Anti-hypertensives (1)

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Blood Pressure

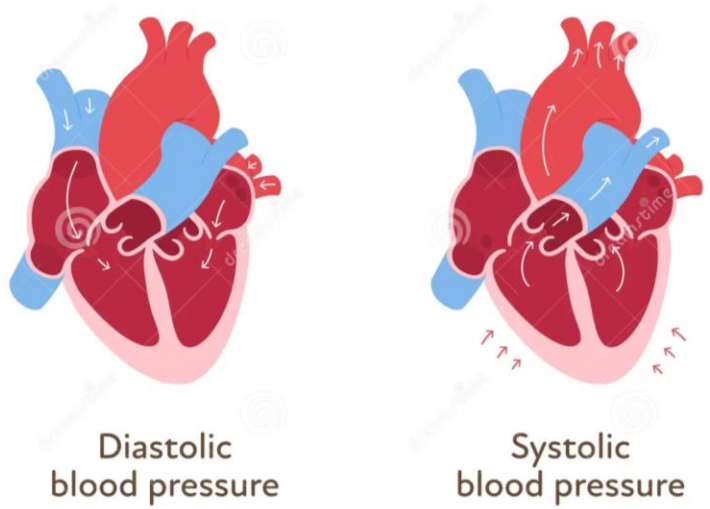
Blood pressure is the force that circulating blood exerts on walls of arteries.

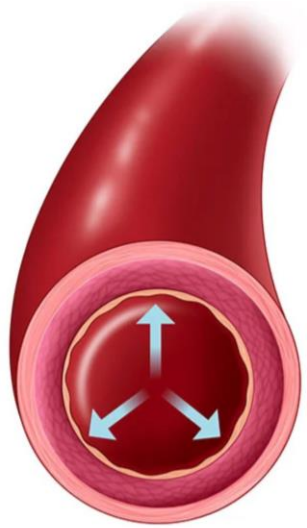
Two blood pressures are measured, systolic blood pressure and diastolic blood pressure.

Systole occurs while the heart contracts. Diastole occurs while the heart rests between beats.

Blood pressure= Cardiac output x Peripheral vascular resistance (CO x PVR).

The blood pressure can thus be controlled by controlling the (cardiac output) or by controlling the (peripheral vascular resistance).





Hypertension

Definition:

Elevation of arterial blood pressure above 140/90 mm Hg—> any number between (120/80) and (140/90) is considered to be pre-hypertensive patient.

The normal blood pressure is 120/80, 120 systolic blood pressure and 80 diastolic blood pressure.

There is medical case called "white coat hypertension" refers to raise in blood pressure due to stress 'fear of sickness' which cause (increase in cortisol and adrenaline and both can raise blood pressure).

One test is not enough to decide that the patient is hypertensive or not.

Blood Pressure Categories

American Heart Association.

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

Primary VS. secondary hypertension

Primary and secondary hypertension use same treatment.

Primary (Essential) Hypertension: 90% of cases have no specific cause. High blood pressure associated with increased peripheral vascular resistance.

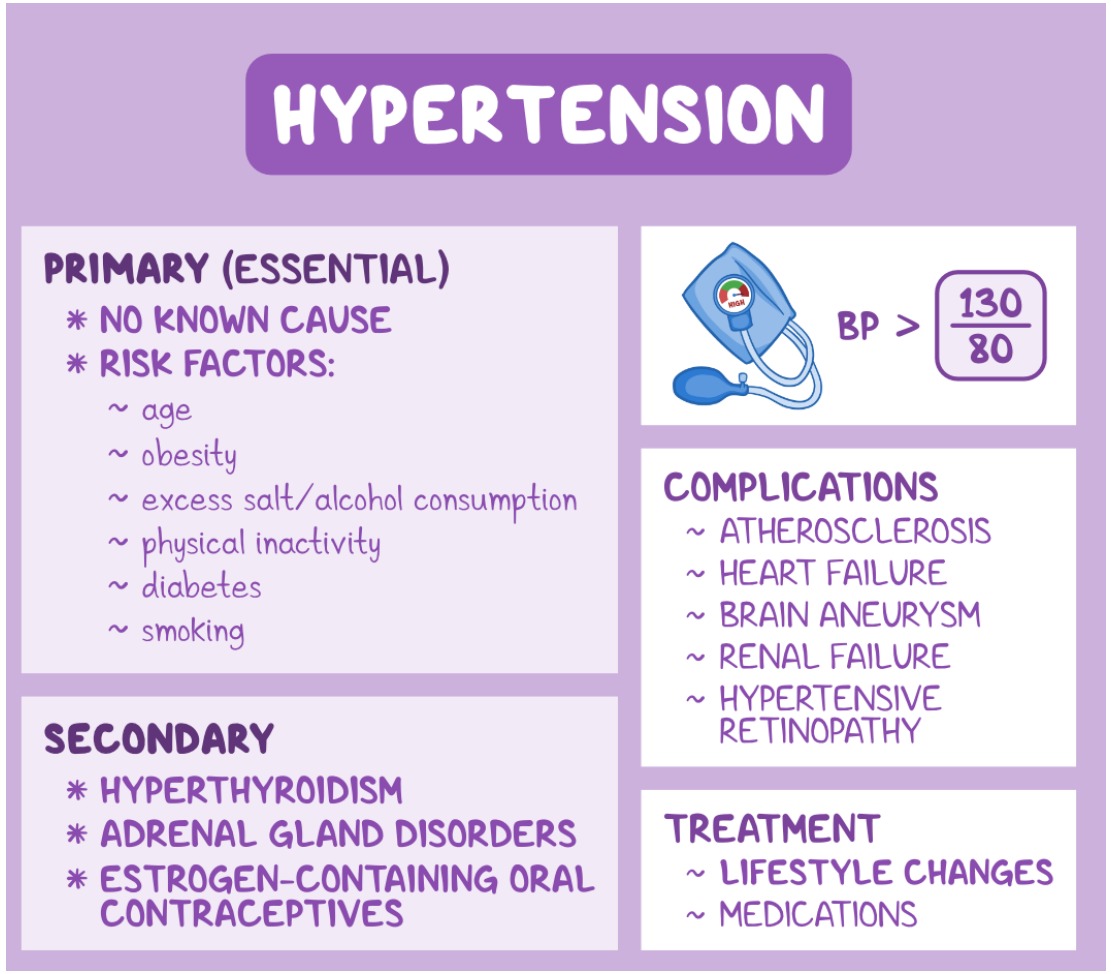
Multifactorial abnormalities:

Genetics.

Stress.

Environment and diet (Smoking/High salt diet):

Smoking cause hypertension by act over nicotinic receptors on sympathetic and parasympathetic ganglia and cause vasoconstriction (activation of alpha-1 of sympathetic) that will cause hypertension, or via acting over the heart (effect determined by the dominant tone).



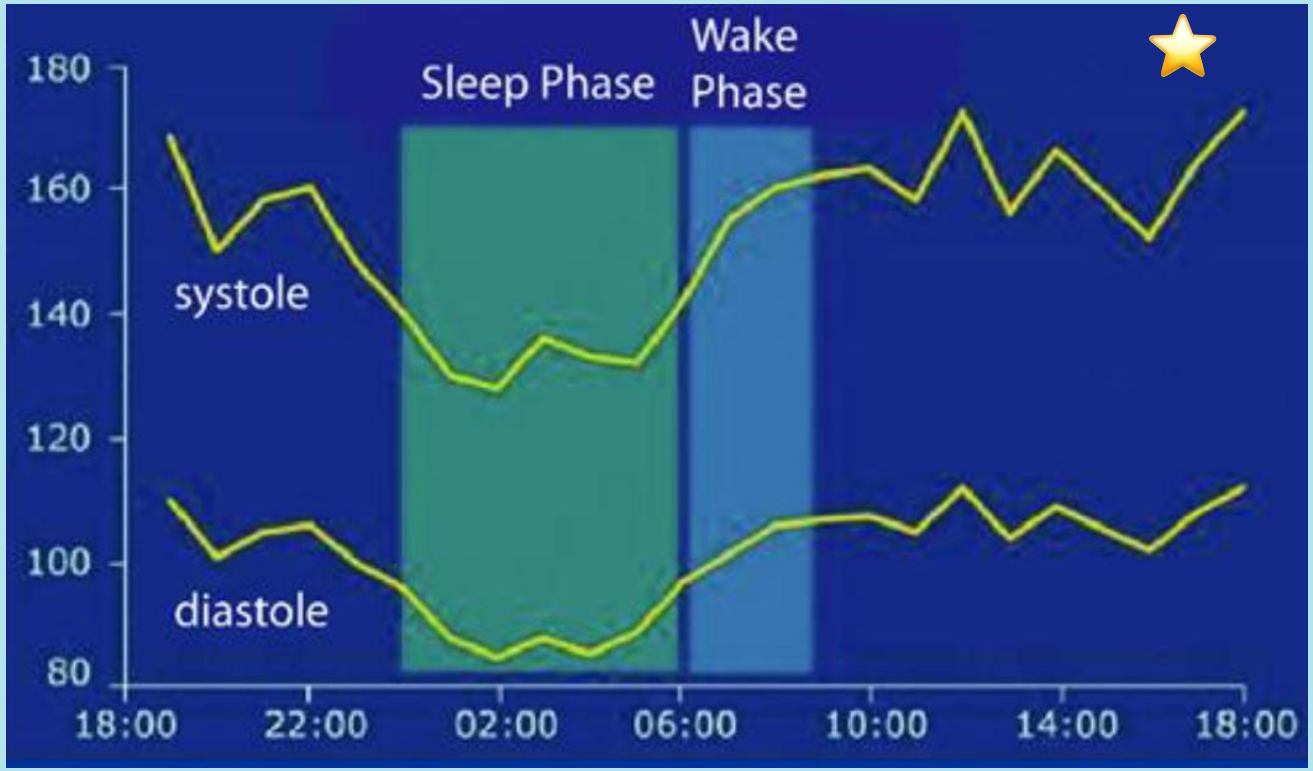
Clinical Presentation

Most times asymptomatic

(silent disease).

Headache: Coincides with morning surge in BP (Due to cortisol increase).

Circadian variation of blood pressure.



Category	Systolic (mm Hg)	Diastolic (mm Hg)
Normal	<120	<80
Prehypertensive	120-139	or 80-89
Hypertensive		
Stage 1	140-159	or 90-99
Stage 2	≥160	≥100

Classification of Hypertension

A classification of hypertension is based on the impact on risk.

Epidemiology

- Currently, the prevalence of hypertension in Americans age 35-45 years is as follows:
- White Women : 17%
- White Men : 26%
- African American Women : 37%
- African American Men : 44%
- We can notice from the details that the men develop hypertension more than women (regardless white or African) due to difference in hormones.
- The estrogen (called heart protective hormone) which is due to menstrual cycle is considered to be the cause.
- After age of 45 (menopause) the percentage (men and women) become close.

Uncomplicated to Complicated/Malignant Hypertension: End-Organ Damage

Chronic hypertension alters blood vessel/cardiac muscle structure:

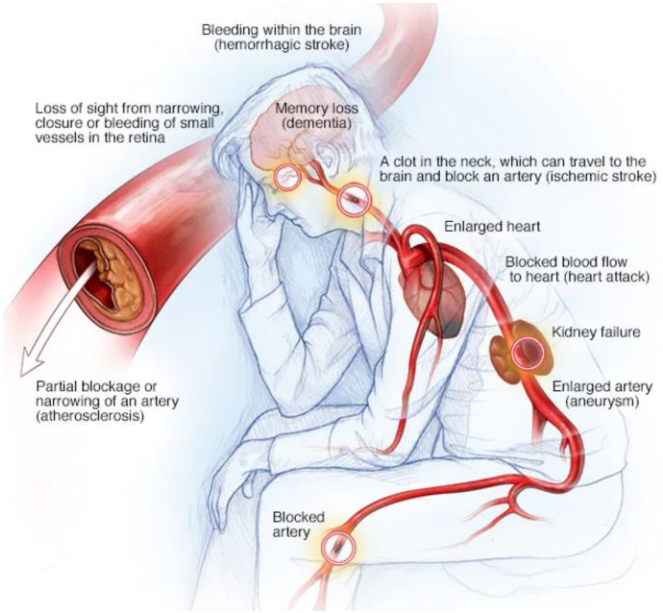
Decreases blood vessel diameter (Lumen diameter).

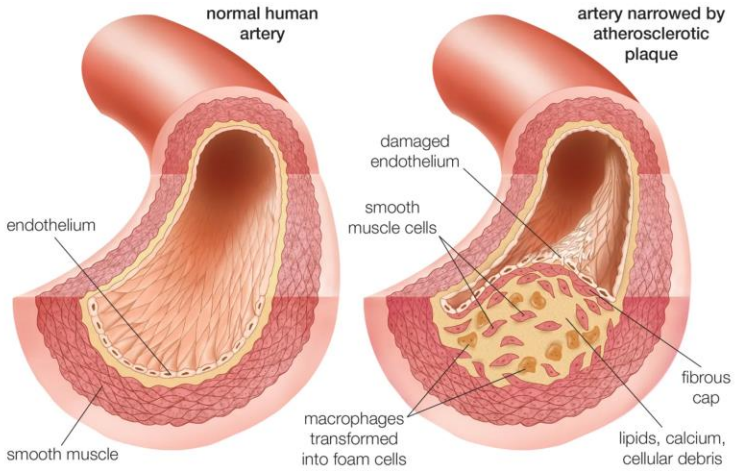
Diminishes distribution of oxygenated blood to tissue targets.

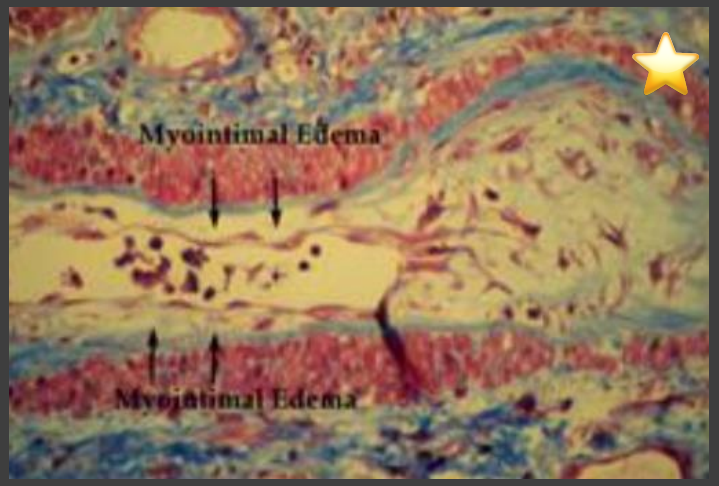
Cardiac hypertrophy (That will cause heart failure).

High blood pressure ultimately leads to major end-organ damage i.e., heart attack, stroke, renal failure.

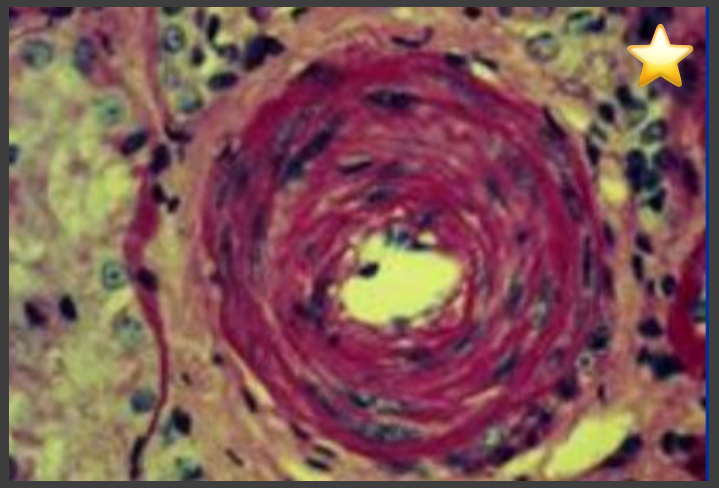
That's why we need to diagnose and treat hypertension early.







Edema



Vascular hyperplasia

Papilledema

Treating Hypertension

Lifestyle Modification: Alterations in diet and exercise may reduce blood pressure in some patients. Also reduce stressful exposure.

Drug Treatments: There are many antihypertensive drugs, commonly used in combination therapy.

Tailor treatment according diagnostic exam: Uncomplicated vs complicated disease, Ethnicity, Severity of hypertension, Pregnancy, Drug Interactions, Patient compliance.

Antihypertensive drugs may be divided into the following classes:

- Diuretics.
- Calcium channel blockers.
- Beta blockers.
- Angiotensin converting enzyme (ACE) inhibitors (ACEI).
- Angiotensin Receptor Blockers (ARBs).
- Central α2-adrenergic receptor agonists.
- Adrenergic neuron blocking agents.
- Peripheral α-adrenergic antagonists.
- Vasodilators.

Antihypertensive Drug Classes

	Classes	Drug Names	Examples	Mechanism of Action	Main Effect on BP
A	ACE Inhibitors	"pril"	Lisinopril Enalapril	Inhibit ACE	↓ SVR, SV
A	ARBs	"sartan"	Losartan Valsartan	Block Angiotensin II Receptors	↓ SVR, SV
A	Alpha Blockers	"osin"	Doxazosin Terazosin	Block Alpha Receptors	↓ SVR
B	Beta Blockers	"lol"	Metoprolol Labetalol	Block Beta Receptors	↓ HR, SV
C	Calcium Channel Blockers (CCBs)	"dipine"	Amlodipine Nicardipine	Block Calcium Channels	↓ SVR
D	Diuretics	"ide"	Furosemide Hydrochlorothiazide	Facilitate Diuresis	↓ SV

**Alpha blockers refer to selective alpha-1 blockers, and calcium channel blockers refer to dihydropyridines

Ways of Lowering Blood Pressure

Reduce plasma volume (diuretics).

Reduce cardiac output (ß-blockers, Ca2+ channel blockers).

Reduce peripheral vascular resistance (vasodilators)

MAP = CO X TPR

Mean arterial pressure = cardiac output * total peripheral resistance