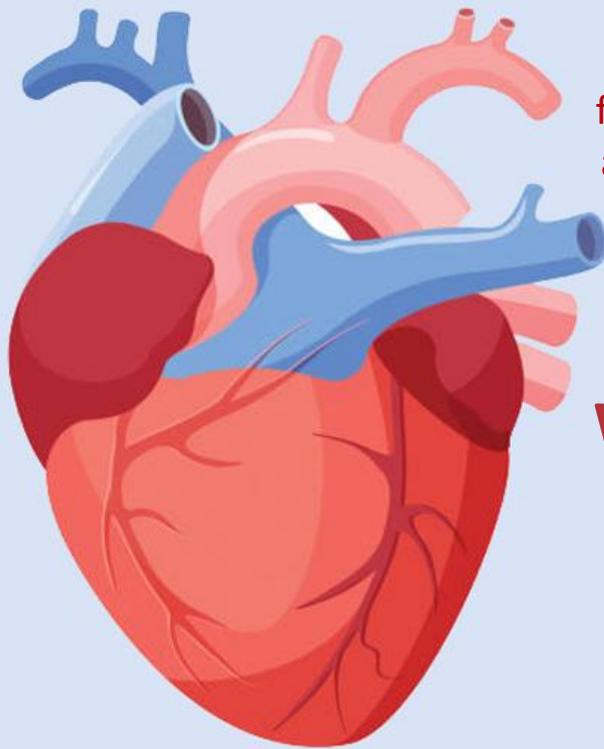




CVS – PBL 3

Hypertension

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2017 ACC/AHA/AAPA/ABC/ACPM/AGS/
APhA/ASH/ASPC/NMA/PCNA Guideline
for the Prevention, Detection, Evaluation,
and Management of High Blood Pressure
in Adults.

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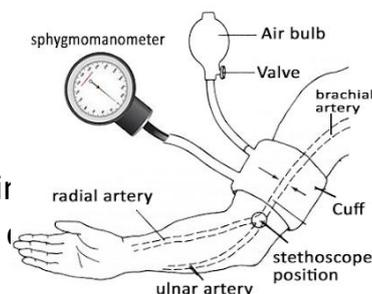


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Hypertension (HTN):

- 46% of the population surveyed have hypertension, according to recent used guidelines. It can be classified into the following



1. Essential (Primary) HTN: Most people. More than (90-95%) of the cases are affected. Etiology is still unknown.

2. Secondary HTN: (5-10%) Due to a pathological disorder, HTN should be resolved once you treat it. E.g., Patients with hyperthyroidism who have elevated blood pressure because of their disease. Once we've treated it, HTN should go away.

CVD Risk Factors Common in Patients with Hypertension:

- Modifiable risk factors are not necessarily to be 1:1 relationship, it's just an association. If changed, it may reduce CVD risk.

- Factors that are difficult to change (CKD, low socioeconomic/educational status, obstructive sleep apnea) or cannot be changed (family history, increased age, male sex), or, if changed using current intervention techniques, may not reduce CVD risk (psychosocial stress).

MODIFIABLE RISK FACTORS	RELATIVELY FIXED RISK FACTORS
CURRENT CIGARETTE SMOKING, SECONDHAND SMOKING	CKD (CHRONIC KIDNEY DISEASE)
DIABETES MELLITUS	FAMILY HISTORY
DYSLIPIDEMIA/HYPERCHOLESTEROLEMIA	INCREASED AGE
OVERWEIGHT/OBESITY	LOW SOCIOECONOMIC/EDUCATIONAL STATUS
PHYSICAL INACTIVITY/LOW FITNESS	MALE SEX
UNHEALTHY DIET	OBSTRUCTIVE SLEEP APNEA
	PSYCHOSOCIAL STRESS (الضغط النفسي بالمنزل أو طبيعة العمل)

BP Measurement Definitions:

- When measuring the blood pressure, we wrap the cuff around the patient's arm and place the stethoscope on the brachial artery. And then we start to increase the pressure until it reaches 200 **atmospheric pressure** (This is what the doctor mentioned. However, I believe he meant mmHg), after that we start dialing down, the first sound that we would hear for pulsation is called **First Korotkoff sound**. When you keep dialing down, the sound gets louder.

- When the knocking sound disappears, that is the diastolic blood pressure (DBP), which we call **Fifth Korotkoff sound** – Nearly disappearing sound.

BP Measurement	Definition
SBP (Systolic blood pressure) ** First sound that we hear when measuring BP.	First Korotkoff sound
DBP (Diastolic blood pressure)	Fifth Korotkoff sound
Pulse pressure	SBP minus DBP
Mean arterial pressure	DBP plus one third pulse pressure
Mid-BP	Sum of SBP and DBP, divided by 2

- **Pulse Pressure:** Systolic blood pressure (SBP) minus the diastolic blood pressure (DBP).

- **Mean Arterial Pressure:** DBP plus one third pulse pressure.

It's used often in critical ICUs as target for doctors during treatment either for hypertensive crisis or Hypotension requiring vasopressors.

- **Mid-BP:** Sum of SBP and DBP, divided by 2.

E.g., BP = 120/90, Calculate the mean arterial pressure?

Pulse Pressure = $120 - 90 = 30$

Mean arterial pressure = $90 + 1/3$ (Pulse Pressure)

= $90 + 1/3 (30)$

= $90 + 10$

= 100

Definition of High BP:

- First, we must specify the definitions of level of evidence (LOE) and classes of recommendation (COR). Beginning with COR:

- **Classes of Recommendation (COR)** is divided into mainly 3 categories (**I, II and III**), with **I** being a highly recommended procedure, and **III** being a not recommended/beneficial procedure and in some cases may be harmful. However, **II** is further subdivided into **IIa** (Probably Beneficial), **IIb** (Possibly Beneficial).

- **Level of Evidence (LOE)** is categorized into (**A,B,C**).

LOE A: This Drug or Device has multiple randomized clinical trials showing evidence that is beneficial.

LOE B: Data derived from a single randomized trial.

LOE C: Only Consensus opinion of experts. (A group of experts gathered and said, in our opinion, the best thing to do is like this).

This could be a consequence of difficulty in studying a specific drug in certain situations.

Aspirin, for example, is **COR I (Definitely beneficial)** in MI. However, giving half of these MI patients a placebo and the other half this medicine would be unethical. Studies should be safe! As a result, it's classified as **LOE C**.

Definition of High BP:

COR	LOE	Recommendation for Definition of High BP
I	B-NR	BP should be categorized as normal, elevated, or stage 1 or 2 hypertension to prevent and treat high BP.

** إذا شخصنا المريض أنه عنده HTN يلزم بعد ذلك أن نصنّفه إلى Stage 1 OR Stage 2 !!

- We divide HTN into (Normal, Elevated, Stage 1 and Stage 2)

- We don't call it as Hypertension.

-You shouldn't have the two numbers within same categories (It could be one number of them, either diastolic or systolic).

Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.

E.g., BP= 135/92, Thus it's considered to be Stage 2 HTN, despite the SBP.

(موا لازم يكون عنا رقمين يكفي رقم واحد)

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

Pay attention to

- BP indicates blood pressure based on an average of ≥ 2 careful readings obtained on ≥ 2 occasions, as detailed in DBP, diastolic blood pressure; and SBP systolic blood pressure.

** If the patient's blood pressure is high, tell him to come back to your clinic in 4 days for a second reading.

Prevalence of Hypertension Based on 2 SBP/DBP Thresholds

	SBP/DBP \geq 130/80 mm Hg or Self-Reported Antihypertensive Medication	SBP/DBP \geq 140/90 mm Hg or Self-Reported Antihypertensive Medication†
Overall, crude	46%	32%

- According to the previous guidelines, SBP/DBP \geq 140/90 mm Hg or Self-Reported Antihypertensive Medication, prevalence was estimated to be 32%.

- Now, according to the present guidelines that were seated on 2017, SBP/DBP \geq 130/80 mm Hg or Self-Reported Antihypertensive Medication, prevalence increase to 46% by lowering the bar!! We brought an extra 14% increase by lowering the thresholds of HTN.

(يعني كمريض ضغطه 135/80 زمان ما كان عنده ضغط حسب ال Guidelines القديمة أو Pre-HTN، ولكن حسب ال Guidelines الجديدة هو معاه ضغط)

Accurate Measurement of BP in the Office:

COR	LOE	Recommendation for Accurate Measurement of BP in the Office
I	C-EO	For diagnosis and management of high BP, proper methods are recommended for accurate measurement and documentation of BP.

Checklist for Accurate Measurement of BP:

Step 1: Properly prepare the patient.

The patient must not smoke or drink coffee for an hour, and then sit in the clinic for five to ten minutes before measuring his BP. There should be no effort on behalf of the patient and try to be relax as much he can.

Step 2: Use proper technique for BP measurements.

The back should be supported, as well as the arm. During the measurement, the patient should remain silent. Cuff size must be probable to the patient size.

Step 3: Take the proper measurements needed for diagnosis and treatment of elevated BP/hypertension.

Step 4: Properly document accurate BP readings.

Step 5: Average the readings.

Two readings are required to determine if a patient has HTN.

Step 6: Provide BP readings to patient.

Out-of-Office and Self-Monitoring of BP:

COR	LOE	Recommendation for Out-of-Office and Self-Monitoring of BP
I	ASR	Out-of-office BP measurements are recommended to confirm the diagnosis of hypertension and for titration of BP-lowering medication, in conjunction with telehealth counseling or clinical interventions.

SR indicates systematic review.

When a patient says to you, "Every time I come to this hospital, my blood pressure rises up high," for example.

(والله يا دكتور أنا كل ما آجي للمستشفى ضغطي بيعلى وبعدين لما تقربوا الجهاز علي بحس حالي خفت)

- You should be able to deal with this situation without difficulty. By asking him to measure his BP in his home. After that, he must bring the device to the next clinic appointment to validate his home device and check its' readings.

- After examining the patient, you discover that his blood pressure only increases at your clinic, and that all his other BP home measurements were normal. As a result, this patient is diagnosed with White coat HTN.

White coat syndrome: It doesn't affect morbidity nor mortality; thus, it doesn't require any pharmacological interventions. There is also some guidance available, such as lifestyle modification and avoiding the presence of patients in the hospital. (بالبيت ضغطه تمام بس لما يجي للعيادة ضغطه بيعلى ممكن لأنه)

(بيخاف)

- If the patient informs you that he can't afford the device, you might offer him one from your office and ask him to return it in 24 hours. Whether the patient is asleep or awake, this device takes a reading every 30 minutes, resulting in 48 readings in 24 hours. This device is called an Ambulatory blood pressure

monitoring (ABPM).

Corresponding Values of SBP/DBP for Clinic, HBPM, Daytime, Nighttime, and 24-Hour ABPM Measurements:

Clinic	HBPM	Daytime ABPM	Nighttime ABPM	24-Hour ABPM
120/80	120/80	120/80	100/65	115/75
130/80	130/80	130/80	110/65	125/75
140/90	135/85	135/85	120/70	130/80
160/100	145/90	145/90	140/85	145/90

HBPM, home blood pressure monitoring.

Clinic Reading is the only # that is required. You just have to understand the basic idea.

- At home, we have different readings that are less than what we consider them to be HTN. For example, at home, if the BP reaches 135/85, we can consider it to be Stage 2, regardless of the 5-degree difference. Also, pay attention to his HBPM (145/90) and compare it to the clinic reading. There should be around a 15-degree difference between the two. Inspect the Night-time ABPM and see the differences from Daytime.

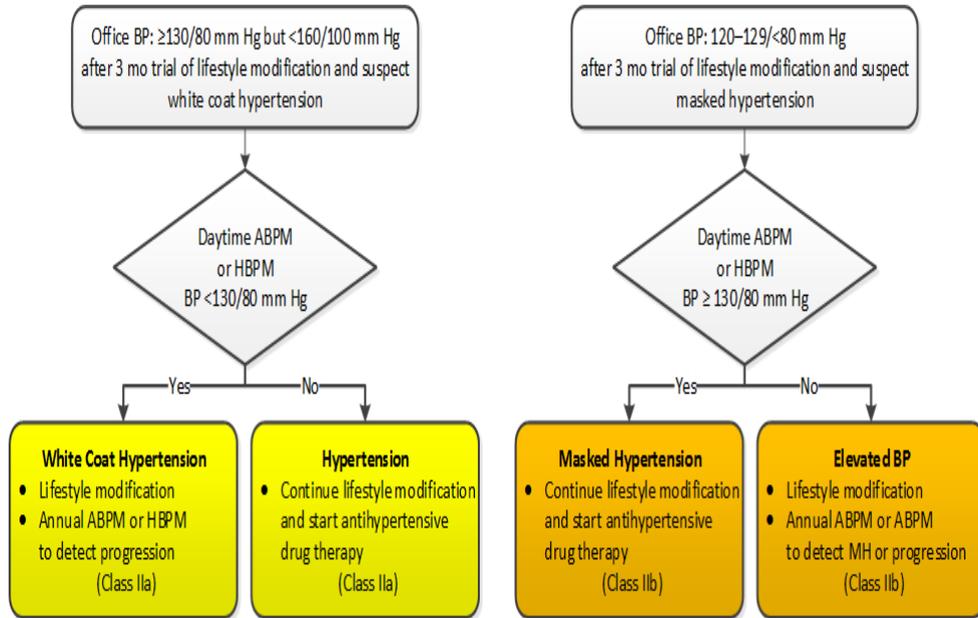
BP Patterns Based on Office and Out-of-Office Measurements:

	Office/Clinic/Healthcare Setting	Home/Nonhealthcare/ ABPM Setting
Normotensive	No hypertension	No hypertension
Sustained hypertension	Hypertension	Hypertension
Masked hypertension	No hypertension	Hypertension



White coat hypertension	Hypertension	No hypertension
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Masked hypertension: It's due to an overlying stress in his house, we deal with it as if he has a sustained hypertension. Why? Because most of his time in his house.



Secondary Forms of Hypertension:

- When we see a clinical or physical examination that indicates an anomaly, we may have suspicions. For example, paraumbilical bruit (Stenosis in vessels). Bruits are blowing vascular sounds resembling heart murmurs that are perceived over partially occluded blood vessels. For this patient, he most likely had a renal artery stenosis which causes an elevated blood pressure.

- Or when we see any abnormalities in his laboratory findings, E.g., Hypokalemia, which we can think now of hyperaldosteronism (Conn's syndrome).

COR	LOE	Recommendations for Secondary Forms of Hypertension
I	C-EO	Screening for specific form(s) of secondary hypertension is recommended when the clinical indications and physical examination findings are present or in adults with resistant hypertension.
IIb	C-EO	If an adult with sustained hypertension screens positive for a form of secondary hypertension, referral to a physician with expertise in that form of hypertension may be reasonable for diagnostic confirmation and treatment.

Common causes	Uncommon causes
Renal parenchymal disease	Pheochromocytoma/paraganglioma
Renovascular disease	Cushing's syndrome
Primary aldosteronism	Hypothyroidism
Obstructive sleep apnea	Hyperthyroidism
Drug or alcohol induced	Aortic coarctation (undiagnosed or repaired)
	Primary hyperparathyroidism
	Congenital adrenal hyperplasia
	Mineralocorticoid excess syndromes other than primary aldosteronism
	Acromegaly

Screening for Secondary Hypertension:

- Again, when we must screen for secondary hypertension?

- **Drug-resistant/induced hypertension.**

We Call it to be Drug-Resistant in two cases: If one had been taking 3 different medication including diuretics with their maximum dose, or if one had been taking 4 different drugs regardless of dose or the presence of the thiazide (diuretic).

- **Abrupt onset of hypertension**
- **Onset of hypertension at <30 y**
- **Exacerbation of previously controlled hypertension**
- **Disproportionate target organ damage (TOD) for degree of hypertension.**

E.g., Renal damage, retinal damage, etc., and the patient's blood pressure wouldn't be too high, we would suspect the patient of having paroxysmal hypertension, in which pheochromocytoma attacks occur.

- **Accelerated/malignant hypertension**
- **Onset of diastolic hypertension in older adults (age ≥65 y)**

As you get older, your diastolic blood pressure should go down and your systolic goes up, even that we call it as isolated systolic HTN. So, if I detect an elevated diastolic blood pressure in someone over the age of 65, I'm guessing they have secondary hypertension.

- **Unprovoked or excessive hypokalemia**

Causes of Secondary Hypertension with Clinical Indications:

Obstructive sleep apnea: It's very common in obese. We take the patient to the sleep lab for a sleep study, and we discover that this patient has a very high Apnea–Hypopnea Index (وقف نفسه), which leads to hypoxia and, as a result, an increase in blood pressure.

Complications include: Arterial Fibrillation or Heart Failure.

E.g., 50-year-old male with BMI index - 42, complaining of his elevated BP. His BP was 150/90.

COR	LOE	Recommendation for Obstructive Sleep Apnea
IIb	B-R	In adults with hypertension and obstructive sleep apnea, the effectiveness of continuous positive airway pressure (CPAP) to reduce BP is not well established.

- We can tell the patient to do certain lifestyle modification. However, we must understand that the obesity is a disease by itself. It's not something that we can modify easily. As a result, we now have a variety of medications and surgical treatments to treat obesity as if it were an illness.

- We should engage in depth discussion to reach the best management plan.

CPAP: We advise it for sure, to avoid Apnea–Hypopnea, which happen during sleeping, but it hasn't shown a 1:1 beneficial relationship. We use this gadget when the patient is sleeping to keep the airway open and prevent Apnea–Hypopnea. Even if the BP don't turn out to be perfect, it improves it.

Primary Aldosteronism:

- In adults with hypertension, screening for primary hyperaldosteronism is recommended in the presence of any of the following concurrent conditions:

1. Resistant hypertension

2. Hypokalemia (spontaneous or substantial if diuretic induced).

We can diagnose adrenal abnormalities by measuring plasma aldosterone : renin level activity, and if it is greater than 20%, we have adrenal problems.

COR	LOE	Recommendations for Primary Aldosteronism
I	C-EO	In adults with hypertension, screening for primary aldosteronism is recommended in the presence of any of the following concurrent conditions: resistant hypertension, hypokalemia (spontaneous or substantial, if diuretic induced), incidentally discovered adrenal mass, family history of early-onset hypertension, or stroke at a young age (<40 years).

I	C-LD	Use of the plasma aldosterone: renin activity ratio is recommended when adults are screened for primary aldosteronism.
I	C-EO	In adults with hypertension and a positive screening test for primary aldosteronism, referral to a hypertension specialist or endocrinologist is recommended for further evaluation and treatment.

Renal Artery Stenosis:

Screening for renal artery stenosis is recommended in the presence of any of the following concurrent conditions:

1. Refractory hypertension, worsening renal function, and/or **intractable HF.**
2. **May be presented to your clinic have pulmonary edema.**
3. **Paraumbilical bruit.**

Renal artery stenosis Can be classified into:

1. Atherosclerotic renal artery stenosis.

Older male patients. The stenosis (Atherosclerosis) happens mostly at the origins or proximal parts of renal artery.

Can be treated by stent placement.

2. Fibromuscular dysplasia (FMD).

Young Female patients. Medial layer causes narrowing on the shape of (المسبحة - بتضمم وبتفتح وبتضمم و..)!

It's involving the middle part of the vessels to the distal part.

Can be treated by balloon angioplasty only.

Not all patients are recommended to undergo for such procedures, but certain subgroup!

COR	LOE	Recommendations for Renal Artery Stenosis
I	A	Medical therapy is recommended for adults with atherosclerotic renal artery stenosis.
IIb	C-EO	In adults with renal artery stenosis for whom medical management has failed (refractory hypertension, worsening renal function, and/or intractable HF) and those with nonatherosclerotic disease, including fibromuscular dysplasia, it may be reasonable to refer the patient for consideration of revascularization (percutaneous renal artery angioplasty and/or stent placement).

Nonpharmacological Interventions:

When a patient comes, we told him some instructions:



COR	LOE	Recommendations for Nonpharmacological Interventions
I	A	Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese.
I	A	A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet "rich in vegetables, fruits and proteins, low carbohydrates and fat", that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension.
I	A	Sodium reduction is recommended for adults with elevated BP or hypertension.
I	A	Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion.

COR	LOE	Recommendations for Nonpharmacological Interventions
I	A	Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension. (30 mins, five days a week)
I	A	Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively.

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss	Weight/body fat	Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	-5 mm Hg	-2/3 mm Hg
Healthy diet	DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	-11 mm Hg	-3 mm Hg
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	-4/5 mm Hg	-2 mm Hg

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension. DASH indicates Dietary Approaches to Stop Hypertension; and SBP, systolic blood pressure.

Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH?

Available at: <https://www.nhlbi.nih.gov/health/resources/heart/hbdash-how-to>.

Top 10 Dash Diet Tips. Available at: http://dashdiet.org/dash_diet_tips.asp



Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension* (cont.)

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Physical activity	Aerobic	<ul style="list-style-type: none"> ● 90–150 min/wk ● 65%–75% heart rate reserve 	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	<ul style="list-style-type: none"> ● 90–150 min/wk ● 50%–80% 1 rep maximum ● 6 exercises, 3 sets/exercise, 10 repetitions/set 	-4 mm Hg	-2 mm Hg
	Isometric resistance	<ul style="list-style-type: none"> ● 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk ● 8–10 wk 	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol [†] to: <ul style="list-style-type: none"> ● Men: ≤2 drinks daily ● Women: ≤1 drink daily 	-4 mm Hg	-3 mm

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.

[†]In the United States, one "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

