

Hypertension and Heart Failure Medications

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Plan

- Heart Failure
 - Acute vs. chronic Mx
- Hypertension
- Common drugs used
 - Method of action
 - Choice of medications



Heart Failure

- Aims;
 - Short term: Symptomatic / stabilise
 - Long term: Mortality and morbidity
- Chronic vs Acute management
- What is the treatment of acute heart failure?

Acute Heart Failure

- **Oxygen** (high flow)
- **Diuretic** (Furosemide 20-50mg IV)
- **Morphine** 5-10mg IV (reduce anxiety and cause vasodilatation)
- **GTN** infusion 10-200mcg/min (venodilatation)
- Consider - **CPAP** / Inotropes / HDU or ITU

Heart Failure - chronic

- **Lifestyle**

- Smoking / exercise / diet / weight loss

- **Pharmacological**

- Diuretics
- ACEi / ARB
- Beta-blockers
- Digoxin
- Other meds



- **Devices**

- Cardiac resynchronisation / ICDs
- Heart transplantation

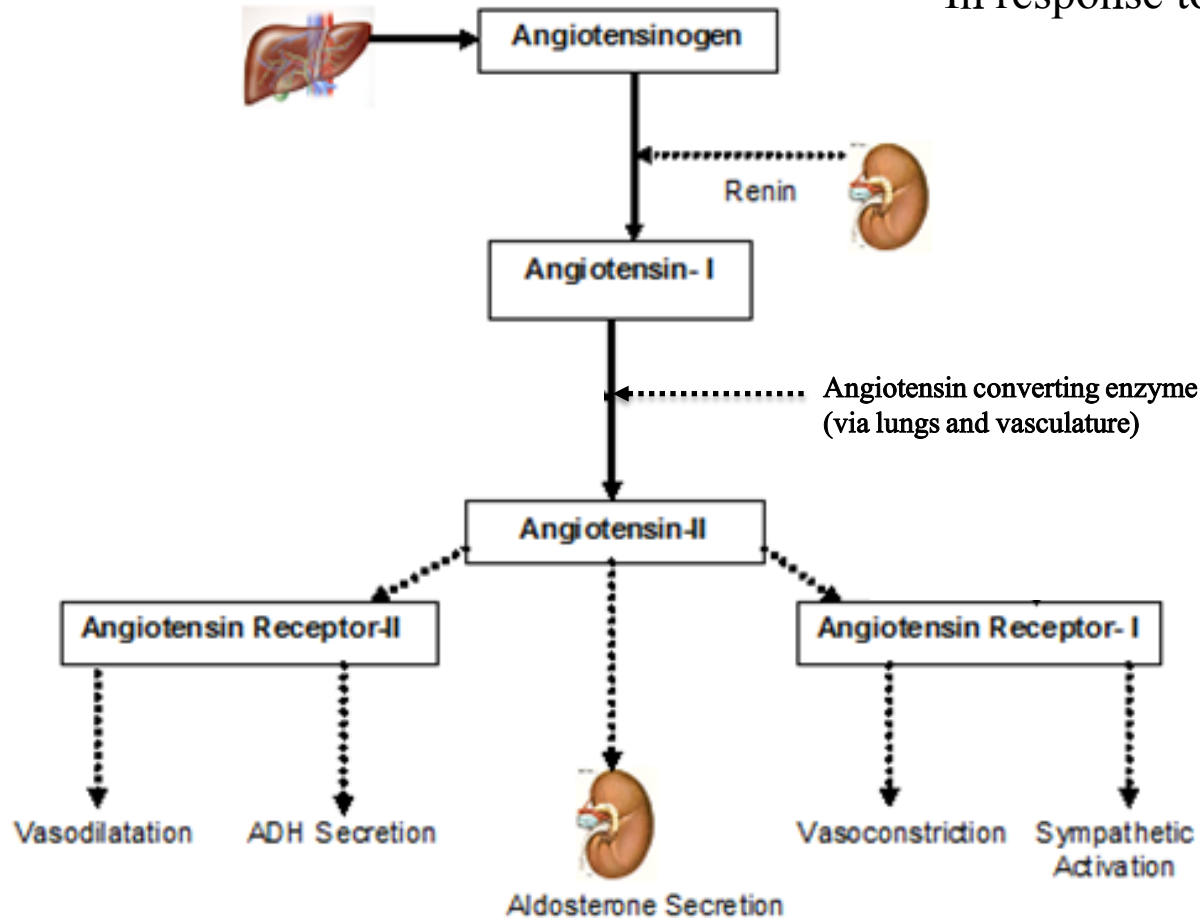
Hypertension

- **Lifestyle**
 - Smoking / exercise / diet / weight loss
- **Pharmacological**
 - ACEi / ARBs
 - Calcium Channel Blockers
 - Diuretics
 - Specific Algorithm
- **Special Circumstances**



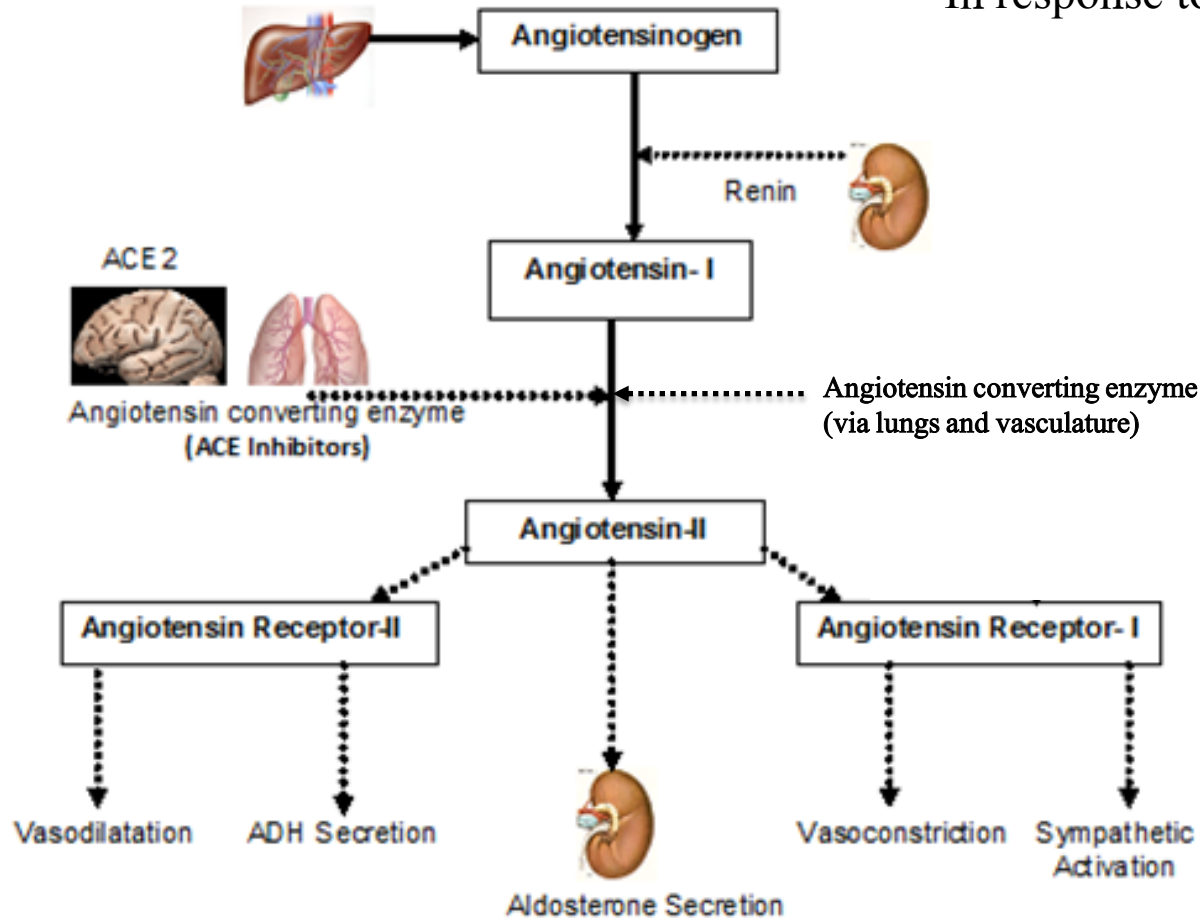
Renin-angiotensin system

In response to low BP



Renin-angiotensin system

In response to low BP



ACE-inhibitors

Mode of Action (vasodilatation and natriuresis)

- Inhibition of Angiotensin I → Angiotensin 2 (a vasoconstrictor)
- **Stop bradykinin degradation** (a vasodilator)- ?cause of wide SE
- Vasodilatation- reducing preload and afterload and reduce aldosterone so promotes excretion of Na/H₂O by kidneys to reduce blood volume/pressure

Side effects (due to poor receptor specificity)

- First Dose Hypotension
- Deterioration of renal function / Hyperkalaemia
- Dry cough
- Angio-oedema

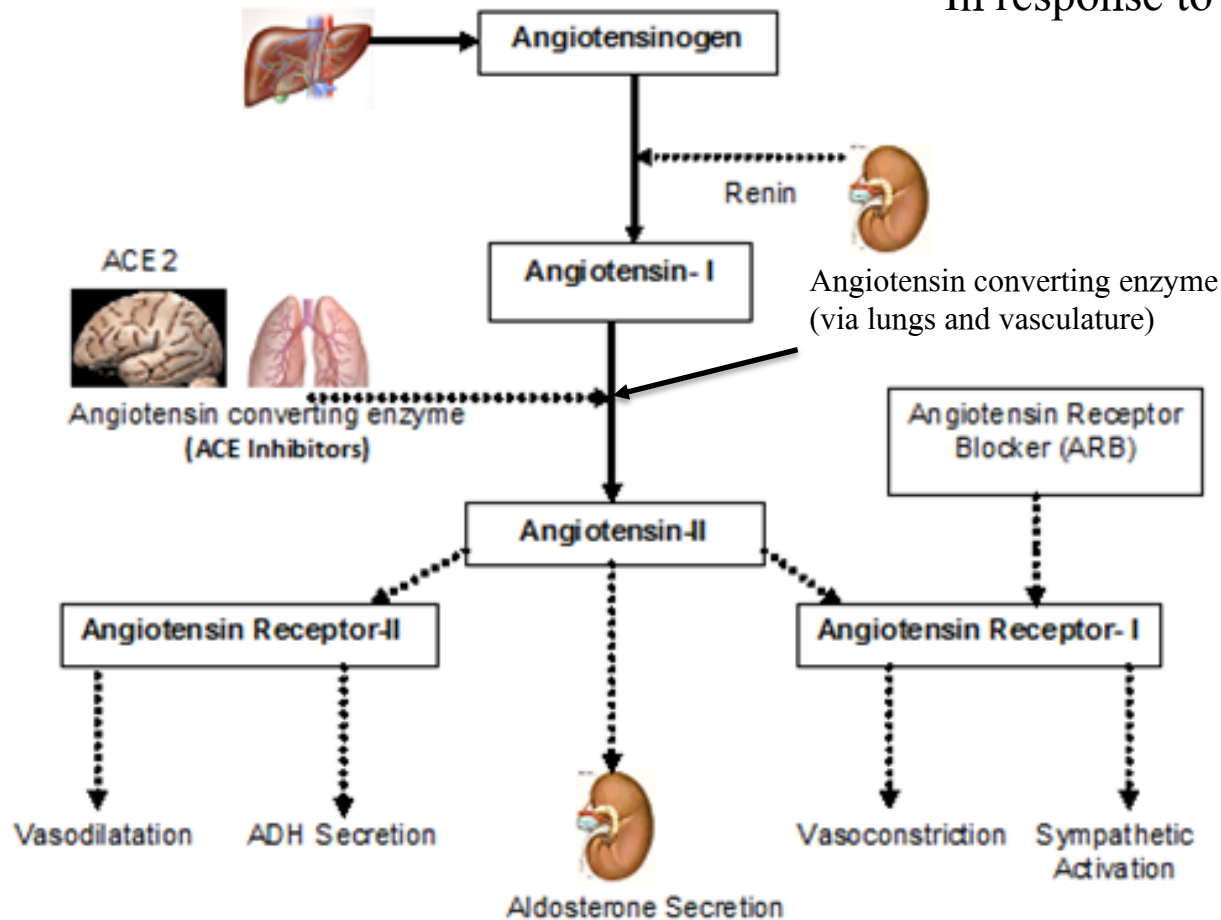
Examples (-pril)

- Perindopril/Enalapril/Ramipril/Lisinopril



Renin-angiotensin system

In response to low BP



Angiotensin II Receptor Antagonists (ARBs)

Mode of Action (similar to ACEi)

- Selectively block angiotensin 2
- Decreased peripheral vascular resistance
- DO NOT affect bradykinin degradation

Side effects (due to poor receptor specificity)

- Rare
- Angio-oedema may still occur

Examples (-sartan)

- Losartan / Candesartan / Valsartan



B-Blockers

Mode of Action (Sympatholytic)

- Reduce effects of sympathetic nervous system and the RAS
- Reduce cardiac contraction and lower heart rate
- Used in H.failure, not first line in HTN

Side effects

- AV Block
- Glucose intolerance
- Bronchospasm (un-selectivity)

Examples

- Bisoprolol / metoprolol / propranolol / atenolol



Calcium Channel Blockers

- **Dihydropyridines**

- e.g. Amlodipine / Nifedipine
- HTN

- **Non-dihydropyridines**

- e.g. Verapamil / Diltiazem
- Angina



Calcium Channel Blockers- Dihydropyridines

Mode of Action

- Work on smooth muscles
- Reduce systemic vascular resistance and arterial pressure

Side effects

- Headache, **hypotension**, **tachycarida**, flushing



Calcium Channel Blockers- **Non-Dihydropyridines**

Mode of Action

VERAPAMIL

Relatively selective to the myocardium and less systemically acting
Very important in treatment of angina and arrhythmias

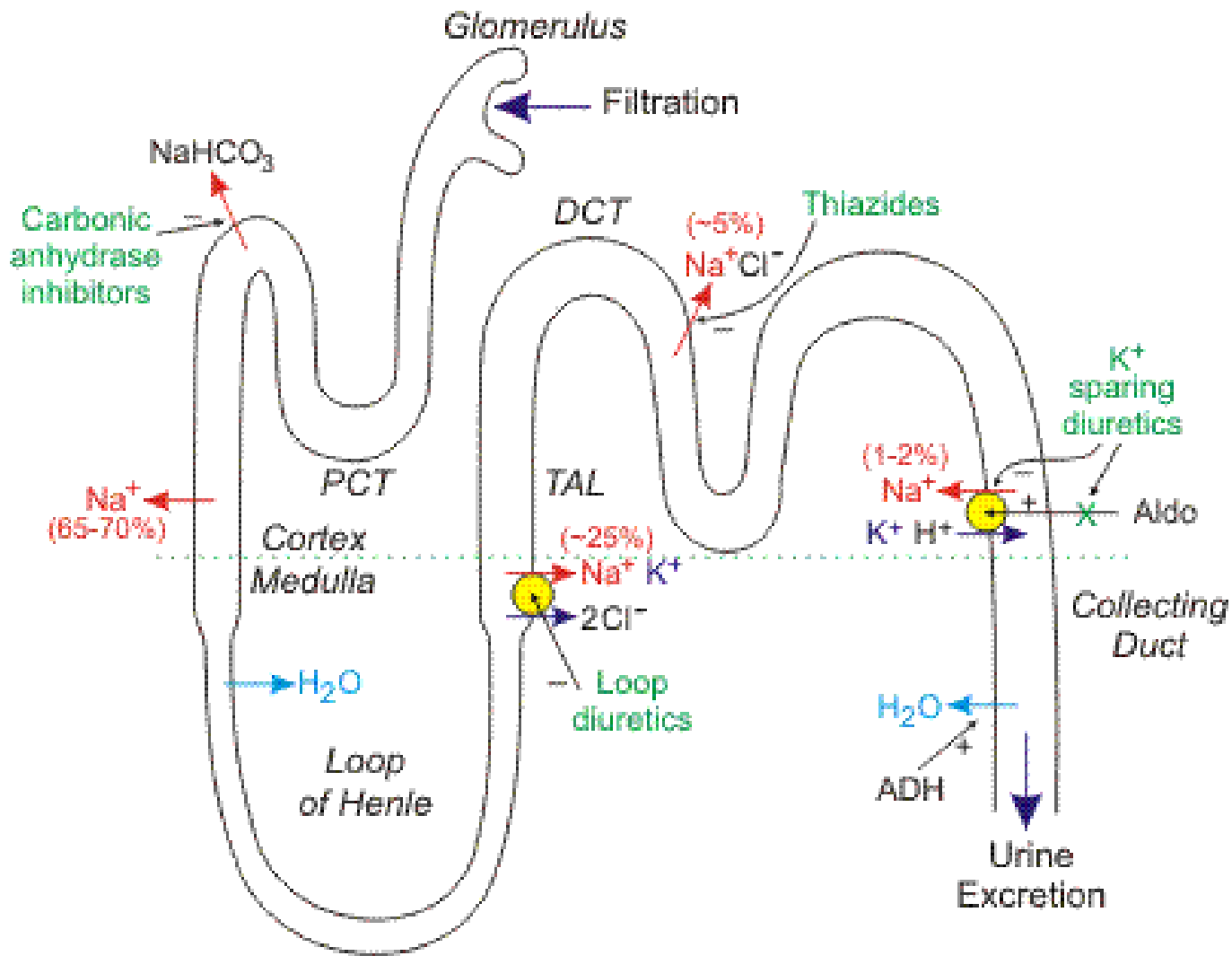
DILTIAZEM

Intermediate between verapamil and dihydropyridines in selectivity
for vascular Ca channels

Side effects

- Bradycardia, AV block, reduced cardiac contractility
- **AVOID IN HEART FAILURE**





Diuretics- Thiazides

Mode of Action - Used for HTN

- Block Na reabsorption in the distal convoluted tubule by inhibiting the Na/Cl co-transporter
- Work within 1-2hrs and last 24hrs

Side effects

- Hypokalaemia / Hypomagnesaemia
- Impaired glucose tolerance / Hypercholesterolaemia

Examples

- Bendroflumethiazide / Indapamide



Diuretics- Loop diuretics

Mode of Action - Used for H.Failure. Rarely for HTN

- Block Na reabsorption in the thick ascending loop of Henle through inhibiting Na/K/Cl co-transporter
- Work within 1-2 hrs and last 24hrs

Side effects

- Hypotension
- Renal impairment
- Hypokalaemia / Hyponatraemia / Hypomagnesaemia

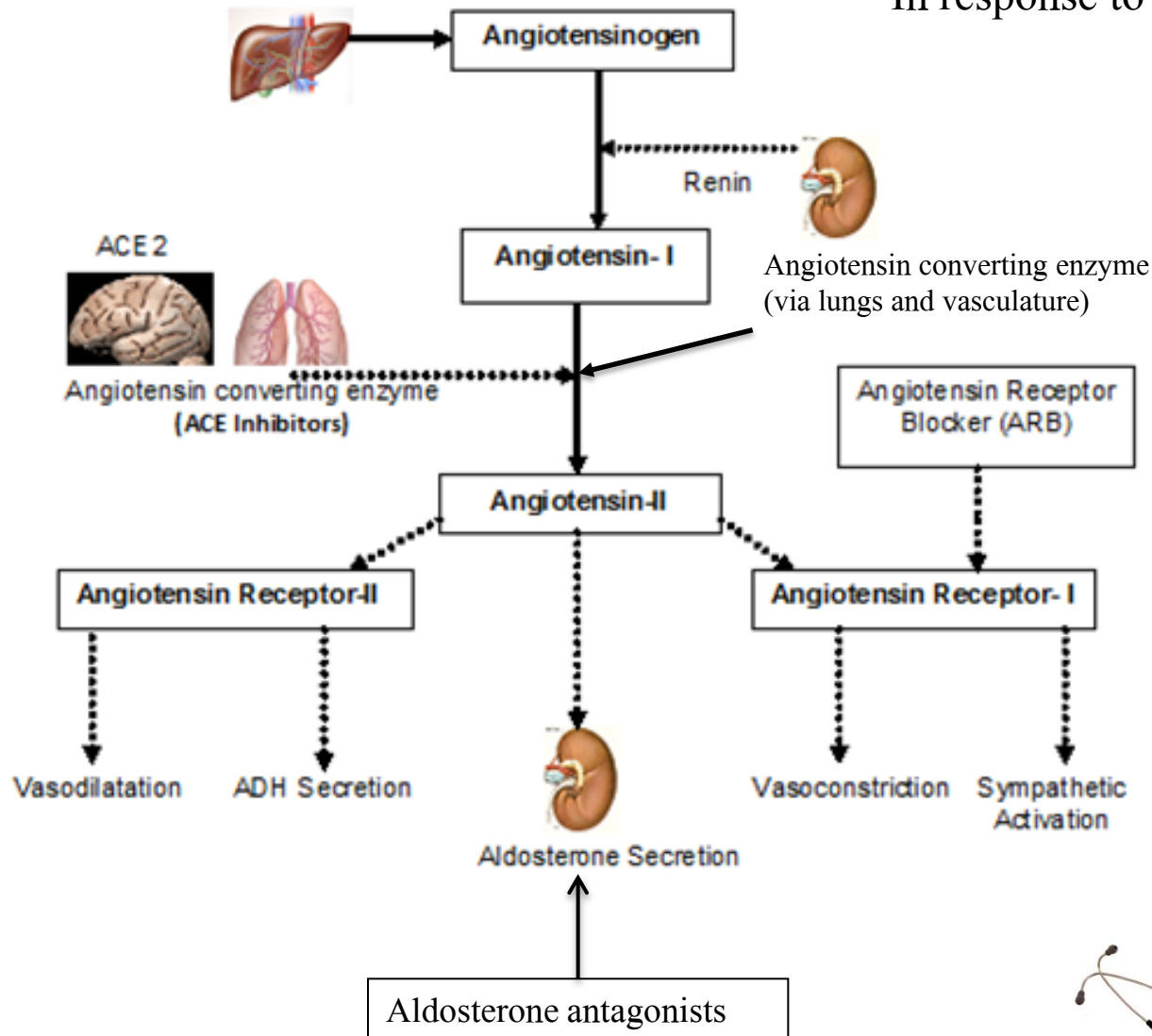
Examples

- Furosemide / Bumetanide



Renin-angiotensin system

In response to low BP



Diuretics - Potassium-Sparing

Mode of Action

- Aldosterone antagonist

Side effects

- Hyperkalaemia
- Gynaecomastia

Examples

- Spironolactone / Amiloride



Other medications

Ivabridine

Has affect on the F-channels in AV Node

Lowers HR

Indicated in treatment of Angina

Recently added to NICE for NYHA class II-IV stable CHF only by specialist team



Special Circumstance- PREGNANCY

METHYL-DOPA

Stimulate central receptors to decrease peripheral sympathetic tone to reduce systemic vascular resistance with mild reduction of CO / HR

S/e - Bradycardia / Postural hypotension

HYDRALAZINE

Short-acting potent vasodilator

S/e - Reflex tachycardia (usually used with Beta blocker)
- Hydralazine- headache , SLE-like syndrome

LABETOLOL

Both alpha and beta blocking activity

S/e - postural hypotension / hepatocellular damage



Cases - all persistent readings

- 60yo Caucasian pt BP 170/95
- 50yo Black pt with IDDM on Amlodipine BP 150/90
- 40yo Caucasian pt BP 145/96
- 50yo Caucasian pt on Ramipril BP 150/90
- 50yo Black pt BP 174/97
- 50yo Caucasian pt with IDDM BP 145/95

What treatment would you give???



Hypertension

Drug therapy indicated if:

Persistent BP of **> 160/100 mmHg**

OR

> 140/90 mmHg with and raised CV risk or DM

(10-year CVD risk of >20%/ existing CVD or target organ damage).

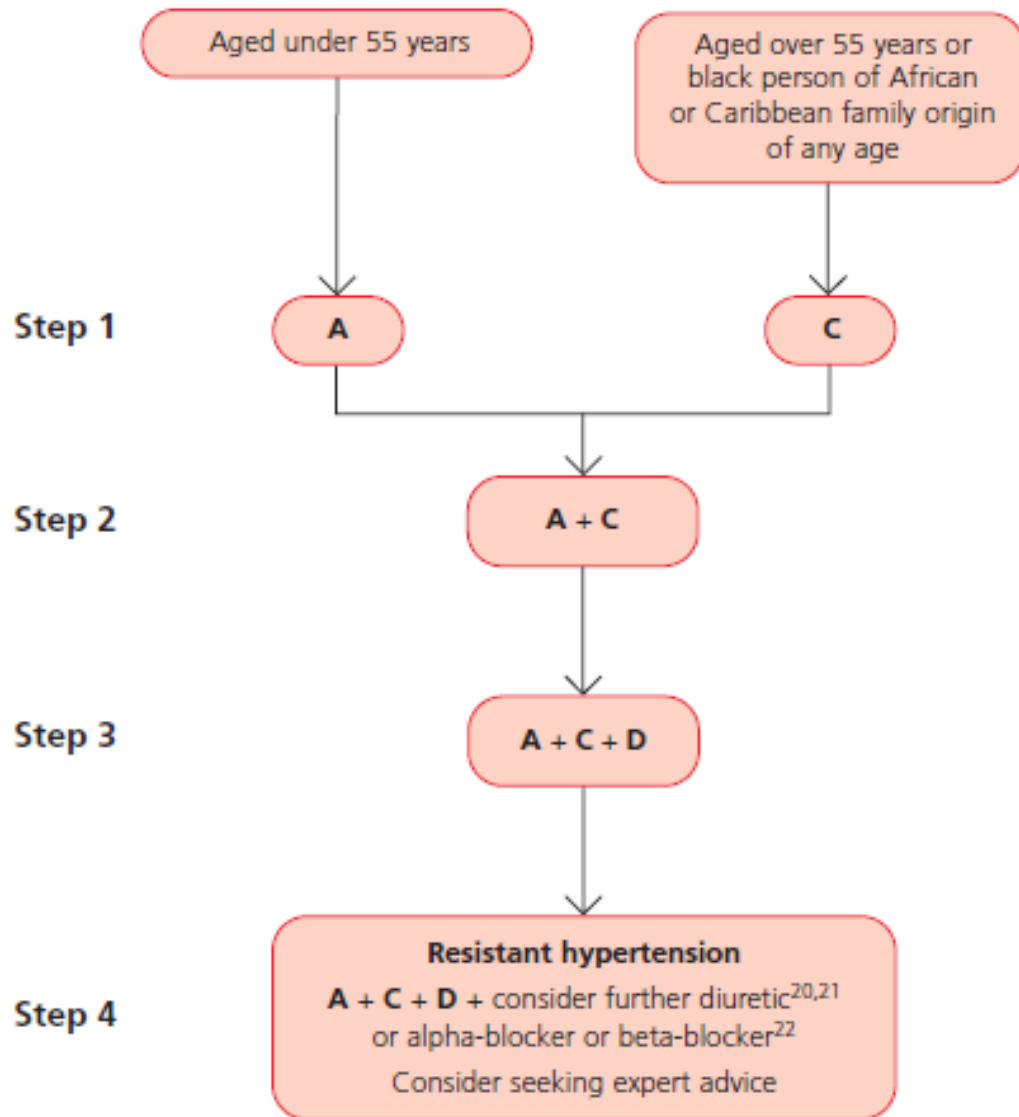
Aim to reduce to BP to:

< 140/90 mmHg in non-DM pts

OR

130/80 mmHg in DM pts





Key

- A** – ACE inhibitor or angiotensin II receptor blocker (ARB)¹⁸
- C** – Calcium-channel blocker (CCB)¹⁹
- D** – Thiazide-like diuretic

Cases - all persistent readings

- **60yo Caucasian pt BP 170/95**
 - AGE: Start on Calcium Channel Blocker
- **50yo Black pt with IDDM on Amlodpine BP 150/90**
 - ETHNICITY and DM: On CCB so add ACEi
- **40yo Caucasian pt BP 145/94**
 - Below target BP: Conservative Management- lifestyle and repeat in 6 months
- **50yo Caucasian pt on Ramipril BP 150/90**
 - Still above target BP: On ACEi so add Calcium channel blocker
- **50yo Black pt BP 174/97**
 - ETHNICITY and above target BP: Start Calcium channel blocker
- **50yo Caucasian pt with IDDM BP 145/95**
 - DM and above target BP: Start ACEi



Heart Failure- CHRONIC

Best medication for SYMPTOMS?

Which medications shown to improve MORTALITY?



Treatment Algorithm in Heart Failure Following Recent or Remote Myocardial Infarction

Control volume

Reduce mortality

Diuretic

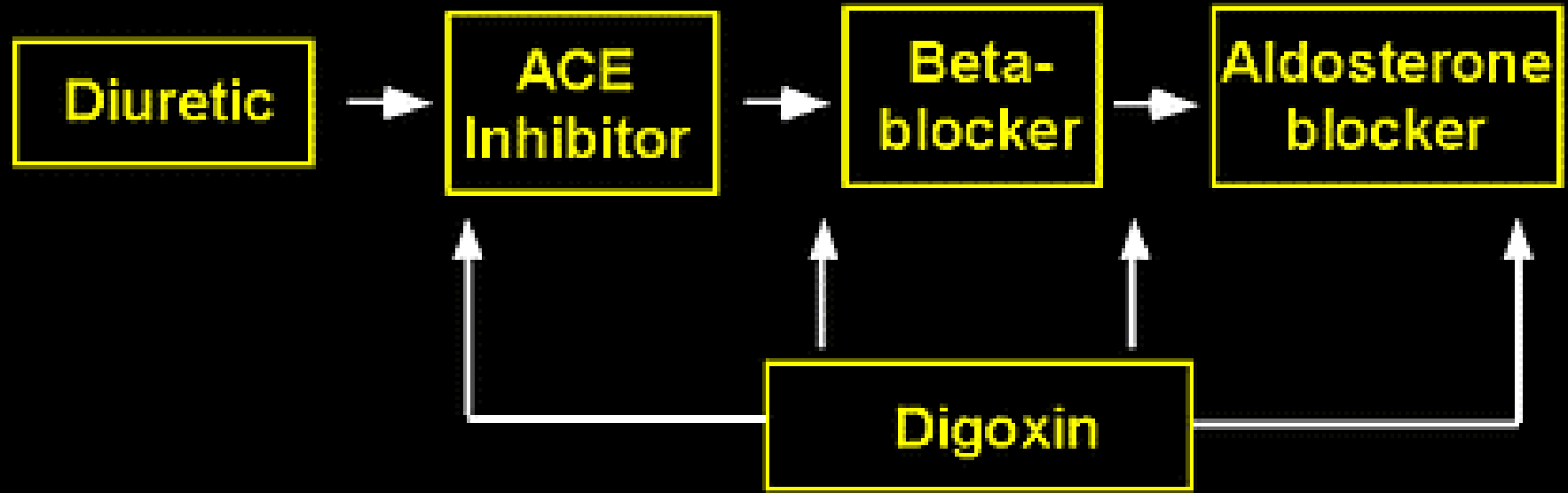
ACE
Inhibitor

Beta-
blocker

Aldosterone
blocker

Digoxin

Treat residual symptoms



Heart Failure

- **Loop Diuretics** – SYMPTOMATIC: minimum effective dose adding different diuretic if required to work synergistically
- **ACEi** - improve mortality and symptoms. Need to check U+Es.
- **Beta-Blockers**- improve mortality and hospitalisation
- **Aldosterone blocker**- e.g. spironolactone reduces mortality in severe HF
- **Digoxin**- positive inotropic effect improve symptoms. NO MORTALITY improvement. SE include nephrotoxicity



Summary...

- This lecture only meds- remember other treatment options
- Understand mechanisms
- Review algorithms
- Be aware of key S/E



QUESTIONS??