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

Angiotensin converting enzyme (via lungs and vasculature)
Renin-angiotensin system

In response to low BP

Angiotensin converting enzyme (via lungs and vasculature)
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 after load 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 converting enzyme (via lungs and vasculature)
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 / propanolol / 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

Angiotensin converting enzyme (via lungs and vasculature)

Aldosterone antagonists
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 Amlodpine 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
Aged under 55 years

Aged over 55 years or black person of African or Caribbean family origin of any age

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**Step 1**

A

C

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**Step 2**

A + C

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**Step 3**

A + C + D

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**Step 4**

Resistant hypertension

A + C + D + consider further diuretic\textsuperscript{20,21} or alpha-blocker or beta-blocker\textsuperscript{22}

Consider seeking expert advice

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**Key**

A – ACE inhibitor or angiotensin II receptor blocker (ARB)\textsuperscript{18}

C – Calcium-channel blocker (CCB)\textsuperscript{19}

D – Thiazide-like diuretic

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**Simply Finals**
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

- Diuretic

Reduce mortality

- 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+Ees.
• **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??