



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

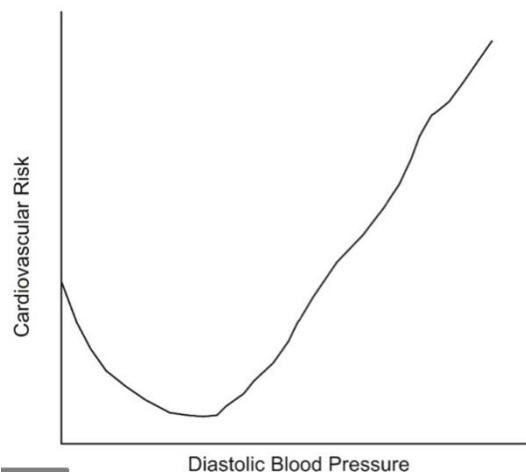
- Systolic pressure increases with age
- Diastolic pressure increases with age but peaks between 55 and 60 then starts to decrease
- Arterial stiffness: cause of elevated systolic and lower diastolic pressure with aging

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



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 |

Definitions

Isolated Systolic Hypertension:

Persistent high Office SBP ≥ 140 mm Hg and Office DPB < 90 mm Hg.

White-coat hypertension (isolated office HTN, isolated clinic HTN):

- White coat HTN is defined as an elevated BP in the office at repeated visits, while it is normal out of the office, using either ABPM or HBPM.
- Target organ damage and cardiovascular events are less prevalent than those in sustained HTN. However, follow up is required.

Masked (isolated ambulatory) hypertension:

- Masked HTN is defined as normal BP in the office at repeated visits and elevated out of the office, either on ABPM or HBPM.
- Possible causes: anxiety, stress.
- Prevalence of masked hypertension averages about 13%.

- CV events are 2 times higher than those in true normotension.

Malignant Hypertension:

- Presentation of acute very high BP with multi organ damage.
- Stage III or IV retinopathy is common in this group. It is considered as a hypertensive emergency.

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

Screening

1. Measure blood pressure in each visit for all adults aged 18 years and older.
2. Children aged 3 years and older should have their BP measured during every healthcare visit, especially with the growing prevalence of obesity in children.
3. Screening is recommended annually for adults aged 40 years or older and for those who are at increased risk of high blood pressure including those who have high-normal blood pressure (130–139/85–89 mm Hg) and those who are overweight or obese. Adults aged 18–39 years with normal blood pressure (<130/85 mm Hg) who do not have other risk factors should be re-screened every 3–5 years.

Measurement

1. **Automated arm sphygmomanometers:** They are good alternative, for both office-based and home-based measurements (HBPM).
2. **Automated wrist sphygmomanometers** are widely used by patients, but they are less reliable. Minimal position changes can result in variable readings. Measurement of BP at the upper arm is preferred.
3. **Automated unattended office sphygmomanometers** is automated office BP (ABPM), taken without patient-health provider interaction using a fully-automated device.

Home Blood Pressure Monitoring (HBPM)

- HBP may be used for both diagnosis and monitoring of BP.
- Home SBP values ≥ 135 mmHg or DBP values ≥ 85 mmHg should be considered as elevated.
- When using HBPM to confirm a diagnosis of

Ambulatory BP Monitoring (ABPM)

- BP is measured at repeated intervals (every 15–30 mins while awake, and every 30–60 mins during sleep).
- At least 70% of BPs during day me and night me periods should be satisfactory.

hypertension, ensure that:

1. for each blood pressure recording, two consecutive measurements are taken, at least 1 minute apart and with the person seated.
 2. 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.
 3. Discard the measurements taken on the first day and use the average value of all the remaining measurements to confirm a diagnosis of hypertension.
- ABPM is a more sensitive risk predictor of CV outcome than is office BPM.
 - Normal average daytime BP is <135/85 mm Hg.
 - A 24-hour average value of 130/80 mm Hg corresponds to a 140/90 mm Hg of office value.
 - Nocturnal BP is 10%–20% less than the average daytime BP (<120/75 mm Hg) "Dipping".
 - Possible reasons for the absence of dipping are: sleep disturbance, obstructive sleep apnea (OSA), CKD, and obesity.
 - The incidence of CV events is higher in non-dippers.

Diagnosing HTN

Table 3 Classification of office blood pressure^a and definitions of hypertension grade^b

| 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 ^b | ≥140 | and | <90 |

BP = blood pressure; SBP = systolic blood pressure.

^aBP category is defined according to seated clinic BP and by the highest level of BP, whether systolic or diastolic.

^bIsolated 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.

Table 9 Definitions of hypertension according to office, ambulatory, and home blood pressure levels

| Category | SBP (mmHg) | | DBP (mmHg) |
|-----------------------------|------------|--------|------------|
| Office BP ^a | ≥140 | and/or | ≥90 |
| Ambulatory BP | | | |
| Daytime (or awake) mean | ≥135 | and/or | ≥85 |
| Night-time (or asleep) mean | ≥120 | and/or | ≥70 |
| 24 h mean | ≥130 | and/or | ≥80 |
| Home BP mean | ≥135 | and/or | ≥85 |

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BP = blood pressure; DBP = diastolic blood pressure; SBP = systolic blood pressure.

^aRefers to conventional office BP rather than unattended office BP.

Table 19 Summary of office blood pressure thresholds for treatment

| Age group | Office SBP treatment threshold (mmHg) | | | | | Office DBP treatment threshold (mmHg) |
|--|---------------------------------------|------------|-------|-------------------|-------------------|---------------------------------------|
| | Hypertension | + Diabetes | + CKD | + CAD | + Stroke/TIA | |
| 18 - 65 years | ≥140 | ≥140 | ≥140 | ≥140 ^a | ≥140 ^a | ≥90 |
| 65 - 79 years | ≥140 | ≥140 | ≥140 | ≥140 ^a | ≥140 ^a | ≥90 |
| ≥80 years | ≥160 | ≥160 | ≥160 | ≥160 | ≥160 | ≥90 |
| Office DBP treatment threshold (mmHg) | ≥90 | ≥90 | ≥90 | ≥90 | ≥90 | |

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BP = blood pressure; CAD = coronary artery disease; CKD = chronic kidney disease; DBP = diastolic blood pressure; SBP = systolic blood pressure; TIA = transient ischaemic attack.

^aTreatment may be considered in these very high-risk patients with high-normal SBP (i.e. SBP 130–140 mmHg).

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**:

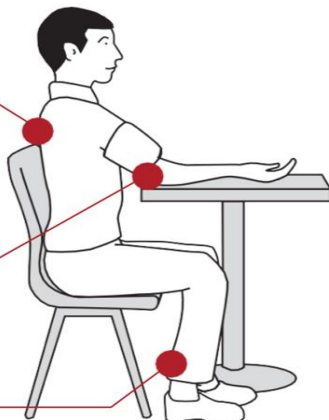
offer ambulatory blood pressure monitoring (ABPM) to confirm the diagnosis of hypertension (home blood pressure monitoring (HBPM)>>alternative).

MEASUREMENT TECHNIQUE

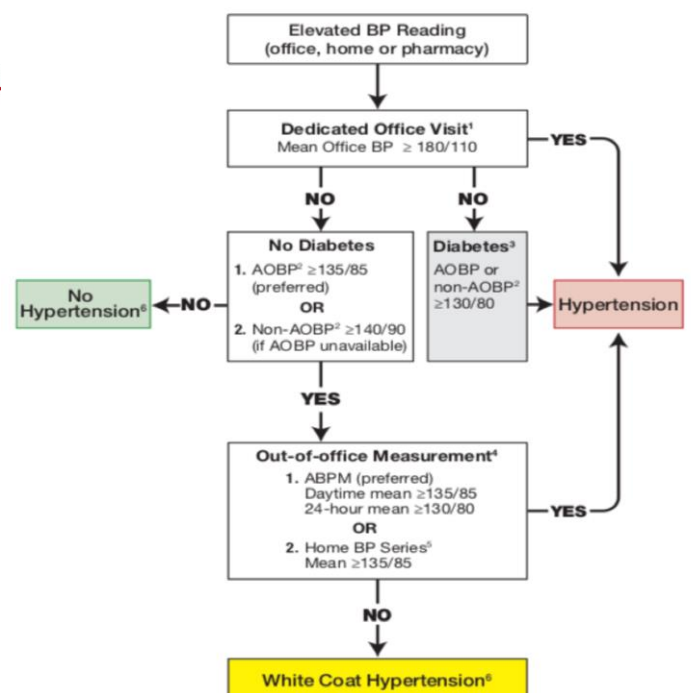


Accurate diagnosis begins with

- ✓ Sitting position
- ✓ Back supported
- ✓ Arm bare and supported
- ✓ Use a cuff size appropriate for your arm
- ✓ Middle of the cuff at heart level
- ✓ Lower edge of cuff 3 cm above elbow crease
- ✓ Do not talk or move before or during the measurement
- ✓ Legs uncrossed
- ✓ Feet flat on the floor



Hypertension Diagnostic Algorithm for Adults



- 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**.

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 Vanillyl mandelic Acid 7. 24-hour Urinary Catecholamines 8. 24-hour Urinary Free Hydrocortisone |

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 |

Target Organ Damage:

Cardiovascular disease

- Coronary Artery Disease
 - Acute coronary syndromes
 - Angina pectoris
 - Myocardial infarction
- Heart Failure
- Left Ventricular Dysfunction
- Left Ventricular Hypertrophy

Cerebrovascular Disease

- Aneurysmal sub-arachnoid hemorrhage
- Dementia
- Intracerebral hemorrhage
- Ischemic stroke or transient ischemic attack
 - Vascular dementia

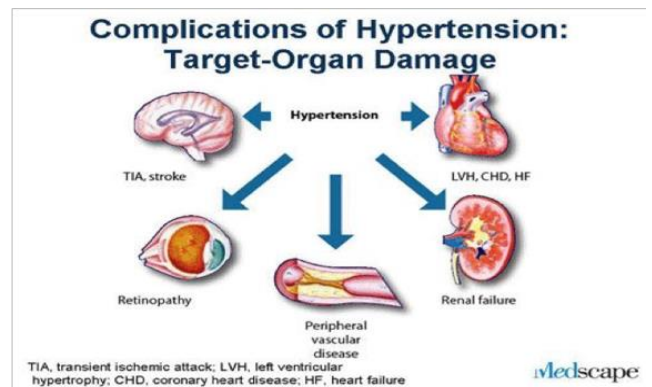
Hypertensive Retinopathy

Peripheral Arterial Disease

- Intermittent claudication

Renal Disease

- Albuminuria
- Chronic Kidney Disease (GFR < 60 ml/min/1.73 m²)



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:

Blood pressure thresholds for initiation of antihypertensive and treatment targets in adults

| Patient Population | BP threshold (mm Hg) for initiation of antihypertensive therapy | BP target (mm Hg) for treatment |
|--|---|---|
| Low-risk (No target organ damage or cardiovascular risk factors) | SBP \geq 160 (Grade A) DBP \geq 100 (Grade A) | SBP < 140 (Grade A) DBP < 90 (Grade A) |
| High-risk* of cardiovascular disease | SBP \geq 130 (Grade B) | SBP < 120 (Grade B) |
| Diabetes mellitus | SBP \geq 130 (Grade C) DBP \geq 80 (Grade A) | SBP < 130 (Grade C) DBP < 80 (Grade A) |
| All others | SBP \geq 140 (Grade C) DBP \geq 90 (Grade A) | SBP < 140 (Grade A) DBP < 90 (Grade A) |

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

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.

Considerations in the individualization of pharmacological therapy in adults

| | Initial therapy | Second-line therapy | Notes and/or cautions |
|--|--|---|--|
| Hypertension without other compelling indications | | | |
| Diastolic hypertension with or without systolic hypertension | Monotherapy or SPC. Recommended monotherapy choices include thiazide/thiazide-like diuretics (with longer-acting diuretics preferred), β -blockers, ACE inhibitors, ARBs, or long-acting CCBs. Recommended SPC choices include combinations of an ACE inhibitor with CCB, ARB with CCB, or ACE inhibitor/ARB with a diuretic. (Consider ASA and statins in selected patients.) | Further addition of first-line drugs. | Not recommended for monotherapy: α -blockers, β -blocker in those ≥ 60 years of age, ACE inhibitors in black people. Hypokalemia should be avoided in those prescribed diuretics. ACE inhibitors, ARBs and direct renin inhibitors are potential teratogens, and caution is required if prescribing to women with child-bearing potential. Combination of an ACE inhibitor with an ARB is not recommended. |
| Isolated systolic hypertension without other compelling indications | Thiazide/thiazide-like diuretics, ARBs or long-acting dihydropyridine CCBs. | Combinations of first-line drugs. | Same as diastolic hypertension with or without systolic hypertension. |
| Diabetes mellitus | | | |
| Diabetes mellitus with microalbuminuria*, renal disease, CVD or additional CV risk factors | ACE inhibitors or ARBs. | Addition of a dihydropyridine CCB is preferred over a thiazide/thiazide-like diuretic. | A loop diuretic could be considered in hypertensive chronic kidney disease patients with extracellular fluid volume overload. |
| Diabetes mellitus without factors listed above | ACE inhibitors, ARBs, dihydropyridine CCBs or thiazide/thiazide-like diuretics. | Combination of first-line drugs. If combination with ACE inhibitor is being considered, a dihydropyridine CCB is preferable to a thiazide/thiazide-like diuretic. | Normal urine microalbumin to creatinine ratio < 2.0 mg/mmol. |

| | Initial therapy | Second-line therapy | Notes and/or cautions |
|-------------------------------|--|---|--|
| Cardiovascular disease | | | |
| Coronary artery disease | ACE inhibitors or ARBs; β -blockers or CCBs for patients with stable angina. | When combination therapy is being used for high risk patients, an ACE inhibitor/dihydropyridine CCB is preferred. | Avoid short-acting nifedipine. Combination of an ACE inhibitor with an ARB is specifically not recommended. Exercise caution when lowering SBP to target if DBP is ≤ 60 mm Hg, especially in patients with LVH. |
| Recent myocardial infarction | β -blockers and ACE inhibitors (ARBs if ACE inhibitor intolerant). | Long-acting CCBs if β -blocker contraindicated or not effective. | Non-dihydropyridine CCBs should not be used with concomitant heart failure. |
| Heart failure | ACE inhibitors (ARBs if ACE inhibitor-intolerant) and β -blockers. Aldosterone antagonists (mineralocorticoid receptor antagonists) may be added for patients with a recent cardiovascular hospitalization, acute myocardial infarction, elevated BNP or NT-proBNP level, or NYHA Class II to IV symptoms. | ACE inhibitor and ARB combined. Hydralazine/isosorbide dinitrate combination if ACE inhibitor and ARB contraindicated or not tolerated. Thiazide/thiazide-like or loop diuretics are recommended as additive therapy. Dihydropyridine CCB can also be used. A combined ARB/neprilysin-inhibitor is recommended (in place of an ACE inhibitor or ARB) in symptomatic patients with hypertension and HFrEF on standard guideline-based therapies. | Titrate doses of ACE inhibitors and ARBs to those used in clinical trials. Carefully monitor potassium and renal function if combining any of ACE inhibitor, ARB and/or aldosterone antagonist. |

| | Initial therapy | Second-line therapy | Notes and/or cautions |
|---|--|-----------------------------------|---|
| Cardiovascular Disease (continued) | | | |
| Left ventricular hypertrophy | ACE inhibitor, ARB, long-acting CCB or thiazide/thiazide-like diuretics. | Combination of additional agents. | Hydralazine and minoxidil should not be used. |
| Past stroke or TIA | ACE inhibitor and a thiazide/thiazide-like diuretic combination. | Combination of additional agents. | Treatment of hypertension should not be routinely undertaken in acute stroke unless extreme BP elevation. Combination of an ACE inhibitor with an ARB is not recommended. |

| Non-diabetic chronic kidney disease | | | |
|---|---|------------------------------------|---|
| Non-diabetic chronic kidney disease with proteinuria† | ACE inhibitors (ARBs if ACE inhibitor-intolerant) if there is proteinuria. Diuretics as additive therapy. | Combinations of additional agents. | Carefully monitor renal function and potassium for those on an ACE inhibitor or ARB. Combinations of an ACE inhibitor and ARB are not recommended in patients without proteinuria. |
| Renovascular disease | Does not affect initial treatment recommendations. Atherosclerotic renal artery stenosis should be primarily managed medically, while revascularization should be considered for renal fibromuscular dysplasia. | Combinations of additional agents. | Caution with ACE inhibitors or ARB if bilateral renal artery stenosis or unilateral disease with solitary kidney. Renal artery angioplasty and stenting could be considered for patients with renal artery stenosis and complicated, uncontrolled hypertension. |

| | Initial therapy | Second-line therapy | Notes and/or cautions |
|-----------------------------|--|------------------------------------|--|
| Other conditions | | | |
| Peripheral arterial disease | Does not affect initial treatment recommendations. | Combinations of additional agents. | Avoid β -blockers with severe disease. |
| Dyslipidemia | Does not affect initial treatment recommendations. | Combinations of additional agents. | — |
| Overall vascular protection | Statin therapy for patients with 3 or more cardiovascular risk factors or atherosclerotic disease. Low dose ASA in patients ≥ 50 years. Advise on smoking cessation and use pharmacotherapy for smoking cessation if indicated. | — | Caution should be exercised with the ASA recommendation if BP is not controlled. |

* Microalbuminuria is defined as persistent albumin to creatinine ratio >2.0 mg/mmol.

† Proteinuria is defined as urinary protein >500 mg/24hr or albumin to creatinine ratio [ACR] >30 mg/mmol in two of three specimens.

ACE: Angiotensin converting enzyme

ARB: Angiotensin receptor blocker

ASA: Acetylsalicylic acid

CCB: Calcium channel blocker

CVD: Cardiovascular disease

HFrEF: Heart failure with reduced ejection fraction $< 40\%$

NYHA: New York Heart Association

TIA: Transient ischemic attack

LVH: Left ventricular hypertrophy

SPC: Single pill combination



| 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/m ²). | 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.

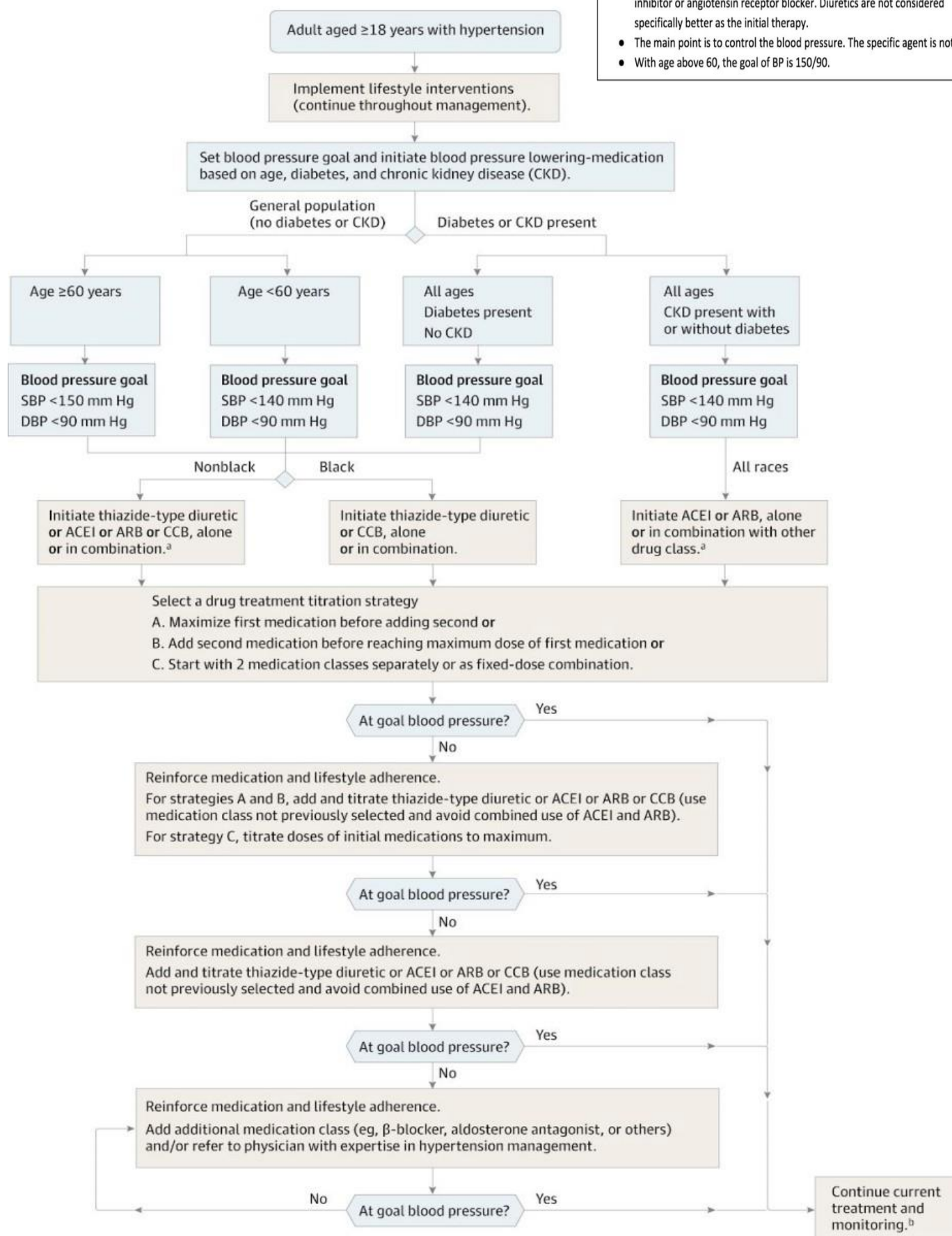
Exercise increases life span by 10 years

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.

WHAT are THE BENEFITS OF LOWERING BLOOD PRESSURE ?

The Clinical Trials had shown: Reduction in STROKE 35 – 40 % , MI 20 – 25 % , HEART FAILURE > 50%

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

[Link](#)

Important (questions will come from it)

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 unremarkable.

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)

You are seeing a 60-year-old man for the first time. He has untreated hypertension (168/106 mm Hg and blood pressure has been elevated on at least 3 occasions).

There is currently no evidence of target organ dysfunction (heart, neurological, or

B) ARB

A. Initiate treatment with 25 mg of hydrochlorothiazide

B. Consider initiating

A) ACEI

C. Delay pharmacologic

A 34-year-old woman, married and has 2

ANSWER

C, C, C, B

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