Family Medicine: Hypertension

Color Index	IMPORTANT	NOTES	GOLD	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

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Revise	
Sources	435 team

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. One study showed that an increase of SBP from 115 to 120 doubles the risk of cardiovascular disease.

a study conducted in 2001 on 14805 patients (6225 males, 8580 females) published in saudi journal showed that the prevalence of HTN in obese and non-obese saudis in age group 14-70 is

	Male	Female
Non obese prevalence	4.8%	2.8%
Obese prevalence	8%	8%

Another study measured HTN among attendants of primary health care centers (1114 patients) 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 .

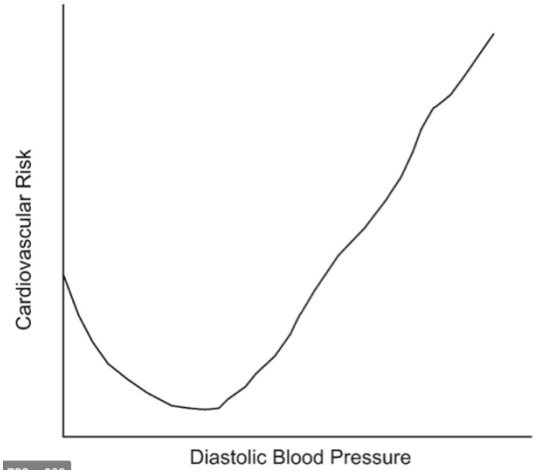
Blood Pressure and Aging

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

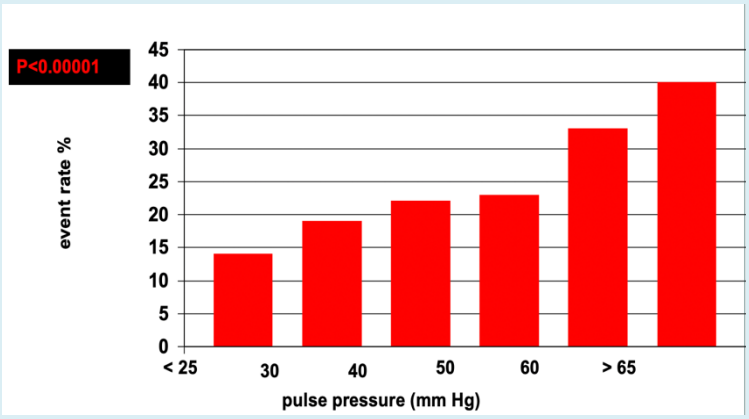
In the Framingham Heart Study :

- 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.

A low DBP is dangerous since the heart receives its blood supply during diastole.
The relationship between DBP and mortality is represented in a “J curve”. The lower the DBP the lower the mortality up to a point which is around 60. DBP lower than that increases mortality



Pulse Pressure and Total Mortality



Description:

This slide shows the relation between the pulse pressure amplitude and the event rate of total mortality in the Survival and Ventricular Enlargement Study.

Background:

Pulse pressure was taken baseline from a casual blood pressure measured just prior to randomisation, 3 to 16 days after myocardial infarction.

Are we Achieving Adequate Control?

Up to 65% of Americans with hypertension do not achieve adequate blood pressure control.

The World Health Organization now projects that by 2030, ischemic heart disease and stroke will become the second and third leading causes of death worldwide.

Trends in Awareness, Treatment and Control of High BP in Adults Aged 18-74

National Health and Nutrition Examination Survey, Percent				
	II (1976- 80)	III (Phase 1 1988- 91)	III (Phase 2 1991- 94)	1999- 00
Awareness	51	73	68	70
Treatment	31	55	54	59
Control	10	29	27	34

Diagnosis of HTN[1]

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 [2]	**140-159**	**90-99**
Stage 2 HTN[3]	**> = 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.

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.

•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).

[1] https://www.nice.org.uk/guidance/cg127/chapter/1-Guidance
[2] and subsequent ambulatory blood pressure monitoring (ABPM) daytime average or home blood pressure monitoring (HBPM) average blood pressure is 135/85 mmHg or higher
[3] and subsequent ABPM daytime average or HBPM average blood pressure is 150/95 mmHg or higher

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.

Table 5. Clinical situations in which ambulatory blood pressure monitoring may be helpful

- Suspected white-coat hypertension in patients with hypertension and no target organ damage
- Apparent drug resistance (office resistance)
- Hypotensive symptoms with antihypertensive medication
- Episodic hypertension
- Autonomic dysfunction

Definition of Hypertension

	Normotension	Hypertension
24 hourr average blood pressure	<130/80 mmHg	135/85 mmHg or more.
Daytime (awake) blood pressure	<135/85 mmHg	140/90 mmHg or more
Nighttime (asleep) blood pressure	<120/70 mmHg	125/75 mmHg or more

Dipping: The average nocturnal blood pressure is approximately 15 percent lower than daytime values in both normotensive and hypertensive patients.
Failure of the blood pressure to fall by at least 10 percent during sleep is called non-dipping. Non-dipping is a risk factor for IHD.
All Anti hypertensives are taken at night to prevent non dipping except diuretics which are taken in the morning

Home Measurement of BP

Morning and Evening, for an initial 7-day period.

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.

HBMP used for which patients?

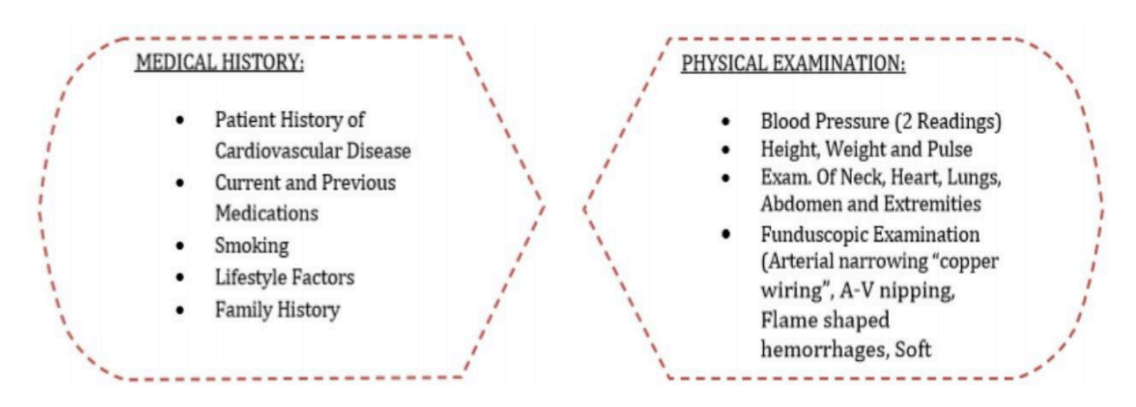
- For the diagnosis of hypertension
- Suspected non adherence
- Masked hypertension
- White coat hypertension

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

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.



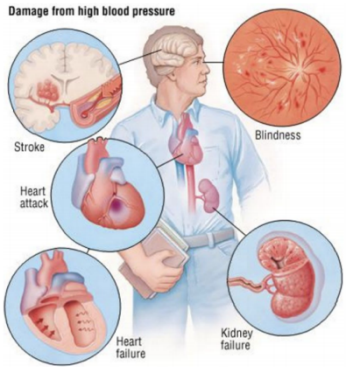
Investigations	
Routine	**Optional (to exclude secondary causes)**
1. CBC 2. Urine Analysis and Microalbuminuria 3. Urea, Creatinine, Electrolytes, Uric Acid and Calcium 4. Fasting Plasma Glucose 5. Lipid Profile (T.ch, Trig, LDL and HDL) 6. ECG 7. Chest X-ray	1. 24-hour Urinary Protein 2. Creatinine 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

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

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 (<70 mmHg)
- Diabetes mellitus
- Metabolic syndrome
- >= 3 cardiovascular risk factors

One or more of the following subclinical organ damages:

- Established cardiovascular or renal disease
- 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

Management:

CLASSES OF ANTIHYPERTENSIVE DRUGS

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

Side Effects:
ACEI:

- Cough
- Rash
- Renal insufficiency (afferent arteriole constriction)
- Hypotension (vasodilation)
- Angioedema
- Hyperkalemia

ARB: Hyperkalemia, ARF

CCB: lower limb edema

Thiazide: Hyper GLUC Hyperglycemia/ lipidemia/ uricemia/ calcemia

WHAT are THE BENEFITS OF LOWERING BLOOD PRESSURE ?
The Clinical Trials had shown: Reduction in STROKE 35 – 40 % , MI 20 – 25 % , HEART FAILURE > 50%

Beta Blockers and Hypertension:

Why are they are no longer recommended as a first-line drug.

➢ Given the increased 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 ≤ 130/80

	Initial Drug Choice
Isolated Systolic Hypertension CD	• Thiazides • Calcium Channel Blockers (Long Acting)
Peripheral Arterial Disease C	• Calcium Channel Blockers (Long Acting)
Heart Failure: ABD	• ACE Inhibitors • Angiotensin II Receptor Blockers • Diuretics • B-Blockers
IHD and MI:ABC	• B-Blockers • ACE Inhibitors / ARBS • Calcium Antagonists (Diltiazem) (not Amlor)

Evidence of Use of BB

Conditions	Weak to None	Some Evidence	Strong Evidence
Hypertension (uncomplicated)	√		
Heart Failure			√
Acute Coronary Syndrome		√	
Post MI			√
Stable Angina without MI		√	
Perioperative (non cardiac)		√	
HOCM		√	

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; Pregnancy; Young Patient with Risk of Developing DM
DHP CCBs	Elderly Patients; Angina; PAD; Pregnancy		Atrio-Ventricular Block (Grade 2 or 3); CHF; Tachyarrhythmias
ACE-Is	CHF; LV Dysfunction; Post-MI; DM; CKD	Pregnancy; Hyperkalemia; Bilateral Renal Artery Stenosis Angioedema	
ARBs	CHF; LV Dysfunction; Post-MI; DM; CKD	Pregnancy; 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/m2).	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.

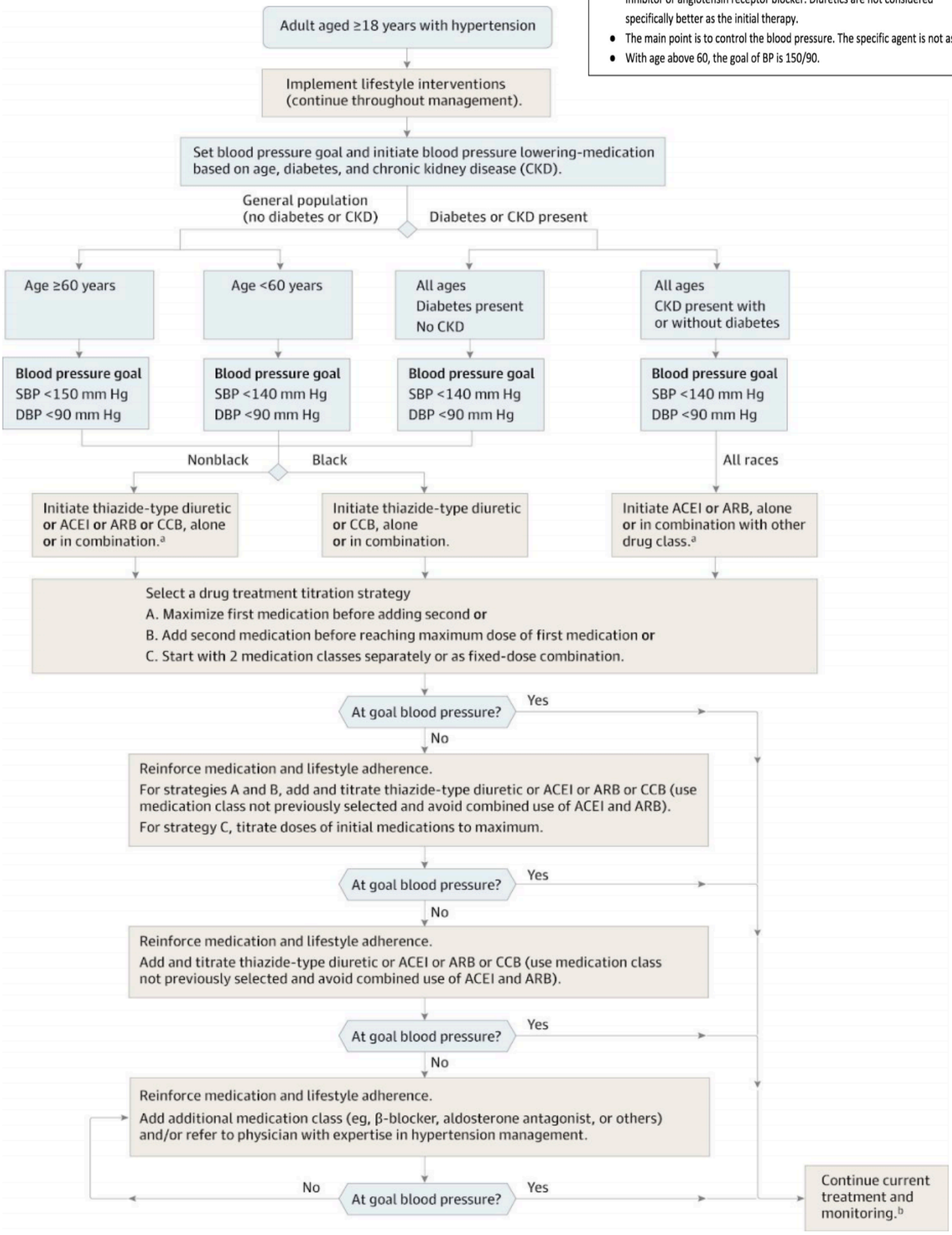
Exercise increases life span by 10 years

Recommended Exercise is 30 minutes of walking daily. Three times per week If exercise is vigorous

Pharmacological Treatment (JNC8) Important 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.



Indications for Specific Drugs:

nondihydropyridine CCB: Diltiazem not amlor

Indication	Antihypertensive drugs
Compelling indications (major improvement in outcome independent of blood pressure)	
Systolic heart failure	ACE inhibitor or ARB, beta blocker, diuretic, aldosterone antagonist*
Postmyocardial infarction	ACE inhibitor, beta blocker, ARB, aldosterone antagonist
Proteinuric chronic kidney disease	ACE inhibitor or ARB
Angina pectoris	Beta blocker, calcium channel blocker
Atrial fibrillation rate control	Beta blocker, nondihydropyridine calcium channel blocker
Atrial flutter rate control	Beta blocker, nondihydropyridine calcium channel blocker
Likely to have a favorable effect on symptoms in comorbid conditions	
Benign prostatic hyperplasia	Alpha blocker
Essential tremor	Beta blocker (noncardioselective)
Hyperthyroidism	Beta blocker
Migraine	Beta blocker, calcium channel blocker
Osteoporosis	Thiazide diuretic
Raynaud's syndrome	Dihydropyridine calcium channel blocker

The amount of blood pressure reduction is the major determinant of reduction in cardiovascular risk in both younger and older patients with hypertension, **not** the choice of antihypertensive drug.

White Coat Hypertension:

- White coat hypertension is defined when a patient has a persistently elevated clinic BP ≥ 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 leading to:
  - Incorrect diagnosis of hypertension.
  - Diagnosis of uncontrolled hypertension (receive inappropriate dose titrations or additional antihypertensive agents)
  - Resistant hypertension, with a reported prevalence of 37 to 44 % in some studies.

2014 Evidence Based Guidelines for The Management of High Blood Pressure in Adults (JNC-8)

Link

Important (questions will come from it)

Cases

Case 1

A 49 year old lady, a known case of OA of knees, incidentally discovered to have high Bp in two visits, 156 / 106 and 164 / 100 respectively.

- What is the target of Bp for this lady?
- What additional history you need from this lady?
- What investigations are you going to request?
- Mention one medication are you going to start with?

Case 2

Mohammed a **53-year** old man presents to your clinic to control his blood pressure. He is regular on Atenolol 50 mg OD for the last 3 years.

PMH is u**nremarkable**.

FH: his father is hypertensive.

BP:162/98 **P.** 62/m **BMI 31**

O/E: nothing is significant apart from A-V nipping on retinal examination.

- What is your comment on his medication based on guidelines?
- What action plan are you going to take?
- Non-pharmacological management is an important aspect, Explain.

Case 3

***Saleh a* 64-year** old man who is a known case of hypertension, came for follow up. He is regular on Hydrochlorthiazide 25mg daily. BP is **176 / 82.**

On reviewing his file the BP is ranging from

162 / 76 to 180 / 88

- **U** and **E**: **within normal**
- **FBS: 6.4 mmol/L 2hpp: 9.56 mmol/L**
- **ECG**: **LVH**
- What is/are the diagnosis of Saleh?
- Based on evidence, which medication of choice are you going to choose?

QUESTIONS

QUESTIONS (1)

The goal of BP for non-diabetic patients is:

A) <120/ 70

B) <130/80

C) <140/80

QUESTIONS (2)

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

A. ACEI

B) ARB

C) CC blocker

QUESTIONS (3)

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

A) ACE inhibitor + thiazide
B.

B) Alpha blocker + CC

C) CC blocker + thiazide

QUESTIONS (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

ANSWER

C, C, C, C

QUESTIONS (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) ACEI

B) alpha blocker

C) CC blocker

QUESTIONS (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) BB

QUESTIONS (7)

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

A) ACEI and BB

B) ACEI and thiazides

B) C) ARB and BB

QUESTIONS (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

C) 10 readings over 5 days morning and evening

B) 14 readings over one week morning and evening

ANSWER

C, C, B, C

QUESTIONS (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 artery

QUESTIONS (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) BB and thiazide

B) ACEI and CC blocker

C) CC blocker and methyldopa

ANSWER A, C