Heart failure (HF)

- HF is a clinical syndrome...not simply pump failure.
- The syndrome has symptoms and signs due to neurohormonal responses to HF.
- The body responds to low cardiac output, with neuro-hormonal reactions.
- Huge adrenergic drive and RAAS.
- But when its a chronic neurohormonal drive it's counterproductive.

1/3 non ischaemic due to:
- Dilated cardiomyopathy idiopathic.
- Viral.
- Alcohol.
- Hypertention.
- Chemotherapy drugs.
- Vascular disease.
- Hyperthyroidism.

2/3 ischaemic due to:
- Coronary artery disease.

References:
1. Dr Angus Nightingal, cardiology consultant BMJ webinar June 2016.
2. Yassir Javaid GPSI cardiology lecture, Dec 2017.
3. Cardiology consultant Russells Hall Hospital, Feb 2018.
4. How to prescribe loop diuretics in oedema, BMJ 2019.
5. Yassir Javaid GPSI sgltZ lecture, Mar 2021.

Symptoms

- Dyspnoea.
- Orthopnea.
- Ankle oedema.
- Fatigue.
- 3rd heart sound.
- Displaced apex beat.
- Raised (>3cm) JVP.

- Almost certain to be HF, unless murmur also present.

Cardiac
- Heart failure.
- Valve disease.
- Arrhythima.

Pulmonary
- Asthma/COPD.
- Pulmonary fibrosis.
- Lung CA.
- Recurrent PE.

- 40% of them have HF !
- So dont just keep putting their SOB down to respiratory condition.

Other
- Deconditioning/obesity.
- Anaemia.
- Hyperthyroidism.
- Anxiety.
- Neuromuscular (Myasthenia gravis, Guillian Barre).

Investigations

??? Urinaylisis to rule out protein losing conditions which will need nephrology not cardiologist. ???

???if low (double figures) should refer for intravenous iron.
iron is critical for normal functioning of heart.
cant use oral iron as doesnt have bioavailabilty.
even if not anaemic, give iron infusion if low ferrin.

- NYHA class.
- Finger clubbing.
- BMI.
- FBC.
- UEs.
- LFTs.
- TFT.
- Lipids.
- HbA1c
- Ferritin.
- BNP.
- ECG.
- CXR.
- Spirometry (smoker).
- Echo if the ↑ BNP.

- Helps assess effect of management interventions.

Class
I
II
III
IV

No limitation to ordinary activity
Comfortable at rest. Slight limitation of physical activity.
Comfortable at rest. Marked limitation of physical activity.
Symptoms at rest.

- If normal you can confidently exclude HF as the cause of SOB.

can be raised due to

- COPD.
- AF.
- LVH.
- Atrial dilation.
- DM.
- Obesity.
- CKD.
- Liver failure.

can be low due to

- BMI > 35.
- Diuretics.
- Beta blocker.
- ACEI.

- If completely normal, unlikely to be HF.
- Look for Lt axis deviation (bulky Lt ventricle pulls the axis to the left).
- Only worry about LVH on ECG if T wave changes.

- Anything < 55% of ejection fraction is HF.
- HFpEF = HF with Preserved Ejection Fraction (aka LVDD).
- Where 'preserved' = ejection fraction about > 50%
- Usually insidious injury e.g. hypertension, which causes ↑ wall thickness so LV is normal size.
- The heart becomes stiff resulting in a diastolic filling problem.
- Left atrium dilates because the LV is so stiff (LVH).
- Have to dramatically reduce BP.

- HFrEF = HF with Reduced Ejection Fraction (aka LVSD).
- Usually acute injury e.g. MI, which causes LV dilation.

Management

- Refer to 2o care for diagnosis.

- Start diuretics if fluid retention or congestive symptoms while waiting for 2o care review.
- Stop NSAIDs and dilitiazem/verapamil.
- Mainstay of treatment will be diuretics PRN for symptom control, beta blocker and ACEI.
- Warn them it will make them feel worse initially, but after few months will feel better and prevent cardiac remodelling.
- Spironolactone/eplerenone can be added to this if still NYHA II-IV.
- Ivabradine to only be started by 2o care teams.

- Do not use diltiazem/verapamil as have -ve ionotropic effect.
- Amlodipine and felodipine can be used. Usually stopped to allow increase of other medications (to avoid hypotension).

Lifestyle

- Alcohol causes cardiac supression.
- Salt reduction (50% are salt sensitive).
- Exercise has massive improvement.
- Smoking cessation.
- Weight monitoring.

- Refer to cardio/pulmonary rehabilitation programme.

- Buy weighing scales.
- Weight your self after micuration, daily at same time each day.
- > 2kg ↑ weight in 2/7 = they need review in GP same day
OR
-Follow the diuretic plan (see below).

Immunisation

- Influenza annually.
- Pneumococcal immunisation.

Monitoring

- Six monthly heart failure review.
- Six minute walk test.
- Fluids status.
- ECG.
- UEs.

- At least every 6/12, but more frequently if unstable.

Re-refer if any following:

- EF ≤ 35% (may need ICD).
- LBBB.
- AF.
- Complete LBBB (may need CRT).
- NYHA > II despite max medical treatment.
- Repeat admissions (> 3 in last 6/12).
- Angina.
- Significant valve lesion.

2o care may discuss

- CRT = Cardiac Resynchronisaiton Therapy.
- aka biventricular pacing.

CRT-P (pacemaker)

CRT-D (defibrillator)
- Has an additional defibrillator (ICD) ability.
- ICT = Implantable Cardioverter Defibrillator

Palliative

- Ensure ICD turned off.
- No accurate prognostic model available.
- Initiate end of life discussion early to allow pt's to express their needs.
- e.g. NYHA III or IV, difficult symptoms, repeated admissions.

Diuretic

- Use for relief of fluid retention and congestive symptoms.
- Metolazone is sometimes used in severe/palliative stage.
- For spironolactone/eplerenone see below.

first line

ACEi AND Beta blocker

??? if what ???

- Must do baseline UEs. If dont will never know if
- Start Ramipril 1.25mg. Double dose every 2-4 weeks.
- Go to max tolerated (e.g. 10mg).
- Try to use split dose e.g. 5mg BD.
- UEs 2/52 after every dose increase.
- Once on max dose, UEs every 3-6/12.

- Has the highest benefit in ↓ mortality.
- Hence must try to initiate and continue whenever possible.
- Only use licensed medication i.e. bisoprolol or carvedilol or metoprolol.
- If need to switch from atenolol, 50mg is equivalent to bisoprolol 5mg.
- COPD is not a C/I to beta blocker. Evidence of benefit in fact.
- Ensure stable and 'dry' before initiating.
- Titrate to max tolerated dose.
- If needed (symptomatic hypotension) you should ↓ ACEi dose to allow initiation of the beta blocker (this is how important it is to ensure they are taking a beta blocker) OR might be able to ↓ diuretic dose if dry.
- If worsening HF, ↑ diuretic, and ↓ beta blocker (rather than stopping it).
- Dont need to anything if pt hypotensive but is assymptomatic.
- Start bisoprolol 1.25mg for 2/52, then 2.5mg for 2/52, then 3.75mg for 2/52, then 5mg for 1/12, then 7.5mg for 1/12, then 10mg.
- During titration check pulse. Target about 60. If < 50, ↓ beta blocker.

- If s/e cough.
- Once stop ACEi it takes 3/12 for the bradykinin to stop.
- See after 2/52, and if cough resolved tell them it was not the ACEi and restart.
- Conclusively the ARB are no where as near to ACE in preventing morbidity and mortality.
- So dont switch or stop too soon.
- Use candesartan. Go to max tolerated (32mg).

- Worsening renal function expected.
- If small and assymptomatic, no action needed.
- Cr ↑ 30-50% is acceptable if < 200.
- eGFR ↓ 30%, is acceptable.
- K+ up to 5.9 is of no concern according to American guidelines.
- However, a limit of K+ up to 5.5 may be less worrying.

- If had to ↓ dose for whatever reason, simply try again with the higher dose after a few months.
- If could not tolerate, simply half dose.

if still symptomatic ADD

Aldosterone antagonist

- Do not use spironolactone/eplerenone if you are not meticulous with checking renal function.
- Do not initiate if K > 5 OR eGFR < 30.
- Start spironolactone 12.5mg.
OR
- Start eplerenone 25mg.

- Monitor UEs twice in week 1, then weekly for 1/12, then monthly for 3/12.

if still symptomatic may need

Ivabradine

- Selective sinus node inhibitor.
- ↓ heart rate.
- Only to be started by 2o care.

- Only used if:
- At maximum medical treatment.
- NYHA II-IV.
- Pulse >75.
- Sinus rhythm.
- Ejection fraction ≤ 35%.

Sacubitril/valsartan (Entresto)

- Neutral EndoPeptidase (NEP) inhibitor (sacubitril).
- Prevents breakdown of BNP allowing it to cause vasodilation.
- Only to be started by 2o care.

- Only used if:
- Can tolerate ACEi.

Errors

- The common habit of giving furosemide and then ↑ / ↓ the dose is an error.
- Loop diuretics have a binary effect.
- So rather than a dimmer switch with a gradual response, they are more like a on/off switch.
- So either they are either working, or they are not. There is no middle ground.
- And once they are working there is no point ↑ the dose.
- So find the therapeutic dose and stick to that dose only (taken PRN).

Common errors:
1) Prescribing different doses through the day.
- e.g. 40 mg am and 20 mg at pm.
- Instead, find a dose that works, and use only that dose.
- There is no point using a subtherapeutic dose.

2) Prescribing variable doses for different symptoms.
- e.g. 20 mg a day, but 40 mg if you re very oedematous.
- Instead find a dose that works, and use only that dose.

3) ↑ doses that are already effective.
- e.g. The 40 mg dose is working but your still swollen, so take 80mg for a few days.
- Once the switch is on, you can t turn it up.

4) Using subtherapeutic doses to achieve 'gentle diuresis' or to "save the kidneys.
- e.g. 40 mg isn t doing anything, so take it twice daily.
- Keeping a switch in the off position has no effect, and is essentially a placebo.

Which loop diuretic

Torasemide advantages over furosemide include:
- Higher potency.
- Longer duration of action.
- Higher and more predictable bioavailability.
- Lower hospital readmission rates for heart failure.
- Aldosterone inhibition.
- Higher functional/symptomatic improvements.
- Lower rates of cardiac fibrosis than furosemide.
- Less hypokalaemia.
- Absence of potentially damaging low thiamine levels.

Bumetanide may have favourable features, similar to those of torasemide when compared with furosemide.

Initial dosing

1st line = Torasemide 5-20 mg OM.
2nd line = Bumetanide 0.5-1mg OM.
3rd line = Furosemide 20-40mg OM.

- How to find the therapeutic dose?
- Determine the effect the medication has on the patient.

- 'Does anything change in how much and how often you pass urine?
- 'How long does this last for?'

therapeutic dose if

- Frequent urination for 4-6 hrs.
- Void 2000-4000 mL during this period.

- The dose has worked.
- You might have been able to get the medication to work at a lower dose. But the only way to tell would be to use a lower dose the next time and see if it has the same effect.
- Note: a higher dose of loop diuretic, above the dose that is already working will not lead to greater diuresis.

note

- Diuresis caused by a loop diuretic (frequent urination for 4-6 hrs) is distinct from the frequent urination caused by hypervolaemia, where excess fluid chronically fills the intravascular space and causes continuous polyuria, often worse at night when lying down.
- Nocturia typically indicates ineffective daytime diuresis, not excessive diuretic response.

not reached therapeutic dose if

- No significant change in urine output.

- The dose is below the therapeutic threshold.
- ↑ dose until the diuretic threshold is reached.

note

80 mg PO furosemide = 40 mg IV furosemide = 20 mg PO or IV torsemide = 1 mg PO or IV bumetanide.

PRN dosing

- Once you have moved the pt from hypervolaemia to euvolaemia, if you continue the diuretic you can cause hypovolaemia.
- Hence, once euvolaemia is achieved stop the diuretic, and use PRN based on either:
- ↑ in weight (*ideal method*).
OR
- ↑ in their symptoms (if difficulty weighing themselves).

- An ↑ weight can serve as an early indicator of fluid retention.
- Pt to weigh themselves daily.
- If higher than the target = take a therapeutic dose.
- If at or below target = nil medication needed.
- e.g. "Take 20 mg of torsemide if ≥ 93 kg, but if less than that do not take torsemide'.
- Target weight is also known as 'dry weight'.
- Dry weight is their weight when they are no longer fluid overloaded, have no swelling, no SOB in any position, and there is no weakness or dizziness to suggest dehydration.

- Alternative trigger for starting diuretic based on symptoms.

- Visible swelling.
- SOB.
- Orthopnea.

Remember
- Do not take less or more than the prescribed dose.
- There is only one best dose.

You want less diuresis

- Other diuretics are a good choice when patients need a 'gentle' diuresis for relatively mild hypervolemia or oedema.
- Thiazides cause only 25% of the urine output expected from a loop diuretic
- Potassium sparing diuretics 3%.

You want more diuresis

- When a loop alone proves insufficient, adding a thiazide or potassium sparing diuretic can increase the effect of the loop diuretic by blocking reabsorption beyond the loop of Henle in the nephron.
- Alternatively, patients can take a 2nd therapeutic dose of the loop diuretic ≥6 hr after the 1st to achieve additional diuresis.
- Limit fluid intake.
- Limit Na+ intake. The kidneys aggressively retain Na+ (sodium avidity) starting from the administration of the diuretic. It becomes even more potent after the 4-6 hr diuretic phase ends. Hence, it can noticeably ↓ the diuretic effect, ↑ fluid retention and ↓ the effect of a 2nd dose.