HYPERTENSION

PROF. JAMAL AL WAKEEL

Consultant Nephrology Division

Department of Medicine

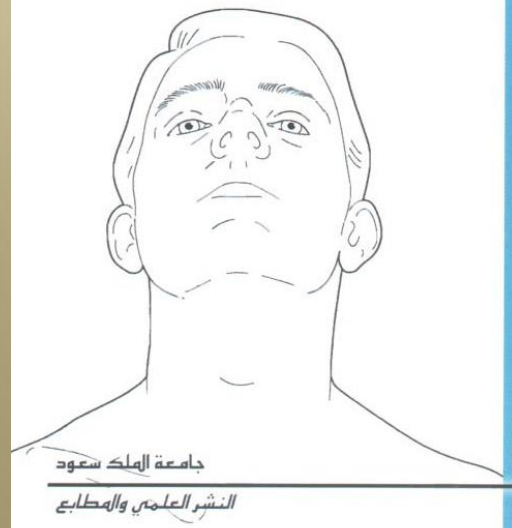
تأليف

نيكولاس ج. تالي سيمون أوكونر

كتاب الفحص الإكلينيكي الجيبي

ترجمة

أ.د. جمال بن صالح الوكيل



جامعة الملك سعود

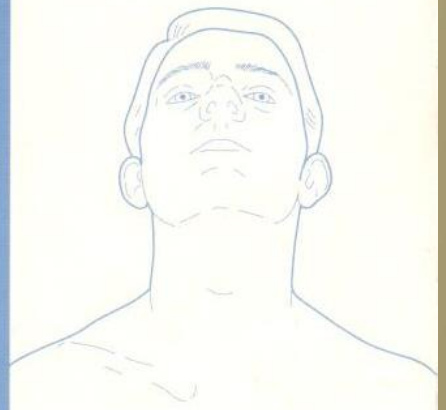
النشر العلمي والمطابع

NICHOLAS J TALLEY

SIMON O'CONNOR

POCKET CLINICAL EXAMINATION

SECOND EDITION



The Objectives of this Lecture are:

1. To be able to recognize the definition of hypertension
2. To be able to identify the Stages of Hypertension (ACC/AHA - European Society of Cardiology/European Society of Hypertension (ESC/ESH)
3. To find out the complication of Hypertension
4. To learn how to measure blood pressure
5. To acquire knowledge on how to treat hypertension

Case

47 year old man came to your clinic with headache for 3 weeks. The nurse measure his Blood Pressure and was found to be 150/95 mmHg:

1. Does he have Hypertension?
2. What is the stage of Hypertension?
3. What investigation should you perform?
4. What could be your management on his case?
5. Is their any possible prevention to his disease and its complication?

Prevalence of hypertension

- The 4th most common cause of death worldwide
- The overall prevalence of hypertension in adults is around 30 - 45%
- The global prevalence of hypertension was estimated to be 1.13 billion in 2015
- Onset stage 25-55 years mainly in 40-50y
- more common with advancing age
- prevalence of >60% in people aged >60 years
- Risk of HTN : A)As populations age, B) sedentary lifestyles C) increase their body weight

- Only 72% are aware of their disease
- The overall prevalence of hypertension in Saudia was 25.5%
- 55% of participants on medication for hypertension had their blood pressure uncontrolled

Mechanism of Blood Pressure:

Blood Pressure = Cardiac output X
Systemic Vascular Resistance

= CO X SVR

= Stroke volume X HR X SVR

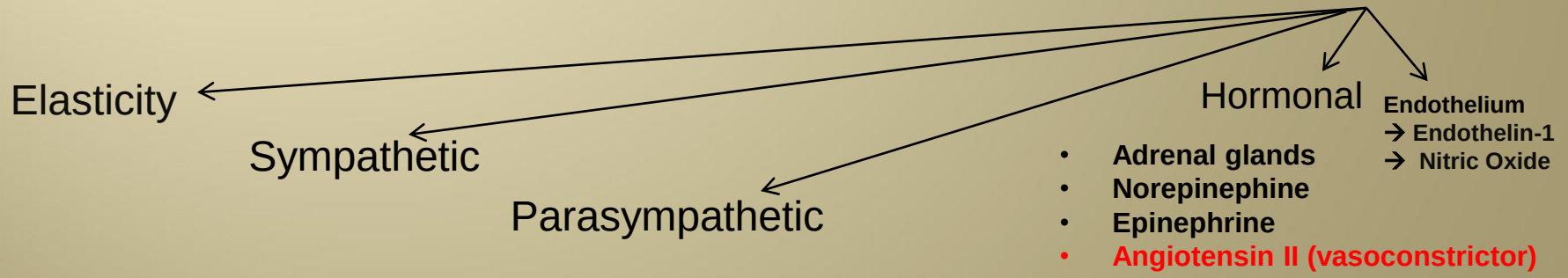
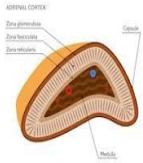


Figure 1: Systems involved in the development and maintenance of hypertension

Sympathetic Nervouse System
- Sympathetic tone



Systemic Epinephrine,
Systemic Norepinephrine
Aldosterone

Pathogenisis of Hypertension

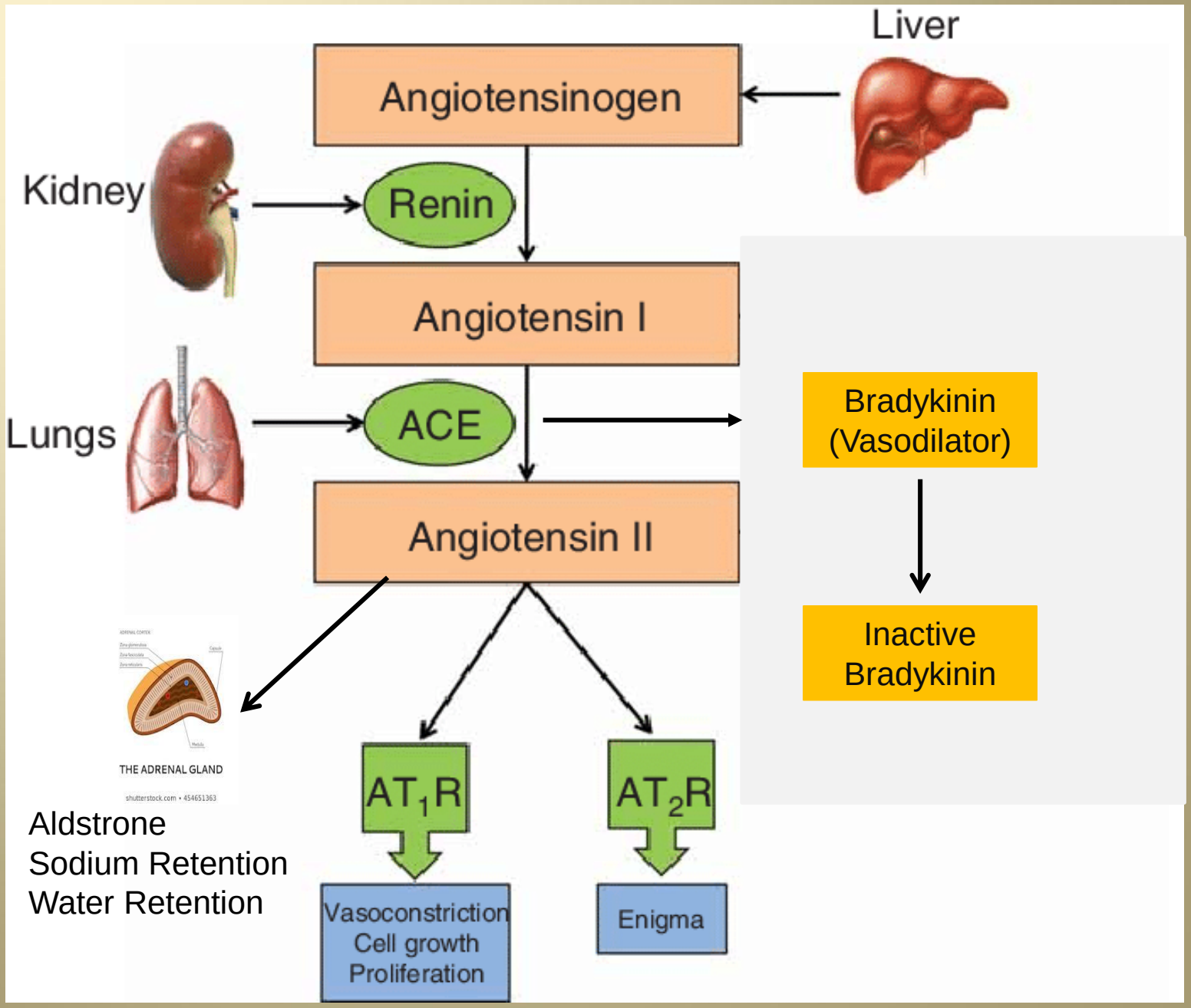
- Heart rate
- Myocardial contractility

- Systemic Vasoconstriction

Endothelium
→ **Endothelin-1**
→ **Nitric Oxide**

Renal Effects
RAAS activation
- Renin Release
- Sodium Retention
- Water Retention

Figure 1: Systems involved in the development and maintenance of hypertension



- Aldstrone
- Sodium Retention
- Water Retention

Hypertension

- In 90%-95% of cases no cause can be found primary hypertension (essential)
- Secondary hypertension 5-10%

Essential HTN

- Risk factors (modeflied)
  - Obesity---metabolic syndrome
  - UnhealthydietExcessive saltintake---lowpotassium intake
  - Excessive alcohol intake
  - Polycythemia
  - Lack of exercise
  - Non-steroid anti-inflammatory drugs
- Risk factors (Non modeflied)
  - Family history of essential HTN
  - Aging
  - Race &gentic
- Caffeine and smoking increase the BP acutely but are not risk factors for the development of chronic essential HTN

Secondary Hypertension

- Primary renal disease
- Oral contraceptives
- Sleep apnea syndrome
- Primary hyperaldosteronism
- Renovascular disease
- Cushing's syndrome
- Pheochromocytoma
- Other endocrine disorders
- Coarctation of the aorta

Types Of BP Apparatuses

Non-automated device [non-AOBP]

Aneroid Type

Mercury Type

Half automated device

- Finger and/or wrist BP measuring devices are not recommended

Automated Device

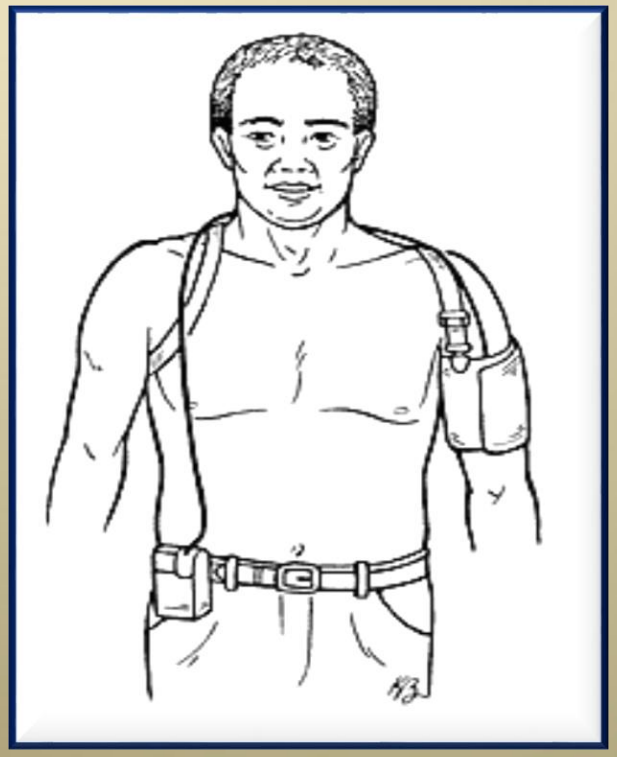
Digital Type

- **AOBP** is the preferred method of performing in-office BP measurement

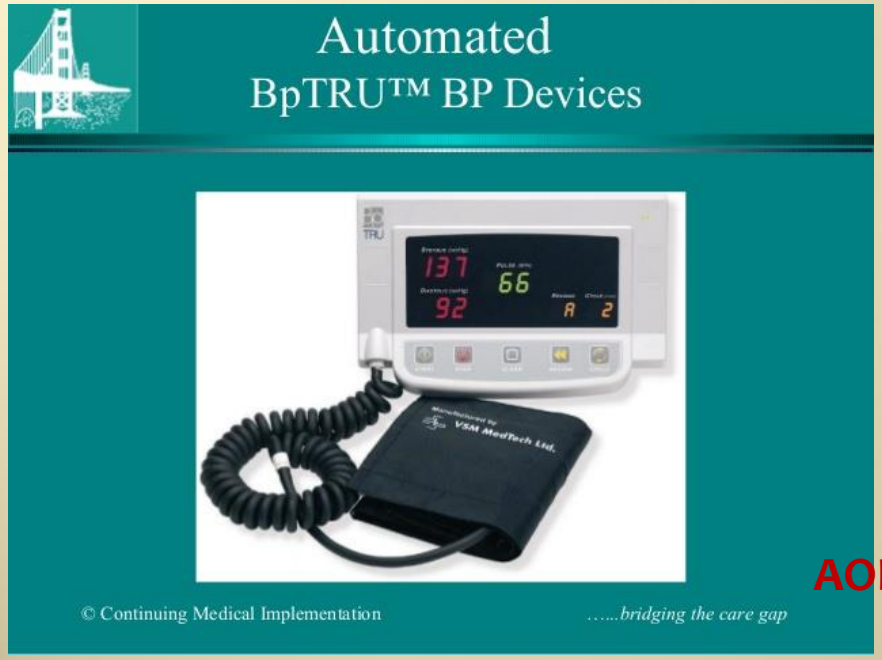
Type of Instrument of Blood Pressure Measurement

Home Blood Pressure Monitoring

Ambulatory Pressure Monitoring



Automated Blood Pressure Tru Device (Automated Office Blood pressure)



AOBP Automated Office Blood Pressure

AOBP ≥135 A130 or more than 85 A80

Blood Pressure

- Apply to adults on no antihypertensive medications and who are not acutely ill.
- If there is a disparity in category between the systolic and diastolic pressures, the higher value determines the severity of the hypertension.
- Measure blood pressure to arm the high reading.

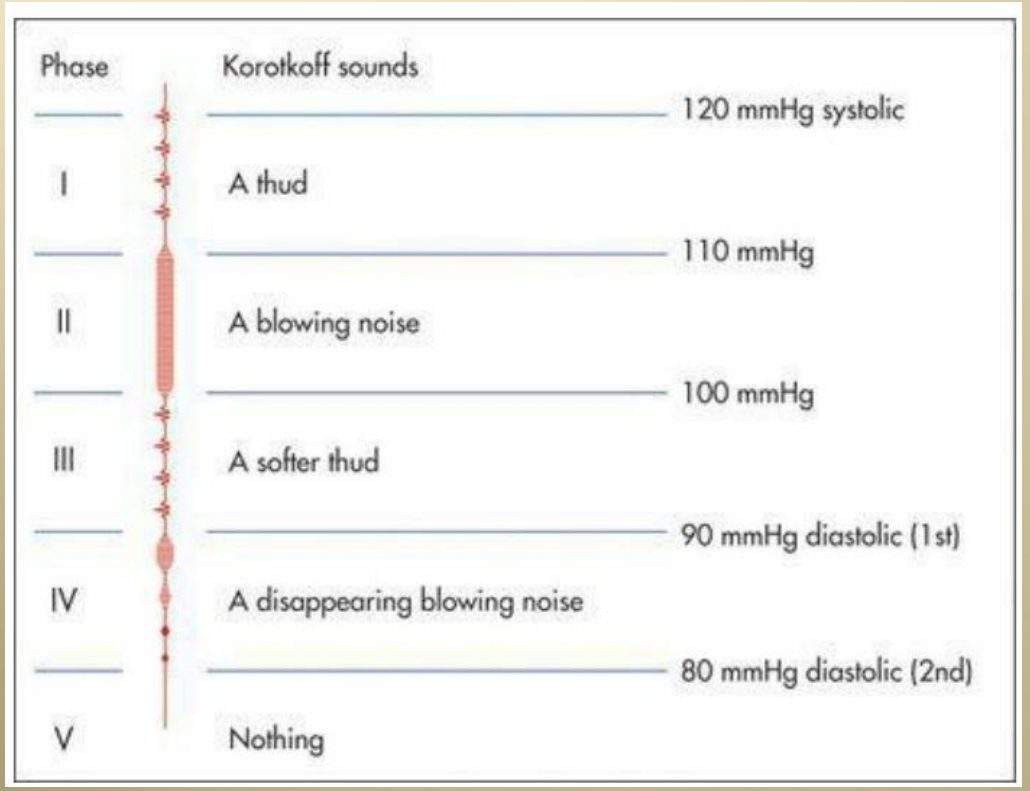
Office blood pressure measurement

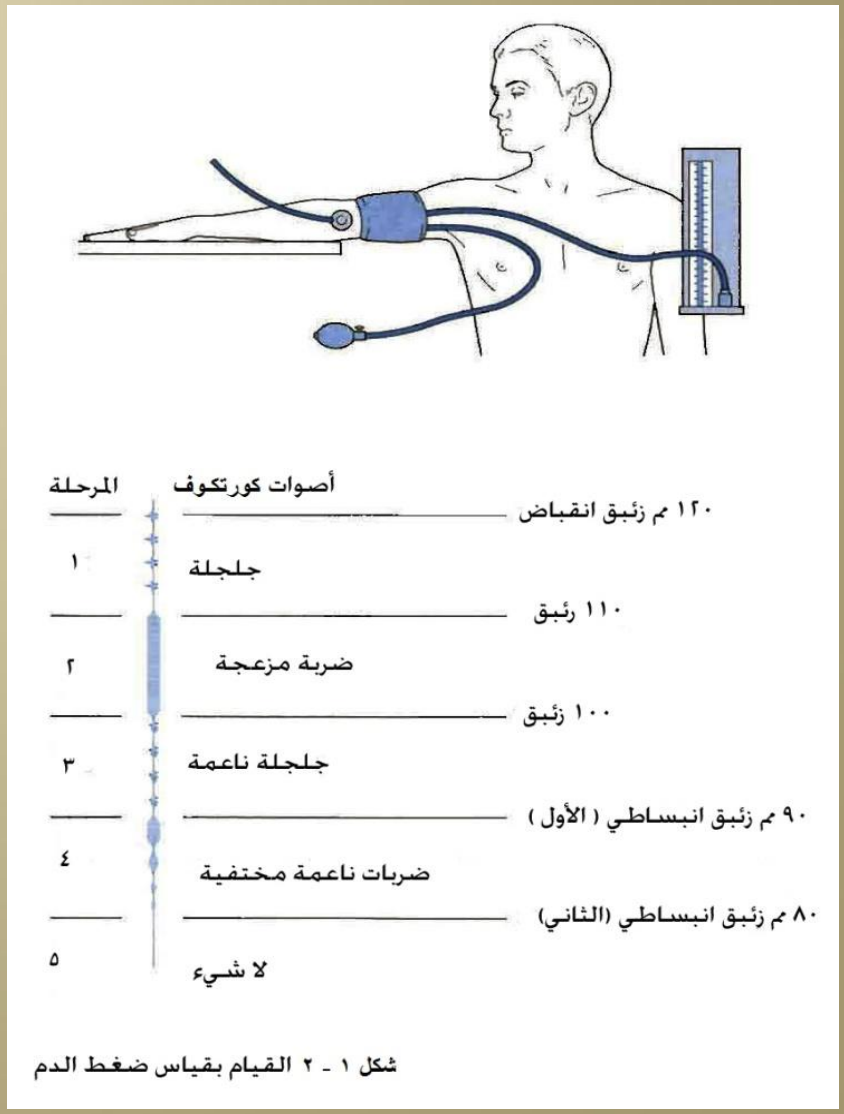
- To allow the patients to sit for 3–5 minutes before beginning BP measurements
- Back straight and arm supported at heart level
- Take at least two BP measurements, spaced 1–2 min apart, and additional measurements if the first two are quite different.
- Consider the average BP if deemed appropriate.
- To use a standard bladder (12–13 cm wide and 35 cm long)
- A larger bladder for larger arm (circumference >32 cm)
- The bladder of the pressure cuff should encircle at least 80% of the upper arm

Office blood pressure measurement

- Place the cuff at the heart level, whatever the position of the patient.
- Measure BP in both arms at first visit to detect possible differences. In this instance, take the arm with the higher value as the reference.
- Measure BP in sitting and standing position in elderly subjects and diabetic patients
- Use phase I and V (disappearance) Korotkoff sounds to identify systolic and diastolic BP, respectively.

Korotkoff sounds





شكل ١ - ٢ القيام بقياس ضغط الدم

- The diagnosis of mild hypertension should not be made until the blood pressure has been measured on at least two time in three visits within1-3 months
- Average of 10 to 15 mmHg decrease between visits 1 and three
- The diagnosis of sever asympotomatic hypertension (>160/110) should be made until the blood pressure has been measured on at least two time in two visits one or 2 week apart

White Coat Hypertension(PseudoHTN)

- s a phenomenon in which patients exhibit a blood pressure level above the normal range, in a clinical setting, though they do not exhibit it in other settings
- **Approximately 20 to 25% of patients with mild office hypertension**
- **More common in elderly**
- **Infrequent in patients with office diastolic pressures ≥105 mmHg**

Masked hypertension

- office blood pressure (BP) level is <140/90 mm Hg but ambulatory or home BP readings are in the hypertensive range
- In adults with untreated office BPs that are consistently between 120 mm Hg and 129 mm Hg for SBP or between 75 mm Hg and 79 mm Hg for DBP, screening for masked hypertension with home BPM (or ABPM) is reasonable.
- The prevalence about 1 in 7 or 8 persons

Cardiology/European Society of Hypertension (ESC/ESH)

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.

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

[b]Isolated 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.

Categories of BP in Adults*

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

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

European Society of Nephrology Classification of Blood Pressure Levels

Category	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Optimal blood pressure	<120	<80
Normal blood pressure	<130	<85
High-normal blood pressure	**130-139**	**85-89**
Grade 1 hypertension (mild)	**140-159**	**90-99**
Grade 2 hypertension (moderate)	160-179	100-109
Grade 3 hypertension (severe)	>/= 180	>/= 110
Isolated systolic hypertension	>140	<90

Categories of BP in Adults*

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

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

AMERICAN COLLEGE of CARDIOLOGY

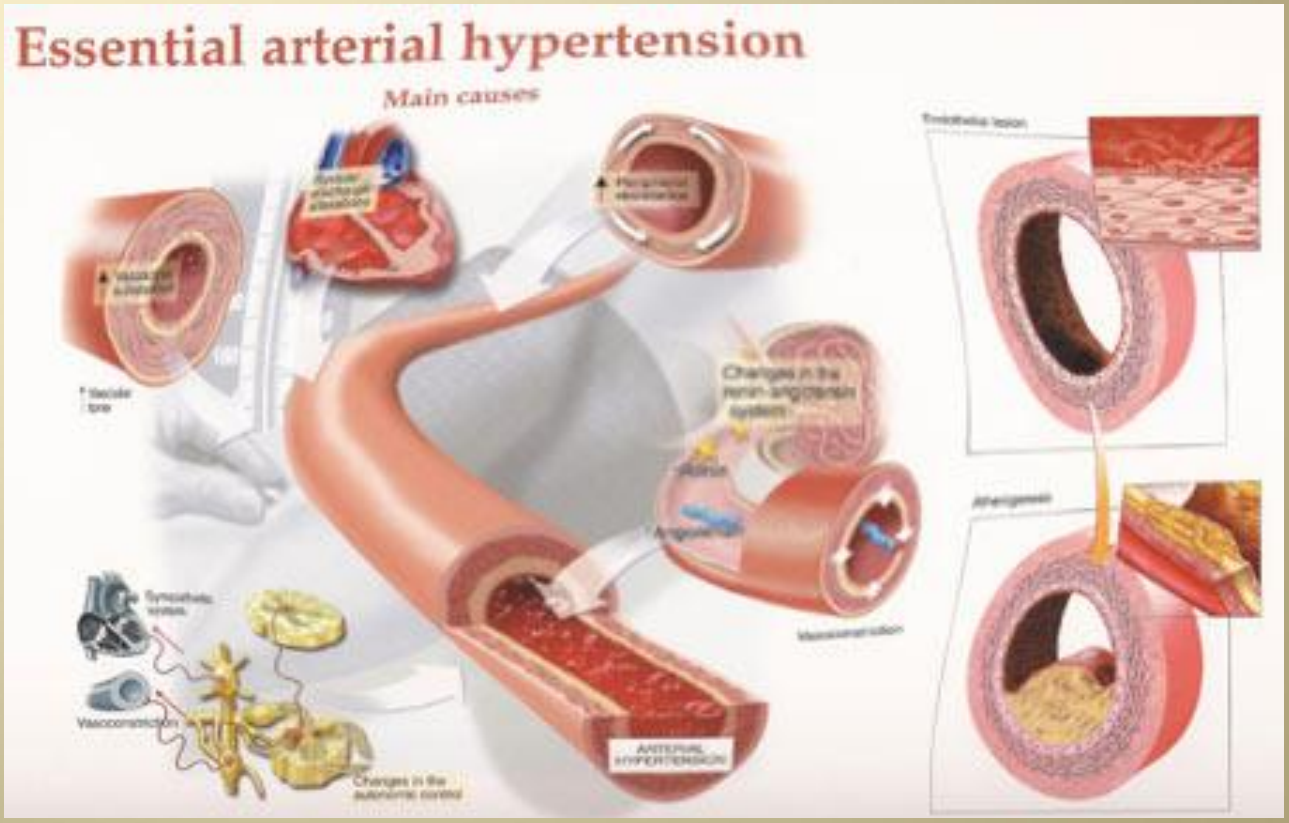
American Heart Association.
life is why

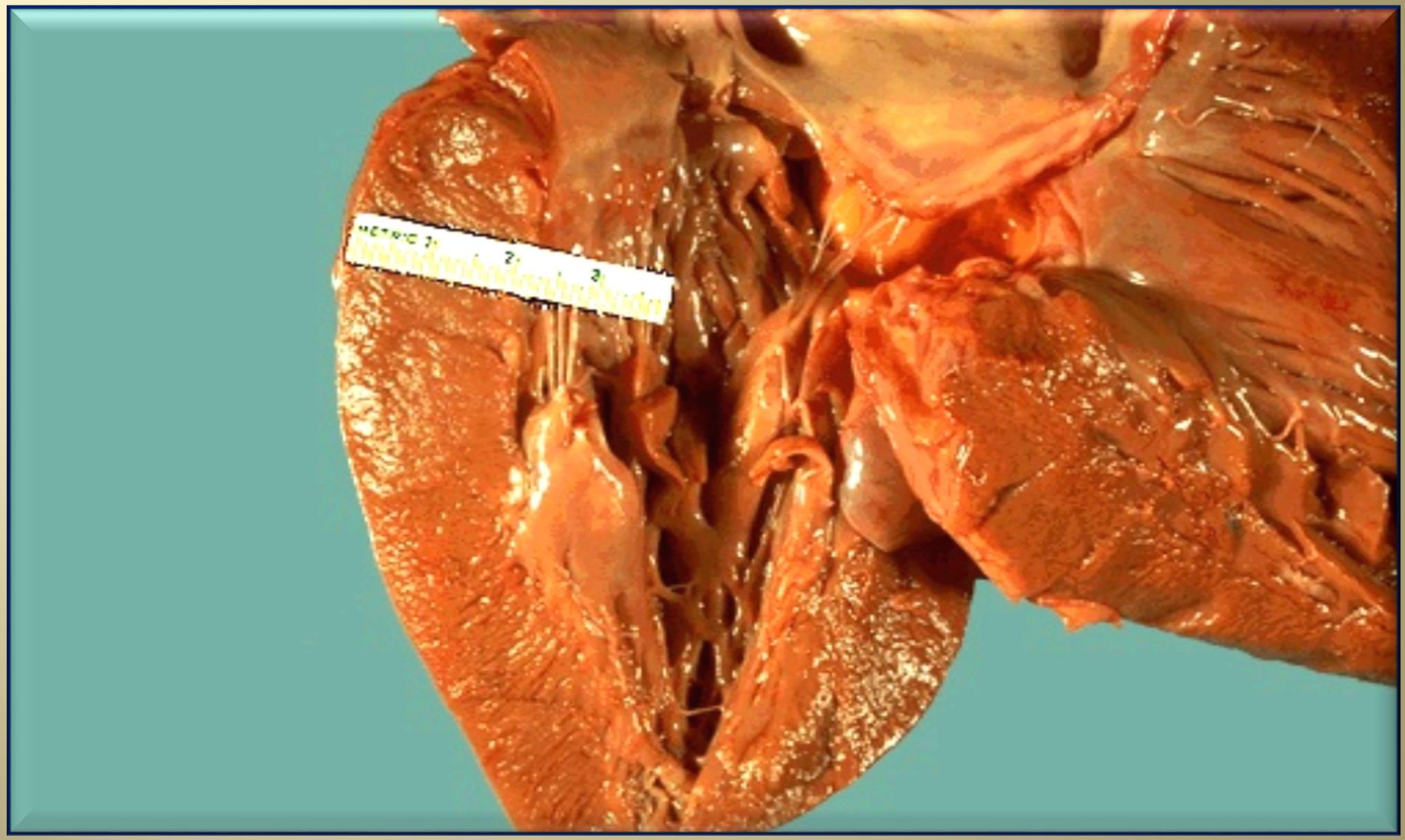
Definitions of hypertension by office and out-of-office blood pressure levels

Category	Systolic BP (mmHg)		Diastolic (mmHg)
Office BP	≥140 A130/	and/or	≥90 A80
Ambulatory BP			
Daytime (or awake)	≥135 A130	and/or	≥85 A80
Nighttime (or sleep)	≥120 A110	and/or	≥70 A 65
24 h	≥ 130 A125	and/or	≥80 A 75
Home BP	≥135 A130	and/or	≥85 A80

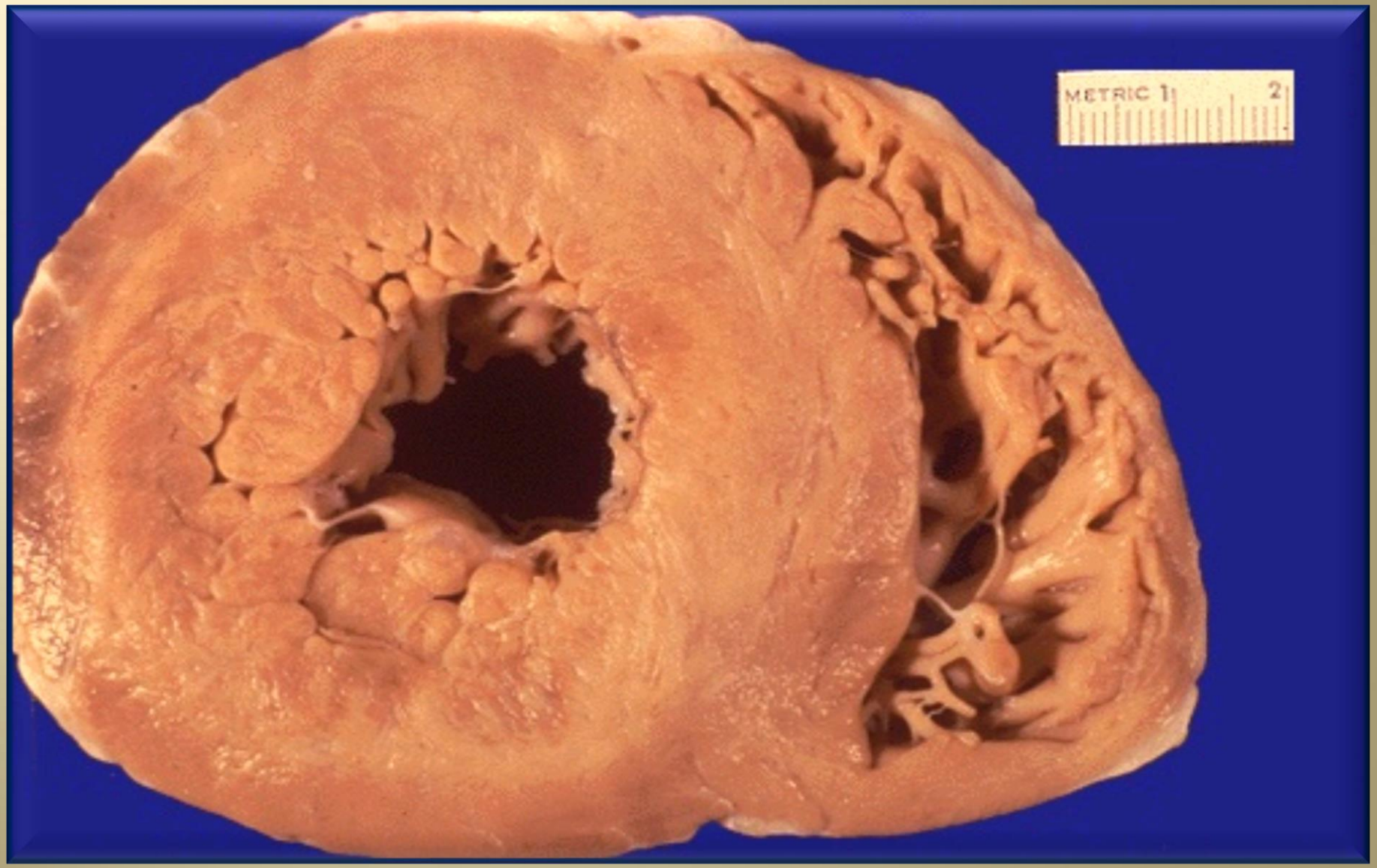
2013 ESH and ESC Guidelines

Essential arterial hypertension



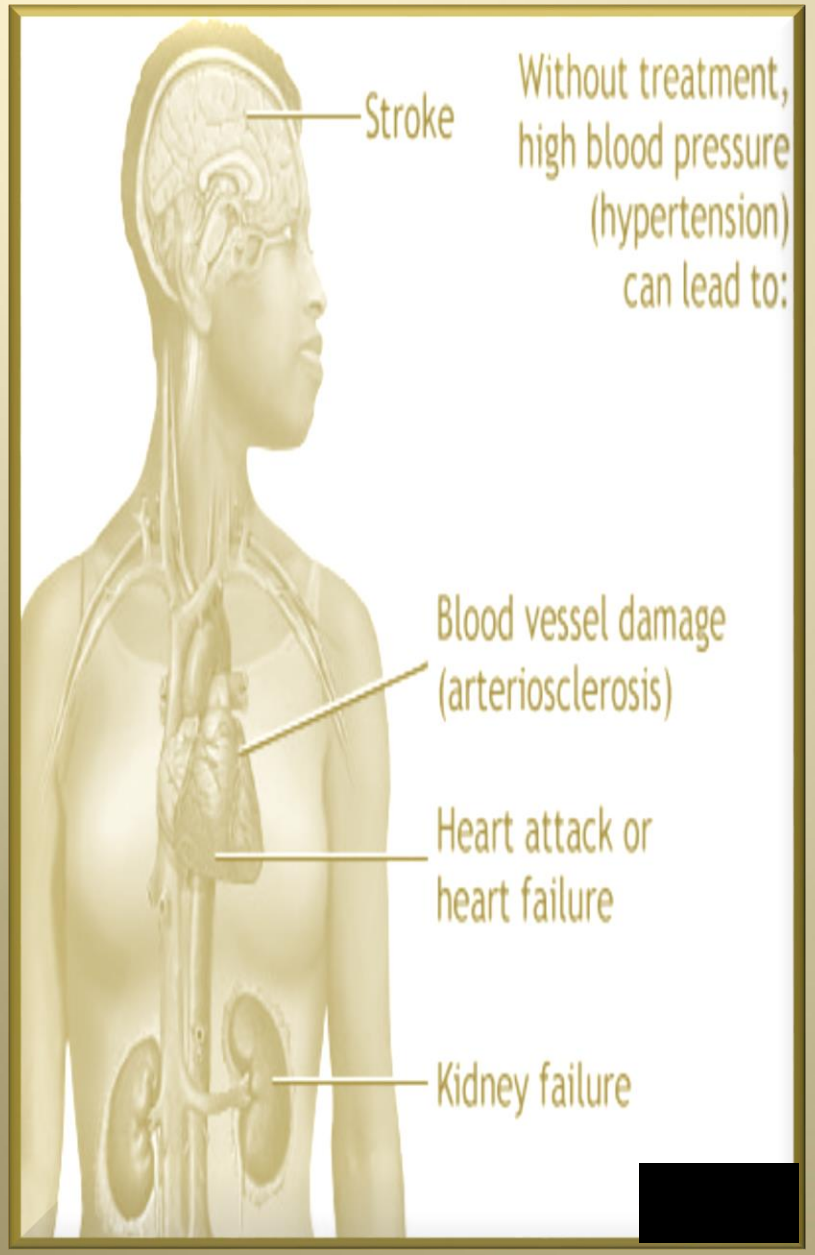


This left ventricle is very thickened (slightly over 2 cm in thickness), but the rest of the heart is not greatly enlarged. This is typical for hypertensive heart disease. The hypertension creates a greater pressure load on the heart to induce the hypertrophy.



The left ventricle is markedly thickened in this patient with severe hypertension that was untreated for many years. The myocardial fibers have undergone hypertrophy.

COMPLICATIONS



- Stroke, Ischemia, Hemorrhage, Alzheimer's Disease, Cognitive, retinal hemorrhage
- CAD, ECG, Arrthymia, Sudden Death
- CHF, LVH, Aortic Dissection
- Renal Disease
- Peripheral Vascular Disease
- Hypertensive Emergency And Increase Emergency Morbidity

Hypertension

Hypertensive Emergency

Severe hypertension (diastolic blood pressure above 120 mmHg) in end organ damage (MI,STROKE,AKI,CHF)

Hypertensive Urgency

- **Severe hypertension (diastolic blood pressure above 120 mmHg) in asymptomatic patients**
- **There is no proven benefit from rapid reduction in BP in asymptomatic patients who have no evidence of acute end-organ and are little short-term risk**

Malignant (Accelerated) Hypertension

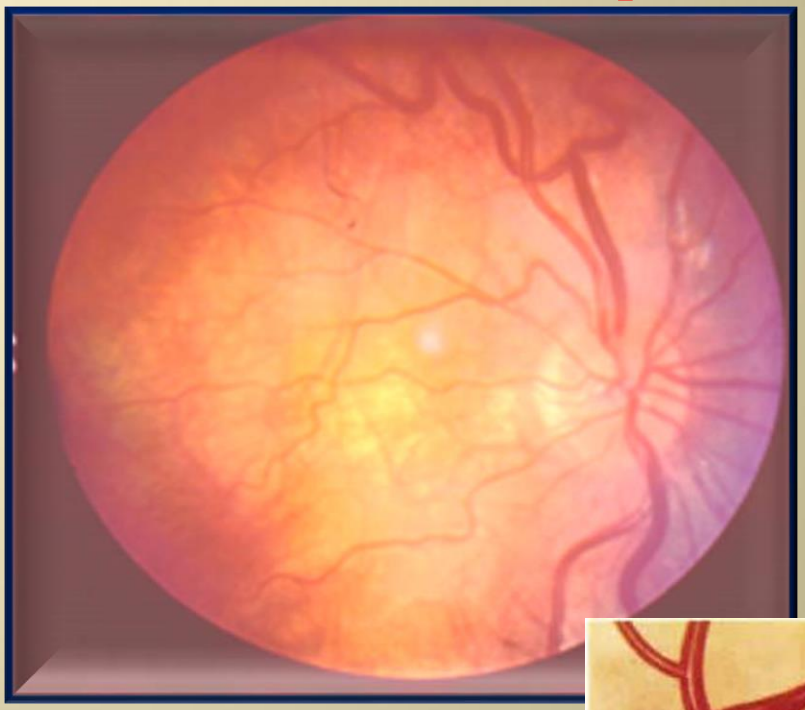
- Marked hypertension with encephapapathy& retinal hemorrhages, exudates, or papilledema
- Associated with a diastolic pressure above 120 mmHg

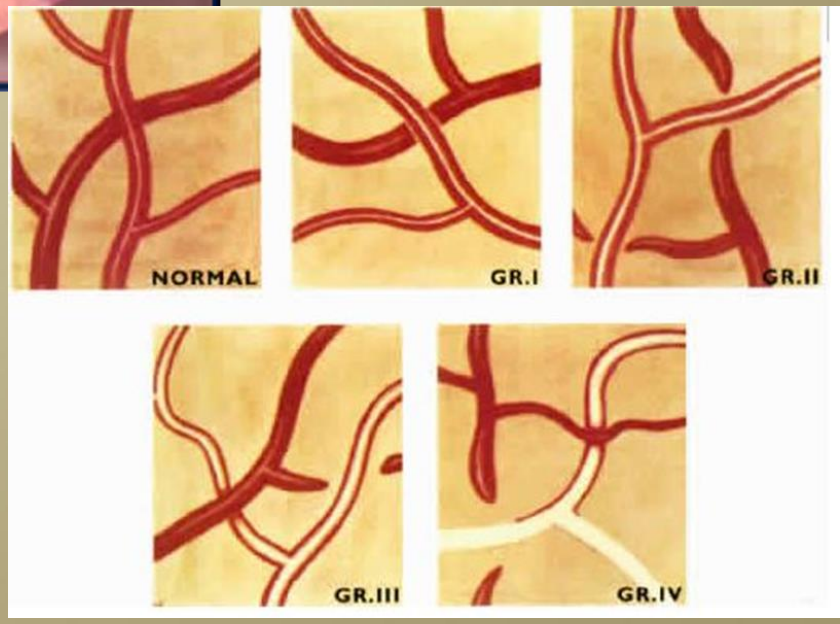
HYPERTENSIVE RETINOPATHY

Grade	Description
I	Minimal narrowing of retinal arteries
II	Narrowing of retinal arteries in conjunction with regions of focal narrowing and arterio-venous nipping
III	Abnormalities seen in Grade 1 and II, as well as retinal hemorrhages, hard exudation and cotton wool spots.
IV	Abnormalities encountered in Grades I through III, as well as swelling of the optic nerve head and macular star

Hypertensive Retinopathy Grade 1

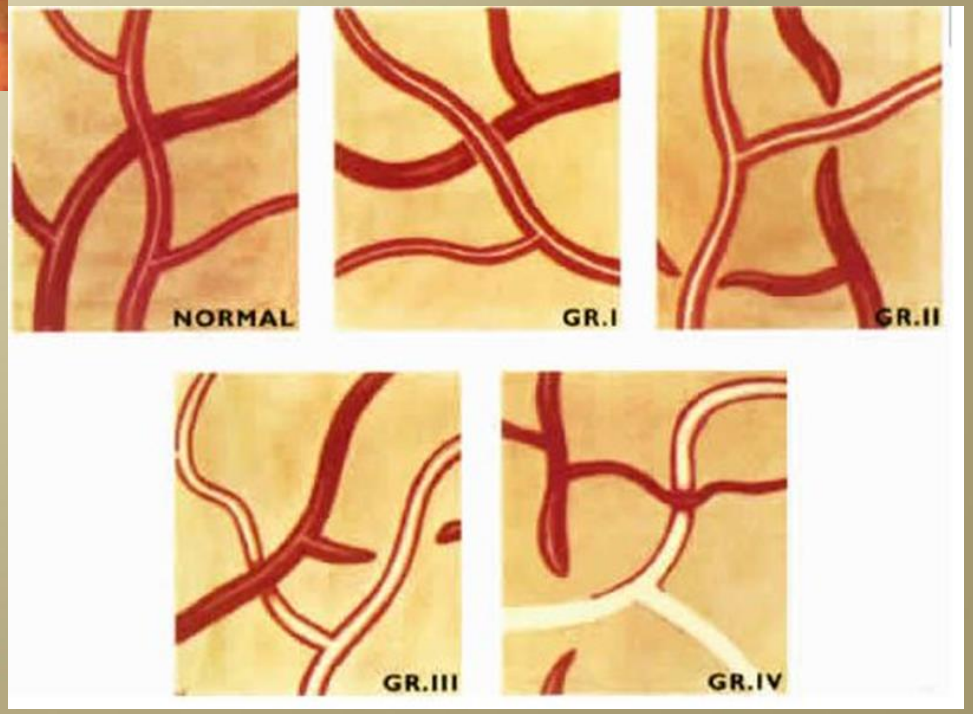
Generalized arteriolar constrictio n-seen as `silver wiring` and Vascular tortuosities





Narrowing of retinal arteries in conjunction with regions of focal narrowing and arterio-venous nipping

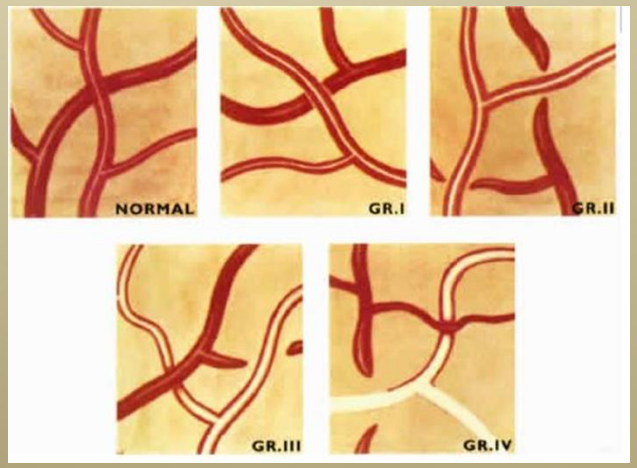
Copper wiring



Hypertensive Retinopathy Grade 2

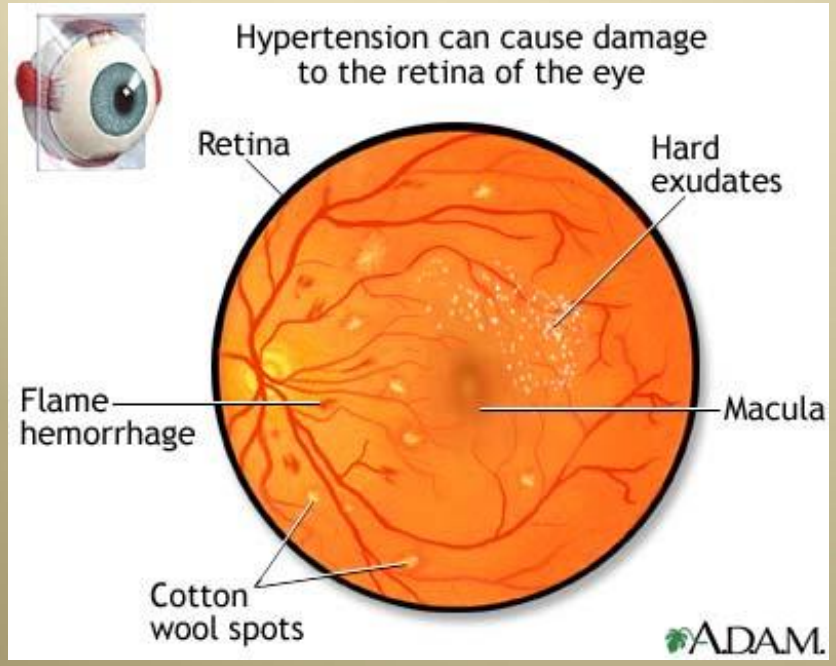
Arteriovenous nicking in association with hypertension Grade 2

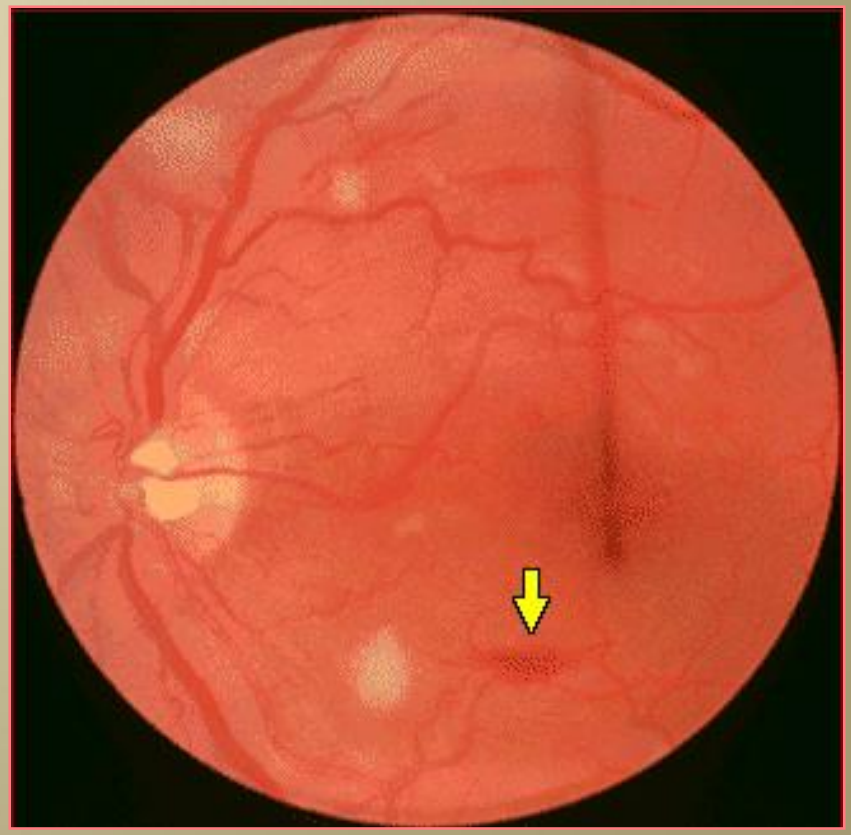
(yellow arrow)



Hypertensive Retinopathy Grade 3

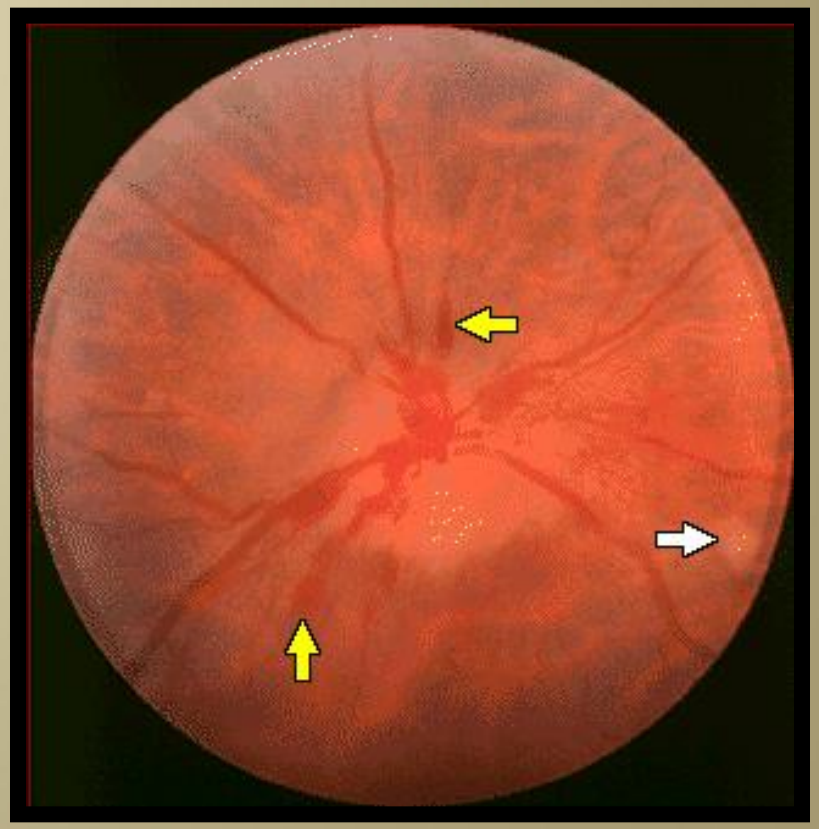
Flame-shaped hemorrhage in association with severe hypertension Grade 3 (yellow arrow)

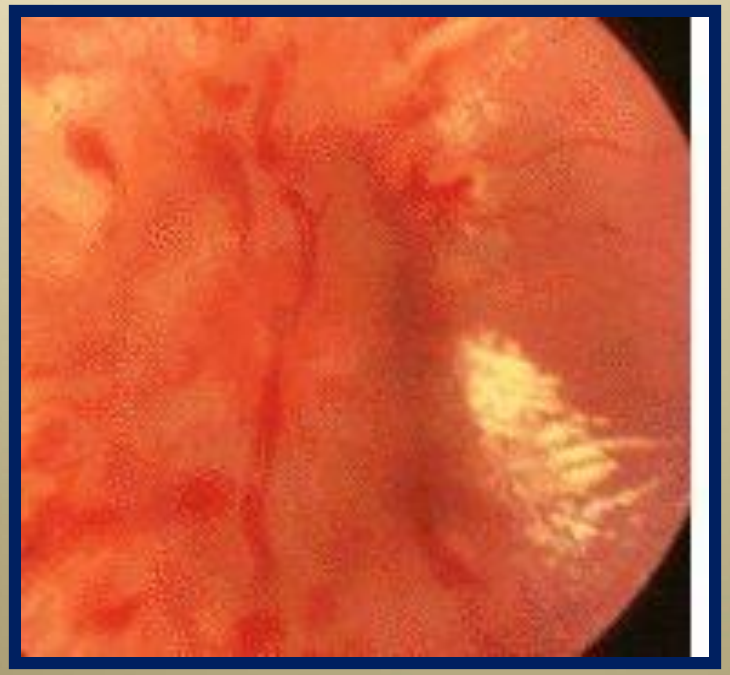




Hypertensive Retinopathy Grade 4

Papilledema from malignant hypertension. There is blurring of the borders of the optic disk with hemorrhages (yellow arrows) and exudates (white arrow)





Diagnosis Hypertension

Clinical Presentations:

- Asymptomatic
- Headache
- Epistaxis
- Chest discomfort
- Symptom of complications

Screening:

- Every one years for persons with systolic and diastolic pressures below 120 mmHg and 80 mmHg

Physical Examination

1. Confirm the diagnosis of hypertension
2. Detect causes of secondary hypertension
3. Assess CV risk
4. Organ damage
5. Concomitant clinical conditions.

Important aspects of the physical examination in the hypertensive patient
Accurate measurement of blood pressure
General appearance
Distribution of body fat
Skin lesions
Muscle strength
Alertness
Fundoscopy
Hemorrhage
Papilledema
Cotton-wool spots
Neck
Palpation and auscultation of carotids
Thyroid
Heart
Size
Rhythm
Sounds
Lungs
Rhonchi
Rales
Abdomen
Renal masses
Bruits over aorta or renal arteries
Femoral pulses
Extremities
Peripheral pulses
Edema
Neurologic assessment
Visual disturbance
Focal weakness
Confusion

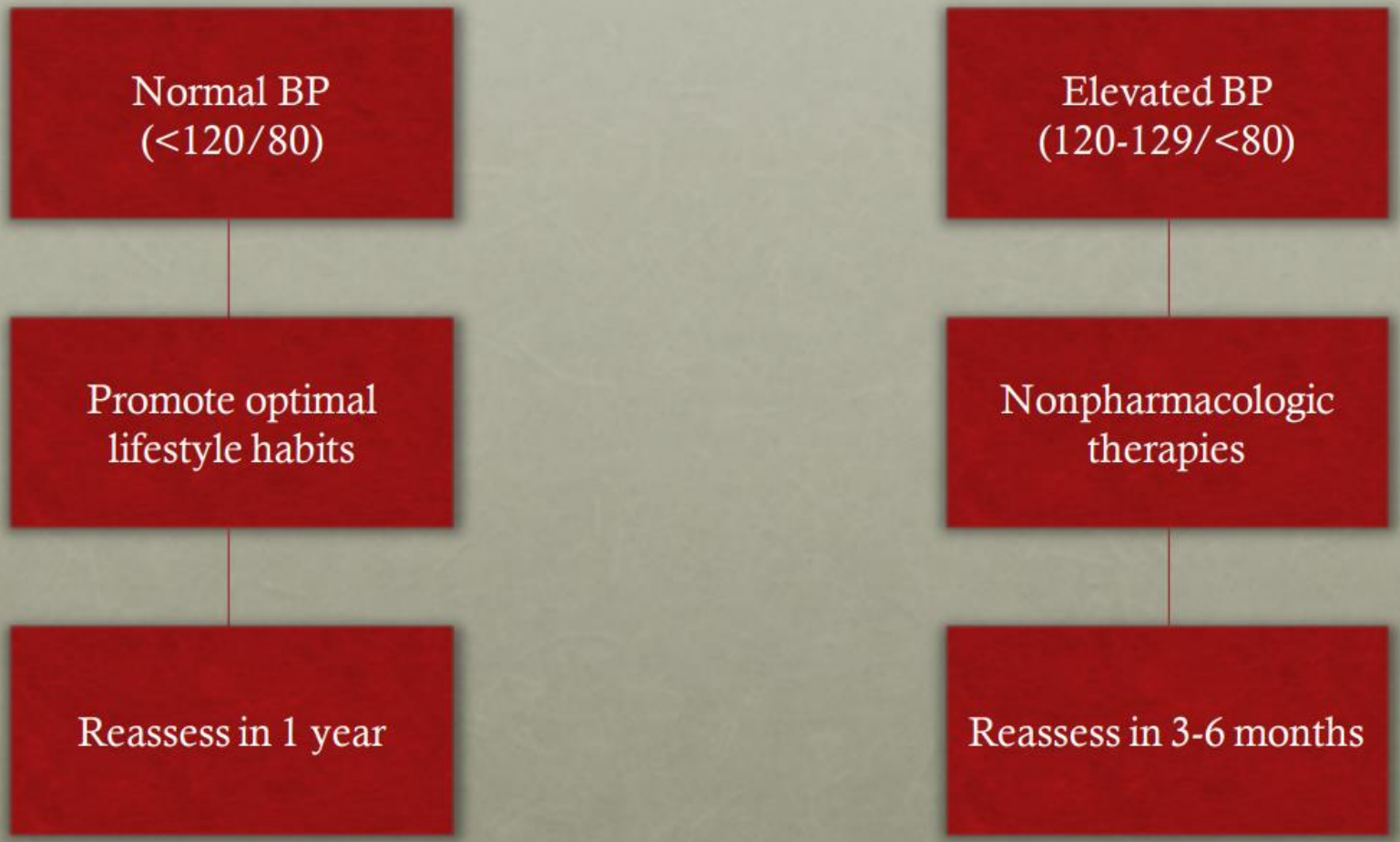
Laboratory Tests

- Routine Tests
  - Electrocardiogram
  - Urinalysis
  - Serum sodium, serum potassium, creatinine, or the corresponding estimated GFR, and calcium
  - Blood glucose, and hematocrit
  - Lipid profile, after 9- to 12-hour fast, that includes high density and low-density lipoprotein cholesterol, and triglycerides

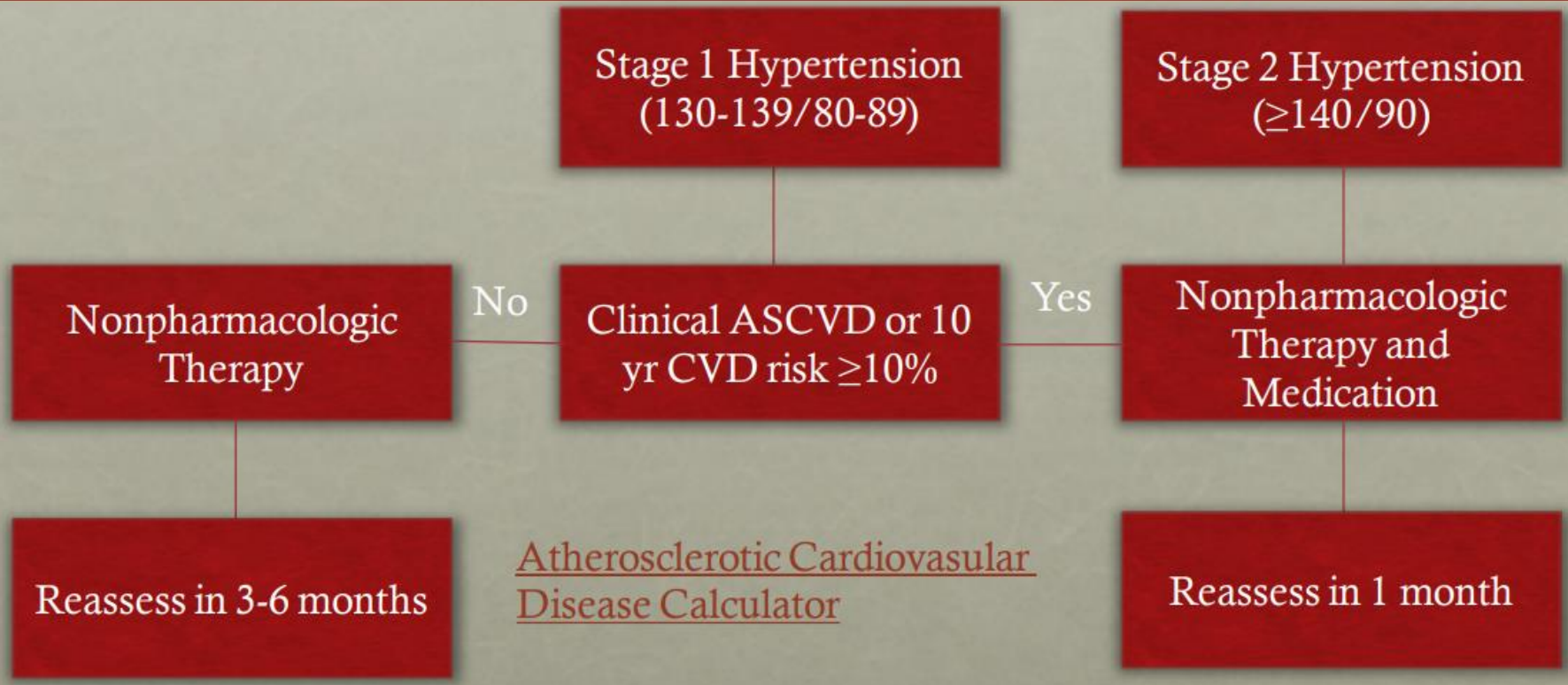
- Optional tests
  - Measurement of urinary albumin excretion or albumin/creatinine ratio

- More extensive testing for identifiable causes is not generally indicated unless BP control is not achieved

RECOMMENDATIONS FOR TREATMENT [5]



RECOMMENDATIONS FOR TREATMENT [5]



First line initial antihypertensive drugs include ACE, ARB, CCB, or thiazide diuretic

Heart Risk Calculator

Age (years) 40-79

Gender
- (•) Male
- ( ) Female

Race
- ( ) African American
- (•) Other

Total cholesterol (mg/dL) 130-320

HDL cholesterol (mg/dL) 20-100

Systolic blood pressure (mmHg) 90-200

Diastolic blood pressure (mmHg) 30-140

Treated for high blood pressure
- (•) No
- ( ) Yes

Diabetes
- (•) No
- ( ) Yes

Smoker
- (•) No
- ( ) Yes

Calculate

Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up

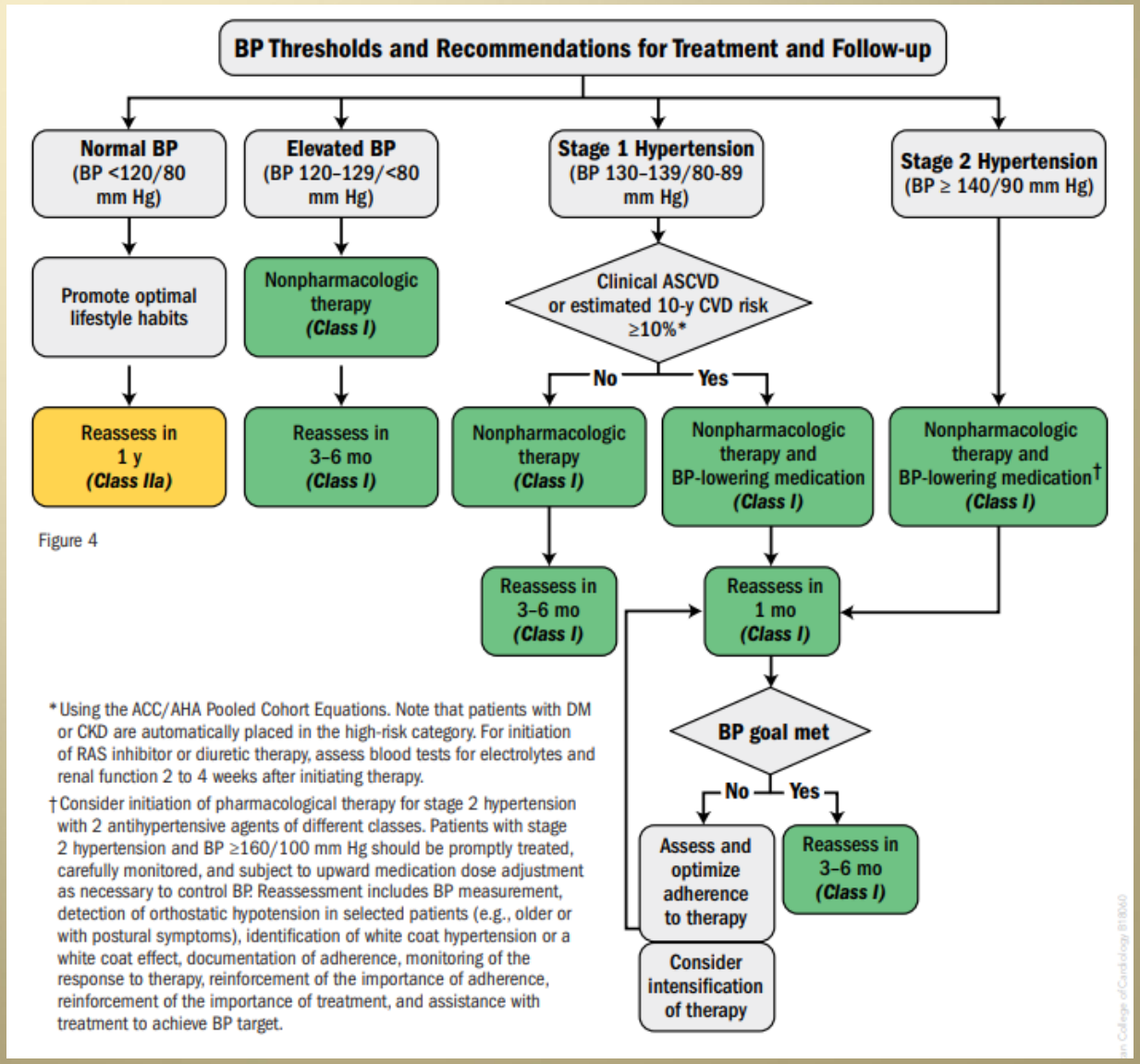


Figure 4

*Using the ACC/AHA Pooled Cohort Equations. Note that patients with DM or CKD are automatically placed in the high-risk category. For initiation of RAS inhibitor or diuretic therapy, assess blood tests for electrolytes and renal function 2 to 4 weeks after initiating therapy.

†Consider initiation of pharmacological therapy for stage 2 hypertension with 2 antihypertensive agents of different classes. Patients with stage 2 hypertension and BP ≥160/100 mm Hg should be promptly treated, carefully monitored, and subject to upward medication dose adjustment as necessary to control BP. Reassessment includes BP measurement, detection of orthostatic hypotension in selected patients (e.g., older or with postural symptoms), identification of white coat hypertension or a white coat effect, documentation of adherence, monitoring of the response to therapy, reinforcement of the importance of adherence, reinforcement of the importance of treatment, and assistance with treatment to achieve BP target.

Targated BP

BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

Clinical Condition(s)	BP Threshold, mm Hg	BP Goal, mm Hg
General		
Clinical CVD or 10-year ASCVD risk ≥10%	≥130/80	<130/80
No clinical CVD and 10-year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)
Specific comorbidities		
Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Chronic kidney disease after renal transplantation	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Secondary stroke prevention (lacunar)	≥130/80	<130/80
Peripheral arterial disease	≥130/80	<130/80

An SBP target range of 130–139 mmHg is recommended for people older than 80 years, if tolerate

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

Follow-Up After Initial BP Evaluation (cont.)

Recommendation for Follow-Up After Initial BP Elevation
For adults with a very high average BP (e.g., SBP> 180 mm Hg or DBP > 110 mm Hg), evaluation followed by prompt antihypertensive drug treatment is recommended.
For adults with a normal BP, repeat evaluation every year is reasonable

Lifestyle changes:

The **DASH diet** (Dietary Approaches to Stop Hypertension)

- Salt restriction to 5-6 gm/day.
- Increased consumption of vegetables, fruits and low-fat dairy products.
- 7-8 servings/day of grain/grain products, 4-5 vegetable, 4-5 fruit
- Reduction of weight to BMI of 25 kg/m^2.
- Regular exercise (≥30 min of moderate dynamic exercise on 5-7 days per week)
- Smoking cessation

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacologi-cal 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

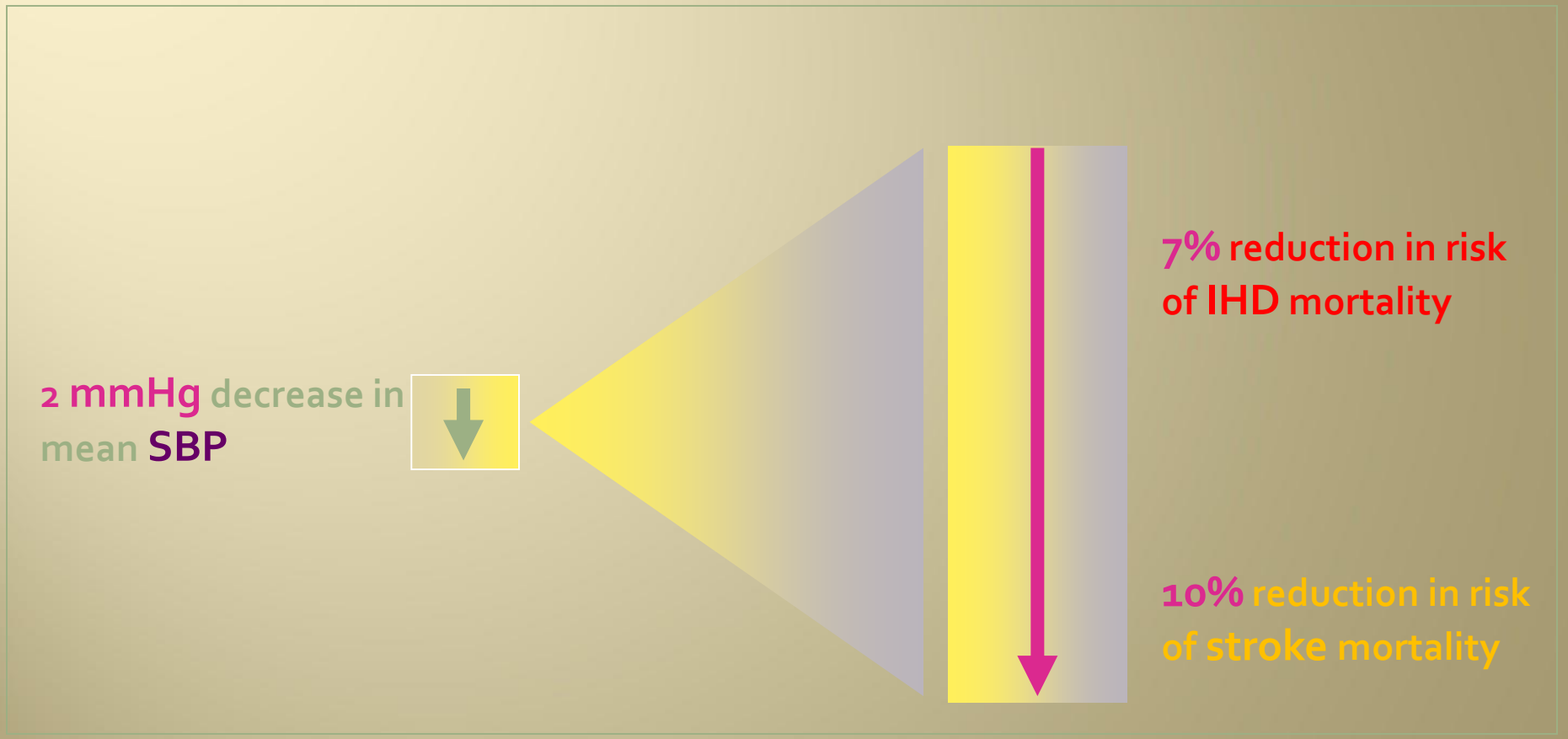
*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
DASH indicates Dietary Approaches to Stop Hypertension; and SBP, systolic blood pressure.
Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH? Available at: https://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-how-to.
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	• 90–150 min/wk • 65%–75% heart rate reserve	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	• 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	• 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: • Men: ≤2 drinks daily • Women: ≤1 drink daily	-4 mm Hg	-3 mm

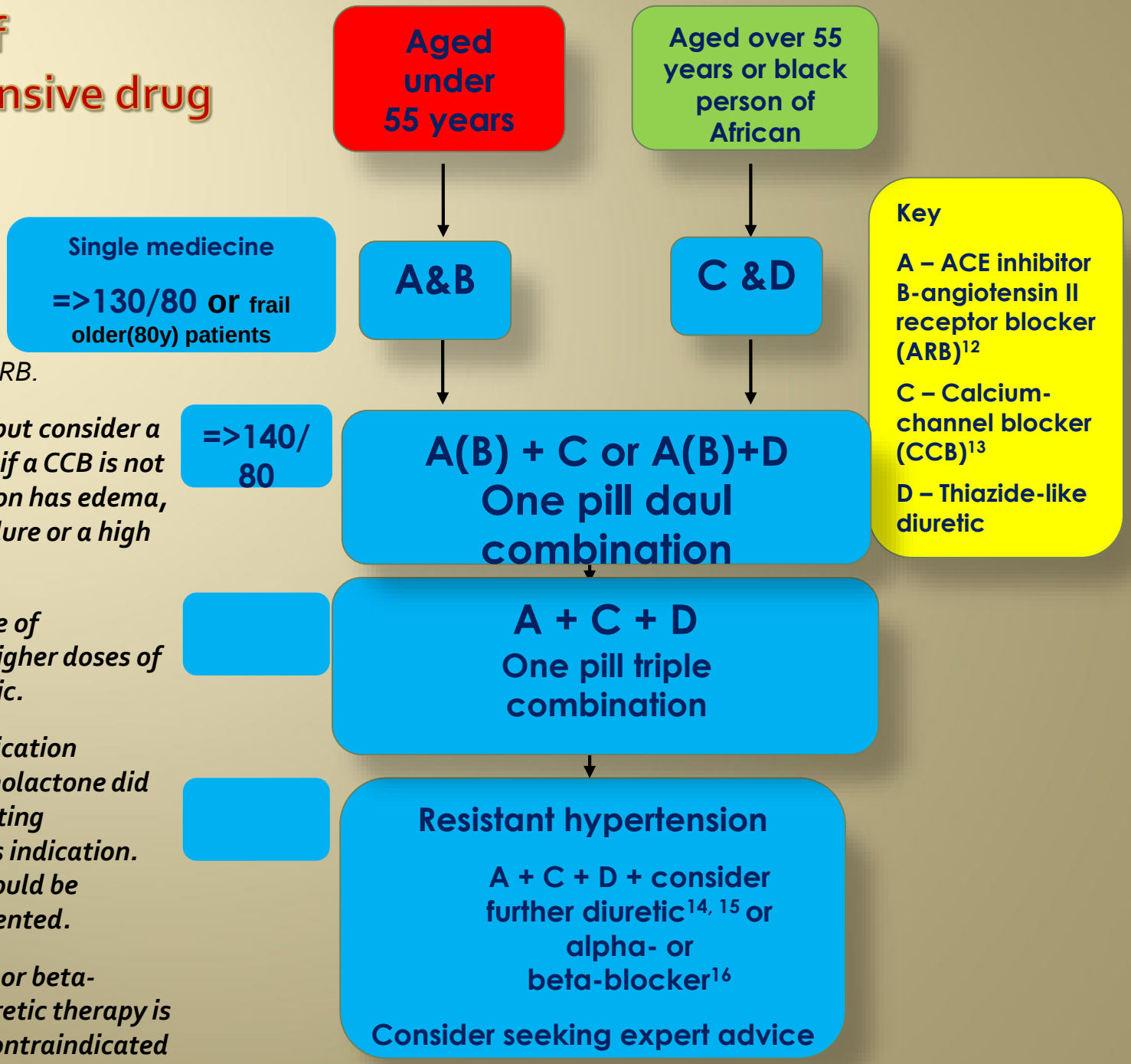
*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
†In the United States, one "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).

Blood Pressure Reductions as Little as 2 *mmHg* Reduce the Risk of Cardiovascular Events by up to 10%



Meta-analysis of 61 prospective, observational studies conducted by Lewington et al involving one million adults with no previous vascular disease at baseline mmHg

Summary of antihypertensive drug treatment



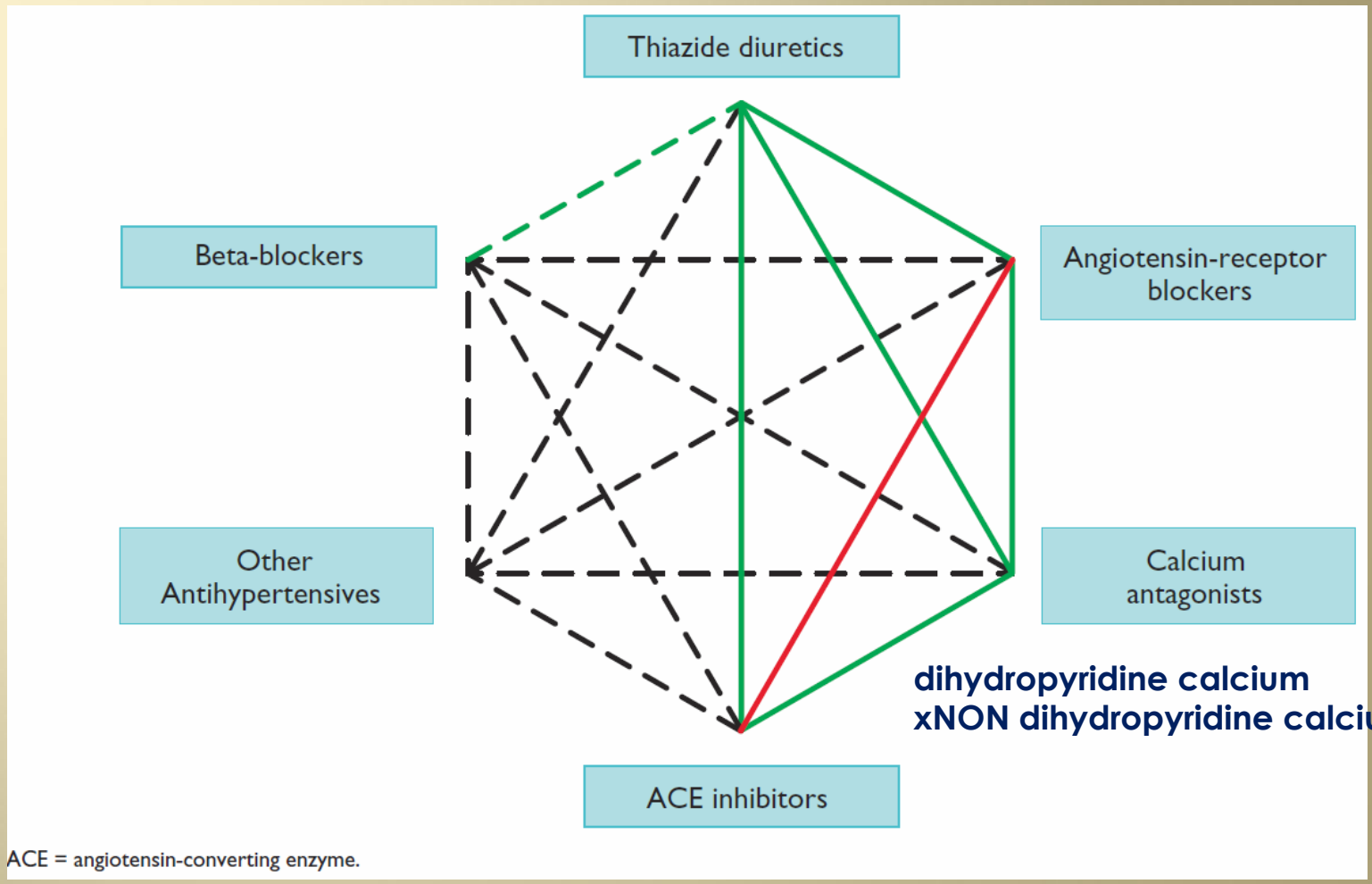
[12] Choose a low-cost ARB.

[13] A CCB is preferred but consider a thiazide-like diuretic if a CCB is not tolerated or the person has edema, evidence of heart failure or a high risk of heart failure.

[14] Consider a low dose of spironolactone[15] or higher doses of a thiazide-like diuretic.

[15] At the time of publication (August 2011), spironolactone did not have a UK marketing authorization for this indication. Informed consent should be obtained and documented.

[16] Consider an alpha- or beta-blocker if further diuretic therapy is not tolerated, or is contraindicated or ineffective.



- Possible combinations of classes of antihypertensive drugs. Green continuous lines: preferred combinations; green dashed line: useful combination (with some limitations); black dashed lines: possible but less well-tested combinations; red continuous line: not recommended combination.
- Although verapamil and diltiazem are sometimes used with a beta-blocker to improve ventricular rate control in permanent atrial fibrillation, only dihydropyridine calcium antagonists should normally be combined with beta-blockers.

2013 ESH and ESC Guidelines

Benefits of Lowering BP

Average Percent Reduction	
Stroke incidence	35–40%
Myocardial infarction	20–25%
Heart failure	50%
Renal Failure	35-50%

Anti-hypertensive Medications and Complications

- Diuretics → Hypokalemia
- β-Adrenergic Blocking Agents → Bradycardia
- Angiotensin-Converting Enzyme Inhibitors → Hyperkalemia + cough
- Angiotensin II Receptor Blockers → Hyperkalemia
- Calcium Channel Blocking Agents → Edema + Tachycardia + Bradycardia
- α-Adrenoceptor Antagonists → 1st dose hypotension
- Drugs with Central Sympatholytic Action → Drowsiness
- Arteriolar Dilators → Tachycardia + Edema

High Risk Group Therapy

- Start in 130/80(130 – 139)/(85 – 89) mmHg
  Lifestyle change +Medication

BP target of less than 130/80 Hg is recommended

- CHF – Thiazide, ACE-1, Aldosterone, BB

- Post Myocardial Infarction – BB, ACEi

- Diabetes Mellitus – proteinuria ACEi, ARB,NO
- Nonproteinuria Thiazide, CCB,ARB, ACEi

- CKD – ACEi, ABB, Thiazide
- Stroke – CCB +ACEi
- Pregnancy Aldomet ,labetalol, Ca channel bloocker

Targated BP

BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

Clinical Condition(s)	BP Threshold, mm Hg	BP Goal, mm Hg
General		
Clinical CVD or 10-year ASCVD risk ≥10%	≥130/80	<130/80
No clinical CVD and 10-year ASCVD risk <10%	≥140/90	<130/80
Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥130 (SBP)	<130 (SBP)
Specific comorbidities		
Diabetes mellitus	≥130/80	<130/80
Chronic kidney disease	≥130/80	<130/80
Chronic kidney disease after renal transplantation	≥130/80	<130/80
Heart failure	≥130/80	<130/80
Stable ischemic heart disease	≥130/80	<130/80
Secondary stroke prevention	≥140/90	<130/80
Secondary stroke prevention (lacunar)	≥130/80	<130/80
Peripheral arterial disease	≥130/80	<130/80

An SBP target range of 130–139 mmHg is recommended for people older than 80 years, if tolerate

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

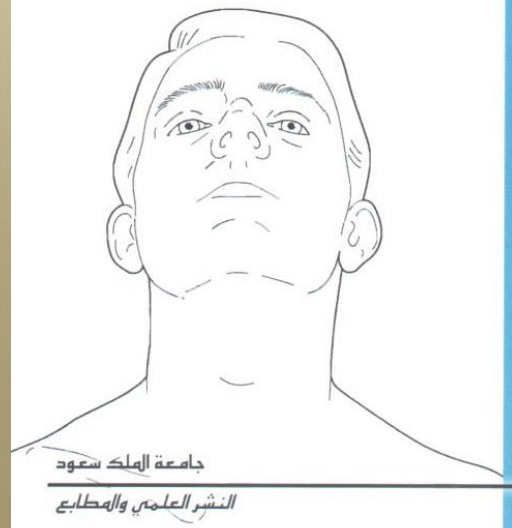
تأليف

نيكولاس ج. تالي سيمون أوكونر

كتاب الفحص الإكلينيكي الجيبي

ترجمة

أ.د. جمال بن صالح الوكيل



جامعة الملك سعود

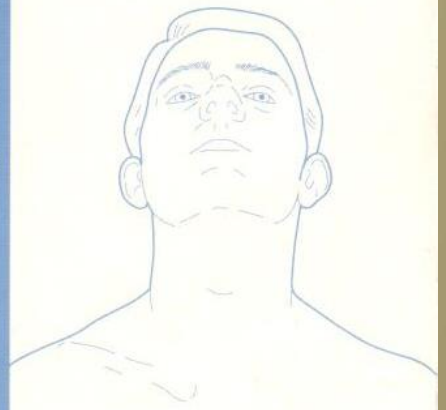
النشر العلمي والمطابع

NICHOLAS J TALLEY

SIMON O'CONNOR

POCKET CLINICAL EXAMINATION

SECOND EDITION



summary

- **The overall prevalence of hypertension in adults is around 30 - 45%**
- Lead cause coronary death or myocardial infarction,CHF or fatal or nonfatal stroke,CKD
- Threshold of treatment start 130/80 mm Hg
- nonpharmacological and antihypertensive drug are effective to reduce all complications in all ages

Thank you