



[ Color index : **Important** | **Notes** | Extra ]

## Objectives:

- Epidemiology in Saudi Arabia
  - Diagnosis of hypertension, and recent guidelines
  - Describe the epidemiology of hypertension in Saudi Arabia.
- Discuss the reasons to control hypertension and the measures of prevention.
  - Outline the diagnosis of hypertension based on recent guidelines.
- Distinguish the different methods for diagnosis of hypertension such as measurement, role of “Ambulatory BP Monitoring” ABPM, Home monitoring).
- Provide a comprehensive approach for hypertensive patient in clinic List the risk factors of hypertension.
  - List the essential Investigations (Routine and Optional, especially for young)
    - Recognize the target organs damage (TOD)
    - Discuss the management of hypertension, non-pharmacological and
- pharmacological and focus on certain chronic illnesses like Diabetes, IHD, Stroke, heart failure,
  - Compare the choices of antihypertensive medication and its indications.

**Done by : Khaled Al Jedia**

**Revised by: Abdullah Alghizzi**

References : Slides , master the boards, JNC & NICE guidelines , 432 team

<https://onlinemeded.org/spa/cardiology/hypertension/acquire> (**RECOMENDED VEDEO**)

[For extra explanation internal medicine 435](#)



## EPIDEMIOLOGY :

In developed and developing countries alike, Essential Hypertension affects **25-35%** of the adult population. Up to **60-70%** of those beyond the seventh decade of life

Each increment of **20 mm Hg** in systolic blood pressure or **10 mm Hg** in diastolic blood pressure doubles the risk of cardiovascular disease events independent of other factors.

- ❑ a study conducted in 2001 published in saudi journal showed that the prevalence of HTN in obese and non-obese saudis in age group 14-70 is

Non-obese prevalence:	4.8 % males
	2.8 % females
Obese prevalence:	8 % males
	8 % female

Another study measures HTN among attendants of primary health care centers in Al-Qassim region showed that the prevalence is 30% and it is higher in: Age > 40 years , overweight and obese people and illiteracy and awareness is 20% , 25% respectively in hypertensive women and men .

### What happens to blood pressure with aging?

- **Systolic pressure increases with age**
- **Diastolic pressure increases with age but peaks between 55 and 60 years then starts to decrease.**
- **Arterial stiffness: cause of elevated systolic and lower diastolic pressure with aging**

### In the Framingham Heart Study :

- ❖ Those below **Age of 55** diastolic Bp is the strongest predictor of cardiovascular risk.
- ❖ **Above 55 years**, diastolic Bp was negatively related to the risk of coronary events, so the pulse pressure became superior predictor to the systolic Bp.



## Diagnosis of HTN :<sup>1</sup>

The average of **two or more** properly measured, seated, BP readings on each of **two or more** office visits

Diagnosis	systolic	diastolic
Normal	<120	<80
Prehypertension	120-139	80-89
Stage 1 HTN <sup>2</sup>	140-159	90-99
Stage 2 HTN <sup>3</sup>	> = 160	> = 100
Hypertensive emergency	> 180	> 110

### How to diagnose ?

- Measure blood pressure in both arms.

^If the difference between arms is **>20 mmHg**: repeat the measurements.

^Remains **>20 mmHg** on the second measurement: measure subsequent blood pressures in the arm with the **higher** reading.

- If blood pressure measured in the clinic is **140/90 mmHg or higher**:

^Take a second measurement during the consultation.

^If the second measurement is substantially different from the first, take a third measurement.

^Record the **lower of the last two measurements** as the clinic blood pressure.

- If the clinic blood pressure is **140/90 mmHg or higher**, offer ambulatory blood pressure monitoring (ABPM) to confirm the diagnosis of hypertension (home blood pressure monitoring (HBPM)>>alternative).

- When using ABPM to confirm a diagnosis of hypertension, ensure that at least two measurements per hour are taken during the person's usual waking hours (for example, between 08:00 and 22:00). Use the average value of at least 14 measurements taken during the person's usual waking hours to confirm a diagnosis of hypertension.

#### Accurate Blood Pressure Measurement in the Office

- Persons should be seated quietly for at **least 5 minutes** in a chair (rather than on an exam table), with feet on the floor, and arm supported at heart level.
- Caffeine, exercise, and smoking should be avoided for at **least 30 minutes** prior to measurement.
- Measurement of BP in the standing position is indicated periodically, especially in those at risk for postural hypotension, prior to necessary drug dose or adding a drug, and in those who report symptoms consistent with reduced BP upon standing.

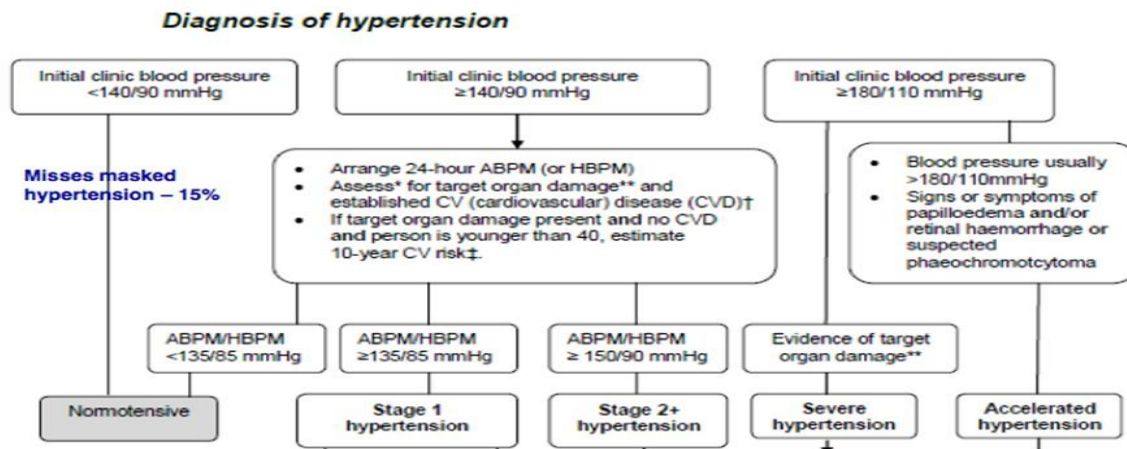
<sup>1</sup> <https://www.nice.org.uk/guidance/cg127/chapter/1-Guidance>

<sup>2</sup> and subsequent ambulatory blood pressure monitoring (ABPM) daytime average or home blood pressure monitoring (HBPM) average blood pressure is 135/85 mmHg or higher.

<sup>3</sup> and subsequent ABPM daytime average or HBPM average blood pressure is 150/95 mmHg or higher.



## NICE Algorithm (diagnosis)



When using HBPM to confirm a diagnosis of hypertension, ensure that:

- for each blood pressure recording, two consecutive measurements are taken, at least 1 minute apart and with the person seated **and**
- blood pressure is recorded twice daily, ideally in the morning and evening **and** blood pressure recording continues for at least 4 days, ideally for 7 days.
- Discard the measurements taken on the first day and use the average value of all the remaining measurements to confirm a diagnosis of hypertension.

### Home blood pressure measurement used for which patients?

For the diagnosis of hypertension ,                      Suspected non adherence  
White coat hypertension<sup>4</sup> ,                                      Masked hypertension

**Average BP equal to or over 135/85 mmHg should be considered elevated**

<sup>4</sup> is defined when a patient has a persistently elevated clinic BP  $\geq 140/90$  and a normal HBPM or ABPM day time average, i.e.  $<135/85$  , White coat hypertension is present in as many as 25% of patients, possibly



## How to approach a patient with Hypertension?

Medical History, Physical Examination, Routine Laboratory Tests, Optional Tests, NonPharmacological Treatment, Drug Treatment.

### Patient Evaluation:

Evaluation of patients with documented HTN has three objectives:

1. Assess lifestyle and identify other **CV risk factors** or concomitant disorders that affects prognosis and guides treatment.
2. Reveal identifiable **causes** of high BP.
3. Assess the presence or absence of **Target Organ Damage** and CVD.

### Risk Factors:

1. Smoking.
2. Dyslipidemia
3. Diabetes Mellitus.
4. Obesity.
5. Age older than 60 years.
6. Sex (men or postmenopausal women).
7. Family history of cardiovascular disease.

#### MEDICAL HISTORY:

- Patient History of Cardiovascular Disease
- Current and Previous Medications
- Smoking
- Lifestyle Factors
- Family History

#### PHYSICAL EXAMINATION:

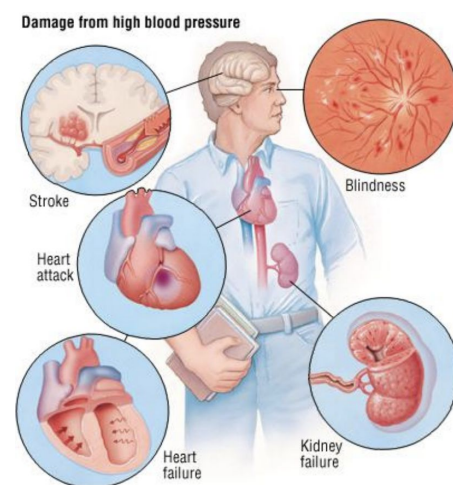
- Blood Pressure (2 Readings)
- Height, Weight and Pulse
- Exam. Of Neck, Heart, Lungs, Abdomen and Extremities
- Funduscopy Examination (Arterial narrowing "copper wiring", A-V nipping, Flame shaped hemorrhages, Soft



Investigations:	
Routine	Optional (to exclude secondary causes)
1. CBC 2. Urine Analysis and Microalbuminuria 3. Urea, Creatinine, Electrolytes, Uric Acid and Calcium 4. Fasting Plasma Glucose 5. Lipid Profile (T.ch, Trig, LDL and HDL) 6. ECG 7. Chest X-ray	1. 24-hour Urinary Protein 2. Creatinine Clearance 3. Echocardiography 4. Ultrasonography 5. Thyroid Stimulating Hormone 6. 24-hour Urinary Vanillylmandelic Acid 7. 24-hour Urinary Catecholamines 8. 24-hour Urinary Free Hydrocortisone

### Target Organ Damage:

- **Heart:** LVH , Angina or prior myocardial infarction ,Heart failure
- **Brain** Stroke or transient ischemic attack
- **Chronic kidney disease**
- **Peripheral arterial disease**
- **Retinopathy**



### Who should be screened for causes of secondary hypertension?

Primary renal disease	Elevated serum creatinine concentration
	Abnormal urinalysis
Oral contraceptives	New elevation in blood pressure temporally related to use
Pheochromocytoma	Paroxysmal elevations in blood pressure
	Triad of headache (usually pounding), palpitations, and sweating
Primary aldosteronism	Unexplained hypokalemia with urinary potassium wasting; however, more than one-half of patients are normokalemic
Cushing's syndrome	Cushingoid facies, central obesity, proximal muscle weakness, and ecchymoses
	May have a history of glucocorticoid use
Sleep apnea syndrome	Primarily seen in obese men who snore loudly while asleep
	Daytime somnolence and fatigue and morning confusion



### High/Very high risk subjects

- ▶ BP **180** mmHg systolic and/or **110** mmHg diastolic
- ▶ Systolic BP > **160** mmHg with low diastolic BP (<70mmHg)
- ▶ Diabetes mellitus
- ▶ Metabolic syndrome
- ▶ **≥ 3** cardiovascular risk factors

One or more of the following subclinical organ damages:

- ▶ ECG with LVH and strain
- ▶ Echo. of concentric LVH
- ▶ U/S evidence of carotid artery wall thickening or plaque
- ▶ Moderate increase in serum creatinine
- ▶ Reduced creatinine clearance
- ▶ Microalbuminuria or proteinuria
- ▶ Established cardiovascular or renal disease

### WHAT'S THE BENEFITS OF LOWERING BLOOD PRESSURE ?

The Clinical Trials had shown:

Reduction in **STROKE** 35 – 40 % , **MI** 20 – 25 % , **HEART FAILURE** > 50%

## MANAGEMENT :

### CLASSES OF ANTIHYPERTENSIVE DRUGS

Drug name	
<b>β BLOCKERS</b>	Atenolol, Bisoprolol, Carvedilol
<b>ACE Inhibitors</b>	Captopril, Lisinopril, and Enalapril
<b>Angiotensin II Receptor Blocker</b>	Losartan, Candesartan, Valsartan, Irbesartan
<b>Ca+ Blockers (Long Acting)</b>	Nifedipine Retard, Amlodipine, Felodipine
<b>Diuretics</b>	Thiazides, Indapamide SR
<b>Vasodilators</b>	Hydralazine (for gestational hypertension)

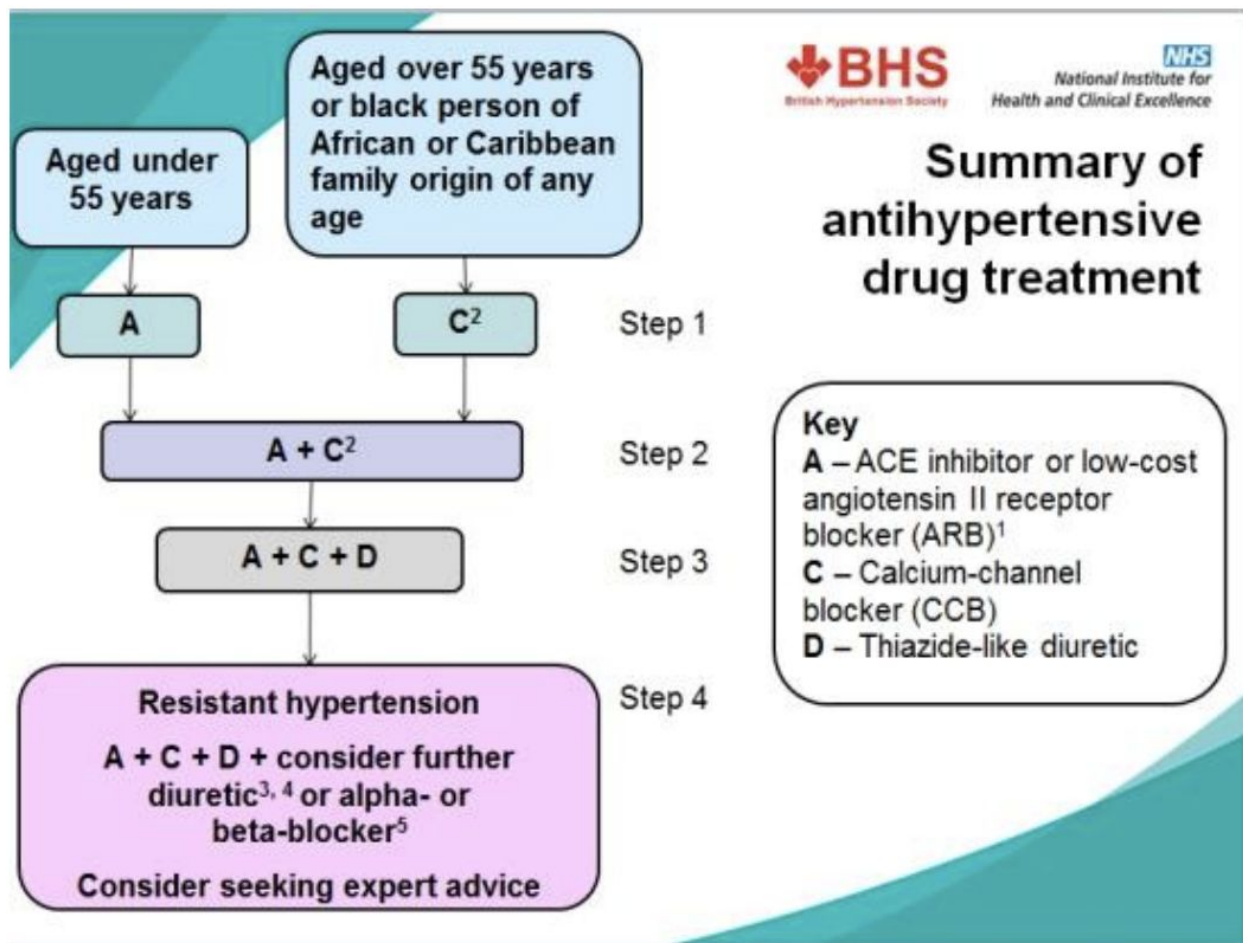
#### Box .2

##### **Angiotensin-receptor blocker:**

ARB therapy may cut the risk of Alzheimer's disease (AD) by reducing amyloid deposition in the brain. (*Archives of Neurology*, September 13, 2012)

890 hypertensive patients with available brain autopsy data.

The risk for AD was 24% lower in those prescribed ACE inhibitor.



### More explanation for the above figure: important!

1. In hypertensive patients aged 55 or older or black patients of any age: The first choice for initial therapy should be either a calcium-channel blocker or a Thiazide-type diuretic. (C or D) If a third drug is needed an ACE inhibitor or ARB is a choice. (C or D +/- A)
2. In hypertensive patients younger than 55: The first choice for initial therapy should be: An ACE inhibitor (or an ARB if an ACE inhibitor is not tolerated). (A or ARB) Adding an ACE inhibitor to a calcium-channel blocker or a diuretic (or vice versa are logical combinations). (A +/- C or D)
3. Beta-blockers may be considered in younger people, particularly: Those with an intolerance or contraindication to ACE inhibitors and ARB or **Childbearing potential** or People with evidence of increased sympathetic drive.
4. If therapy is initiated with a beta-blocker and a second drug is required, add a calcium-channel blocker rather than a Thiazide-type diuretic to reduce the patient's risk of developing Diabetes.





**Beta-blockers and HTN:** They are **no longer recommended** as a first-line drug. **WHY?**

- Given the risk of stroke.
  - Lack of cardiovascular morbidity and mortality benefit.
  - Numerous adverse effects.
  - Lack of regression of target end-organ effects of hypertension (e.g., left ventricular hypertrophy and endothelial dysfunction).
- 
- There is a paucity of data or an absence of evidence to support the use of beta blockers as Monotherapy or as first- line agents in uncomplicated HTN.
  - There is strong evidence to use it in post MI patient or heart failure.
  - B blockers are associated with an increased risk for **new-onset DM by 22%** & for **stroke by 15%**. This risk was greater in patients with higher baseline **BMI** and higher baseline **FPG**.

**B.P. and DM:**

- Diabetic patients with BP > 140/80 are candidate for antihypertensive treatment.
- Patients should be checked to confirm the presence of hypertension.
- Behavioral Approach / Lifestyle Modification
- Drug Treatment: a. ACE Inhibitors b. Angiotensin II Receptor blockers
- In Microalbuminuria and Nephropathy (Renal damage) lower BP to  $\leq 130/80$

	INITIAL DRUG CHOICES
Isolated Systolic Hypertension:	<ul style="list-style-type: none"><li>● <b>Thiazides</b></li><li>● <b>Calcium Channel Blockers(Long Acting)</b></li></ul>
Peripheral Arterial Disease	<ul style="list-style-type: none"><li>● <b>Calcium Channel Blockers(Long Acting)</b></li></ul>
Heart Failure:	<ul style="list-style-type: none"><li>● <b>ACE Inhibitors</b></li><li>● <b>Angiotensin II Receptor Blockers</b></li><li>● <b>Diuretics</b></li><li>● <b>B-Blockers</b></li></ul>
IHD and MI:	<ul style="list-style-type: none"><li>● <b>B-Blockers</b></li><li>● <b>ACE Inhibitors / ARBS</b></li><li>● <b>Calcium Antagonists ( Diltiazem )</b></li></ul>



Drug Class	Conditions Favoring the Use	Contraindications	
		Compelling	Possible
THZ-Ds	CHF; Elderly Hypertensives; IS-HTN; Osteoporosis; Hypertensive patients of African origin	Gout; Hyponatremia	Dyslipidemia; Sexually Active Males; <b>Pregnancy</b> ; Young Patient with Risk of Developing DM
DHP CCBs	Elderly Patients; Angina; PAD <b>Pregnancy</b>		Atrio-Ventricular Block (Grade 2 or 3); CHF; Tachyarrhythmias
ACE-Is	CHF; LV Dysfunction; Post-MI; DM; CKD	<b>Pregnancy</b> ; Hyperkalemia; Bilateral Renal Artery Stenosis; Angioedema	
ARBs	CHF; LV Dysfunction; Post-MI; DM; CKD	<b>Pregnancy</b> ; Hyperkalemia; Bilateral Renal Artery Stenosis	

**Non-pharmacological:** (lifestyle changes “weight loss is the most effective” and any modifiable risk factors, such as obesity or smoking, should be controlled)

### Lifestyle modifications to prevent and manage hypertension

### Approximate SBP Reduction

**Weight reduction** Maintain normal body weight (body mass index 18.5–24.9 kg/m<sup>2</sup>).

5–20 mmHg/10kg

**Adopt DASH eating plan** Consume a diet rich in fruits, vegetables, and low fat dairy products with a reduced content of saturated and total fat.

8–14 mmHg

**Dietary sodium reduction** Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).

2–8 mmHg

**Physical activity** Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).

4–9 mmHg

DASH, Dietary Approaches to Stop Hypertension; SBP, systolic blood pressure  
For overall cardiovascular risk reduction, stop smoking.



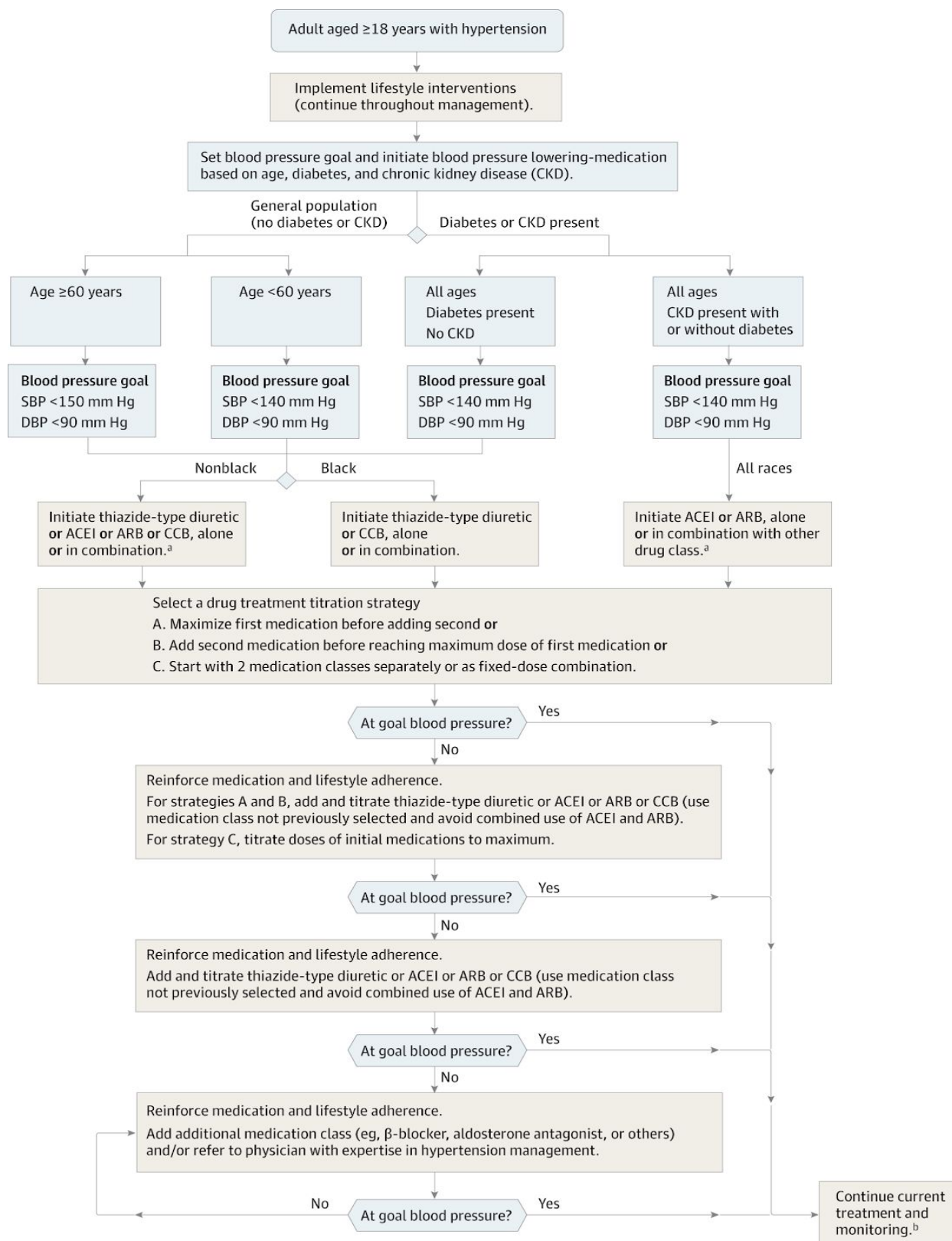
# Pharmacologic Treatment (JNC8)

[JNC Recommendations](#)

## IMP figure

### Summary of JNC 8 Management of Hypertension

- Blood pressure goal in diabetes is 140/90.
- Initial management is with either thiazides or calcium blockers or ACE inhibitor or angiotensin receptor blocker. Diuretics are not considered specifically better as the initial therapy.
- The main point is to control the blood pressure. The specific agent is not as important.
- With age above 60, the goal of BP is 150/90.





MCQs



**1) The goal of BP for non-diabetic patients is:**

- a. < 120/70
- b. < 130/80
- c. < 140/80

**2) In management of HTN patient, according to NICE guidelines, A patient older than 55-year-old, the first choice if antihypertensive is:**

- a. ACEI
- b. ARB
- c. B blocker
- d. CC blocker

**3) What is the most appropriate combination of medication to treat a black hypertensive patient?**

- a. ACE inhibitor + thiazide
- b. Alpha blocker + CC blocker
- c. B blocker + ARB
- d. CC blocker + thiazide

**4) The routine investigations for newly diagnosed patient with HTN:**

- a. CBC, TSH, urea & electrolytes and chest x-ray
- b. Urine analysis, FBG, US kidney and ECG
- c. Albumin/Creatinine ratio, lipid profile, urea & electrolytes and ECG
- d. FBS, LFT, CBC and Echocardiography

Ans: c-d-d-c



**5) A 34-year-old woman, married and has 2 children, recently diagnosed with HTN. She is on no medication or any OCP. What is the most appropriate antihypertensive drug to start with?**

- a. ACE inhibitor
- b. ARB
- c. Alpha blocker
- d. CC blocker

**6) A 46-year-old man, recently discovered to have HTN. You tried nonpharmacological management but still not controlled. Which of the following medications is not considered as a first choice in management of this patient?**

- a. ACEI
- b. ARB
- c. Beta blocker
- d. CC blocker

**7) What is the most appropriate antihypertensive combination to control a hypertensive patient with history of stroke?**

- a. ACEI and B blocker
- b. ACEI and thiazide
- c. ARB and B blocker
- d. CC blocker and thiazide

**8) A 44-year-old man presents to clinic and your nurse informed you that he has high BP. The average BP after three readings came to be 156/97. You decided to get chart of home monitoring. What is the most appropriate way of home BP monitoring for assessing his high BP?**

- a. 6 readings over 3 days morning and evening.
- b. 10 readings over 5 days morning and evening.
- c. 14 readings over one week morning and evening.
- d. 20 readings over 10 days morning and evening.

**Ans: d-c-b-c**



**9) A 23-year-old man presents with high BP of 174/102. You decided to do some investigations to reach a cause. Some of investigations came to be normal like CBC, Lipid profile and Urea & electrolytes. What is the most appropriate investigation could help to reach a cause for his high BP:**

- a. ECG
- b. LFT
- c. Doppler US for renal arteries
- d. TSH 17

**10) A 32-year-old lady, pregnant of 24 weeks, presents to clinic for routine follow-up. BP came to be 156/98. Urine shows +1 protein. You decided to put her on medication. What are the most appropriate two medications are safe to be given for this lady?**

- a. B blocker and thiazide
- b. ACEI and CC blocker
- c. Methyldopa and ARB
- d. CC blocker and methyldopa

**Ans:a-d**