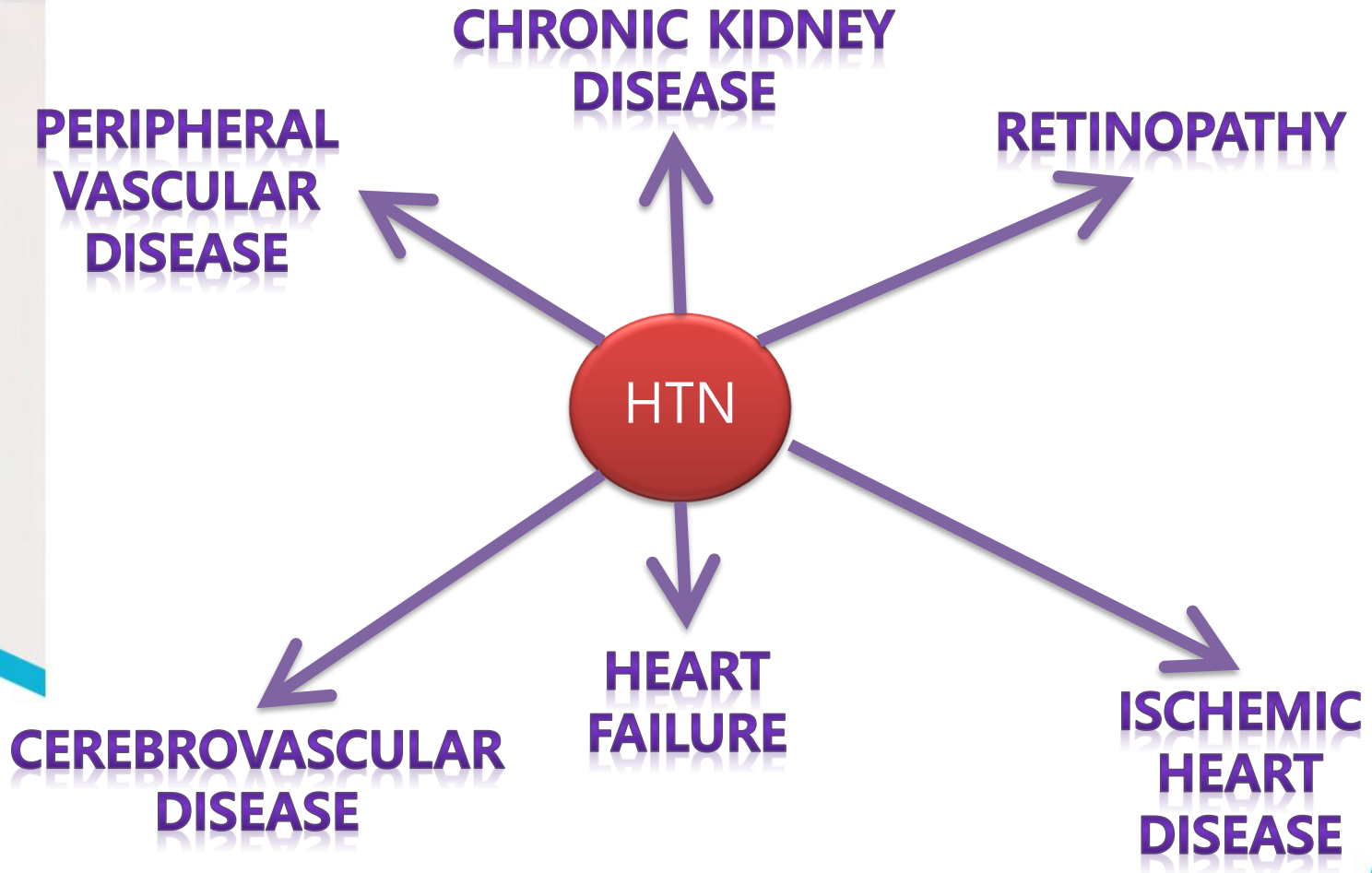


جامعة المنارة- كلية الصيدلة 6/1/2020

# Pathophysiology of Hypertension



# Hypertension as a Risk Factor



# Effect of long-term modest reduction in heart disease risk factors



10% Reduction  
in  
Blood Pressure

+

10% Reduction  
in Cholesterol

=

45% Reduction  
in  
Heart Disease



# JNC8 تصنيف ارتفاع الضغط الشرياني



**Table 2. BP Classification (JNC 7 and the 2017 Hypertension Clinical Practice Guidelines)**

SBP (mm Hg)	and/or	DBP (mm Hg)	JNC 7 <sup>5</sup>	2017 GL <sup>4</sup>
<120	and	<80	Normal BP	Normal BP
120–129	and	<80	Prehypertension	Elevated BP
130–139	or	80–89	Prehypertension	Stage 1 hypertension
140–159	or	90–99	Stage 1 hypertension	Stage 2 hypertension
≥160	or	≥100	Stage 2 hypertension	Stage 2 hypertension

BP should be based on an average of  $\geq 2$  careful readings on  $\geq 2$  occasions. Adults with SBP or DBP in 2 categories should be designated to the higher BP category.

BP indicates blood pressure; DBP, diastolic blood pressure; GL, guideline; JNC, Joint National Committee; and SBP, systolic blood pressure.

# تصنيف ارتفاع الضغط الشرياني - ESC/ESH



**Table 3** Classification of office blood pressure<sup>a</sup> and definitions of hypertension grade<sup>b</sup>

Category	Systolic (mmHg)		Diastolic (mmHg)
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 <sup>b</sup>	≥140	and	<90

BP = blood pressure; SBP = systolic blood pressure.

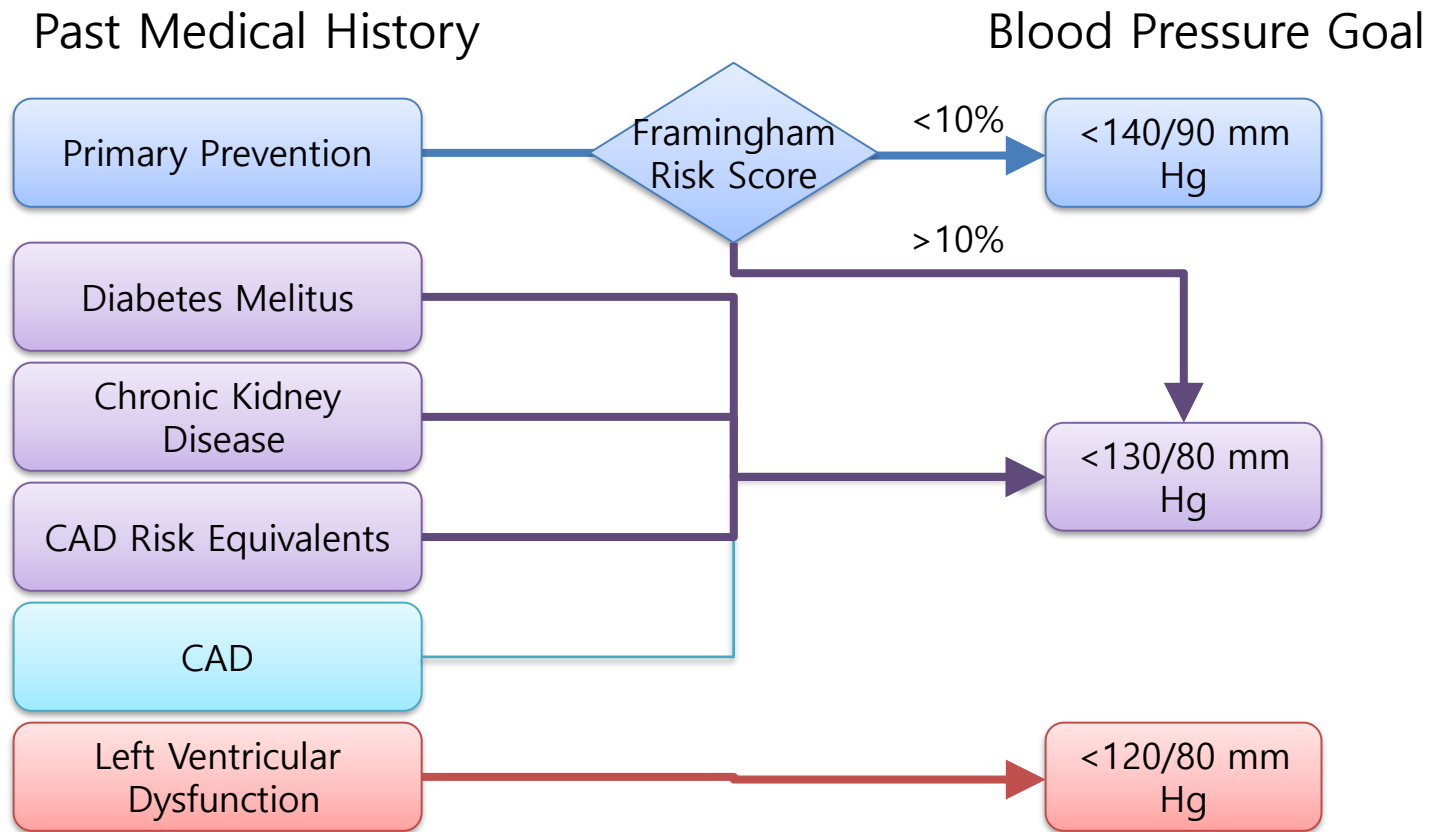
<sup>a</sup>BP category is defined according to seated clinic BP and by the highest level of BP, whether systolic or diastolic.

<sup>b</sup>Isolated systolic hypertension is graded 1, 2, or 3 according to SBP values in the ranges indicated.

The same classification is used for all ages from 16 years.



# From JNC-8 to 2014 AHA Guidelines



Adapted From Saseen, JJ. Essential Hypertension. Applied Therapeutics: The Clinical Use of Drugs 10<sup>th</sup> edition. 2008



**Table 6 Risk modifiers increasing cardiovascular risk estimated by the Systemic COronary Risk Evaluation (SCORE) system<sup>35</sup>**

Social deprivation, the origin of many causes of CVD
Obesity (measured by BMI) and central obesity (measured by waist circumference)
Physical inactivity
Psychosocial stress, including vital exhaustion
Family history of premature CVD (occurring at age <55 years in men and <60 years in women)
Autoimmune and other inflammatory disorders
Major psychiatric disorders
Treatment for infection with human immunodeficiency virus
Atrial fibrillation
LV hypertrophy
CKD
Obstructive sleep apnoea syndrome

BMI = body mass index; CKD = chronic kidney disease; CVD = cardiovascular disease; LV = left ventricular.



Hypertension disease staging	Other risk factors, HMOD, or disease	BP (mmHg) grading			
		High normal SBP 130-139 DBP 85-89	Grade 1 SBP 140-159 DBP 90-99	Grade 2 SBP 160-179 DBP 100-109	Grade 3 SBP $\geq$ 180 or DBP $\geq$ 110
Stage 1 (uncomplicated)	No other risk factors	Low risk	Low risk	Moderate risk	High risk
	1 or 2 risk factors	Low risk	Moderate risk	Moderate to high risk	High risk
	$\geq$ 3 risk factors	Low to Moderate risk	Moderate to high risk	High Risk	High risk
Stage 2 (asymptomatic disease)	HMOD, CKD grade 3, or diabetes mellitus without organ damage	Moderate to high risk	High risk	High risk	High to very high risk
Stage 3 (established disease)	Established CVD, CKD grade $\geq$ 4, or diabetes mellitus with organ damage	Very high risk	Very high risk	Very high risk	Very high risk

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**Figure 1** Classification of hypertension stages according to blood pressure levels, presence of cardiovascular risk factors, hypertension-mediated organ damage, or comorbidities. CV risk is illustrated for a middle-aged male. The CV risk does not necessarily correspond to the actual risk at different ages. The use of the SCORE system is recommended for formal estimation of CV risk for treatment decisions. BP = blood pressure; CKD = chronic kidney disease; CV = cardiovascular; DBP = diastolic blood pressure; HMOD = hypertension-mediated organ damage; SBP = systolic blood pressure; SCORE = Systematic COronary Risk Evaluation.



**Table 46.1** Classification of hypertension in children and adolescents [3]

Category	0–15-year	16-year and older
	SBP and/or DBP percentile	SBP and/or DBP values
Normal	<90th	<130/85 mmHg
High normal	≥90th to <95th percentile	130–139/85–89 mmHg
Hypertension	≥95th percentile	≥140/90 mmHg
Stage 1 hypertension	95th percentile to the 99th percentile plus 5 mmHg	140–159/90–99 mmHg
Stage 2 hypertension	>99th percentile plus 5 mmHg	160–179/100–109 mmHg
Isolated systolic hypertension	SBP ≥95th percentile and DBP <90th percentile	≥140/<90 mmHg

**Table 1.** Comparison of BP Target Recommendations

	BP Targets	BP Categories <sup>a</sup>		
			SBP (mm Hg)	DBP (mm Hg)
JNC 7, 2003	< 140/90 mm Hg < 130/80 mm Hg for those with diabetes or chronic kidney disease	Normal	< 120	< 80
		Prehypertension	120–139	80–89
		Stage 1 hypertension	140–159	90–99
		Stage 2 hypertension	≥ 160	≥ 100
JNC 8, 2014	< 150/90 mm Hg for patients ≥ 60 < 140/90 mm Hg for patients < 60, diabetes, and chronic kidney disease	Was not a comprehensive set of recommendations, and did not discuss hypertension diagnostic thresholds		
ACP/AAFP, 2017	< 150/90 mm Hg for patients ≥ 60 < 140/90 mm Hg for patients at higher CV risk, or with a history of stroke or TIA	Was not a comprehensive set of recommendations and did not discuss hypertension diagnostic thresholds Did not address recommendations in patients < 60		
ACC/AHA, 2017	≤ 130/80 mm Hg	Normal	< 120	< 80
		Elevated	120–129	< 80
		Stage 1 hypertension <sup>b</sup>	130–139	80–89
		Stage 2 hypertension	≥ 140	≥ 90

<sup>a</sup>Patients with SBP and DBP in two different categories should be classified in the higher category.

<sup>b</sup>Antihypertensive medication should be initiated in stage 1 hypertension only in patients with clinical CV disease, a 10-year risk of ASCVD of 10% or higher, diabetes mellitus, or chronic kidney disease.

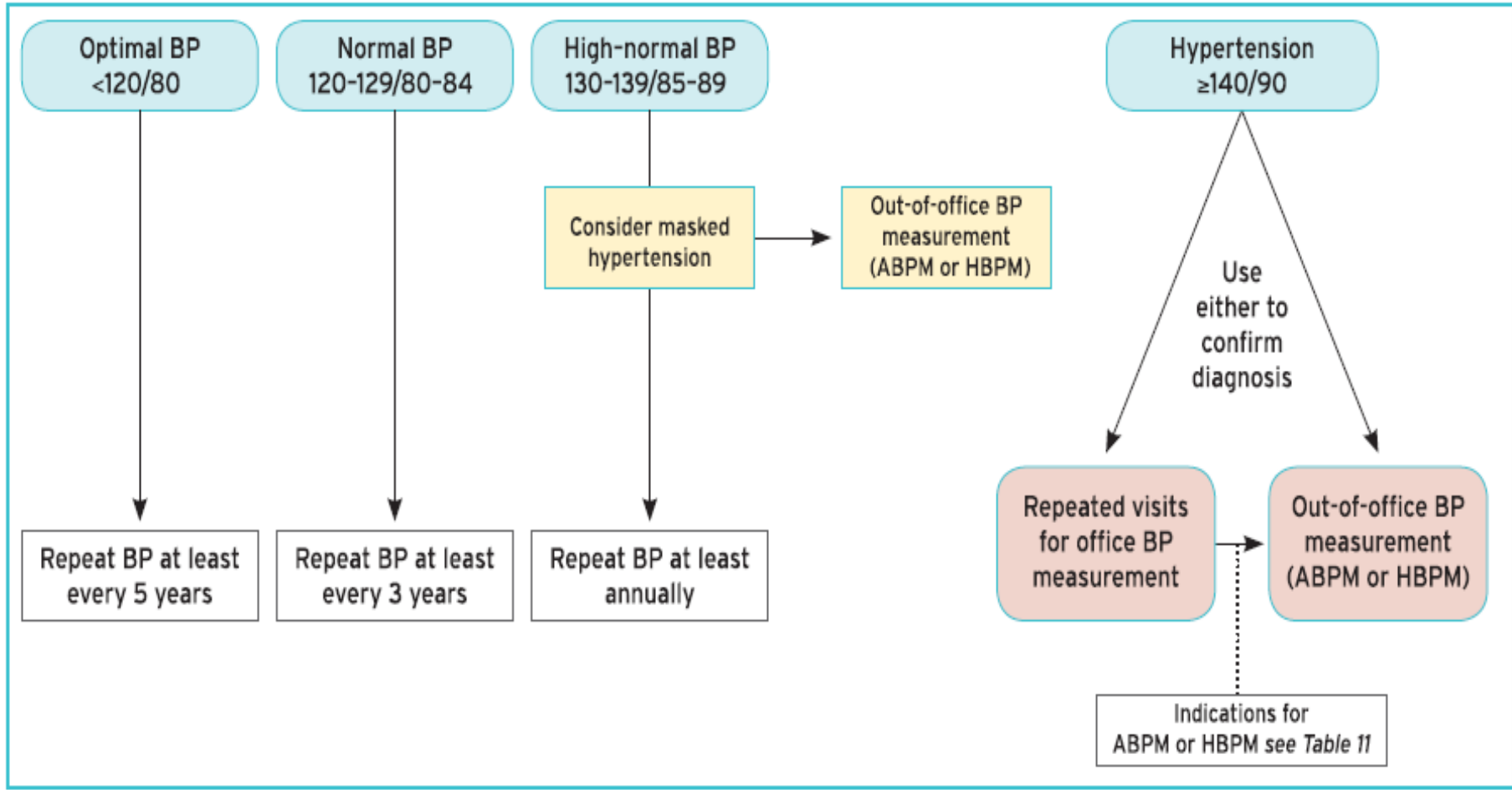
BP = blood pressure; TIA = transient ischemic attack.

**Table 10** Comparison of ambulatory blood pressure monitoring and home blood pressure monitoring

ABPM	HBPM
<p><b>Advantages</b></p> <ul style="list-style-type: none"><li>● Can identify white-coat and masked hypertension</li><li>● Stronger prognostic evidence</li><li>● Night-time readings</li><li>● Measurement in real-life settings</li><li>● Additional prognostic BP phenotypes</li><li>● Abundant information from a single measurement session, including short-term BP variability</li></ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"><li>● Can identify white-coat and masked hypertension</li><li>● Cheap and widely available</li><li>● Measurement in a home setting, which may be more relaxed than the doctor's office</li><li>● Patient engagement in BP measurement</li><li>● Easily repeated and used over longer periods to assess day-to-day BP variability</li></ul>
<p><b>Disadvantages</b></p> <ul style="list-style-type: none"><li>● Expensive and sometimes limited availability</li><li>● Can be uncomfortable</li></ul>	<p><b>Disadvantages</b></p> <ul style="list-style-type: none"><li>● Only static BP is available</li><li>● Potential for measurement error</li><li>● No nocturnal readings<sup>a</sup></li></ul>

ABPM = ambulatory blood pressure monitoring; BP = blood pressure; HBPM = home blood pressure monitoring.

<sup>a</sup>Techniques are being developed to enable nocturnal BP measurement with home BP devices.



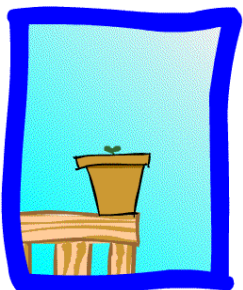
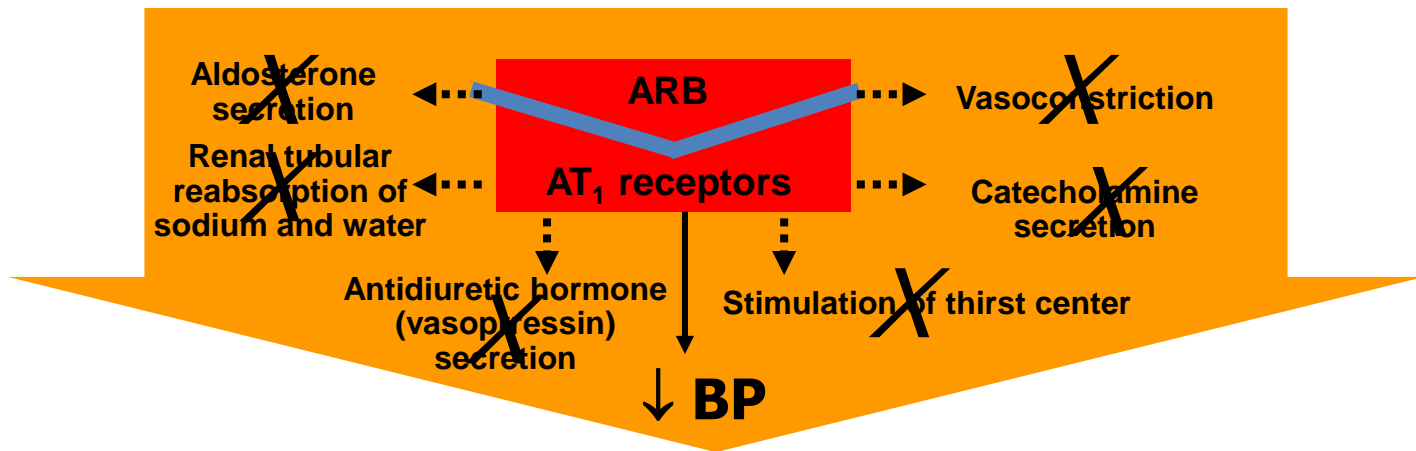
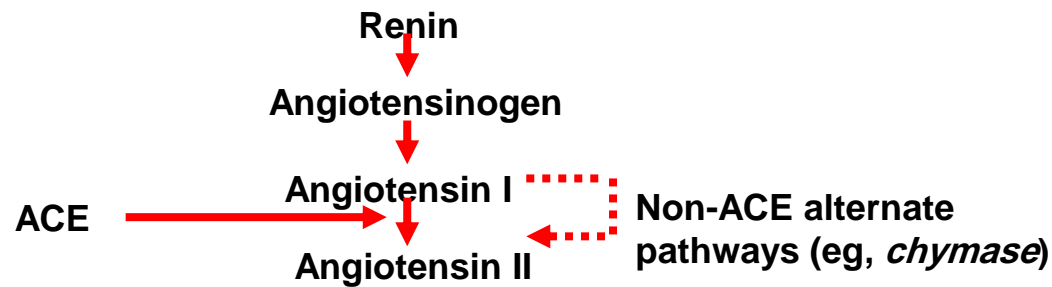
**Figure 2** Screening and diagnosis of hypertension. ABPM = ambulatory blood pressure monitoring; BP = blood pressure; HBPM = home blood pressure monitoring.

**Table 14** Routine workup for evaluation of hypertensive patients

Routine laboratory tests
Haemoglobin and/or haematocrit
Fasting blood glucose and glycated HbA <sub>1c</sub>
Blood lipids: total cholesterol, LDL cholesterol, HDL cholesterol
Blood triglycerides
Blood potassium and sodium
Blood uric acid
Blood creatinine and eGFR
Blood liver function tests
Urine analysis: microscopic examination; urinary protein by dipstick test or, ideally, albumin:creatinine ratio
12-lead ECG

eGFR = estimated glomerular filtration rate; ECG = electrocardiogram; HbA<sub>1c</sub> = haemoglobin A1c.

# Renin- Angiotensin-ALDOSTERON



**Table 15** Assessment of hypertension-mediated organ damage

Basic screening tests for HMOD	Indication and interpretation
12-lead ECG	Screen for LVH and other possible cardiac abnormalities, and to document heart rate and cardiac rhythm
Urine albumin:creatinine ratio	To detect elevations in albumin excretion indicative of possible renal disease
Blood creatinine and eGFR	To detect possible renal disease
Fundoscopy	To detect hypertensive retinopathy, especially in patients with grade 2 or 3 hypertension
More detailed screening for HMOD	
Echocardiography	To evaluate cardiac structure and function, when this information will influence treatment decisions
Carotid ultrasound	To determine the presence of carotid plaque or stenosis, particularly in patients with cerebrovascular disease or vascular disease elsewhere
Abdominal ultrasound and Doppler studies	<ul style="list-style-type: none"><li>● To evaluate renal size and structure (e.g. scarring) and exclude renal tract obstruction as possible underlying causes of CKD and hypertension</li><li>● Evaluate abdominal aorta for evidence of aneurysmal dilatation and vascular disease</li><li>● Examine adrenal glands for evidence of adenoma or pheochromocytoma (CT or MRI preferred for detailed examination); see section 8.2 regarding screening for secondary hypertension</li><li>● Renal artery Doppler studies to screen for the presence of renovascular disease, especially in the presence of asymmetric renal size</li></ul>



# Therapeutic Treatment Options

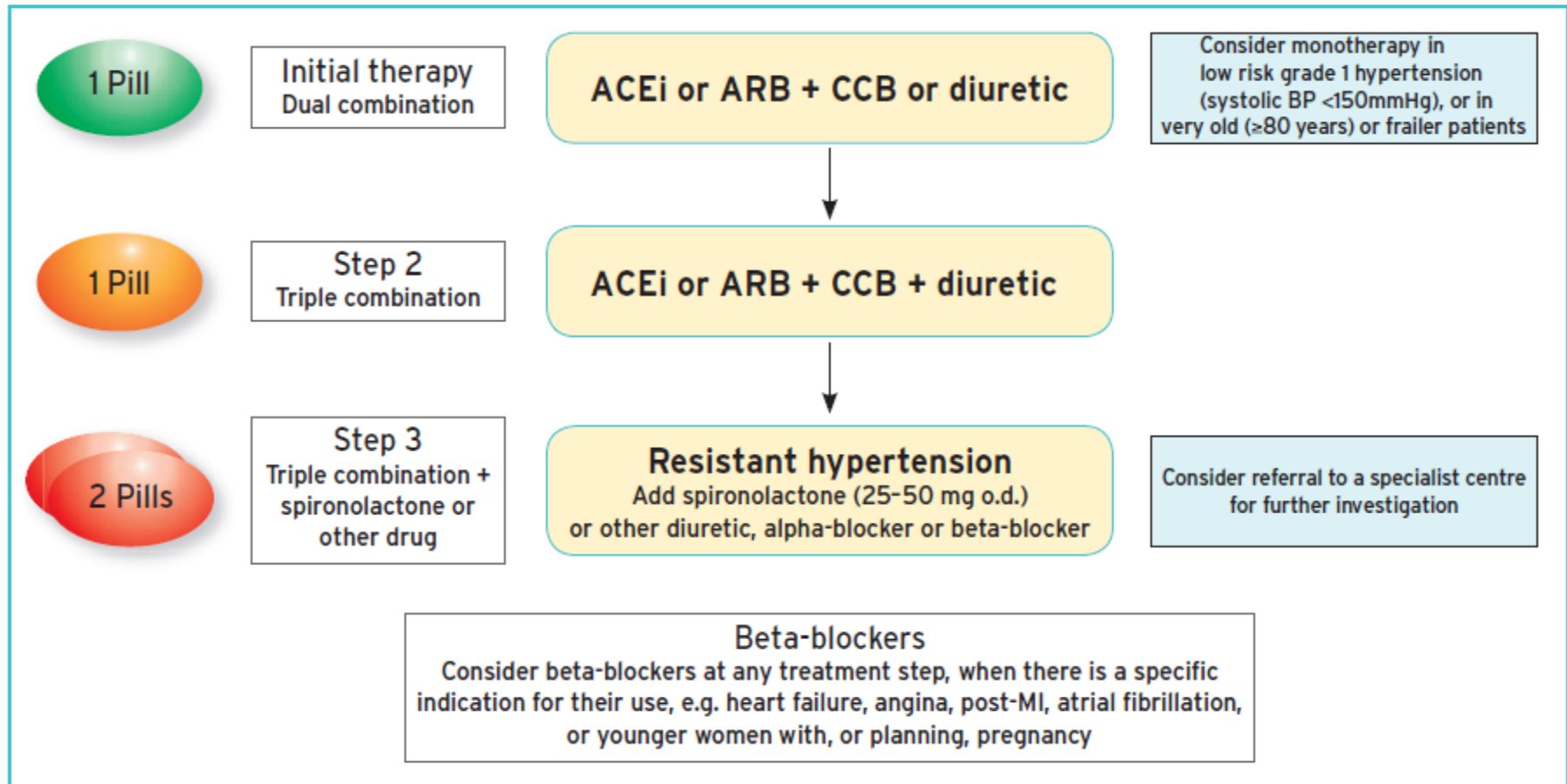
- *Diuretics*
- *ACE inhibitors*
- *Angiotensin II receptor blockers*
- *Calcium channel blockers*
- *Beta blockers*
- Alpha blockers
- Centrally acting alpha agonists
- Direct vasodilators
- Peripheral adrenergic blockers
- RENIN agonists



**Table 20** Compelling and possible contraindications to the use of specific antihypertensive drugs

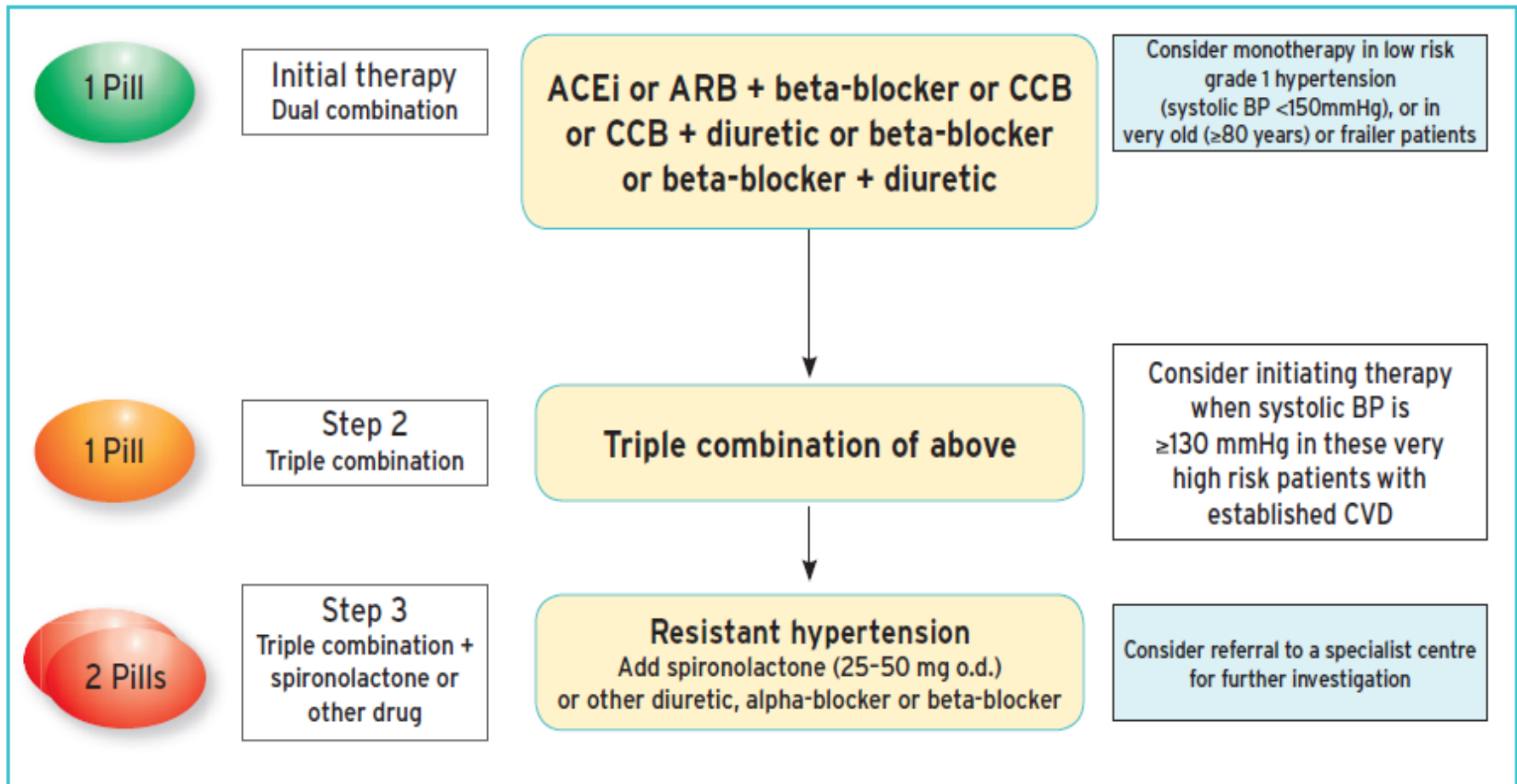
Drug	Contraindications	
	Compelling	Possible
Diuretics (thiazides/thiazide-like, e.g. chlorthalidone and indapamide)	<ul style="list-style-type: none"> <li>● Gout</li> </ul>	<ul style="list-style-type: none"> <li>● Metabolic syndrome</li> <li>● Glucose intolerance</li> <li>● Pregnancy</li> <li>● Hypercalcaemia</li> <li>● Hypokalaemia</li> </ul>
Beta-blockers	<ul style="list-style-type: none"> <li>● Asthma</li> <li>● Any high-grade sinoatrial or atrioventricular block</li> <li>● Bradycardia (heart rate &lt;60 beats per min)</li> </ul>	<ul style="list-style-type: none"> <li>● Metabolic syndrome</li> <li>● Glucose intolerance</li> <li>● Athletes and physically active patients</li> </ul>
Calcium antagonists (dihydropyridines)		<ul style="list-style-type: none"> <li>● Tachyarrhythmia</li> <li>● Heart failure (HFrEF, class III or IV)</li> <li>● Pre-existing severe leg oedema</li> </ul>
Calcium antagonists (verapamil, diltiazem)	<ul style="list-style-type: none"> <li>● Any high-grade sinoatrial or atrioventricular block</li> <li>● Severe LV dysfunction (LV ejection fraction &lt;40%)</li> <li>● Bradycardia (heart rate &lt;60 beats per min)</li> </ul>	<ul style="list-style-type: none"> <li>● Constipation</li> </ul>
ACE inhibitors	<ul style="list-style-type: none"> <li>● Pregnancy</li> <li>● Previous angioneurotic oedema</li> <li>● Hyperkalaemia (potassium &gt;5.5 mmol/L)</li> <li>● Bilateral renal artery stenosis</li> </ul>	<ul style="list-style-type: none"> <li>● Women of child-bearing potential without reliable contraception</li> </ul>
ARBs	<ul style="list-style-type: none"> <li>● Pregnancy</li> <li>● Hyperkalaemia (potassium &gt;5.5 mmol/L)</li> <li>● Bilateral renal artery stenosis</li> </ul>	<ul style="list-style-type: none"> <li>● Women of child-bearing potential without reliable contraception</li> </ul>

# Hypertension



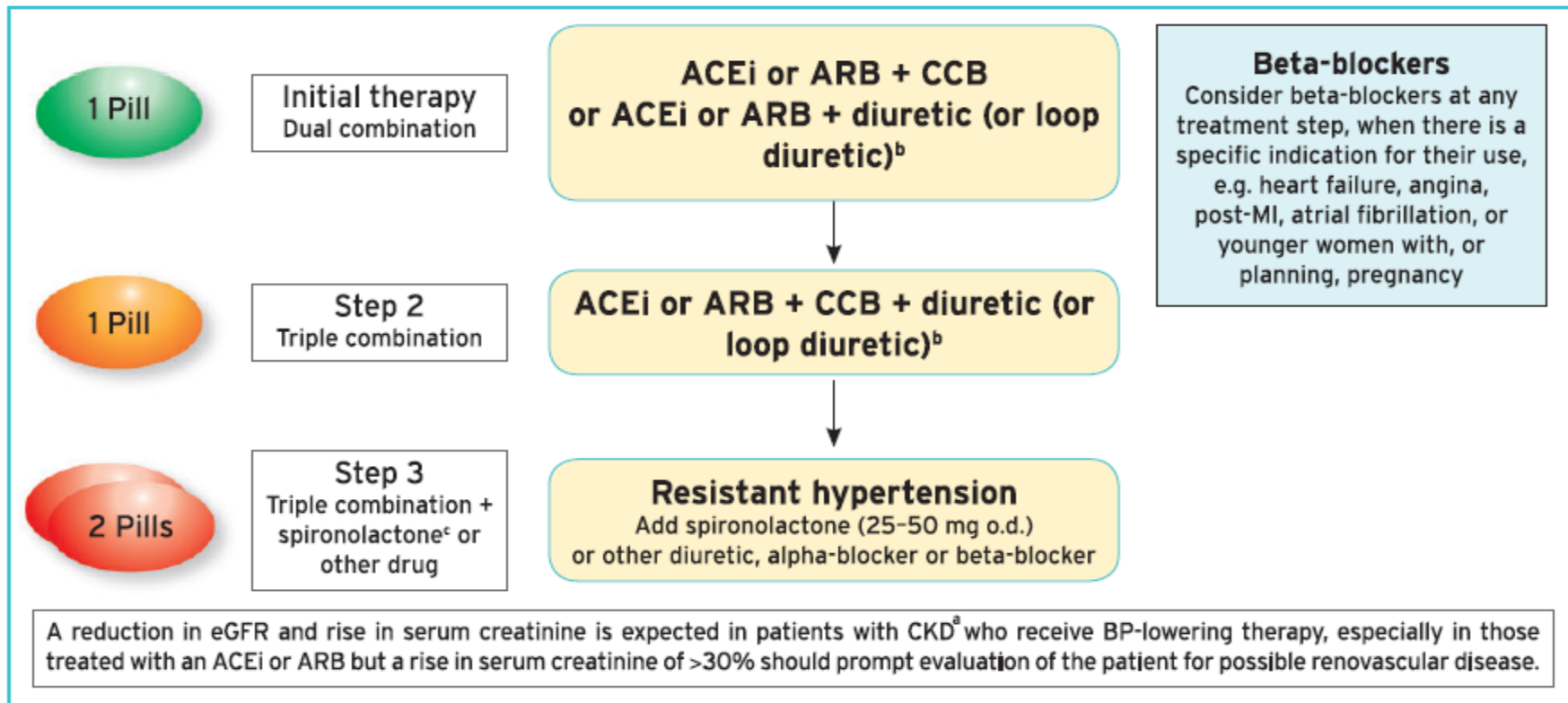
**Figure 4 Core drug treatment strategy for uncomplicated hypertension.** The core algorithm is also appropriate for most patients with HMOD, cerebrovascular disease, diabetes, or PAD. ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; HMOD = hypertension-mediated organ damage; MI = myocardial infarction; o.d. = omni die (every day); PAD = peripheral artery disease.

# Hypertension and CAD



**Figure 5** Drug treatment strategy for hypertension and coronary artery disease. ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; BP = blood pressure; CCB = calcium channel blocker; CVD = cardiovascular disease; o.d. = omni die (every day).

# Hypertension and CKD



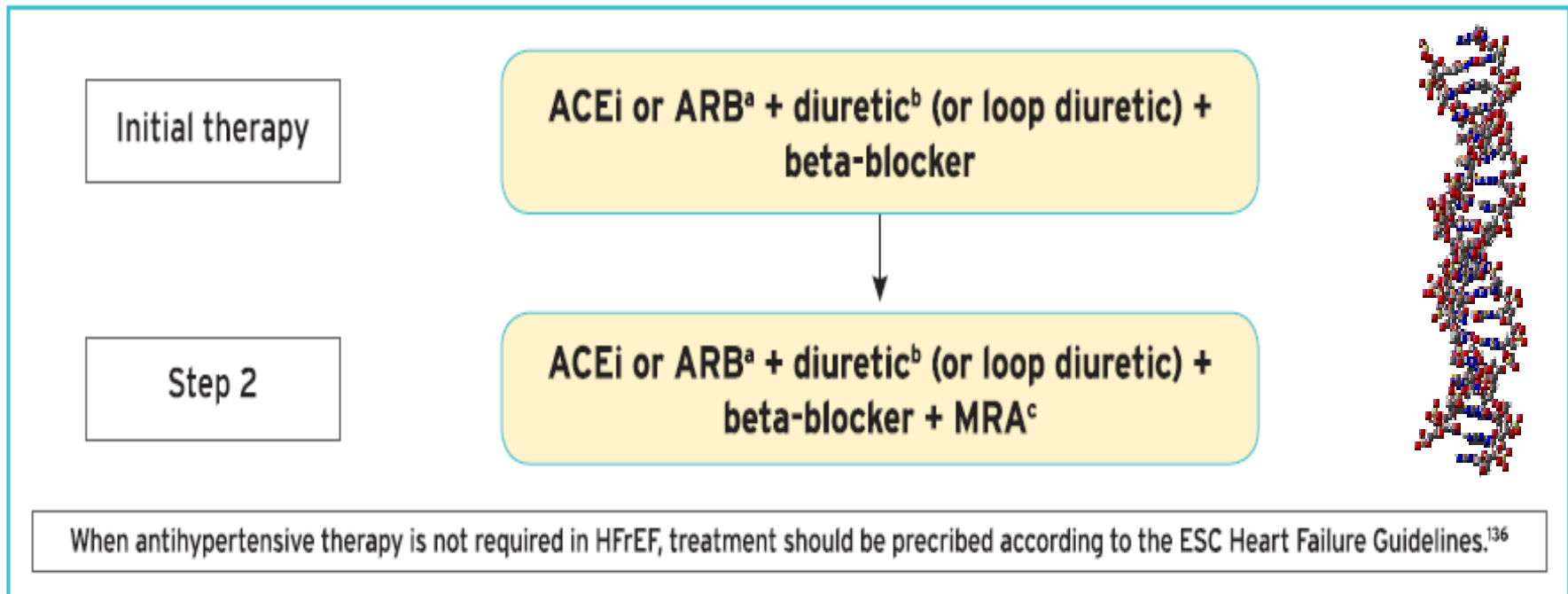
**Figure 6 Drug treatment strategy for hypertension and chronic kidney disease.** ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; BP = blood pressure; CCB = calcium channel blocker; CKD = chronic kidney disease; eGFR = estimated glomerular filtration rate; MI = myocardial infarction; o.d. = omni die (every day).

<sup>a</sup>CKD is defined as an eGFR <60 mL/min/1.72 m<sup>2</sup> with or without proteinuria.

<sup>b</sup>Use loop diuretics when eGFR is <30 mL/min/1.72 m<sup>2</sup>, because thiazide/thiazide-like diuretics are much less effective/ineffective when eGFR is reduced to this level.

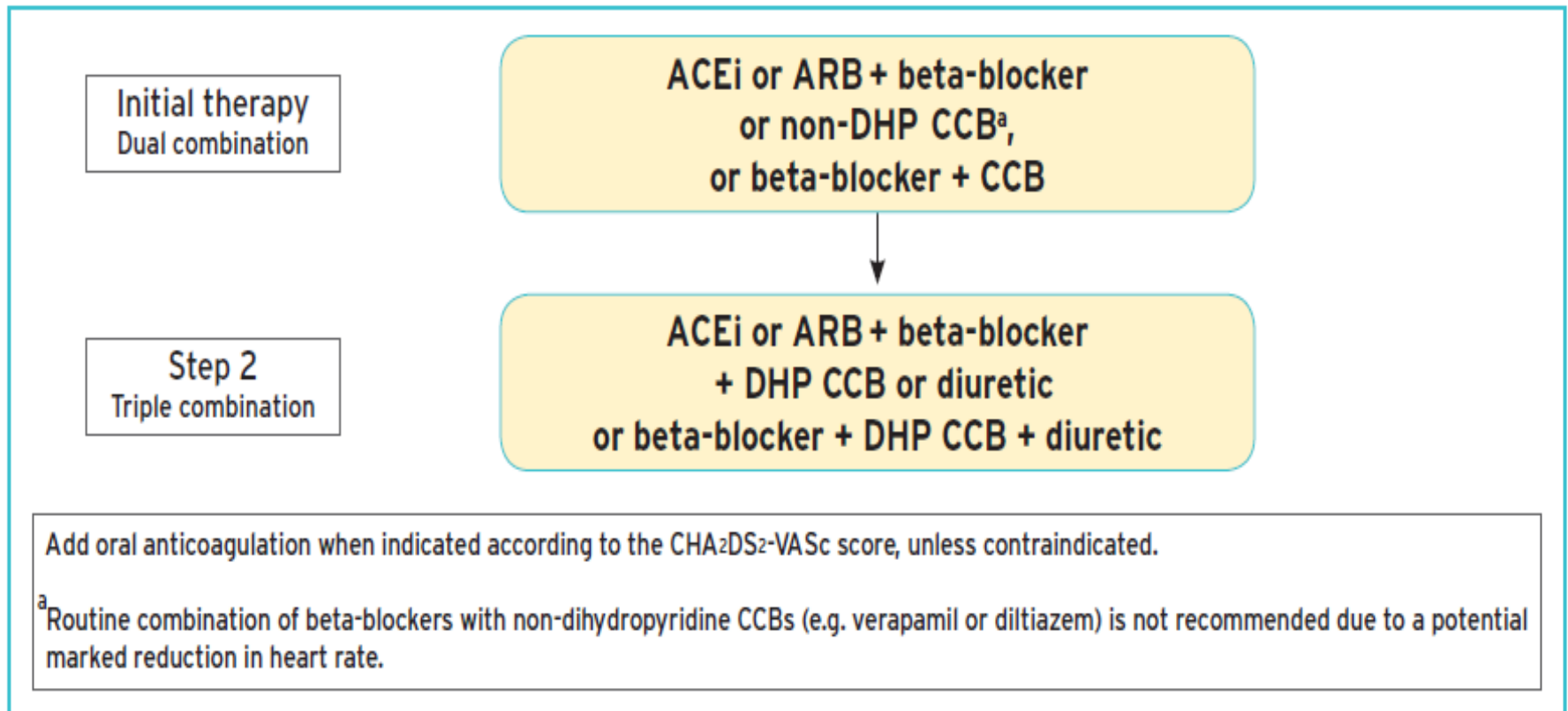
<sup>c</sup>Caution: risk of hyperkalaemia with spironolactone, especially when eGFR is <45 mL/min/1.72 m<sup>2</sup> or baseline K<sup>+</sup> ≥4.5 mmol/L.

# Hypertension and HF



**Figure 7 Drug treatment strategy for hypertension and heart failure with reduced ejection fraction.** Do not use non-dihydropyridine CCBs (e.g. verapamil or diltiazem). ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; ESC = European Society of Cardiology; HFrEF = heart failure with reduced ejection fraction; MRA = mineralocorticoid receptor antagonist.  
<sup>a</sup>Consider an angiotensin receptor/neprilysin inhibitor instead of ACEi or ARB per ESC Heart Failure Guidelines.<sup>136</sup>  
<sup>b</sup>Diuretic refers to thiazide/thiazide-like diuretic. Consider a loop diuretic as an alternative in patients with oedema.  
<sup>c</sup>MRA (spironolactone or eplerenone).

# Hypertension and AF



**Figure 8 Drug treatment strategy for hypertension and atrial fibrillation.** ACEi = angiotensin-converting enzyme inhibitor; AF = atrial fibrillation; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; CHA<sub>2</sub>DS<sub>2</sub>-VASc = CHA<sub>2</sub>DS<sub>2</sub>-VASc = Cardiac failure, Hypertension, Age ≥75 (Doubled), Diabetes, Stroke (Doubled) – Vascular disease, Age 65–74 and Sex category (Female); DHP = dihydropyridine.  
<sup>a</sup>Non-DHP CCB (non-DHP CCB, e.g. verapamil or diltiazem).

# HYPERTENSION RESISTANT



**Table 24** Resistant hypertension characteristics, secondary causes, and contributing factors (adapted from reference<sup>385</sup>)

Characteristics of patients with resistant hypertension	Causes of secondary resistant hypertension	Drugs and substances that may cause raised BP
<p><b>Demographics</b></p> <ul style="list-style-type: none"> <li>● Older age (especially &gt;75 years)</li> <li>● Obesity</li> <li>● More common in black people</li> <li>● Excess dietary sodium intake</li> <li>● High baseline BP and chronicity of uncontrolled hypertension</li> </ul>	<p><b>More common causes</b></p> <ul style="list-style-type: none"> <li>● Primary hyperaldosteronism</li> <li>● Atherosclerotic renovascular disease</li> <li>● Sleep apnoea</li> <li>● CKD</li> </ul>	<p><b>Prescribed drugs</b></p> <ul style="list-style-type: none"> <li>● Oral contraceptives</li> <li>● Sympathomimetic agents (e.g. decongestants in proprietary cold remedies)</li> <li>● Non-steroidal anti-inflammatory drugs</li> <li>● Cyclosporin</li> <li>● Erythropoietin</li> <li>● Steroids (e.g. prednisolone and hydrocortisone)</li> <li>● Some cancer therapies</li> </ul>
<p><b>Concomitant disease</b></p> <ul style="list-style-type: none"> <li>● HMOD: LVH and/or CKD</li> <li>● Diabetes</li> <li>● Atherosclerotic vascular disease</li> <li>● Aortic stiffening and isolated systolic hypertension</li> </ul>	<p><b>Uncommon causes</b></p> <ul style="list-style-type: none"> <li>● Pheochromocytoma</li> <li>● Fibromuscular dysplasia</li> <li>● Aortic coarctation</li> <li>● Cushing's disease</li> <li>● Hyperparathyroidism</li> </ul>	<p><b>Non-prescription drugs</b></p> <ul style="list-style-type: none"> <li>● Recreational drugs (e.g. cocaine, amphetamines, and anabolic steroids)</li> <li>● Excessive liquorice ingestion</li> <li>● Herbal remedies (e.g. ephedra and ma huang)</li> </ul>

BP = blood pressure; CKD = chronic kidney disease; HMOD = hypertension-mediated organ damage; LVH = left ventricular hypertrophy.



# HYPERTENSION RESISTANT



**Table 2.** Fourth-line and Beyond Antihypertension Options

Therapy	Potential Population	Precautions	Notes
MRA	Hypokalemia, HFrEF, proteinuria, edema	Advanced kidney disease, hyperkalemia, hormonal effects with spironolactone	Spironolactone is better studied in resistant hypertension; consider eplerenone for spironolactone intolerance because of antitestosterone effects
$\beta$ -Blocker	HFrEF, MI, atrial fibrillation, tachycardia, migraine prophylaxis, tremor	Bradycardia, asthma	
$\alpha$ -Blocker	BPH, ED, PTSD/nightmares	Orthostatic hypotension	
Hydralazine	HFrEF (in combination with nitrates)	Adherence problems with TID dosing, drug-induced lupus, increased BP variability, reflex tachycardia	
Minoxidil	Very resistant hypertension	Often profound salt and water retention. Reflex tachycardia, hirsutism, pericardial effusion	Give in conjunction with loop diuretic and rate control agent
Central $\alpha$ -agonist	Anxiety disorders, ADHD	Anticholinergic effects, sedation, and cognitive effects may be especially pronounced in older adult patients. Rebound hypertension and/or bradycardia may be exacerbated in patients receiving $\beta$ -blockers. Skin irritation and/or adhesion problems with clonidine patch	

ADHD = attention-deficit/hyperactivity disorder; BPH = benign prostatic hyperplasia; ED = erectile dysfunction; HFrEF = heart failure with reduced ejection fraction; MRA = mineralocorticoid receptor antagonist; PTSD = posttraumatic stress disorder; TID = three times daily.

# NICE guideline 2019

## Hypertension in adults: diagnosis and management



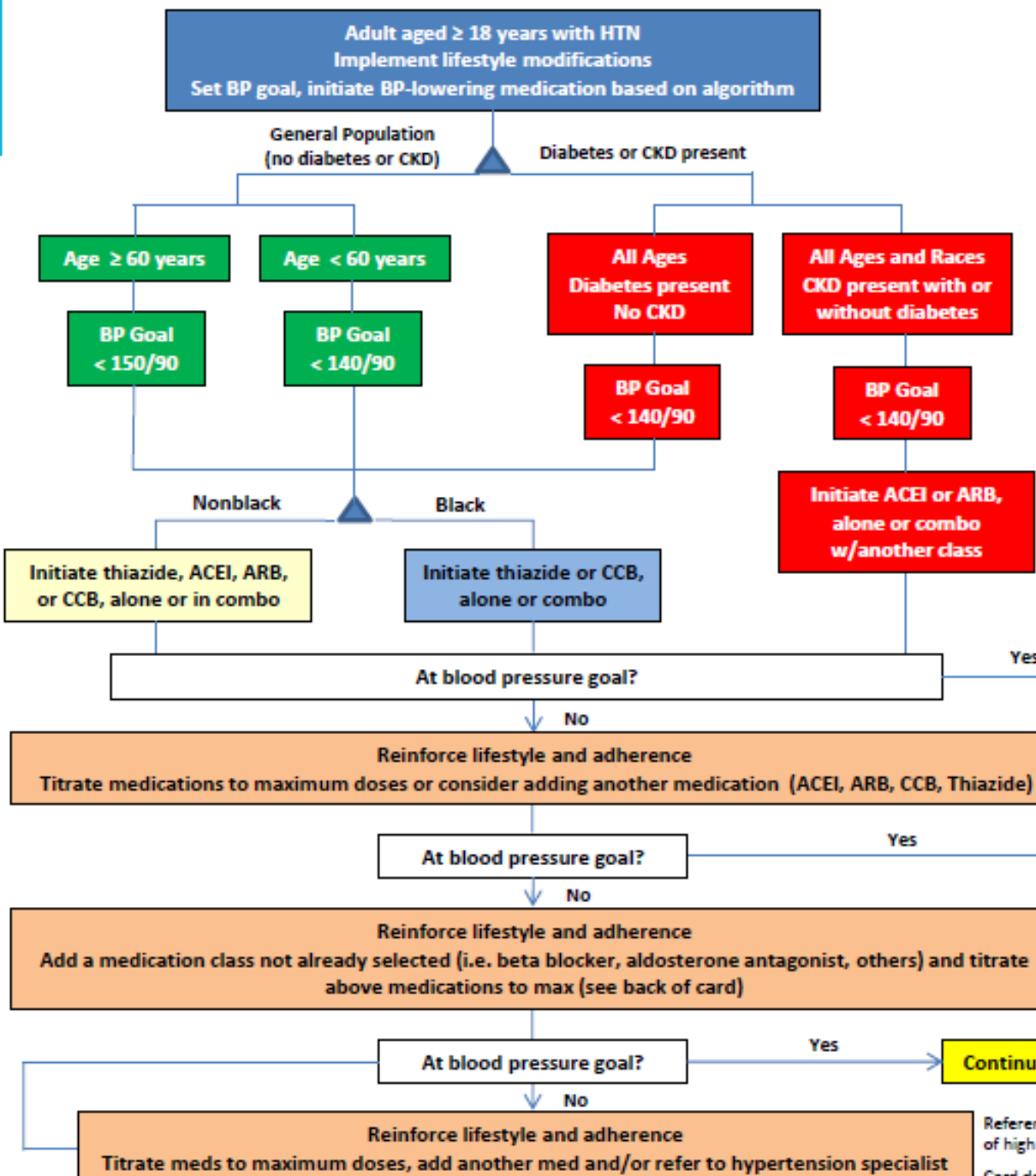
### Step 4 treatment

- 1) If hypertension is not controlled in adults taking the optimal tolerated doses of an **ACE inhibitor or an ARB** plus a **CCB** and a **thiazide-like** diuretic, regard them as having **resistant hypertension**.
- 2) Confirm elevated clinic blood pressure measurements using ambulatory or home blood pressure recordings.
- 3) Consider further diuretic therapy with low-dose **spironolactone**
- 4) [4] for adults with resistant hypertension starting step 4 treatment who have a blood **potassium of 4.5** mmol/l or less.
- 5) Consider an **alpha-blocker or beta-blocker** for adults with resistant hypertension starting step 4 treatment who have a blood potassium level of more than 4.5mmol/l

## JNC 8 Hypertension Guideline Algorithm

### Initial Drugs of Choice for Hypertension

- ACE inhibitor (ACEI)
- Angiotensin receptor blocker (ARB)
- Thiazide diuretic
- Calcium channel blocker (CCB)



Strategy	Description
A	Start one drug, titrate to maximum dose, and then add a second drug.
B	Start one drug, then add a second drug before achieving max dose of first
C	Begin 2 drugs at same time, as separate pills or combination pill. Initial combination therapy is recommended if BP is greater than 20/10mm Hg above goal

- Lifestyle changes:**
- Smoking Cessation
  - Control blood glucose and lipids
  - Diet
    - ✓ Eat healthy (i.e., DASH diet)
    - ✓ Moderate alcohol consumption
    - ✓ Reduce sodium intake to no more than 2,400 mg/day
  - Physical activity
    - ✓ Moderate-to-vigorous activity 3-4 days a week averaging 40 min per session.

Reference: James PA, Ortiz E, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: (JNC8). JAMA. 2014 Feb 5;311(5):507-20  
Card developed by Cole Glenn, Pharm.D. & James L Taylor, Pharm.D.

# Hypertension Treatment

## Compelling Indications

Indication	Treatment Choice
Heart Failure	ACEI/ARB + BB + diuretic + spironolactone
Post-MI/Clinical CAD	ACEI/ARB AND BB
CAD	ACEI, BB, diuretic, CCB
Diabetes	ACEI/ARB, CCB, diuretic
CKD	ACEI/ARB
Recurrent stroke prevention	ACEI, diuretic
Pregnancy	labetolol (first line), nifedipine, methyldopa

Beta-1 Selective Beta-blockers – possibly safer in patients with COPD, asthma, diabetes, and peripheral vascular disease:

- metoprolol
- bisoprolol
- betaxolol
- acebutolol

Drug Class	Agents of Choice	Comments
Diuretics	HCTZ 12.5-50mg, chlorthalidone 12.5-25mg, indapamide 1.25-2.5mg triamterene 100mg <i>K<sup>+</sup> sparing</i> – spironolactone 25-50mg, amiloride 5-10mg, triamterene 100mg  furosemide 20-80mg twice daily, torsemide 10-40mg	Monitor for hypokalemia Most SE are metabolic in nature Most effective when combined w/ ACEI Stronger clinical evidence w/chlorthalidone Spironolactone - gynecomastia and hyperkalemia Loop diuretics may be needed when GFR <40mL/min
ACEI/ARB	<i>ACEI</i> : lisinopril, benazapril, fosinopril and quinapril 10-40mg, ramipril 5-10mg, trandolapril 2-8mg <i>ARB</i> : candesartan 8-32mg, valsartan 80-320mg, losartan 50-100mg, olmesartan 20-40mg, telmisartan 20-80mg	SE: Cough (ACEI only), angioedema (more with ACEI), hyperkalemia Losartan lowers uric acid levels; candesartan may prevent migraine headaches
Beta-Blockers	metoprolol succinate 50-100mg and tartrate 50-100mg twice daily, nebivolol 5-10mg, propranolol 40-120mg twice daily, carvedilol 6.25-25mg twice daily, bisoprolol 5-10mg, labetalol 100-300mg twice daily,	Not first line agents – reserve for post-MI/CHF Cause fatigue and decreased heart rate Adversely affect glucose; mask hypoglycemic awareness
Calcium channel blockers	<i>Dihydropyridines</i> : amlodipine 5-10mg, nifedipine ER 30-90mg, <i>Non-dihydropyridines</i> : diltiazem ER 180-360 mg, verapamil 80-120mg 3 times daily or ER 240-480mg	Cause edema; dihydropyridines may be safely combined w/ B-blocker Non-dihydropyridines reduce heart rate and proteinuria
Vasodilators	hydralazine 25-100mg twice daily, minoxidil 5-10mg  terazosin 1-5mg, doxazosin 1-4mg given at bedtime	Hydralazine and minoxidil may cause reflex tachycardia and fluid retention – usually require diuretic + B-blocker  Alpha-blockers may cause orthostatic hypotension
Centrally-acting Agents	clonidine 0.1-0.2mg twice daily, methyldopa 250-500mg twice daily  guanfacine 1-3mg	Clonidine available in weekly patch formulation for resistant hypertension

# متى نستخدم ABPM او HBPM

1. إذا كان ضغط الدم في العيادة يتراوح بين 140/90 مم زئبق و 180/120 مم زئبق ، فقم بتقديم مراقبة ضغط الدم المتتفلة ( ABPM) لتأكيد تشخيص ارتفاع ضغط الدم.
2. إذا كان ABPM غير مناسب أو كان الشخص غير قادر على تحمله ، فقم بتقديم مراقبة ضغط الدم في المنزل ( HBPM) لتأكيد تشخيص ارتفاع ضغط الدم. [2019]
3. عند استخدام ABPM لتأكيد تشخيص ارتفاع ضغط الدم ، تأكد من إجراء قياسين على الأقل خلال ساعات استيقاظ الشخص المعتادة (على سبيل المثال ، من الساعة 8:00 إلى الساعة 22:00). استخدم متوسط القيمة لما لا يقل عن 14 قياسات تم إجراؤها خلال ساعات الاستيقاظ المعتادة للشخص لتأكيد تشخيص ارتفاع ضغط الدم.
4. عند استخدام HBPM لتأكيد تشخيص ارتفاع ضغط الدم ، تأكد من أنه: لكل تسجيل ل ضغط الدم ، يتم أخذ قياسين متتاليين ، على بعد دقيقة واحدة على الأقل ومع وجود الشخص جالساً ، ويتم تسجيل ضغط الدم مرتين يوميًا ، وبشكل مثالي في الصباح و ي ستمر تسجيل المساء وضغط الدم لمدة 4 أيام على الأقل ، من الناحية المثالية لمدة 7 أيام.
5. تأكيد تشخيص ارتفاع ضغط الدم لدى الأشخاص الذين يعانون من:
6. عيادة ضغط الدم من 140/90 مم زئبق أو أعلى ومتوسط النهار ABPM أو متوسط HBPM من 135/85 مم زئبق أو أعلى. [2019]



# Therapy- Lifestyle Changes

## Therapeutic Lifestyle Changes (TLC)

- Weight
- Exercise
- Diet
- Smoking
- Caffeine

## Pharmacotherapy



# Therapeutic Lifestyle Changes vs. Pharmacotherapy




Adapted From: The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. 2004

Therapeutic Intervention	Approximate SBP Reduction
Weight Reduction (5-10% or 10kg)	5-20mmHg
DASH Diet (Low sodium, low fat)	8-14mmHg
<b>Single Antihypertensive</b>	<b>10mmHg (10 over 5 rule)</b>
30 minutes exercise most days	4-9mmHg
Dietary Sodium Reduction	2-8mmHg
Reduce alcohol to $\leq 2$ drinks/day	2-4mmHg



# Hypertension Worldwide Statistics



Country	Diagnosed Hypertensive	Aware	Treated	Controlled
US	24%	42%	52%	24%
UK	19%	63%	50%	30%
France	41%	79%	59%	24%
Germany	53%	12%	32%	22%
Canada	22%	59%	40%	16%
Italy	58%	79%	51%	19%
China	14%	26%	12%	3%

Chockalingam, *Am J Hypertens*, 1998; Chamontin et al, *Am J Hypertens*, 1998; Marques-Vidal et al, *Q J Med*, 1997; Trenkwalder et al, *J Hypertens*, 1994; Vincenzi et al, *G Ital Cardiol*, 2002; Colhoun et al, *J Hypertens*, 1998; Franklin et al, *Hypertension*, 2011; Tao et al, *Chin Med J*, 2008.







Food

Exercise



Cut Salt



Limit Alcohol



Manage Weight



Stop Smoking



# **VALSARTAN AND AMLODIPIN VS TELMISARTAN AND AMLODIPIN IN TREATMENT OF HYPERTENSION IN DIABETIC PATIENTS - META-ANALYSIS**



# شكرا لإصغائكم

