Treating Hypertensive Heart Disease

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Disclosures

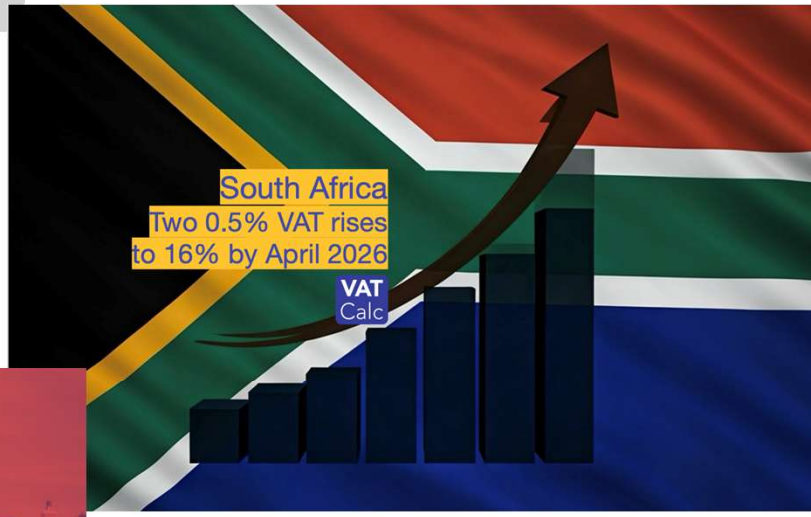
'I have received financial support from the following pharmaceutical companies: Servier

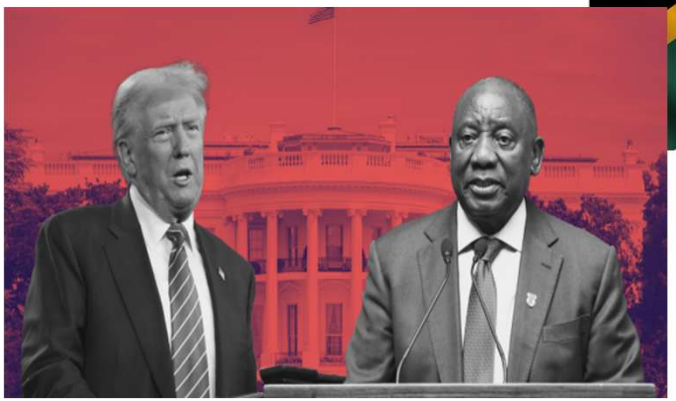
FRIENDLY CITY HEARTS

Healing Hearts, Changing Lives

Living in SA=

cause for HPT





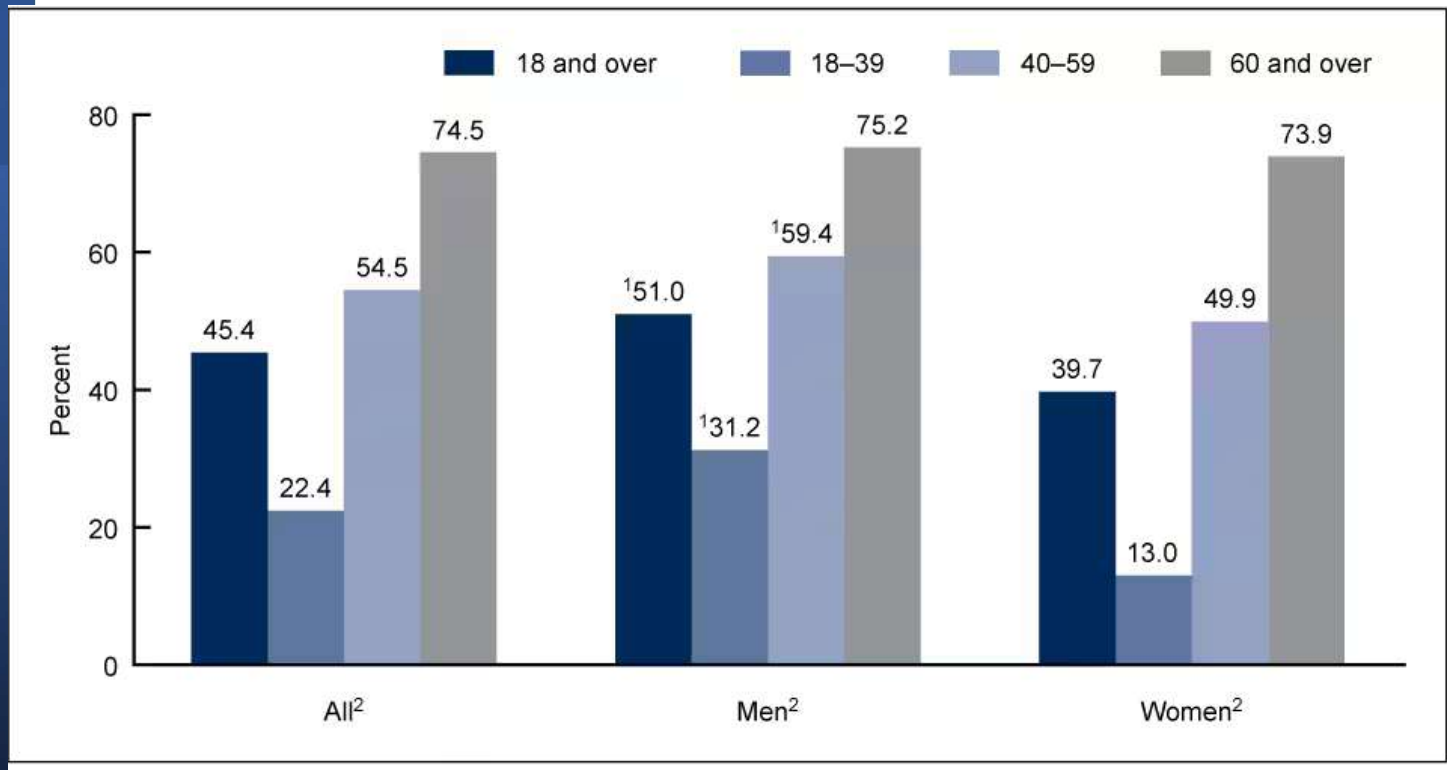
2024 ESC Guidelines for the management of elevated blood pressure and hypertension

30 Aug 2024

The current guidelines support healthcare professionals with the diagnosis and management of elevated blood pressure and hypertension. This 2024 guideline, developed by a multidisciplinary Task Force, updates the 2018 ESC/ESH guidelines on the management of arterial hypertension, using the most robust contemporary evidence. The new updated guideline provides a new simplified classification of blood pressure and outlines processes for the diagnosis, evaluation, and management of individuals with elevated blood pressure and hypertension.

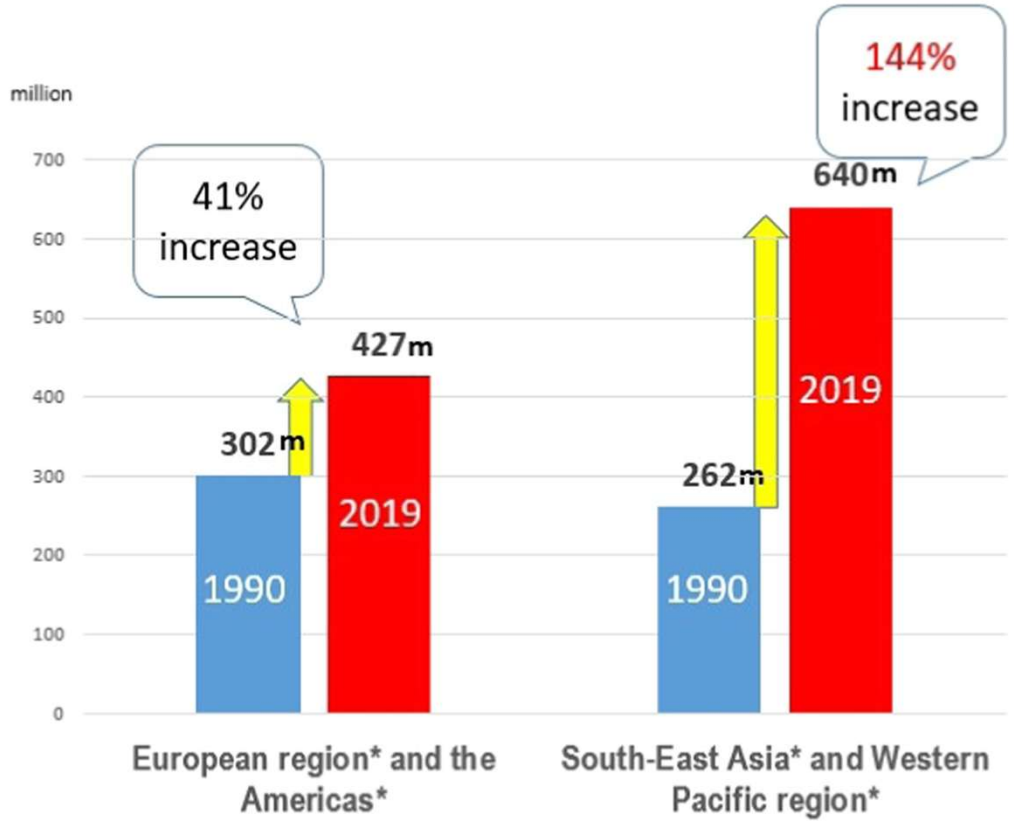
Seeing a problem in
a different way

Prevalence of Hypertension



National Health and Nutrition Examination Survey, 2017-2018

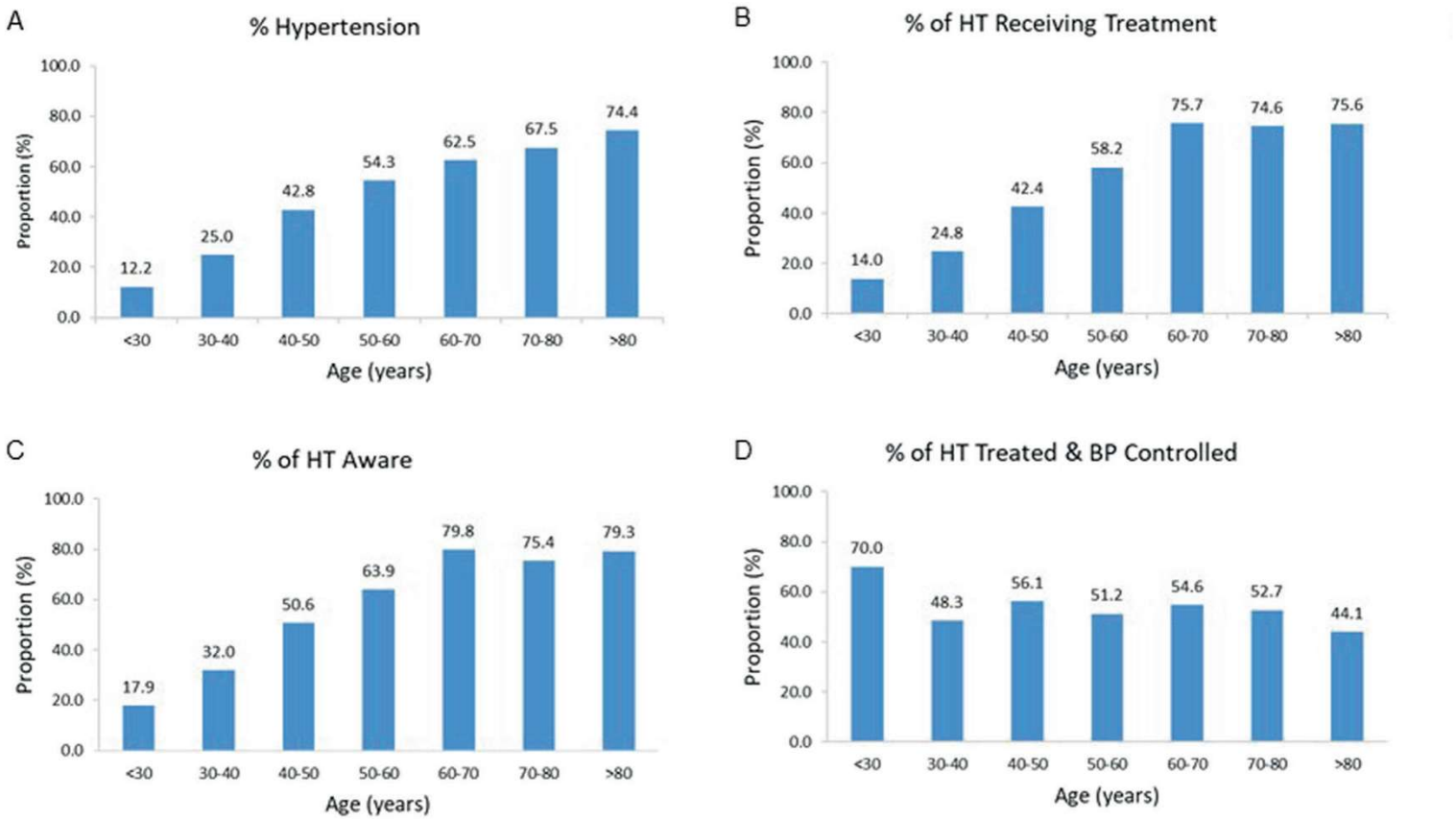
Thirty-year % increase in the number of adults with hypertension in the European region/Americas* and the South-East Asia/Western Pacific region*



*WHO region

Create using the data from: World Health Organization. Global report on hypertension: the race against a silent killer. Geneva, Switzerland: 2023.

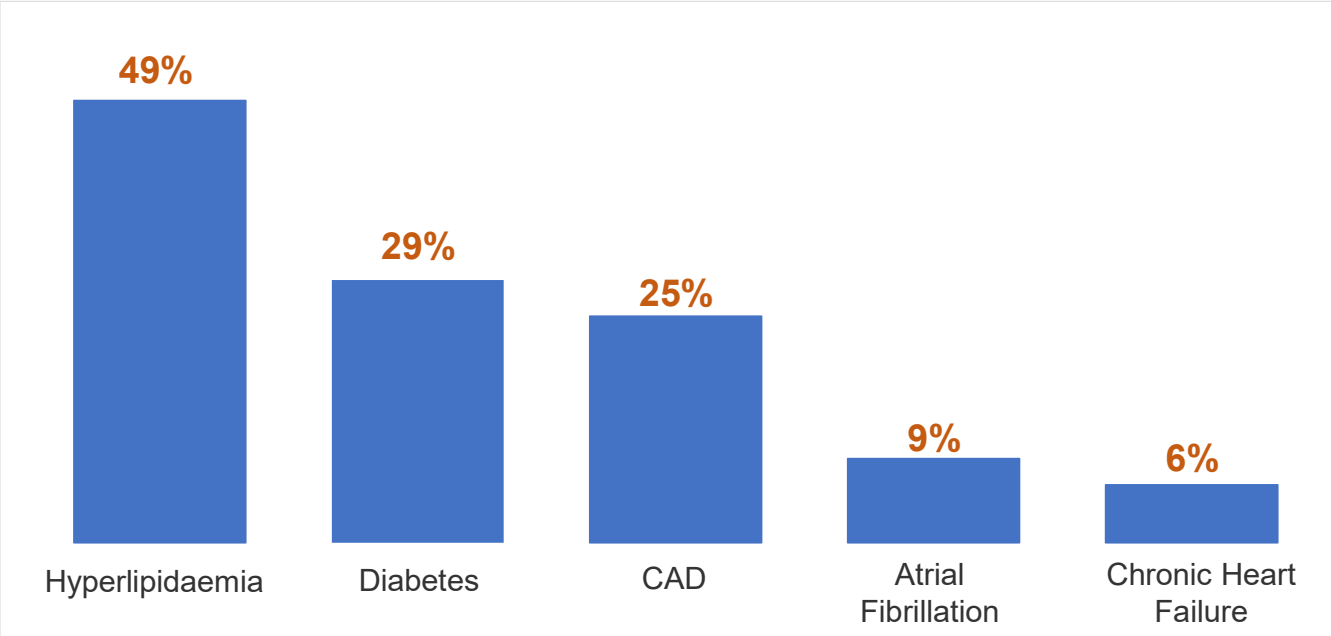
Hypertension in SA



Woodiwiss, A.J., Orchard, A., Mels, C.M.C. *et al.* High prevalence but lack of awareness of hypertension in South Africa, particularly among men and young adults. *J Hum Hypertens* **39**, 111–119 (2025). https://doi.org/10.1038/s41371-023-00873-3

Associated cardiovascular risk factors with Hypertension

Proportion of HT patients with comorbidities in i-SEARCH study, 17 092 patients from 26 countries[1]



Thoenes M et al. Cardiol Res Pract. 2012;2012:925046;

SA is a Salt Nation

Definitions of Hypertension (ESC vs ACC)

Blood Pressure Categories

American Heart Association | American Stroke 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

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

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

[a]Refers to conventional office BP rather than unattended office BP.

Hypertension Definition

Table 5 **Comparison of office, home, and ambulatory blood pressure measurement thresholds for elevated blood pressure and hypertension**

	Office BP (mmHg)[a]	Home BP (mmHg)	Daytime ABPM (mmHg)	24 h ABPM (mmHg)	Night-time ABPM (mmHg)
Reference					
Non-elevated BP	<120/70	<120/70	<120/70	<115/65	<110/60
Elevated BP	120/70–<140/90	120/70–<135/85	120/70–<135/85	115/65–<130/80	110/60–<120/70
Hypertension	≥140/90	≥135/85	≥135/85	≥130/80	≥120/70

AMBP and Home BP

Table 6 Comparison of ambulatory and home blood pressure monitoring

Ambulatory monitoring

Advantages

- Can identify white-coat and masked hypertension
- Measurement in real-life settings and during usual activities
- Stronger prognostic evidence
- Night-time readings
- Abundant information from a single investigation, including short-term diurnal BP variability
- Additional BP phenotyping (e.g. nocturnal dipping status)

Disadvantages

- Relatively expensive and sometimes limited availability
- Can be uncomfortable and affect sleep

Home monitoring

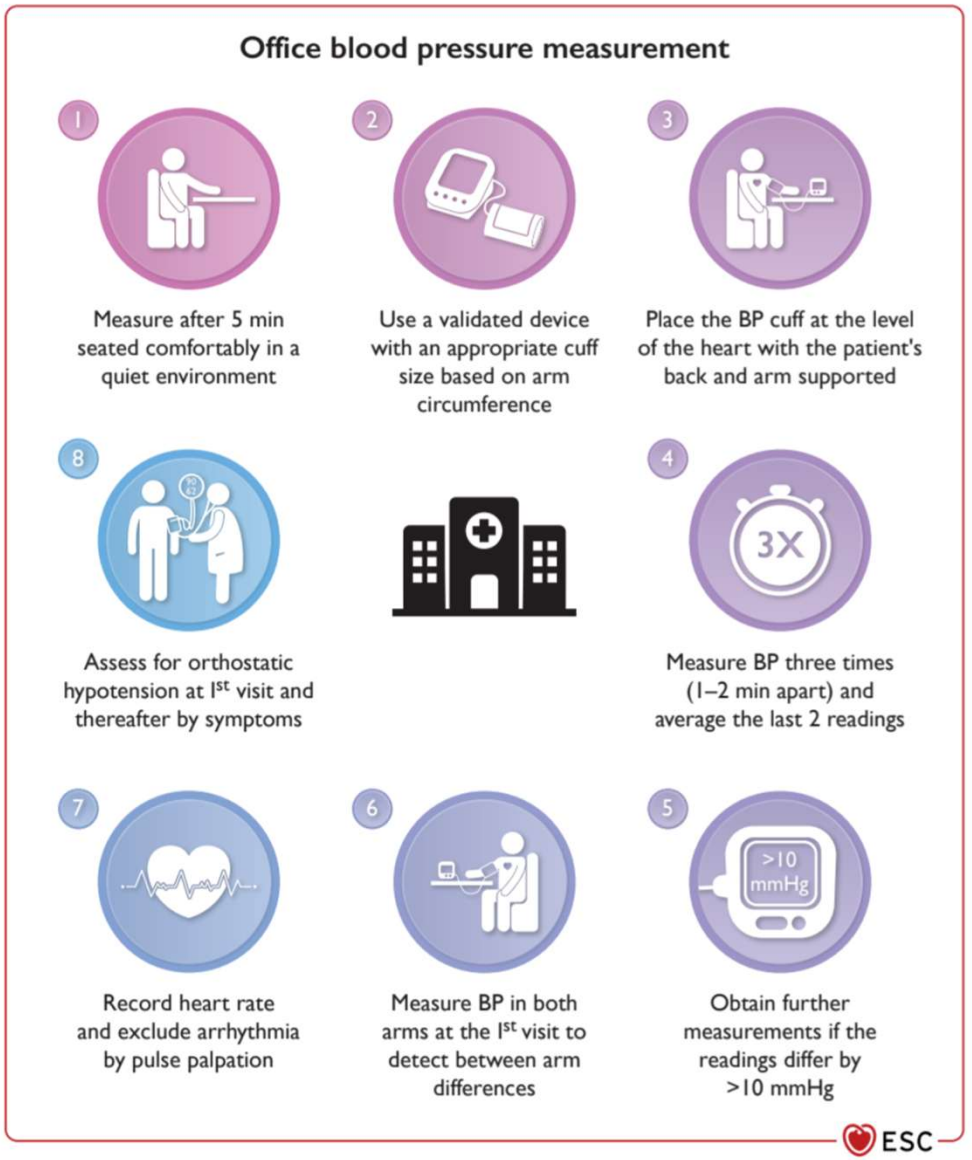
Advantages

- Identify white-coat and masked hypertension
- Cheap and widely available
- Measurement at home, which may be more relaxed than at doctor's office
- Patient engagement in BP measurement and telemedicine potential
- Easily repeated and used over longer periods to assess day-to-day BP variability

Disadvantages

- Only static BP at rest is typically available
- Potential for measurement error due to improper measurement technique or unvalidated or poorly calibrated device
- Nocturnal readings not usually possible

How to take BP



Risk Modifiers

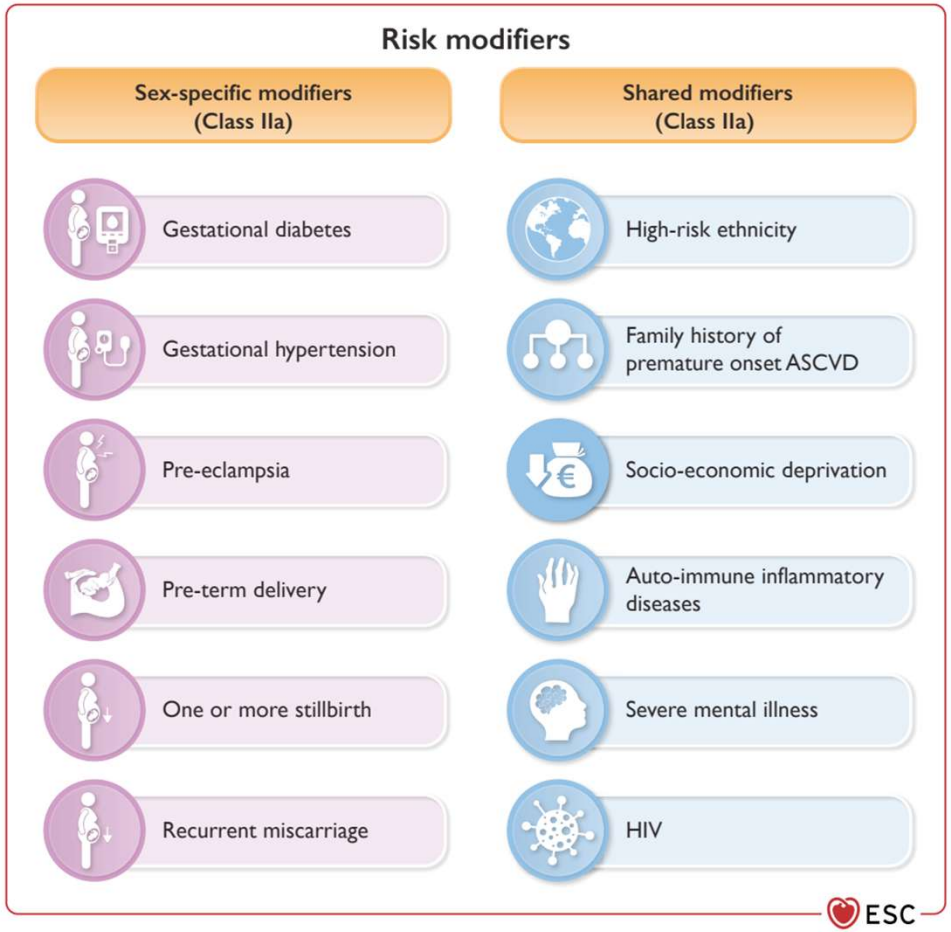
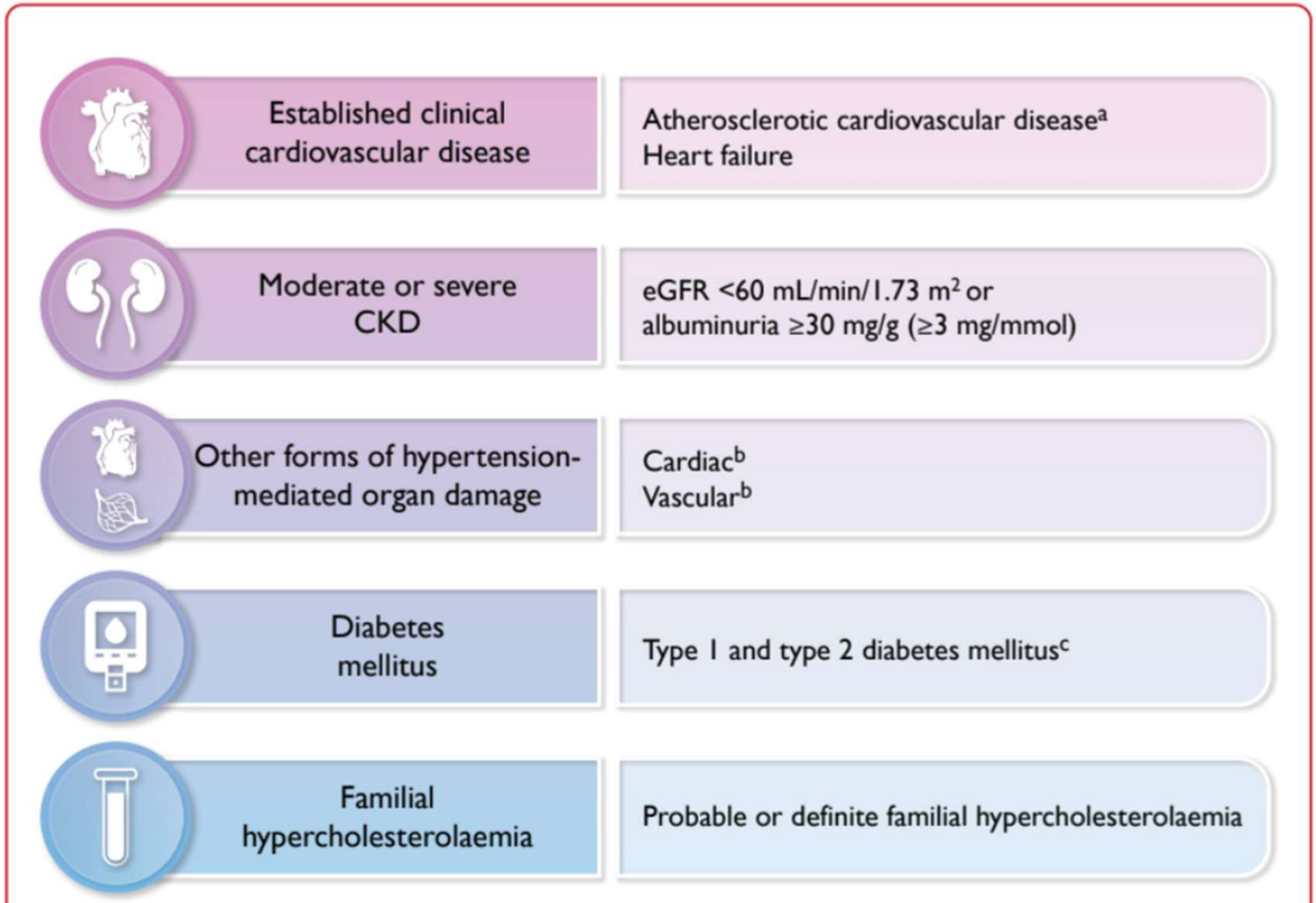
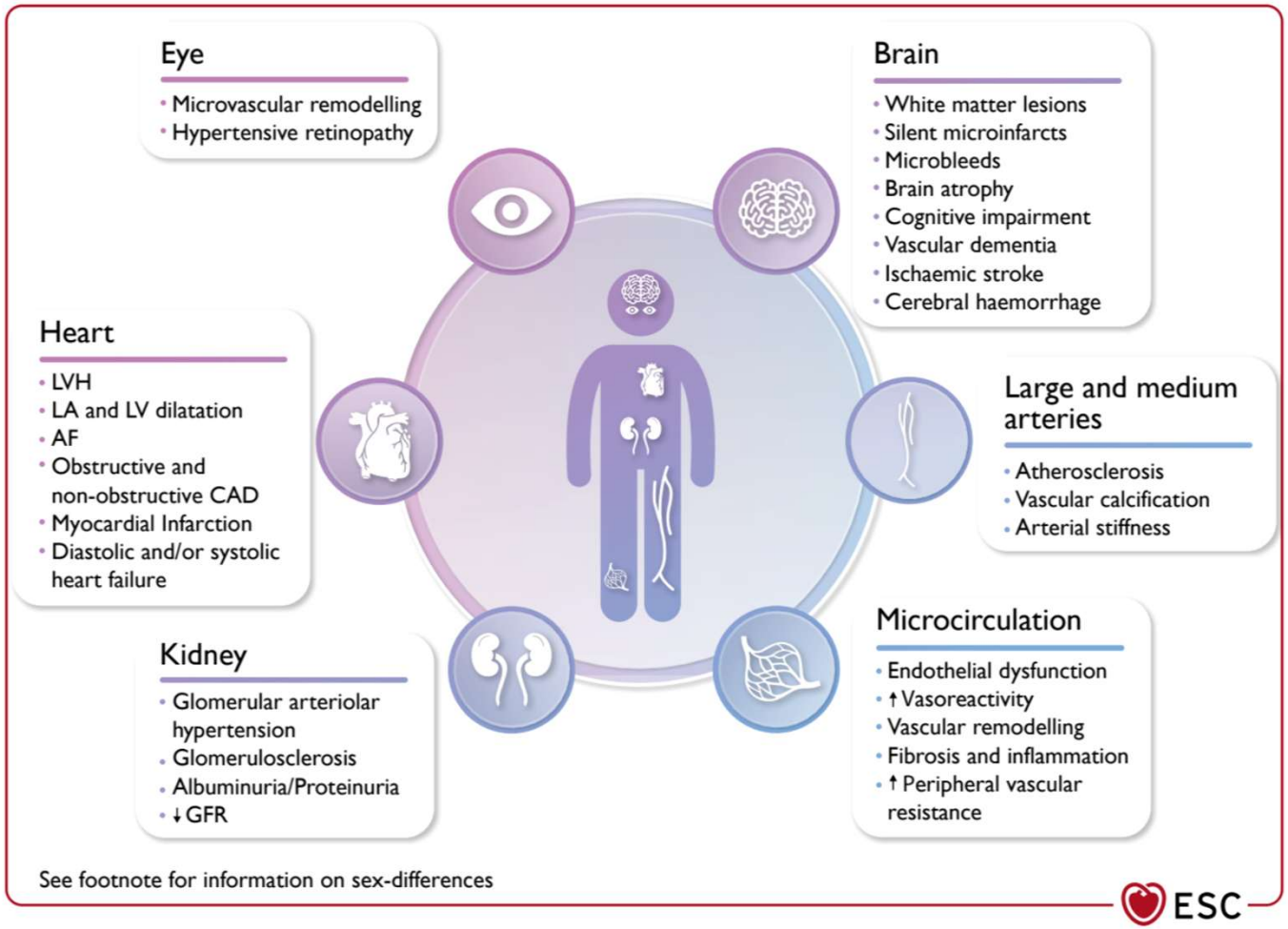


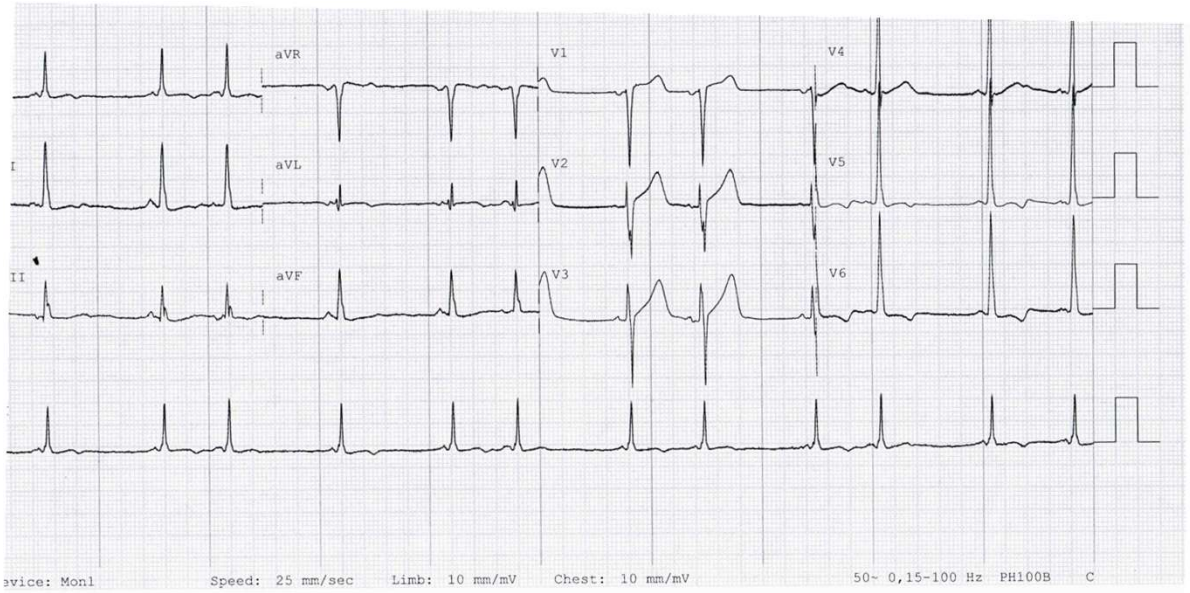
Figure 8 Cardiovascular disease risk modifiers to consider for up-classification of risk. ASCVD, atherosclerotic cardiovascular disease; HIV, human immunodeficiency virus.


Established clinical cardiovascular disease
Atherosclerotic cardiovascular disease[a]
Heart failure
Moderate or severe CKD
eGFR <60 mL/min/1.73 m² or albuminuria ≥30 mg/g (≥3 mg/mmol)
Other forms of hypertension-mediated organ damage
Cardiac[b]
Vascular[b]
Diabetes mellitus
Type 1 and type 2 diabetes mellitus[c]
Familial hypercholesterolaemia
Probable or definite familial hypercholesterolaemia
ESC

Hypertension mediated organ disease



Clinical Case (Mr. K)



61-year-old-gentlemen, known with a background medical history of:

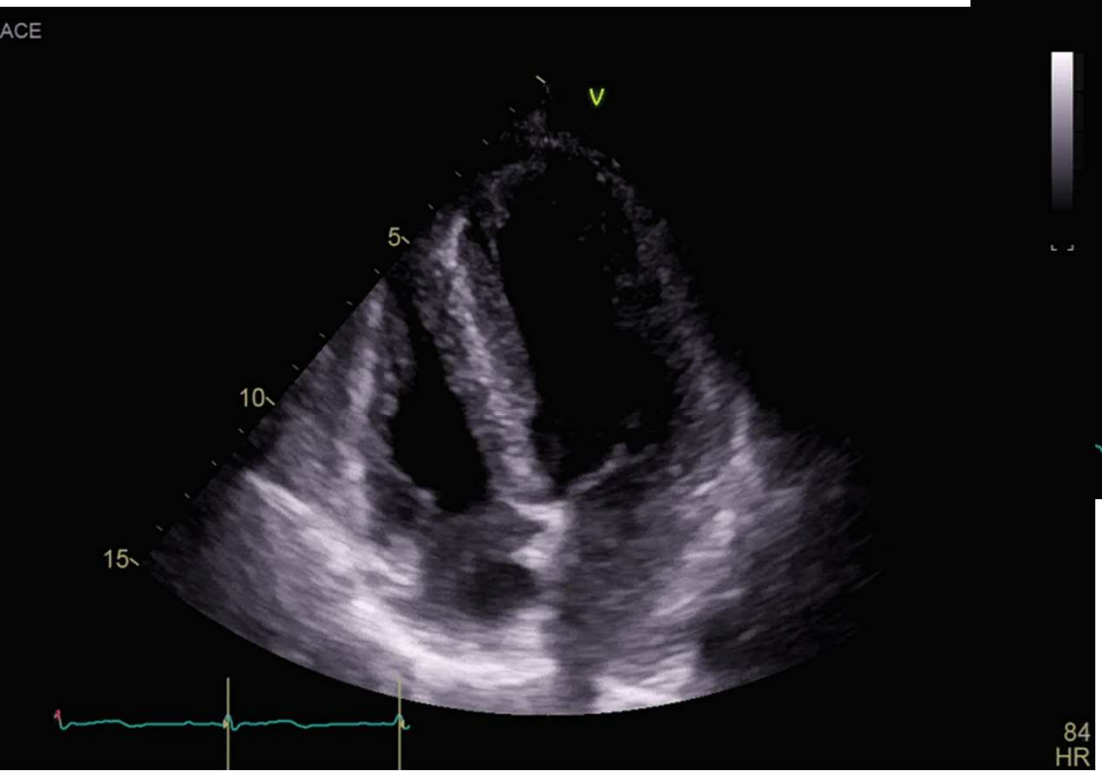
- Resistant hypertension
- Chronic kidney disease stage 4, diabetic nephropathy with anaemia of chronic disease
- Type 2 Diabetes

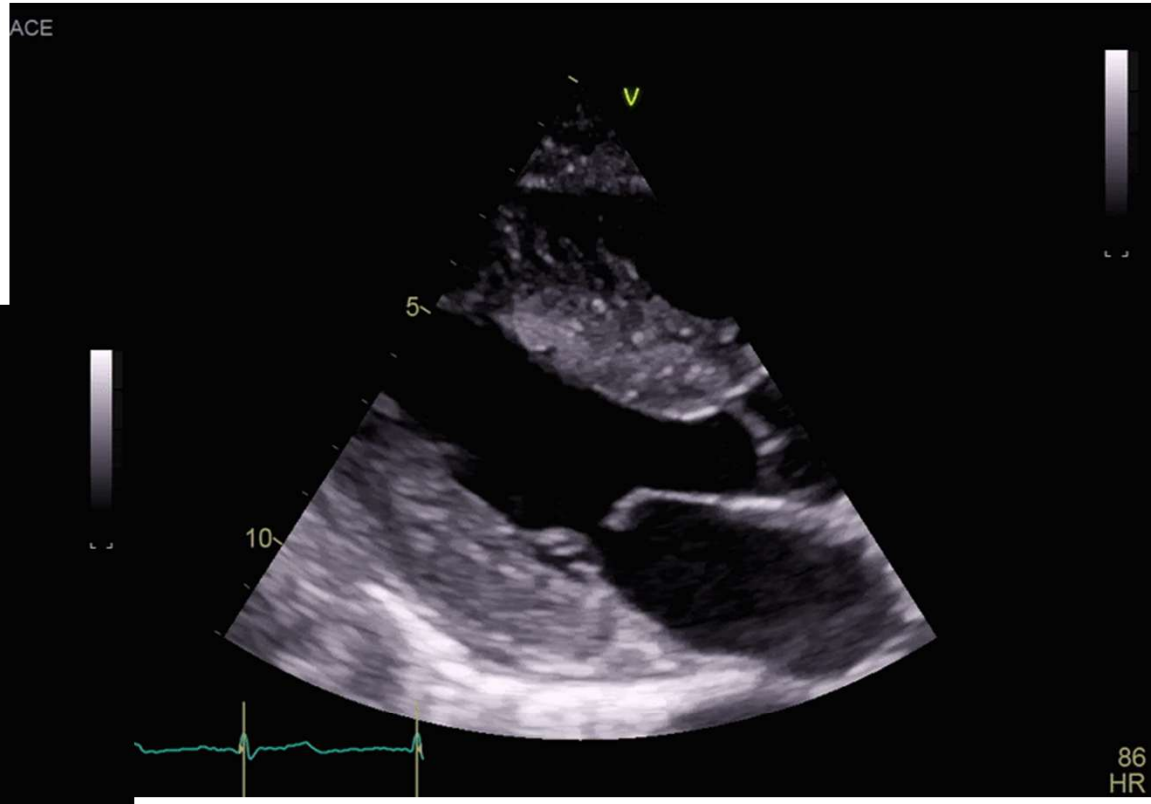
- BP 220/120

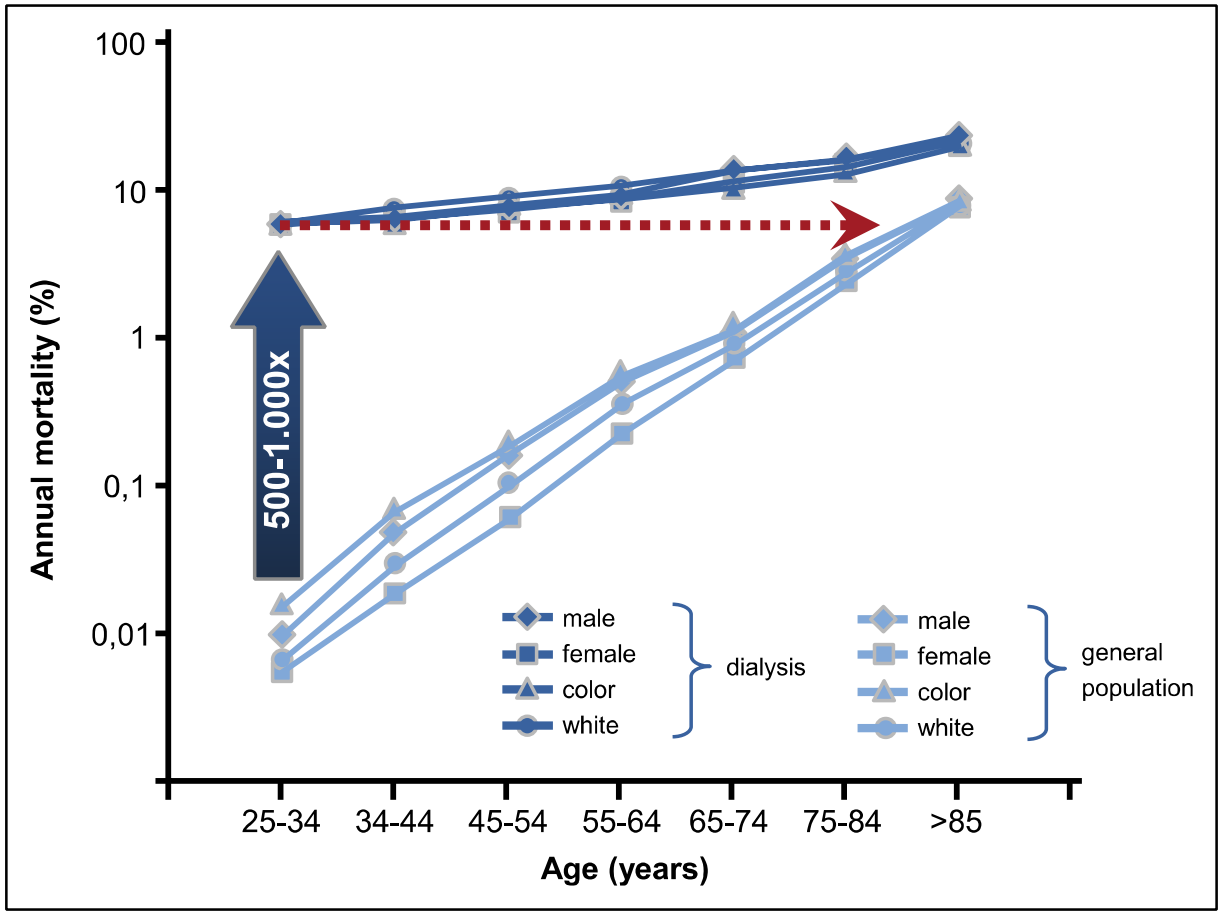
HYPERTENSION

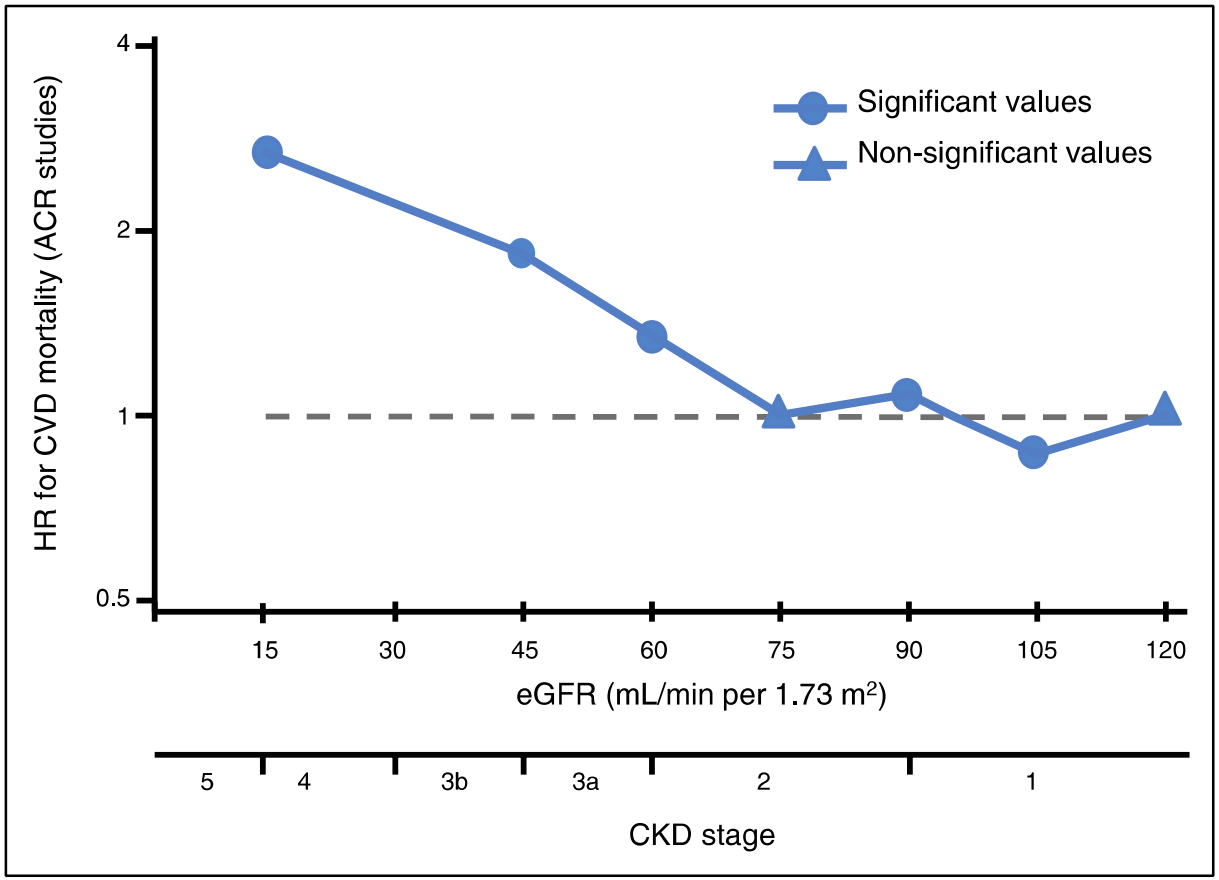
Blood Results

-------- BIOCHEMISTRY --------				
Tests	**Result**	**Flag**	**Range**	**Unit**
LIPAEMIC	ABSENT			
ICTERUS	ABSENT			
HAEMOLYSIS	ABSENT			
S-SODIUM	141		136-145	mmol/L
S-POTASSIUM	4.1		3.5-5.1	mmol/L
S-CHLORIDE	112	H	98-108	mmol/L
S-BICARBONATE	20.2	L	22.0-28.0	mmol/L
ANION GAP	9	#	3-15	mmol/L
S-UREA	12.4	H	2.9-8.2	mmol/L
S-CREATININE (Enzymatic)	159	*H	64-104	umol/L
HIGH SENS TROPONIN-I(ABBOTT)	504	*H	0 - 26	ng/L


ACE
V
5
10
15
84
HR


ACE
V
5
10
86
HR


100
10
1
0,1
0,01
Annual mortality (%)
500-1.000x
male
female
color
white
dialysis
male
female
color
white
general
population
25-34
34-44
45-54
55-64
65-74
75-84
>85
Age (years)



Circulation. 2021;143:1157–1172. DOI: 10.1161/CIRCULATIONAHA.120.050686

Hypertension in Chronic Renal Disease

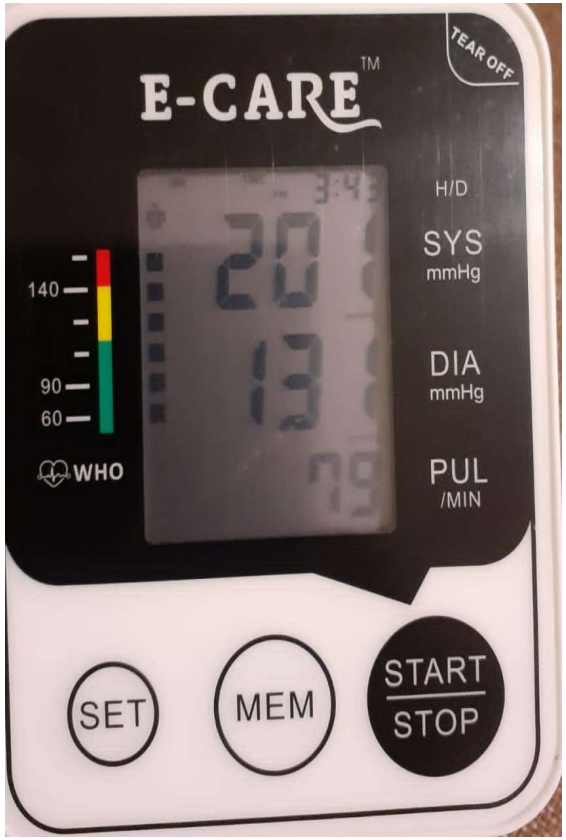
- 80% of patients with CKD has hypertension (resistant hypertension)
- Target BP <120 mmhg

- Ace inhibitors confer kidney protection
- ACE and ARB reduce CVD
- KDIGO 2021 recommends SBP <120 mmhg (Class 2b SPRINT) (HR 0.81 CVD and 0.72 all cause death)
- Finrenone
- Dapagliflozin

Hypertension (Case 2)

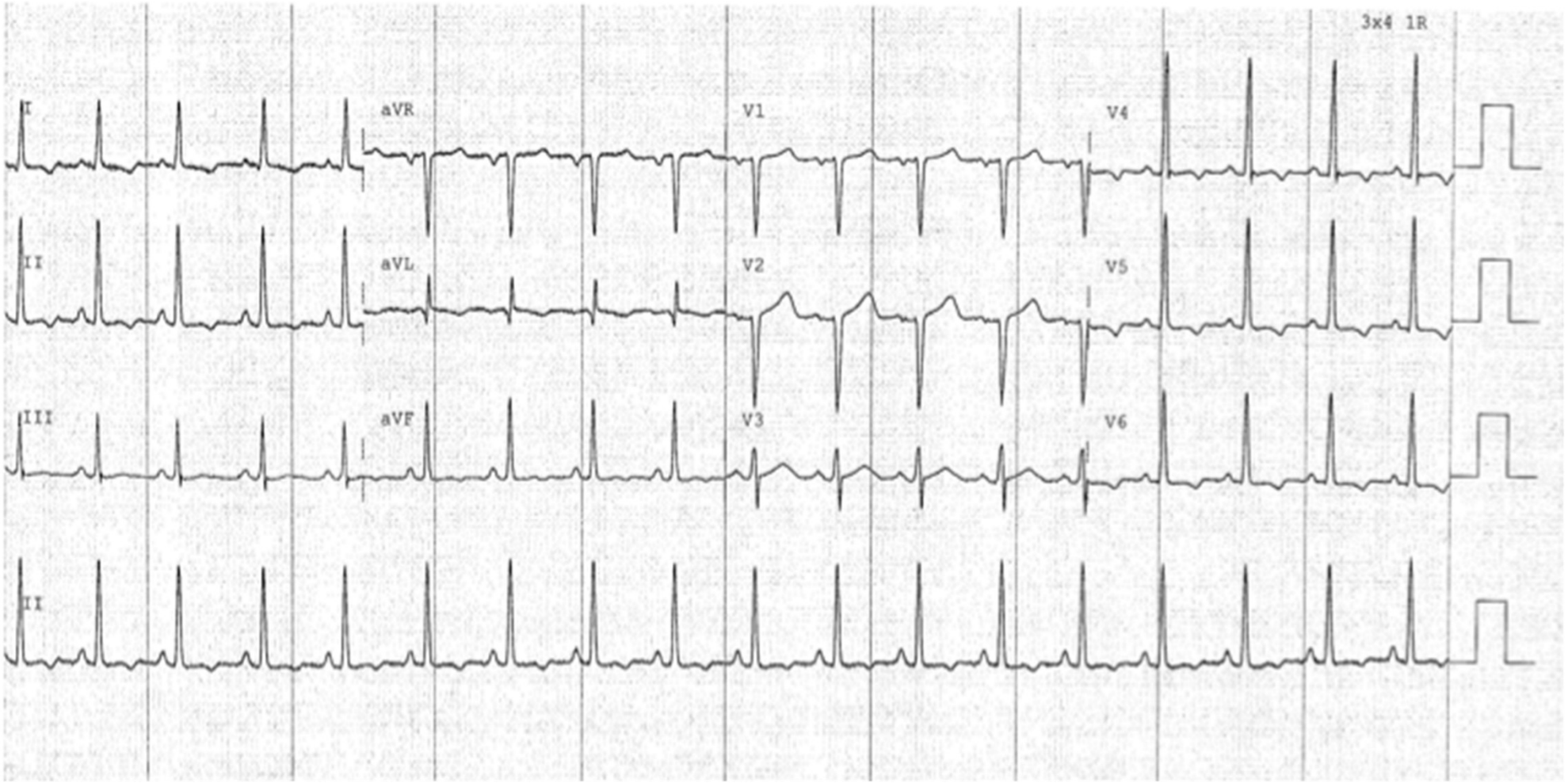
- 75-year-old male
- Resistant Hypertension
- Presented with elevated BP and chest pain with CCF symptoms
- Troponin 200 ng/L
- BNP 2000 pg/ml
- CXR: pulmonary oedema

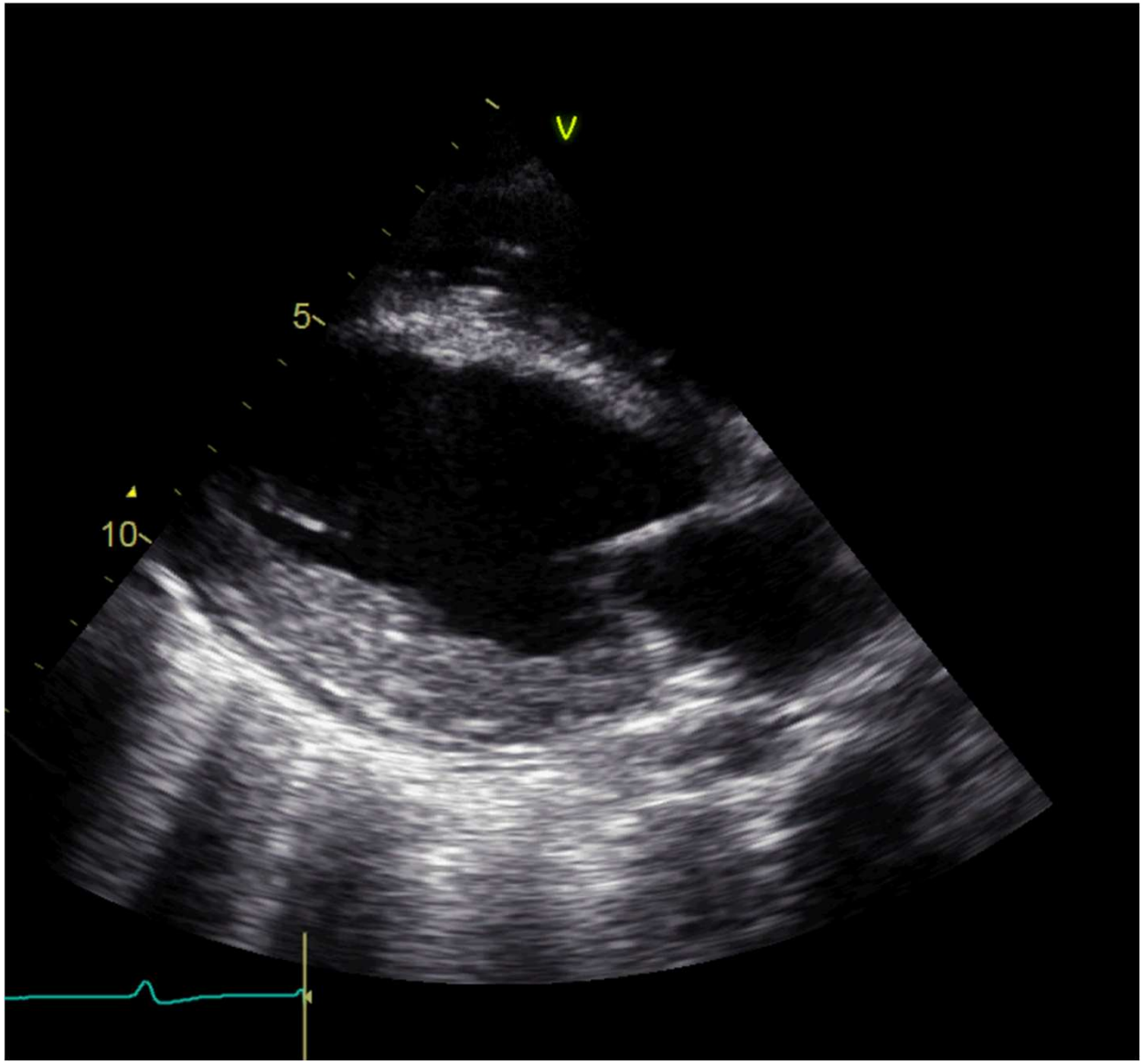
Day 1



Day 2

Day 3


3x4 1R
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II

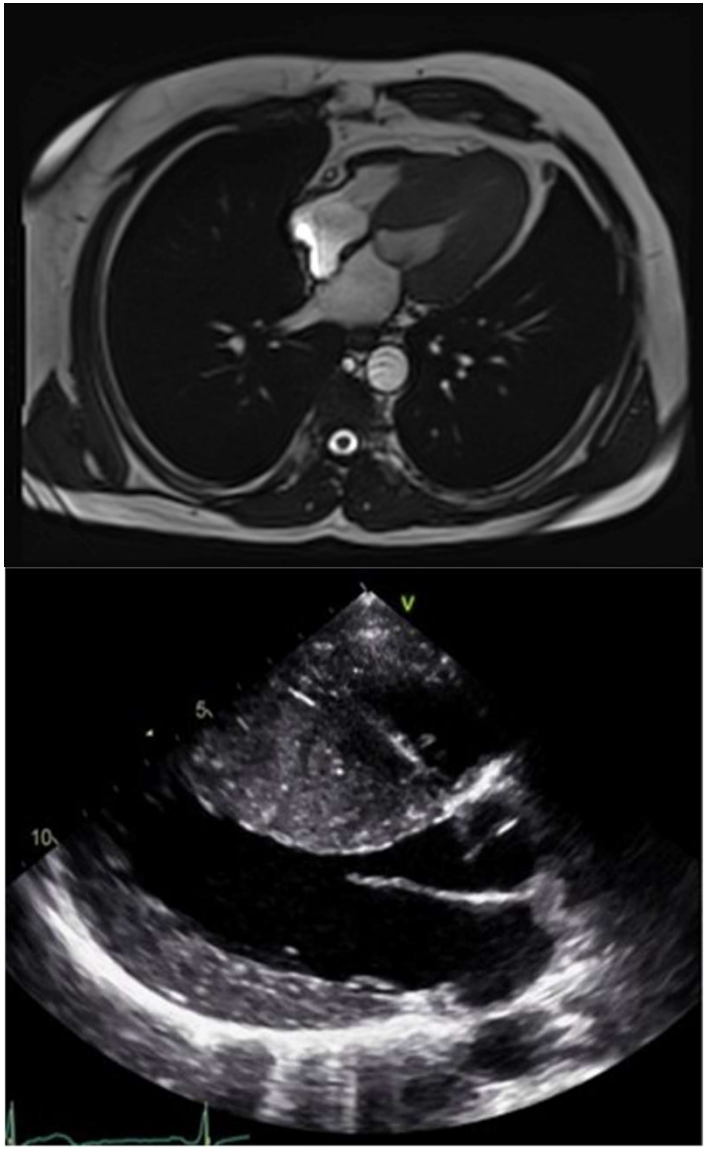

V
5
10

Hypertensive Heart Disease

High afterload on the left ventricle

Series of changes in the left ventricle, left atrium and coronary circulation

High cardiovascular risk/morbidity and mortality



Left Ventricular Hypertrophy

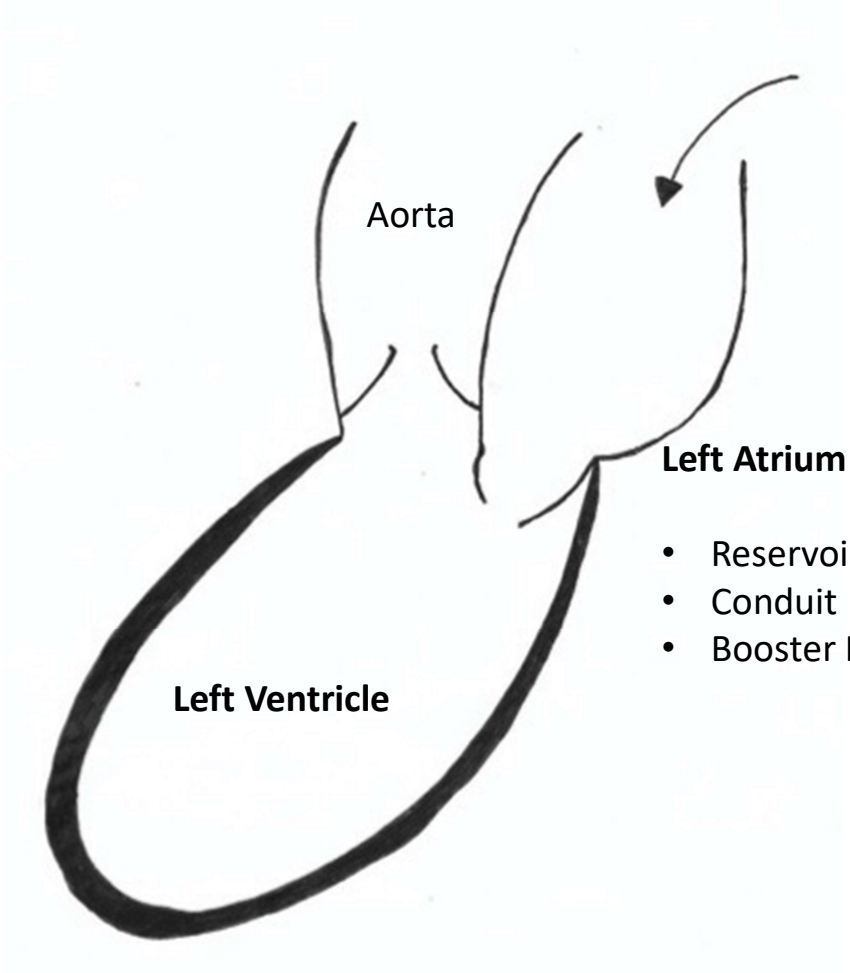
Abnormal loading conditions (high afterload)

- Hypertension
- Coarctation of the aorta
- Severe aortic stenosis

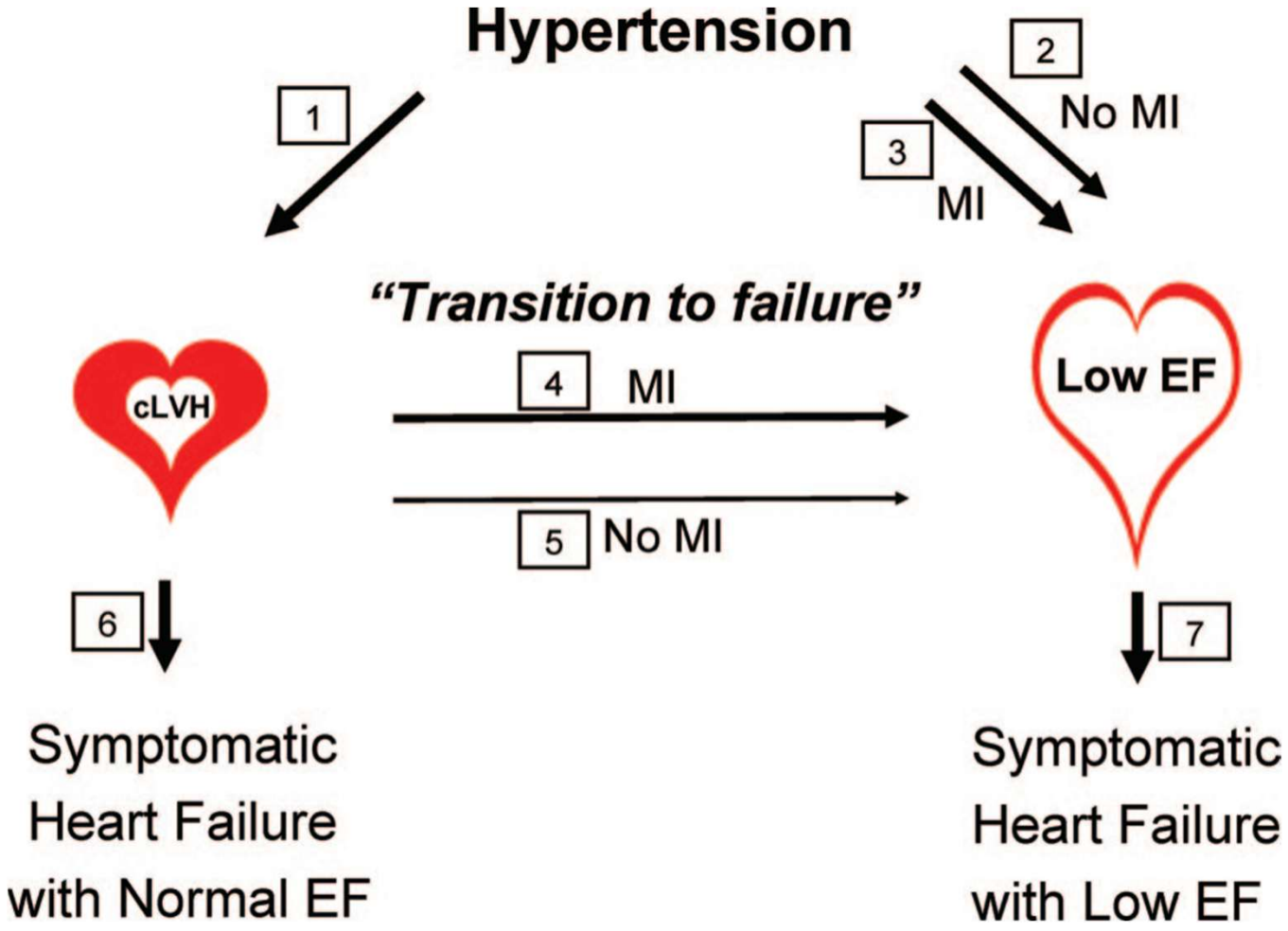
Myopathy

- Hypertrophic cardiomyopathy (sarcomeric positive vs sarcomeric negative)

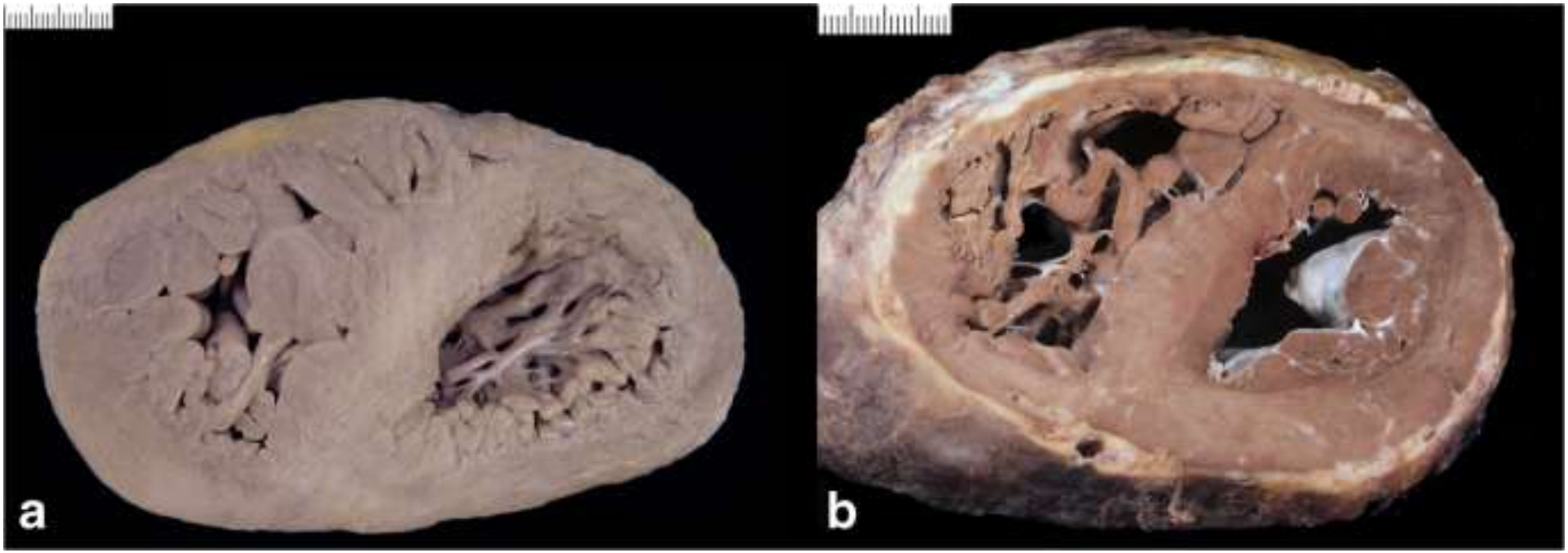
Diastolic Dysfunction

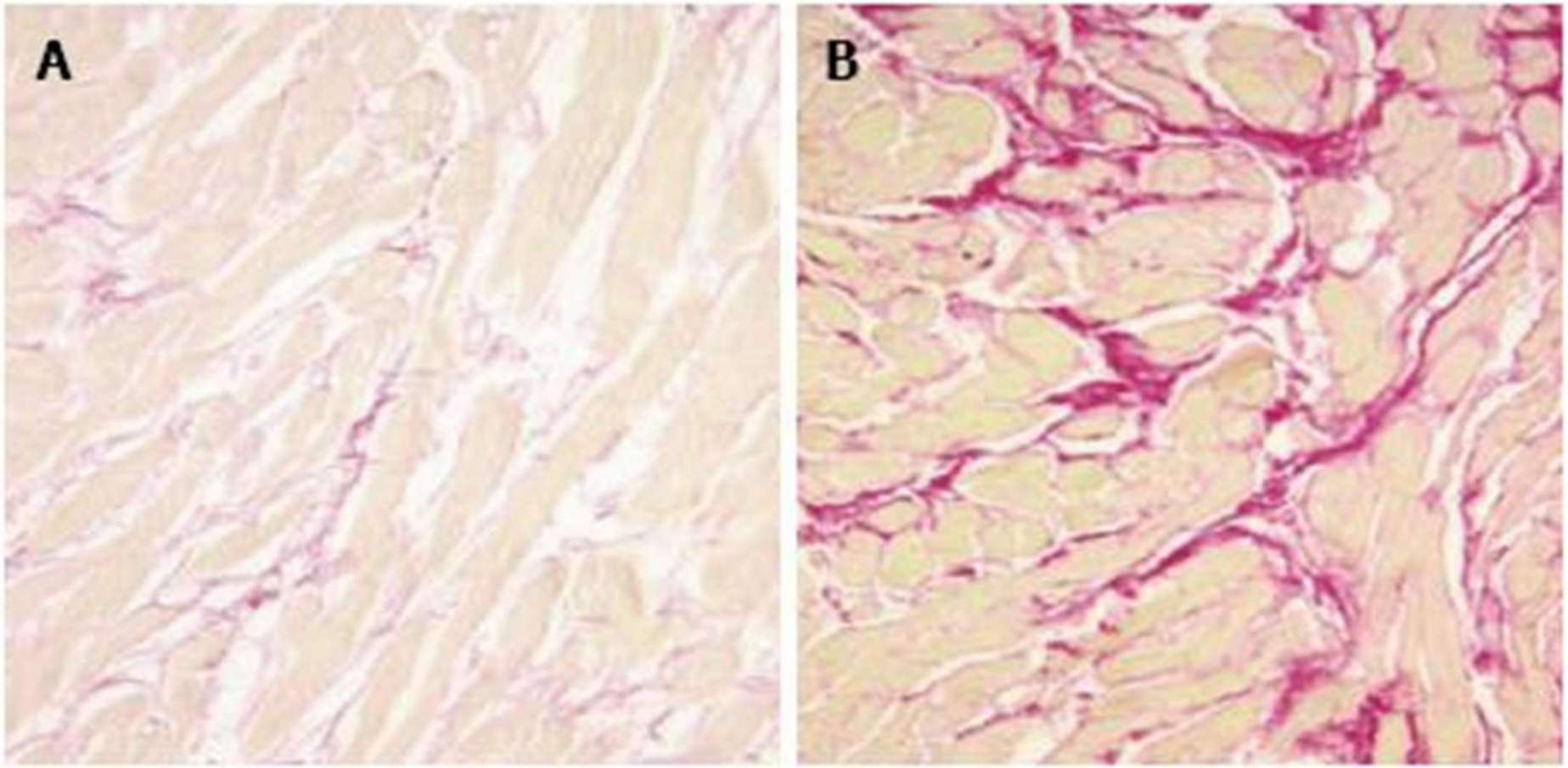


- Reservoir
- Conduit
- Booster Pump


Hypertension
1
2
No MI
3
MI
"Transition to failure"
4
MI
5
No MI
cLVH
Low EF
6
7
Symptomatic
Heart Failure
with Normal EF
Symptomatic
Heart Failure
with Low EF

Hypertensive Heart Disease




A
B

- **Chest Pain in Hypertensive Heart Disease**
- Capillary rarefraction
- Oxygen diffusion distance increases
- Supply demand mismatch

My Approach adapted from the ESC 2024

Step 1: Add an Ace-inhibitor or ARB (both has its pro's and cons) or CCB or thiazide like diuretic

Step 2: Combination therapy which consist of 2 agents (perindopril plus indapamide)

Step 3: Triple combination therapy (perindopril+indapamide+amlodipine)

If not at target (130/80 mmhg) add the following & refer to cardiology

Step 4: Add Spironolactone 25 mg po daily (PATHWAY Trial)

Step 5: Beta blocker plus an alpha blocker if not controlled

Step 6: Centrally acting agent such as minoxidil

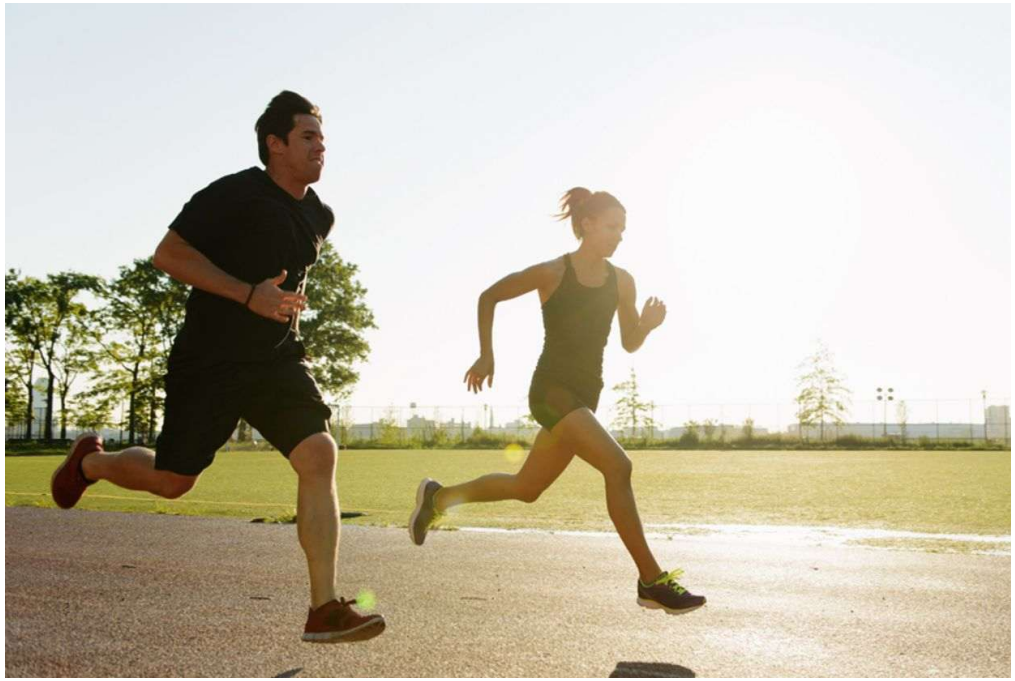
1st Line Blood Pressure Agents

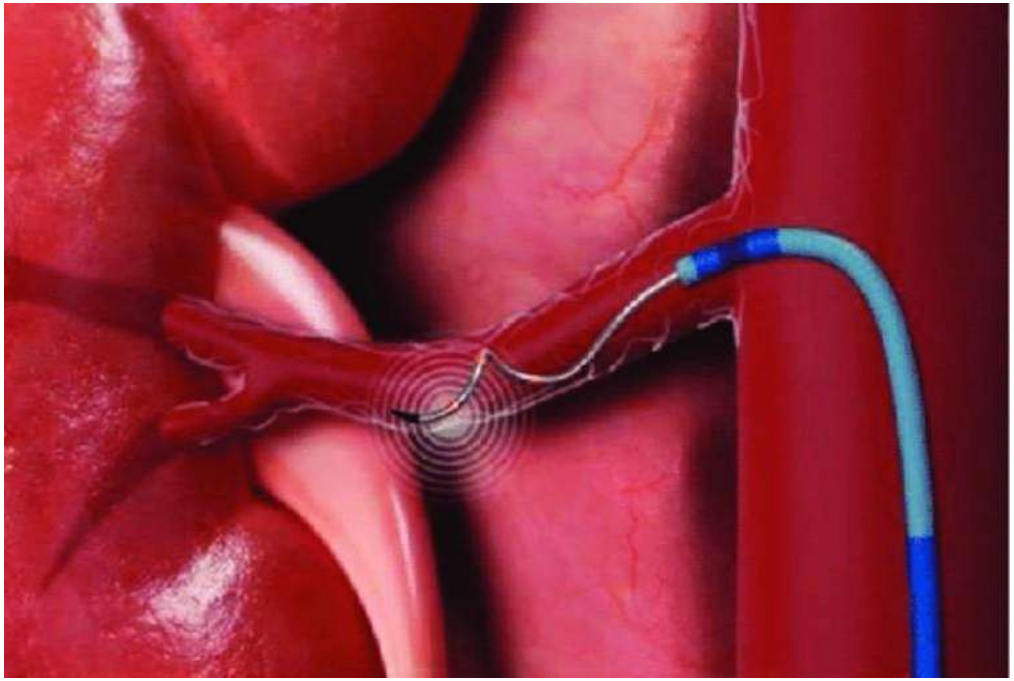
- Ace-inhibitors
- Diuretics(indapamide)
- CCB
- Aldosterone-antagonist(MRA)

- Alpha Blockers
- Beta blockers

Management of Hypertension

Non-pharmacological vs pharmacological vs surgical treatment modalities





Treating Hypertension

ECG

BLOODS: TSH, CHROMOGRANIN A, PRO-BNP

PHAEOCHROMOCYTOMA: PLASMA/URINE METANEPHRINES

CUSHINGS DISEASE: SERUM CORTISOL (8AM) WITH A 24 URINARY CORTISOL (USUALLY CLINICAL PICTURE IS CLEAR)

ECHOCARDIOGRAM IF YOU SUSPECT AORTIC COARCTATION

My Approach

- **Non-pharmacological treatment**
  - Mediterranean style diet
  - Low salt (ACC/ESC recommends less than 2grams of sodium (<5g salt)
  - Weight loss (GLP1 analogues)
  - Reduce caffeine consumption
  - Stress reduction techniques
  - Manage co-morbidities
  - Exercise

Exercise and Hypertension

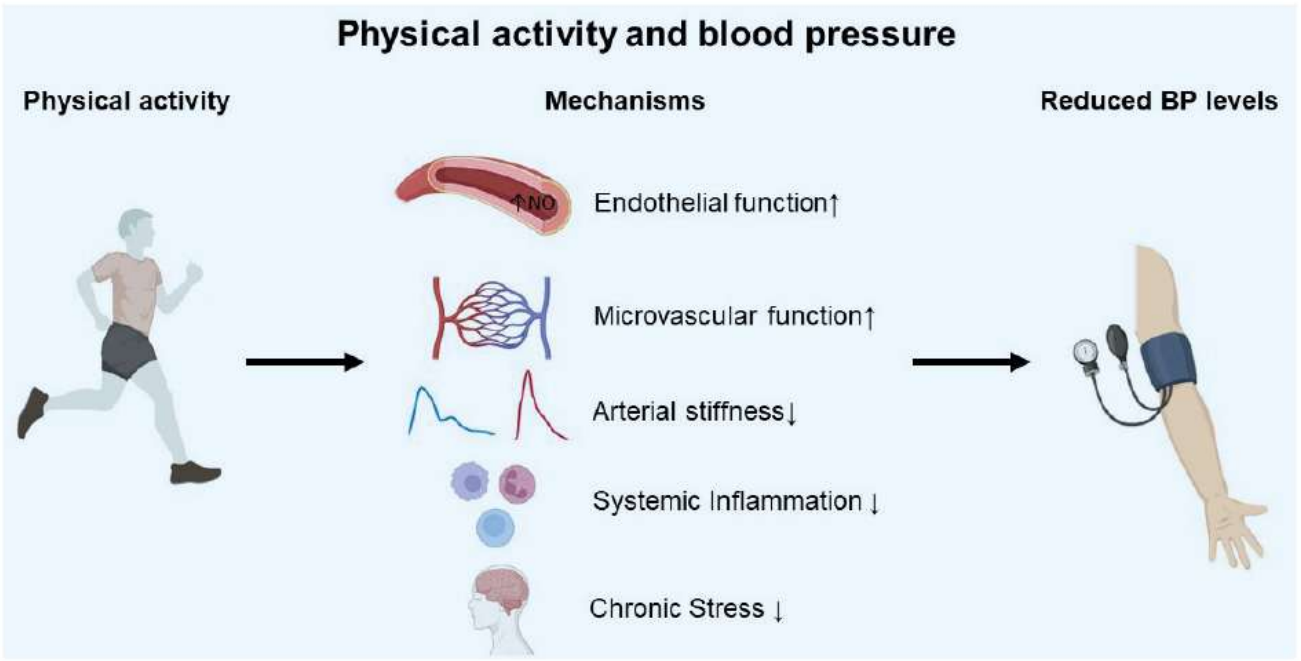


Figure 3

Mechanisms of physical activity on blood pressure levels (created with biorender).

Hypertension

- 85-year-old lady, known with a background medical history of:

- Hypertension
- Rheumatoid arthritis
- Osteoporosis
- Chronic renal failure, eGFR of 34 ml/min
- Frailty, walks with a walker
- Mild aortic stenosis

What to consider when treating elderly patients

- Frailty
- Life expectancy
- Pharmacokinetics (absorption, distribution, elimination)
- Pharmacodynamics (drug drug interactions)
- Orthostatic intolerance
- Co-morbidities
- Risk of falls

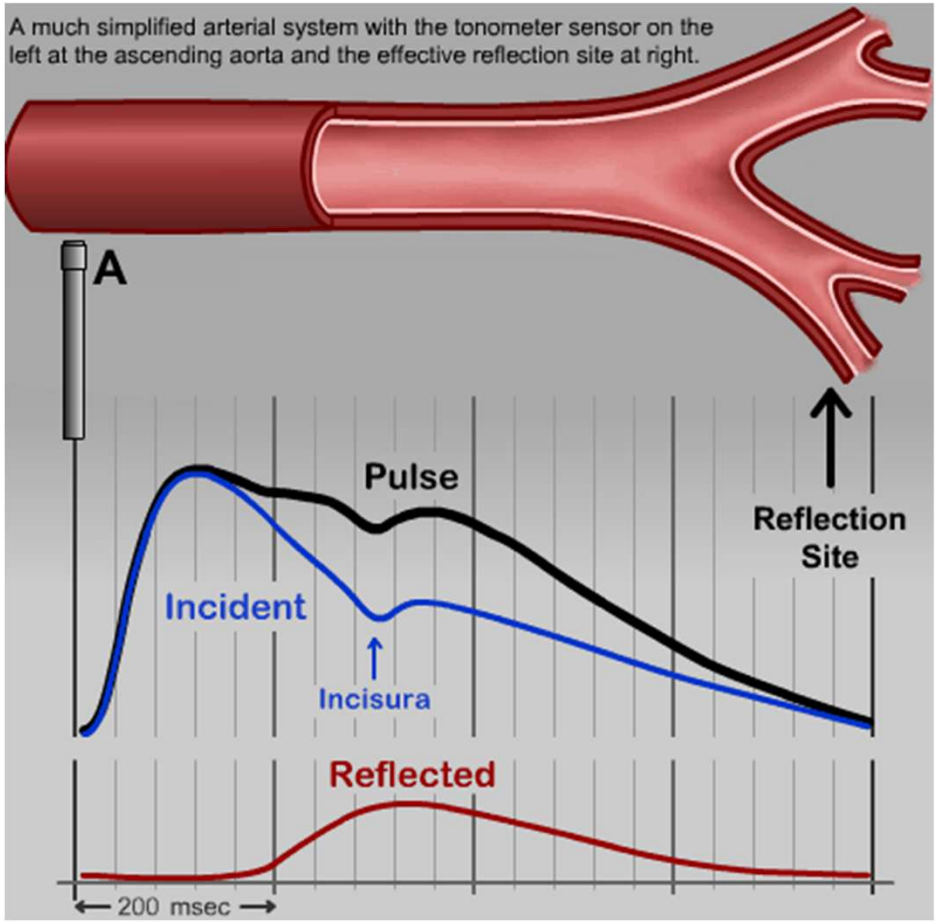
Very Old patients (>85 years of age)

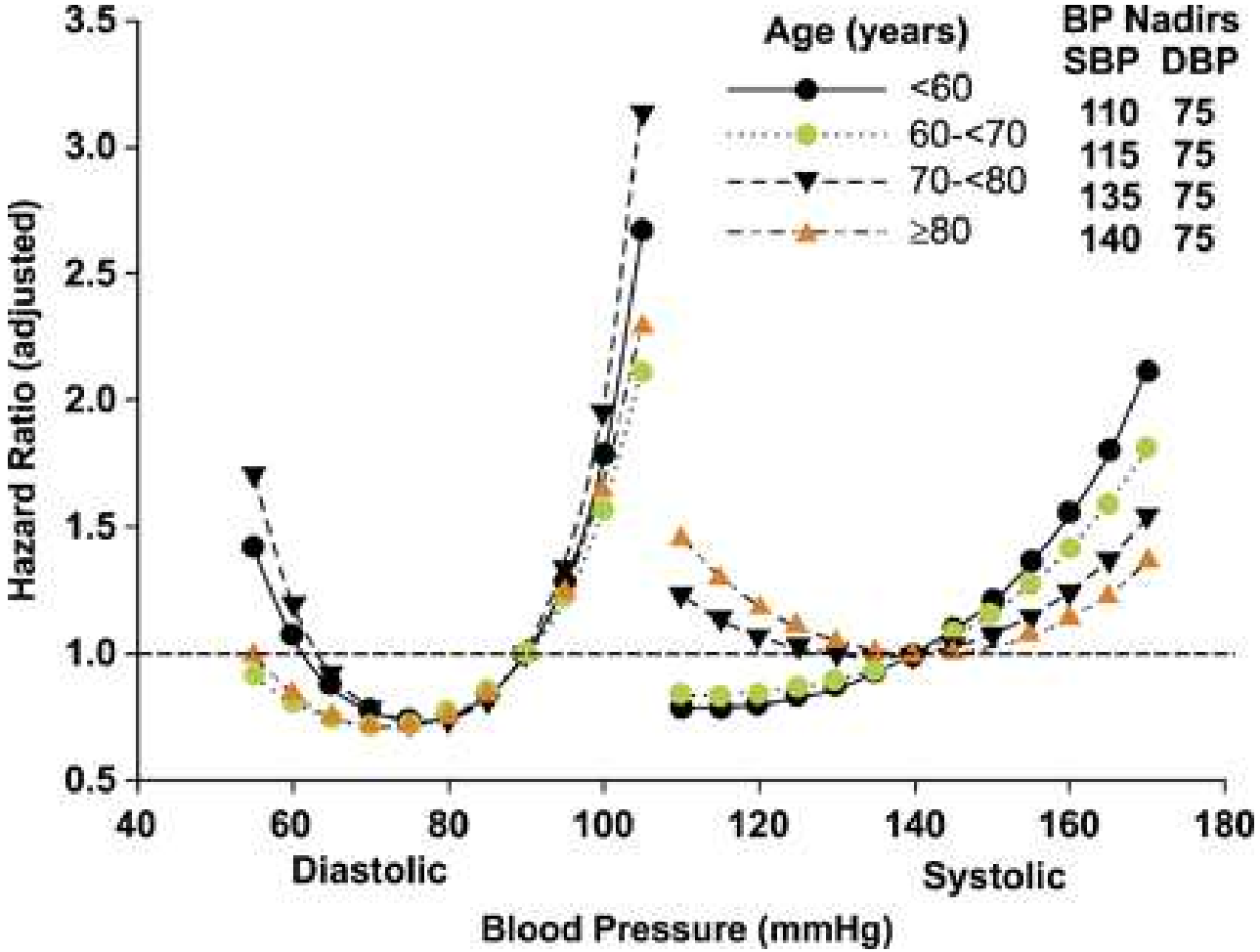
- Frailty (chronological age vs biological age)
- Pulse pressure difference
- J curve
- Lack of randomized control trials
- Observational studies suggest harm in lower blood pressure to normal targets

- Target (<150 mmhg)
- Avoid beta blockers/ alpha blockers/ TCA

Isolated Systolic BP

- Increases with age
- Cardiovascular events is driven by systolic blood pressure





Hypertension therapy in the older adults-do we know the answers to all the questions? The status after publication of the ACCF/AHA 2011 expert consensus document on hypertension in the elderly

Orthostatic hypotension with Supine Hypertension

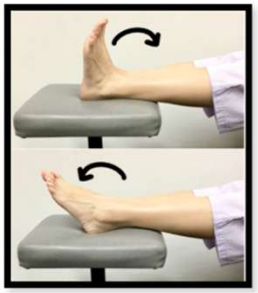
- Defined as having a drop in BP >20/10 mmhg
- Medication induced vs pathological (neurogenic vs non-neurogenic)
- Neurogenic (neurodegenerative disease, B12 deficiency, renal failure, dehydration, prolonged bed rest)
- Alpha blockers, diuretics, nitrates, anti-depressants, antipsychotics

Orthostatic hypotension

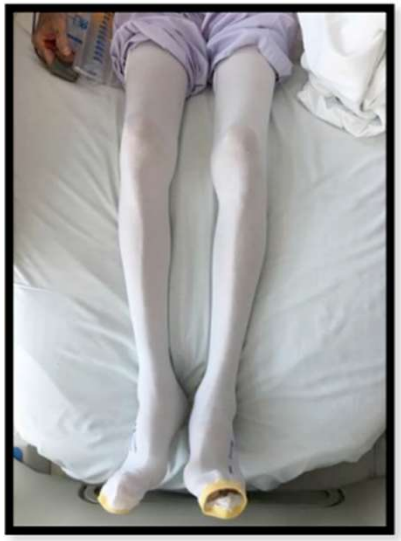
a. Cross your legs

In the sitting or standing position, cross your legs.

b. Ankle pumps



Before sitting or standing up, perform ankle pumps by bending your ankles forwards and backwards or upwards and downwards.



Compression Stockings

Abdominal Binder

Orthostatic Hypotension

c. March on the spot

In a standing position, hold onto a stable object and march on the spot.

d. Calf raises

In a standing position, hold onto a stable object, raise your heels off the floor and lower them back down.

e. Prop up your legs

When sitting out, keep your legs raised on a stool.

Secondary Hypertension

Table 4. Most Common Causes of Secondary Hypertension by Age*

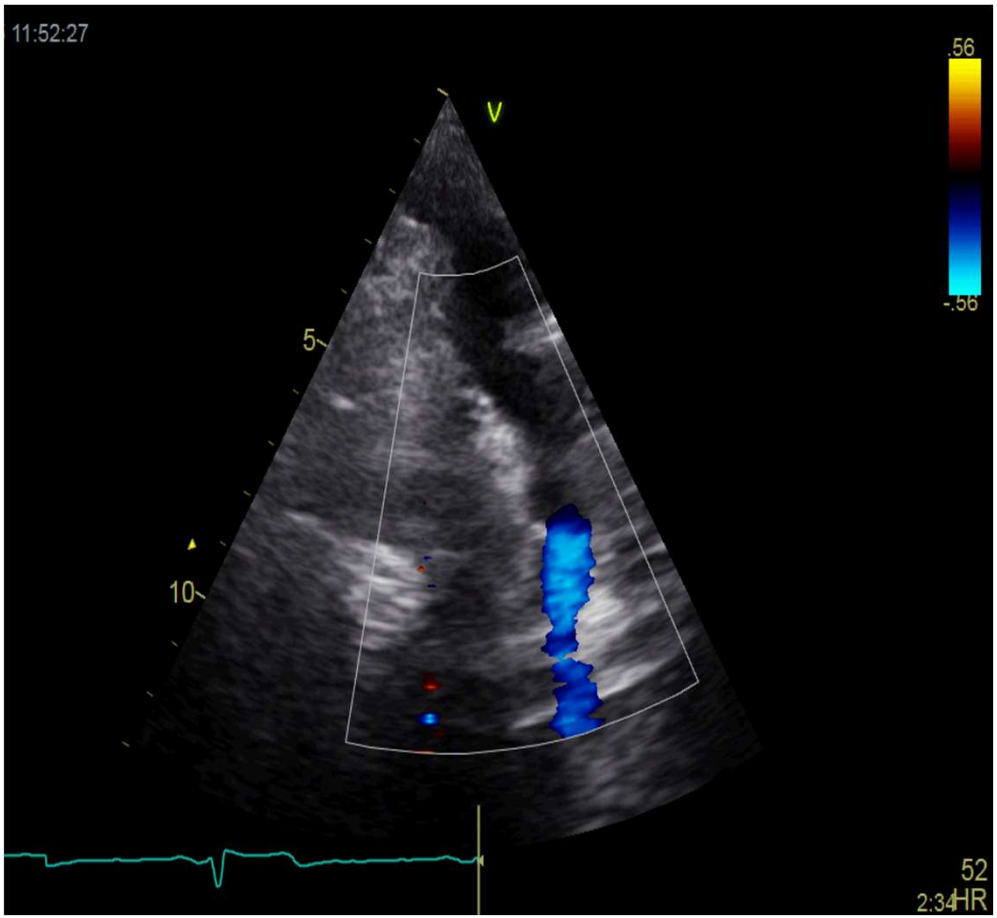
Age groups	*Percentage of patients who have hypertension with an underlying cause*	*Most common etiologies†*
Children (birth to 11 years)	70 to 85	Renal parenchymal disease Coarctation of the aorta
Adolescents (12 to 18 years)	10 to 15	Renal parenchymal disease Coarctation of the aorta
Young adults (19 to 39 years)	5	Thyroid dysfunction Fibromuscular dysplasia Renal parenchymal disease
Middle-aged adults (40 to 64 years)	8 to 12	Hyperaldosteronism Thyroid dysfunction Obstructive sleep apnea Cushing syndrome Pheochromocytoma
Older adults (65 years and older)	17	Atherosclerotic renal artery stenosis Renal failure Hypothyroidism

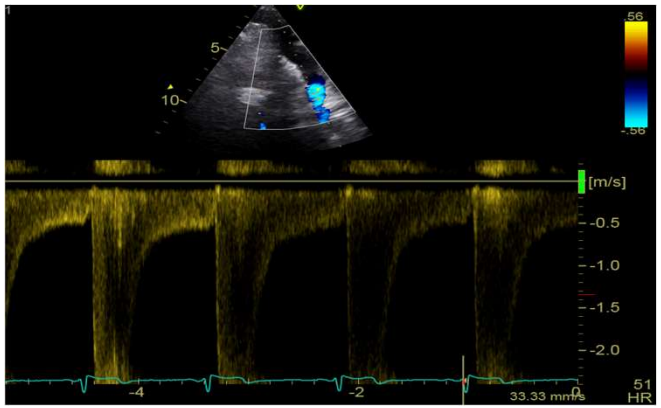
*—Excluding dietary and drug causes and the risk factor of obesity.

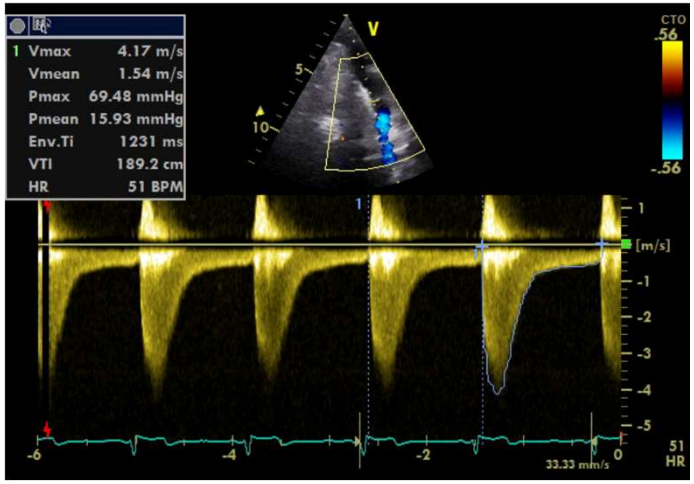
†—Listed in approximate order of frequency within groups.

Adapted with permission from Viera AJ, Neutze DM. Diagnosis of secondary hypertension: an age-based approach. Am Fam Physician. *2010;82(12):1473, with additional information from references 4, 14, and 29.*

Aortic Coarctation

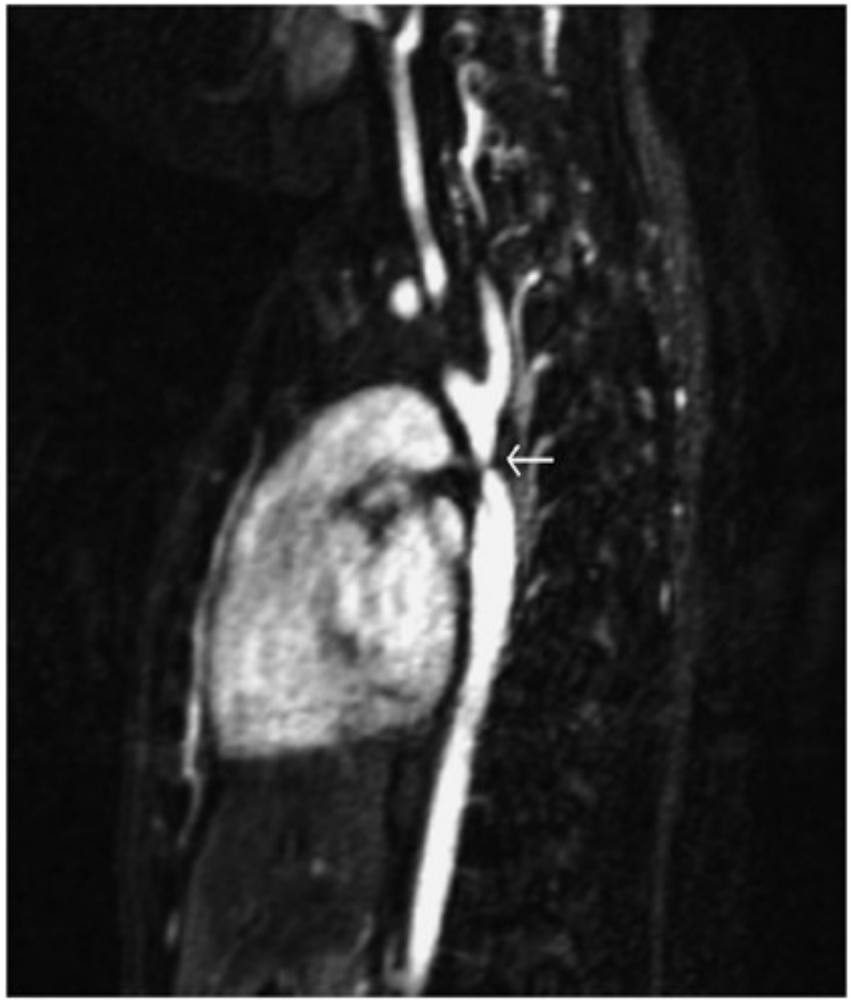


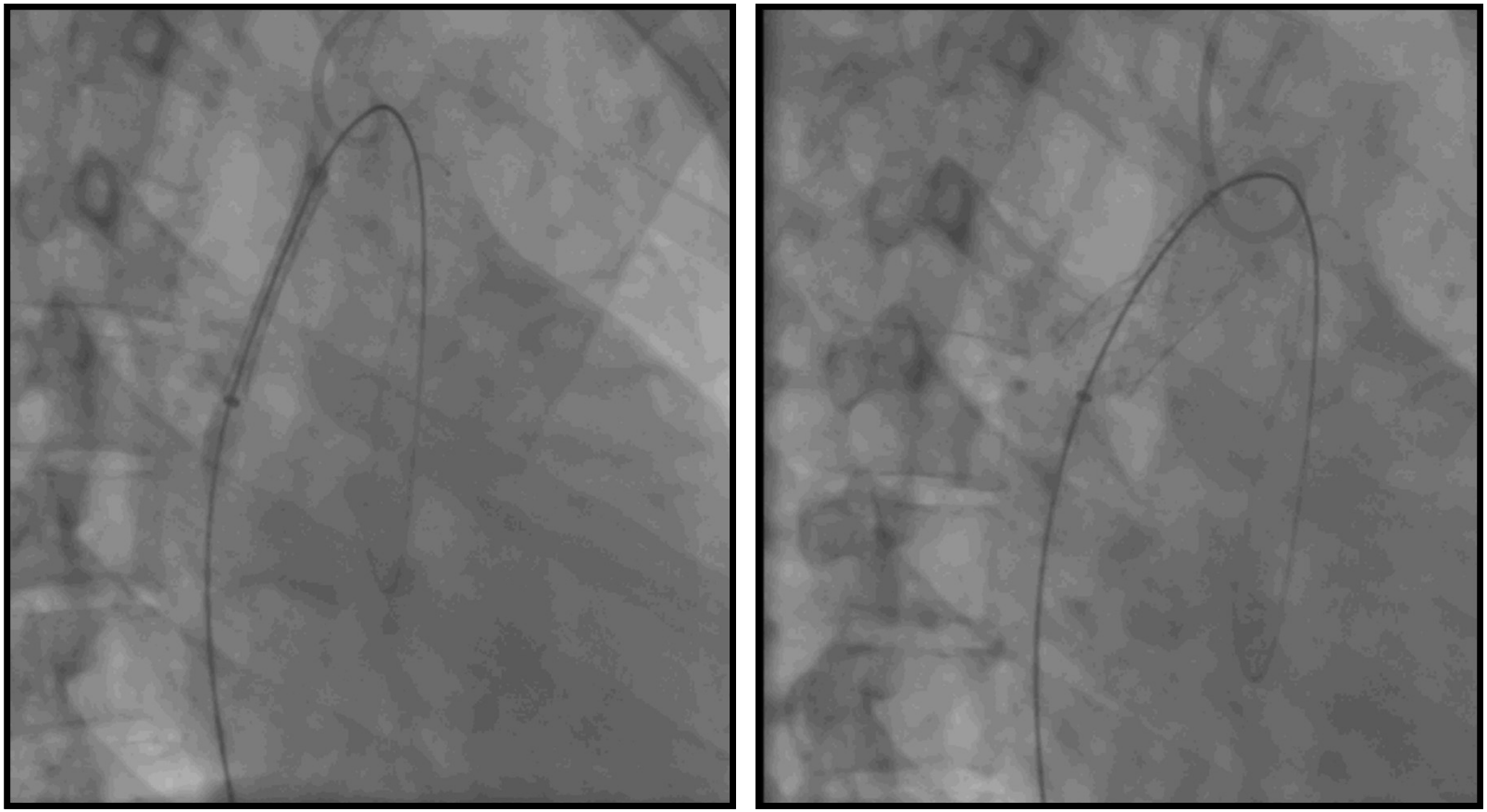




Aortic Coarctation

- Secondary cause for Hypertension
- Radiofemoral delay
- Upper extremity hypertension

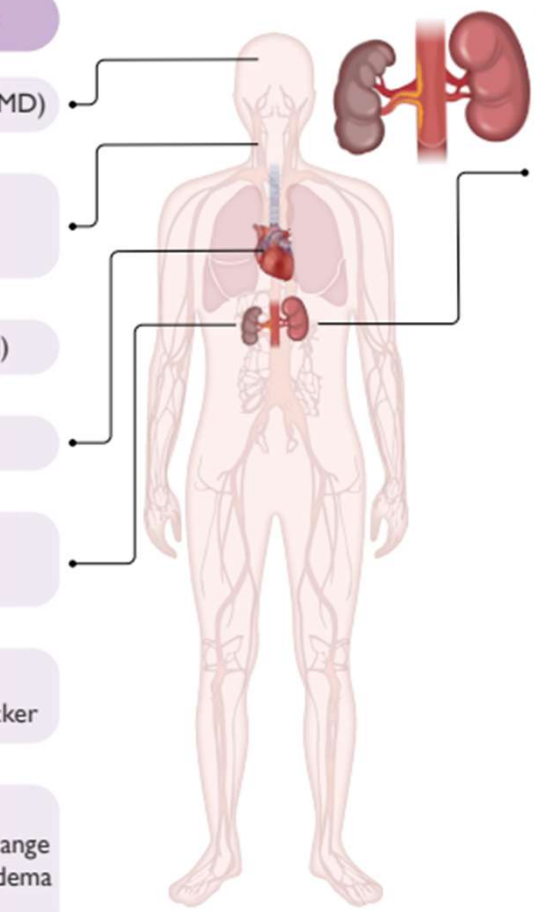




Renovascular hypertension

Signs and symptoms

- Migraine, pulsatile tinnitus (FMD)
- Vascular bruits
- Arterial dissections and/or aneurysms (FMD)
- Pulmonary oedema (bilateral)
- Multisite atherosclerosis
- Unexplained small kidney or kidney asymmetry
- ↓ GFR, albuminuria, ↑ renin
- Acute ↓ eGFR after RAS blocker
- Age <40 years (FMD)
- Age >60 years with acute change in BP or flash pulmonary oedema (atherosclerosis)



Pathophysiology

Significant renal artery stenosis:

- Atherosclerosis
- Fibromuscular dysplasia
- Rare causes

Diagnosis

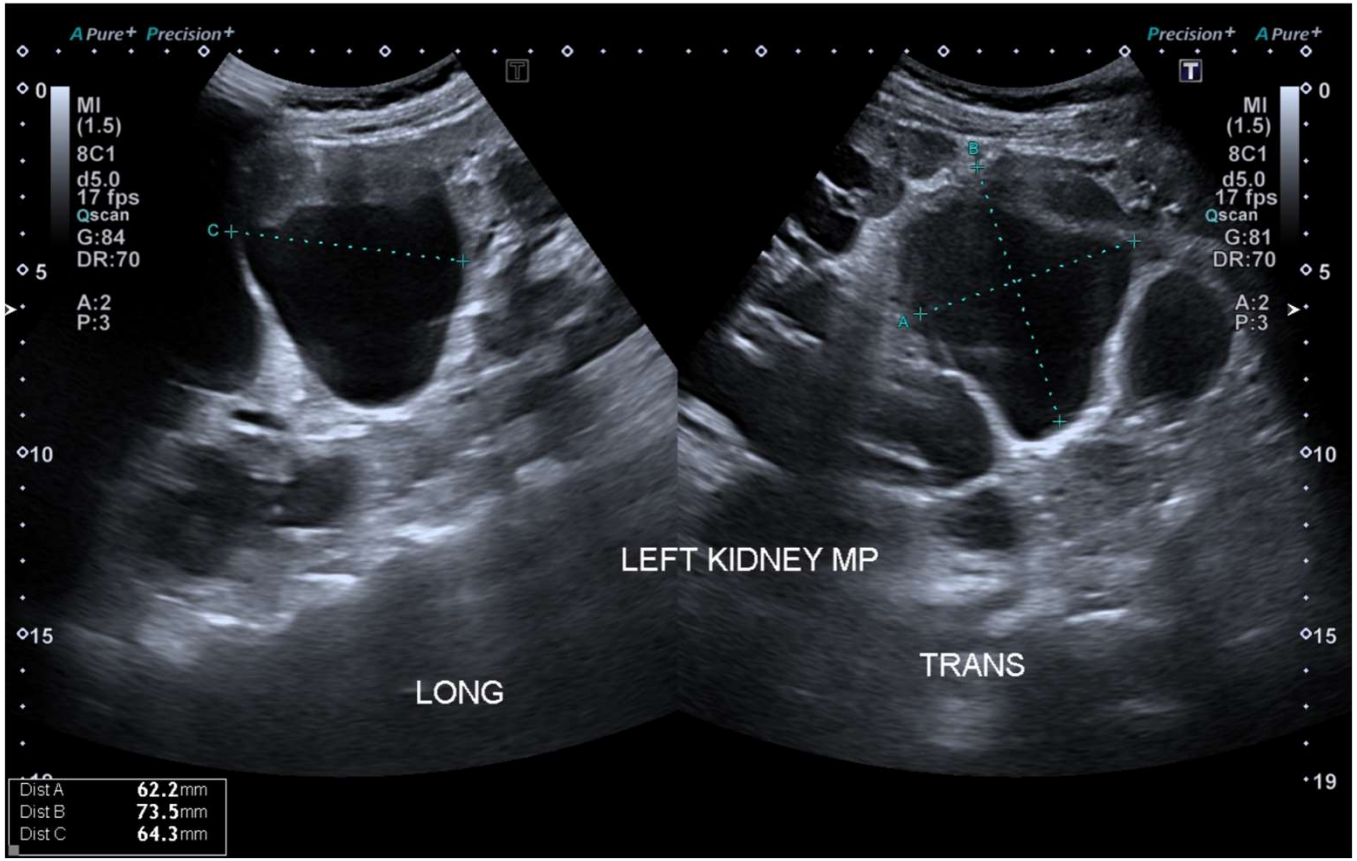
- Renal doppler ultrasound
- Abdominal CT-Angio or MRI

Treatment

- Medical: optimal CV risk management
- Interventional: renal angioplasty without (FMD) or with stenting (atherosclerosis)

ESC

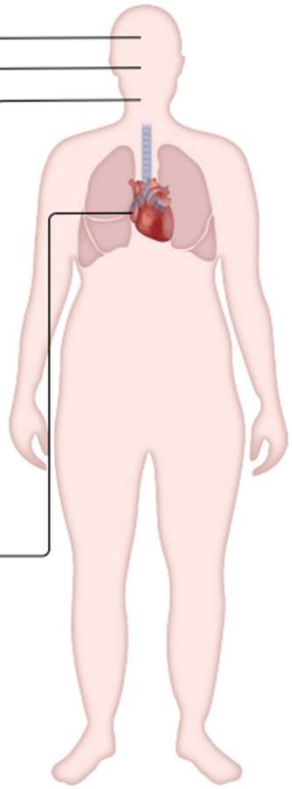
Polycystic Kidney Disease



Obstructive sleep apnoea

Signs and symptoms

- Restless/intermittent sleep, recurrent awakenings daytime sleepiness, fatigue, impaired concentration
- Apnoea, snoring
- Increased neck circumference
- Atrial fibrillation
- Non-dipping or reverse dipping pattern 24 h ABPM
- Obesity



Pathophysiology

- Intermittent upper airway obstruction during sleep

Diagnosis

- Overnight ambulatory polysomnography

Treatment

- Weight loss
- CPAP
- Mandibular advancement devices

ESC

Obstructive Sleep Apnea

IMPORTANT CAUSE IN PATIENTS WITH RESISTANT HYPERTENSION

INCREASE ACTIVATION OF THE SYMPATHETIC NERVOUS SYSTEM

FOUND IN UP TO 60% OF PATIENTS

NON-DIPPERS OR REVERSE DIPPING PATTERN

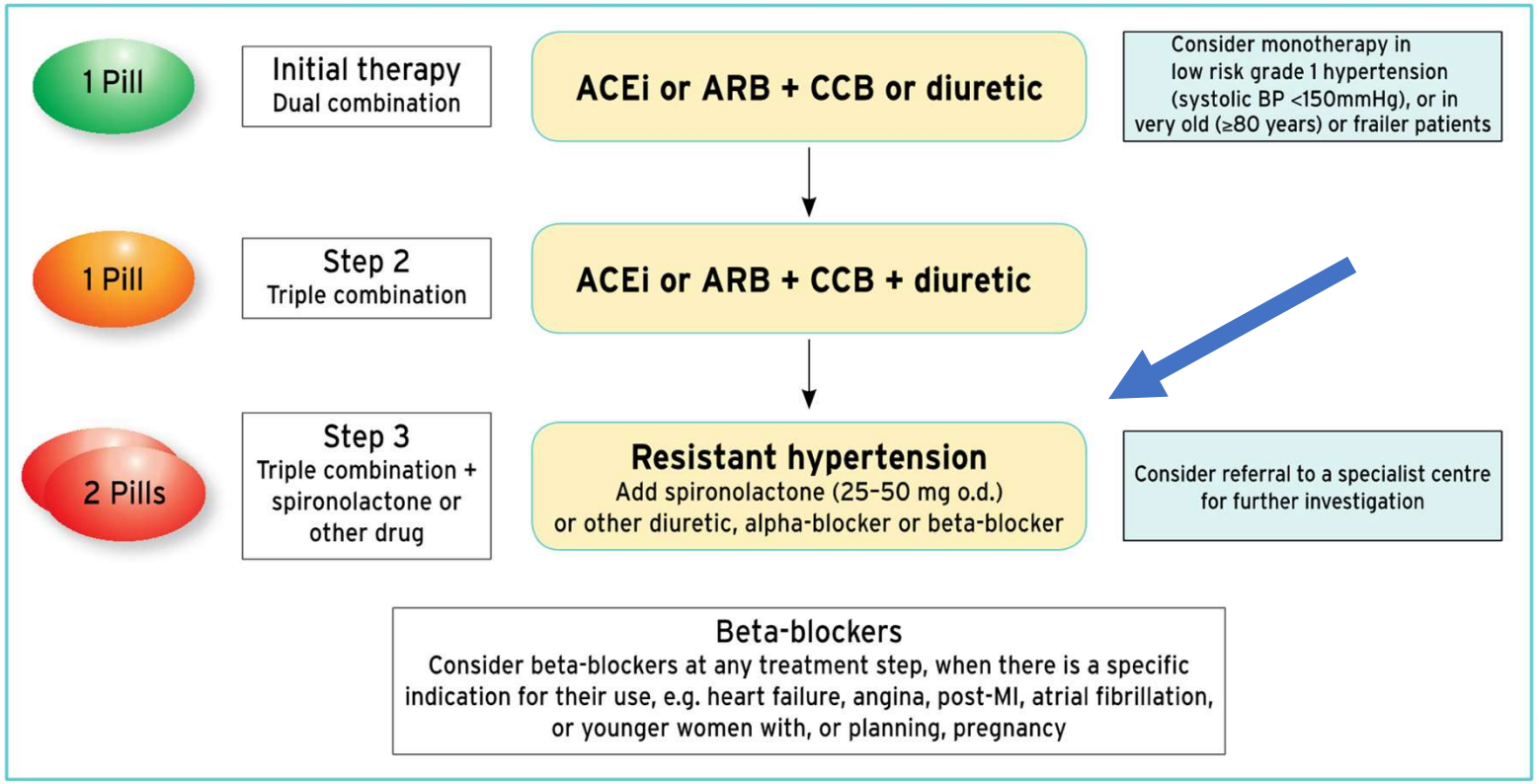
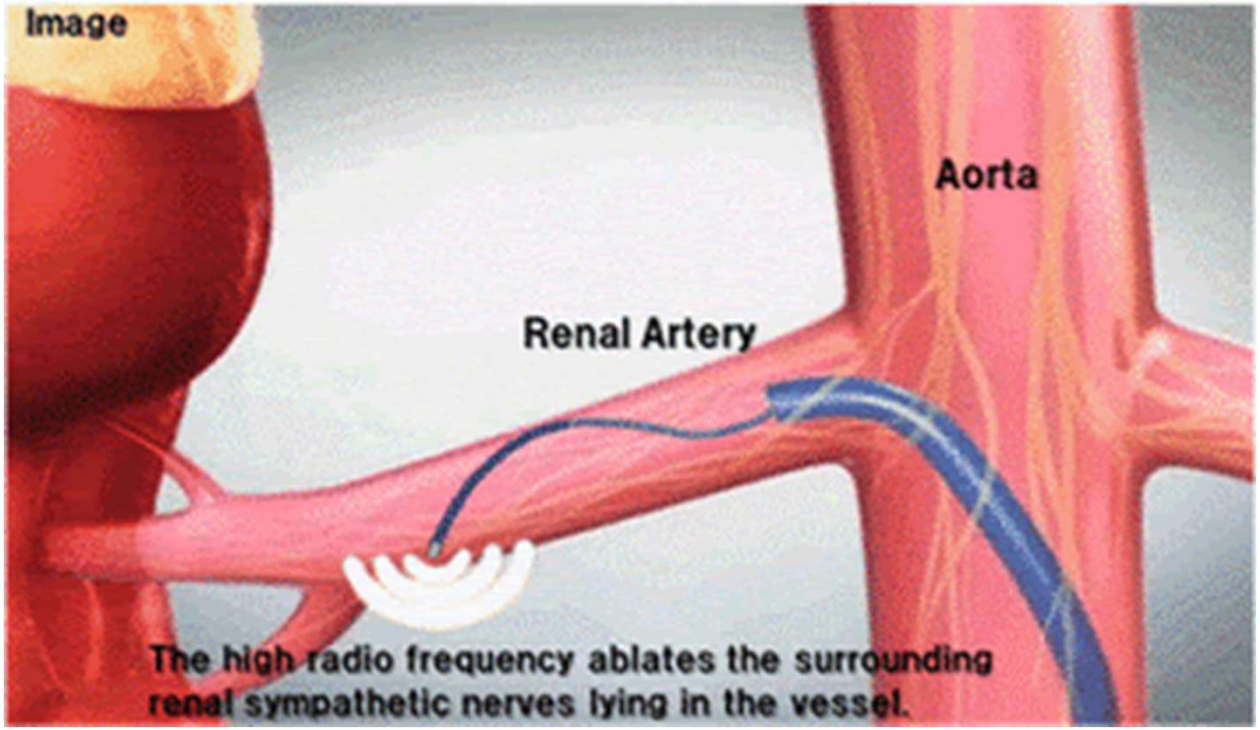


Figure 4 Core drug treatment strategy for uncomplicated hypertension. The core algorithm is also appropriate for most patients with HMOD, cerebrovascular disease, diabetes, or PAD. ACEi = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; CCB = calcium channel blocker; HMOD = hypertension-mediated organ damage; MI = myocardial infarction; o.d. = omni die (every day); PAD = peripheral artery disease.

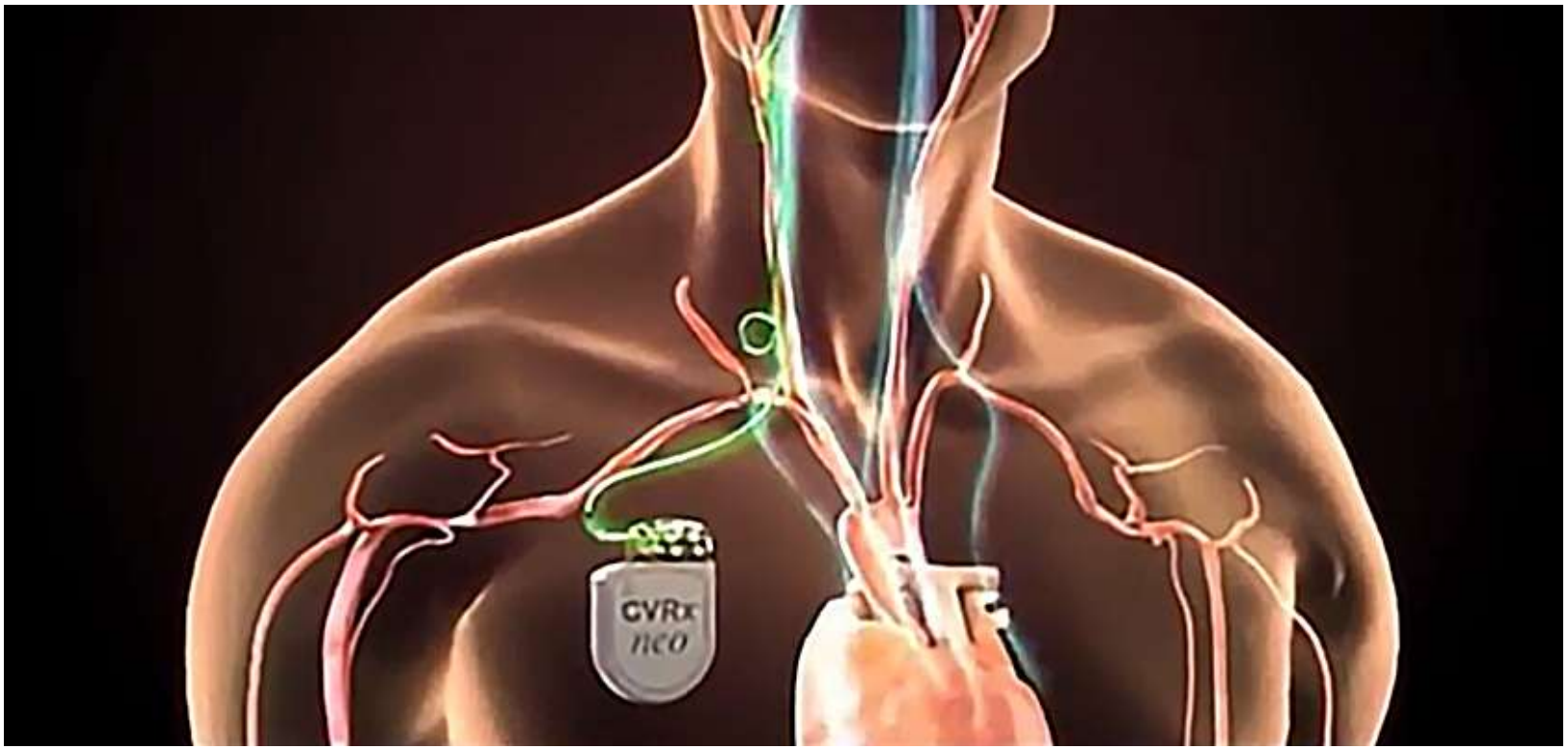
Renal Denervation Therapy



Renal Denervation Therapy

- Reserved for patients who are truly resistant hypertension
- Currently not funded in SA
- Early negative findings in certain studies

Baroreceptor Activation Therapy




The End