UPDATES IN THE DIAGNOSIS
AND
MANAGEMENT OF CARDIAC FAILURE

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Disclosures

• Consultancy and speaker fees
  • Novartis
  • Servier

• Advisory services
  • James Lind Alliance Heart Failure Steering Group
  • Cardiomyopathy UK
  • ESC Myocardial and Pericardial Diseases Working Group
  • Association for Inherited Cardiac Conditions

Why do you need to know about HF?

• HF is a progressive, highly symptomatic and deadly disease that places great demands on patients, caregivers and health care systems
• More common yet worse survival rates than most major cancers
• In-patient mortality around 9%
• One year all-cause mortality for those who survive to discharge 35%
• 40% survival at 5 years

NATIONAL INSTITUTE FOR CARDIOVASCULAR OUTCOMES RESEARCH (NICOR)
www.ucl.ac.uk/nicor/audits/heartfailure

National Annual Heart Failure audit 2015/16
Distribution of adults in need of palliative care at the end of life by disease groups

![Distribution of adults in need of palliative care at the end of life by disease groups](image)

You are increasingly seeing patients with HF

The Heart Failure Epidemic

Unmet needs

- Staggering clinical and public health problem
  - Prevalence 2% but 10-20% of 70-80 year olds
  - Affects ~900,000 people in the UK, incidence 1.2/1000/yr
- Significant morbidity, mortality, LOS, poor QoL
  - 5% of acute hospital admissions
  - 10% of bed occupancy, average LOS 11 days
  - Frequent hospitalisations and readmissions
- Significant related health care expenditure
  - Annual cost £716 million (1.8% NHS budget)
- Challenging case mix (HFrEF, HFrEmEF, HFpEF)
- We need specific treatments not a ‘one size fits all’ management strategy
- Delivering comprehensive services to all
- Variable diagnosis, care provision & access to services (incl ambulatory services)
- Managing expectations and palliation

The Heart Failure Epidemic

Many HF-related things to think about

- Multi-morbidity and frailty
- Risk of HF medications and diseases (Parkinson’s, dementia)
- Cause of falls and blood pressure
- Oedema and reduced mobility
- Renal & liver dysfunction (ascites)
- Hyponatraemia or hypocalbuminaemia
- Anaemia + iron deficiency
- Depression
- Psycho-social elements of illness
- Impact on families (incl DCM)
Aims

- Brief recap - definitions of heart failure, basic terminology and aetiology
- Updates on the diagnosis and clinical course of HF
- Management of HF
  - Pharmacological
  - Non-pharmacological
  - Lifestyle
  - Palliation
Definition of heart failure

Pathophysiological definition
- Inability of the heart to generate a cardiac output sufficient to pump adequate oxygenated blood to meet the demands of the body despite an adequate filling pressure

Clinical definition
- Clinical syndrome characterised by symptoms (breathlessness, fatigue and oedema) accompanied by signs (raised JVP, rales) caused by structural/functional cardiac abnormality → cardiac output and/or raised intracardiac pressure at rest or during stress

Descriptive terms
- Acute vs chronic
- Systolic vs diastolic
- Right vs left
- Low output vs High output
- HFrEF vs HFmrEF vs HFpEF
- Dilated cardiomyopathy (DCM)
- (Peripartum cardiomyopathy (PPCM))
Descriptive terms

- Acute vs chronic
- Systolic (LVSD) vs diastolic
- Right vs left
- Low output vs High output
- HFpEF vs HFmrEF vs HFrEF
- Dilated cardiomyopathy (DCM)
- (Peripartum cardiomyopathy (PPCM))

ESC definition

What is ‘end-stage’ heart failure?
(I prefer the term ‘advanced heart failure’, otherwise we focus on ‘the end’)

- Advanced stage but often advanced age
- Refractory symptoms despite optimal therapy
- > 3 hospital admissions with decompensation in < 6 months
- Dependent for > 3 activities of daily life
- Cardiac cachexia
- Resistant hyponatraemia
- Albumin <25 g/litre, ascites
- Multiple shocks from ICD
- A co-morbidity conferring a poor prognosis, e.g. terminal cancer


13

14

15
Aims

- Definitions of heart failure and basic terminology
- Aetiology
- Diagnosis and clinical course of HF
- Management of HF
  - Pharmacological
  - Non-pharmacological
  - Lifestyle
  - Palliation

Is aetiology important?

- Some have reversible or treatable causes
- Some require specific treatment
- Problems result from the severity of the damage, the rate of progression and the cause
- Premature death
- Some (cardiomyopathies) run in families
- Some causes have an adverse risk…
Aims

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- Diagnosis
- Management of HF
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  - Non-pharmacological
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Heart Failure

Can be hard to recognise and challenging to treat

Development of Heart Failure Events
Clinical course of HF with types & intensities of available therapies including palliative care

Transition to advanced HF
- Oral therapies
- A time for many major decisions
- Consider T & MEC, escalation of care plan to a palliative approach (not frequent)

Clinical course
- Traditional care – disease modifying therapies
- Palliative care: including symptom management

Severity of symptoms = severity of damage

Table 4.1 Symptoms and signs typical of heart failure

<table>
<thead>
<tr>
<th>Major</th>
<th>Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PND</td>
<td>Peripheral oedema (bilaterally)</td>
</tr>
<tr>
<td>Orthopnoea</td>
<td>Night cough</td>
</tr>
<tr>
<td>Elevated JVP</td>
<td>Dyspnoea on exertion</td>
</tr>
<tr>
<td>Pulmonary creps</td>
<td>Hepatomegaly</td>
</tr>
<tr>
<td>3rd heart sound</td>
<td>Pleural effusion</td>
</tr>
<tr>
<td>Cardiomegaly on CXR</td>
<td>Heart rate &gt; 120/min</td>
</tr>
<tr>
<td>Pulmonary oedema on CXR</td>
<td>Weight loss ≥ 4.5kg in 5 days*</td>
</tr>
</tbody>
</table>

Minor criteria
- Peripheral oedema
- Night cough
- Dyspnoea on exertion
- Hepatomegaly
- Pleural effusion
- Heart rate > 120/min
- Weight loss ≥ 4.5kg in 5 days

* Weight loss ≥ 5kg in 5 days considered a major criterion if in response to diuretic therapy

Framingham criteria for a clinical diagnosis of heart failure

2 major or 1 major and 2 minor criteria required:
100% sensitivity but only 78% specificity.

Minor
- Peripheral oedema (bilaterally)
- Night cough
- Dyspnoea on exertion
- Hepatomegaly
- Pleural effusion
- Heart rate > 120/min
- Weight loss ≥ 4.5kg in 5 days*

* Weight loss ≥ 5kg in 5 days considered a major criterion if in response to diuretic therapy
Symptoms & Length of life

NYHA classification
Class I: No symptoms
Class II: Symptoms on ordinary exertion
Class III: Symptoms on minimal exertion
Class IV: Symptoms at rest

The more severe the symptoms, the greater the risk to life
Diuretics (such as frusemide) improve symptoms but do not lengthen life

Other common symptoms esp in advanced HF

- Lack of energy
- Breathlessness
- Feeling drowsy
- Dry mouth
- Numbness/tingling in hands/feet
- Difficulty sleeping
- Worrying
- Cough
- Feeling sad
- Pain
- Change in taste
- Weight loss

Other symptoms

- Worrying
- Cough
- Feeling sad
- Pain
- Change in taste
- Weight loss

Aims

- Definitions of heart failure and basic terminology
- Aetiology
- Clinical course of HF
- Diagnosis
- Management of HF
  - Pharmacological
  - Non-pharmacological
  - Lifestyle
  - Palliation
**UPDATES IN THE DIAGNOSTIC ALGORITHM**

ESC definition

<table>
<thead>
<tr>
<th>Type of HF</th>
<th>Preserved ejection fraction (HFP EF)</th>
<th>Reduced ejection fraction (HFr EF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of patients</td>
<td>50%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Proportion of patients have not been prospectively evaluated against gold standard.


HF=heart failure; HFpEF=heart failure with preserved ejection fraction; HFrEF=heart failure with reduced ejection fraction; LVEF=left ventricular ejection fraction
2018 NICE Diagnostic Algorithm

Take a detailed history and perform clinical examination

- Perform ECG. Consider CXR, bloods, urinalysis, PEFR or spirometry
- Measure NT proBNP

- High BNP: >4000pg/ml (116pmol/l)
- Raised BNP: 1000-4000 (29-116)
- Normal BNP: <100 (<29)

Think about diagnoses in:
- known IHD
- Atrial Fibrillation
- Unresolving chest sepsis/COPD
- Late onset 'asthma'
- Breathlessness and HTN or diabetes

HF unlikely. Consider alternative causes

HF unlikely. Consider alternative causes

Caution

- The level of NT proBNP does not differentiate between types of HF
- Obesity, African or afro-caribbean family origin, or Rx with ACEi, BB, ARBs or MRA can reduce levels of NPs
- High levels of NPs can have causes other than HF:
  - Age >70
  - LVH
  - Ischaemia
  - Tachycardia
  - RV overload
  - Hypoaemia incl PE
  - Renal dysfunction
  - Septic
  - COPD
  - Diabetes
  - Cirrhosis of liver

Role of imaging

- Diagnosis of heart failure
  - Detection of LV and/or RV systolic and/or diastolic impairment

- Assessment of severity
  - Assessment of LV and RV systolic function, diastolic function and dimensions
  - Assessment of dysynchrony

- Helps in determining cause & complications
  - Valvular pathology
  - Cardiomyopathies
  - Regional wall motion abnormalities
  - Thrombus
Patterns of LGE to guide diagnosis & prognosis

Exclude CAD with CT if CP

Excellent Rule out test
In multicentre trials NPV > 95% in unselected patients
? Benefits of seeing early atherosclerosis
Genetics of Heart Failure

- Gene abnormality - 1/5 to 1/2
- Large number of genes cause DCM
  - >80 (and counting) account for less than half of inherited cases
  - condition behaves similar regardless of gene cause
  - 1 or 2 important exceptions (Lamin A/C) where the condition is aggressive
- Very important for family screening
  - family members at risk
  - great interest in prevention


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UPDATES ON HOW TO MANAGE HEART FAILURE
Management

Standard management of HF ideally via integrated HF and palliative care services

- Pharmacological
- Non-pharmacological treatment
  - Invasive procedures
    - Revascularisation, surgery, ICDs, PPM, CRT
- Lifestyle
- Rehabilitation
- Monitoring
- Advanced HF (diuretics, home O2, VADs, Transplantation)
- Palliative care

"Looking after end-stage heart failure is not rocket science, it is much more difficult. The trajectory of a rocket is predictable; the course of heart failure is not. Patients are not made of metal, and it matters what happens to them."

Clinical scenario

- 67 year old male in A+E having woken from his sleep unable to breathe. He cannot complete a sentence due to being unable to breathe.
- You listen to his chest and there are diffuse crackles all over
- He has swelling of his legs and after a succinct history you have established a 6 week Hx of worsening SOB
- What do you do next?

AHF – Management

Normally we do this...

Assessment
- Detailed history and examination
- Arterial blood gases (if needed to guide $O_2$ therapy)
- Venous bloods
  - biochemistry: U&Es, LFTs, troponin, TSH, glucose
  - haematology: FBC, clotting screen, (anaemia screen)
- ECG
- Chest x-ray
- Echocardiogram (or equivalent imaging) – to detect LV systolic impairment, identify cause and assess severity

Management of acute HF

- Sit up, 100% $O_2$ high flow
- Do an ECG, FBC, U&E, cardiac enzymes, ABG, CXR
- Sublingual 2 puffs nitrates or oral to enhance myocardial perfusion
- Oxygen to keep $SaO_2 \geq 95\%$ (or 88-92\% if chronic lung disease)
- Consider IV opiates (diamorphine 2.5-5mg) with anti-emetic (eg. metoclopramide 10mg bolus) to reduce anxiety and preload
- IV/SC frusemide 40-80mg IV to reduce fluid retention & pulmonary oedema
- If systolic >90 then give IV infusion isosorbide dinitrate 2-10mg/h titrated to BP, if sys <90 then treat as cardiogenic shock - caution for drop in BP
- In advanced situation or in cardiogenic shock, can consider:
  - IV inotropic drug (dobutamine or other) to increase contractility and CO
  - IV dopamine to enhance renal perfusion to prevent renal failure
  - Rarely IV aminophylline to enhance contractility and bronchodilate (slow)
  - Assisted ventilation (CPAP & T1 resp failure)
  - Treat underlying cause/precipitant
- Start prognostic drugs once LVSD confirmed and plan safe d/c and follow-up
AHF – Management

Principles of treatment
- Treat congestion – diuretics, vasodilators (caution), ultrafiltration
- Treat hypoxia / distress – opiate, oxygen, ventilatory support (CPAP), treat congestion
- Treat hypotension / hypoperfusion – inotropes, intra-aortic balloon pump (IABP), ventricular assist device (VAD), cardiac transplantation
- Treat precipitant(s) – e.g. acute coronary syndromes, arrhythmias, acute mechanical problem (e.g. ruptured mitral valve), myocarditis, anaemia
- Do not stop HF drugs unless good reason to (e.g. hypotension)
- Refer to heart failure specialist - cardiogenic shock is an emergency

AHF guidelines

Management of oral therapy < 48hrs
Chronic heart failure management

THERAPEUTIC ALGORITHM

Guidelines

Clinical trials
Objectives of treatment for chronic HF

1. Prognosis
   - reduce mortality

2. Morbidity
   - relieve symptoms and signs
   - improve QoL
   - eliminate oedema and fluid retention
   - increase exercise capacity
   - reduce fatigue and breathlessness
   - reduce the need for hospitalization
   - provide end of life care

3. Prevention
   - occurrence of myocardial damage
   - progression of myocardial damage
   - remodelling of the myocardium
   - recurrence of symptoms and fluid accumulation
   - hospitalisation

Treatment of HFrEF vs HFpEF

Therapeutic Algorithm
Treatment

– Standard approach in the management of HF:

  • Confirm diagnosis, aetiology, educate and monitor every 6 months

  • If for palliative management…
    – Symptom control
    – Supportive, holistic care

Treatments options

Diuretics for relief of congestion and fluid retention

Salt, weight, exercise, smoking, alcohol, cholesterol, HTN, DM, anaemia, CKD, pregnancy vaccinations, driving

Revascularisation

Rehabilitation

Af/Anticoagulation

RRT

Palliation

SGLT-2i

Sacubitril-valsartan

ARNI
Mechanisms of action

To overcome the state of ‘neurohumoral imbalance’ from:

- Activation of the sympathetic NS
- The renin-angiotensin system
- Natriuretic peptides
- Ventricular dilatation
- Ventricular remodelling

Remember:

MAP = CO x TPR
CO = SV x HR
SV = EDV – ESV
EDP is important

Step wise therapy in heart failure


Top 15 tips

1. Start meds at low dose and titrate gently upwards at short intervals (eg every 2 weeks)
2. Measure renal function before & <2 weeks after starting ACEi & after each dose increment
3. Measure BP before and after each dose increment
4. Once target dose reached monitor treatment monthly for 3 months then at least every 6 months and at any time of acute illness
5. Switch unlicensed BB to one licensed for HF
6. Consider empagliflozin in patients with T2DM in order to prevent or delay the onset of HF
7. Hydralazine in those with NYHA II IV stable CHF with LVSD and in SR rate >75bpm in addition to standard therapy or when BB is not tolerated or contra-indicated
8. Entresto recommended for treating symptomatic HF with EF only in NYHA II IV with LVEF <35% and in those already taking a stable dose of ACEi/ARB
9. Hydrazine with nitrate if mod/severe HF with EF, esp in Afrocaribbeans
10. Digoxin - for worsening or severe HF/EF despite first line treatment - after specialist input
11. Do not routinely monitor dig level (measure 8-12 hours post last dose if toxicity or non-adherence)
12. In CKD, eGFR <45mim1.73m2 consider lower doses ± slower titration of ACEi/ARBs, MRAx and digoxin. If eGFR <30, base with renal physician
13. Revascularisation: do not offer this routinely in HF/HF with CAD
14. In those with severe refractory Sx or cardiogenic shock, think about IABP, inotropes tend to kill and refer for transplantation
15. Offer a personalised, exercise-based cardiac rehabilitation programme unless unstable
Caveats

- Do not start ACEi if haemodynamically significant valve disease until assessed by a specialist
- Do not withhold BB solely because of age, PVD, ED, DM, pulmonary disease or COPD
- Avoid verapamil, diltiazem, short-acting dihydropyridine agents in HFrEF
- Consider amiodarone in consultation with a specialist and review 6-monthly thereafter and screen LFTs, TFT’s lungs
- If HF and AF, follow anticoagulation guidance (caution in renal and liver impairment)
- If SR but history of thromboembolism, LV aneurysm or intracardiac thrombus, consider anticoagulation

Summary of prognostic treatments

Diuretics

- For relief of symptoms and signs of congestion – no mortality benefit
- Not contraindicated by renal failure, hyponatraemia or hypotension
- Classes:
  - loop (first-line) e.g. furosemide – inhibit Na-K-2Cl carrier in thick ascending loop of Henle
  - DCT - thiazide (synergistic adjuncts) e.g. bendroflumethiazide – inhibit active reabsorption of Na in distal convoluted tubule
  - collecting duct - MRA
What about subcutaneous furosemide?

- For patients nearing the end of life, especially who wish to remain at home or to avoid an inappropriate admission to hospital, consider subcutaneous furosemide.
- It avoids the necessity of intermittent intravenous furosemide and the siting of a cannula.
- The syringe driver pumps used are lightweight, enabling mobility and continued independence.
- The twenty-four hour infusion reduces intrusion into the patient’s life and allows community staff to plan care around the timing of the infusion change.
- It can facilitate discharge from hospital for those who are end of life but requiring ongoing treatment with parenteral diuretics for symptom control.
- Shown to be effective in healthy volunteers (Vernea A) with complete bioavailability and equal diuresis (Sica et al) and used in an elderly life setting with HF (Johnson, Farless & PCF 6).


Galindo-Ocana J et al (2013) Subcutaneous furosemide as palliative treatment with advanced and terminal phase heart failure BMJ Supportive and Palliative Care; vol 3: p7-9


Sica D A et al. (2018) Subcutaneous Furosemide in Heart Failure JACC: Basic to Translational Science; 3: 25-34


Subcutaneous Furosemide in last months of life

Indications for use
- Patients requiring parenteral diuretics:
  - for symptom control
  - who are unresponsive to high dose oral diuretics
  - with poor or no venous access
  - where care is being delivered at home or subcutaneous furosemide will facilitate their transition home
- The heart failure nurses, cardiologists or specialist palliative care team will advise on the use of thiazide diuretics

How to administer
- Use a 1:1 conversion ratio e.g. 120mg PO OD = 120mg / 24 hours via continuous subcutaneous infusion (CSCI) using a McKinley T34 syringe driver
- This represents a dose increase as approximately 60% oral bioavailability
- Furosemide is available in a concentration of 10mg/ml and in two sizes – 2mls and 5mls
- Make up to 21mls with 0.9% w/v sodium chloride
- Note – can use a maximum of 210mg Furosemide subcut / 24 hours
- Site the cannula (BD Saf-T-Intima™) on upper arms or anterior chest wall
- Avoid siting the cannula over bony prominences or damaged tissues
- Cover the syringe driver as furosemide degrades when exposed to light

How to assess
- Check weight daily – aiming to lose up to 1KG / 24 hours
- Check symptoms daily – breathlessness and discomfort due to limb swelling
- Check renal function and electrolytes every 3 – 7 days
- Discuss with HF nurses, cardiologists or palliative care team if any concerns or symptoms are not managed
- Stop the CSCI once target weight reduction achieved
- Please complete audit data collection forms to help inform best practice.
More tips

- PND or orthopnoea = decompensated HF requiring escalation of diuretics
- Diuretic options: oral, s/c, i/v
  - 40mg furosemide = 1mg bumetanide
- Weight increasing by 1kg/day and developing peripheral oedema
  - 1kg gain = likely 1L fluid on board
  - For patients in last days of life, avoid weighing daily & checking fluid balance as will not improve symptoms
  - For longer prognoses, review every 24 hours and aim for weight loss of <1kg/day (monitor bloods twice weekly unless would not change Mx plan)
- If someone deteriorates acutely – ?ESRF or congestion – consider drains
- Remember that anaemia is common in HF and iron replacement is beneficial in deficiency
- Ideally do not stop prognostic HF medications unless in last few days of life
- Stop statins

Important side effects of medications

Treatments to avoid in HF

- Statins also do not improve prognosis in HFrEF
- Uncertainty regarding anticoagulation in severe LVSD
- Aliskiren is not recommended as an alternative to ACEi or ARB
Assessment of stroke risk

What about in very severe LVSD?

Treatment options

Diuretics for relief of congestion and fluid retention

- Salt, weight, exercise, smoking, alcohol, cholesterol, HTN, DM, anaemia, CKD, pregnancy vaccinations, driving

Sacubitril-Valsartan

- Digoxin
- Ivabradine
- H-ISO
- SGLT-2i

Revascularisation Rehabilitation AI/Anticoagulation RRT Palliation

Lifestyle advice

- Education
- Lifestyle modification:
  - stop smoking
  - reduce alcohol intake (if excessive) – abstain if alcohol-related DCM
  - reduce weight (if overweight)
  - limiting salt intake (<3 g/day) is not routine – but reduce intake for people with high salt and/or fluid consumption
  - limit fluid intake (<1.5-2 litres/day) in those with recurrent fluid retention or dilutional hyponatraemia
  - Advise all patients with HF to avoid salt substitutes as they contain potassium
- Exercise - rehabilitation
- Vaccination – Offer annual vaccination against influenza, pneumococcal disease
- Discuss pregnancy and contraception
- Air travel is possible for the majority
- Check DVLA guidelines for individuals
- Co-morbidities - anaemia, BMI, CAD, HTN, erectile dysfunction, DM, gout, electrolyte abnormalities, lung disease, sleep disordered breathing, valve disease
The human face of heart failure

- Atrial fibrillation
- Diabetes
- Anaemia
- Iron deficiency
- CHD/angina
- Hypertension
- Asthma/COPD
- Prostatic disease
- Psychiatric illness
- Hyperkalaemia
- Arthritis
- Glaucoma
- Cachexia
- Hyperuricaemia/gout
- Renal impairment
- Sleep apnoea
- Parkinson’s disease
- Cognitive impairment

Others

- Drugs
  - Treatment
  - Prevention
- Devices/interventions/surgery

‘Devices’ in heart failure patients

- Electronic implantable cardiac devices (EICD)
  - Pacemakers (incl. cardiac resynchronisation therapy (CRT))
  - Implantable cardioverter-defibrillators (ICD)
  - Implantable rhythm monitors (loop recorders (ILR))
- Prosthetic valves
- Pulmonary pressure monitors (cardiomems)
• Pacemakers and ICDs monitor and can intervene
• Loop recorders only monitor
• Remote monitoring of all EICDs possible

Device therapy

Several different types of implantable defibrillators - increasing choice
- all can detect and treat dangerous heart rhythms
- some can act as pacemakers
- some can help the heart improve its efficiency
- some can wirelessly send data to physicians
- some MRI conditional
- CRT - allows simultaneous pacing of RV and LV

Biventricular pacemaker
Proposed mechanisms

Studies (n randomised)
- MIRACLE (453)
- MUSTIC SR (58)
- MUSTIC AF (43)
- PATH CHF (41)
- MIRACLE ICD (369)
- CONTAK CD (490)
- COMPANION (1520)
- PATH CHF II (89)
- MIRACLE ICD II (186)
- CARE HF (814)

RCTs of CRT

CRT Improves
- NYHA Class
- QoL Score
- Exercise capacity (6MWT, pVO2)
- LV Function (EF, degree of MR)
- Reverse remodelling (LVEDV)
- Hospitalisation
- Mortality

General Treatment

Benefits
- Prevent a catastrophe
  - Insurance
- Other (important) benefits

Risks
- Pain
- Infection
- Bleeding & clots
- Pneumothorax (1%)
- Damage to the heart (cardiac rupture & death (<1%)
- Failure to site LV lead (5%)
- Lead displacement
- Mistaken rhythms
- Device failure
- Replace 5-10 years
- May never be used

Individualised treatment
- Detailed discussion & choice
Adapted from NICE TAG 314 published in June 2014


NICE Guidance

DEVICES – when and how to deactivate

Deactivation at the end of life: Principles and Practice - Dr James Beattie

• HCPs have a duty of care to consider withdrawal of non-contributory therapies and the distress caused by resuscitation measures in those near the end of life with a progressive and irreversible decline in their condition.
• Autonomy – the right of an individual to make their own decisions based on personal values
• Beneficence – the obligation to benefit people (prevent SCD)
• Non-maleficence – the obligation not to cause harm (cause uncomfortable shocks)
• Justice – fair and equitable treatment based on guidelines, practice, the law and societal norms

ICD shocks in Dying Patients

- Post mortem interrogation 130 patients died between 2003 – 2010, 35% had ventricular arrhythmias in the last hour before death, 31% received a shock in their last 24 hours, some receiving > 10 shocks in their final hours (Westerdahl et al 2014)
- It is likely that most patients and their families do not realise that deactivation is an option (Lampert, 2014)
- Patients may choose to keep their device active – even when they have a lilac form DNACPR in place but we have a duty to make them aware of the implications of this for themselves and their families and carers

ICD & CRT-D deactivation

- Discuss deactivation PRIOR to implant and re-mention in subsequent contacts thus avoiding the shock of it being raised when very ill/vulnerable and emotional state within days/hours of death
- Introduce idea that deactivation is possible – painless and reversible, does not have to be a ‘heavy’ conversation if this approach used
- In CRT-D, we should explain that it is possible to deactivate the shock function but continue with CRT for symptom control
- We can get very focused on our own agenda as clinicians
- Loved ones have to live with the memory of how someone died

ICD & CRT-D deactivation

- How to deactivate a device?
  - Elective deactivation via pacing/device clinic by a cardiac physiologist
  - At the bedside in hospital
  - In the community/hospice via an outreach service
  - In emergencies temporary deactivation can be performed by placing a doughnut magnet over the device but full deactivation is still required
  - Check your local protocol
Other possible things you may come across

93

Gadgets

94

HOW DO WE BRING ALL OF THIS TOGETHER?
INTEGRATION OF MULTI-DISCIPLINARY HF SERVICES

95
Service mapping - A novel integrated HF service

- Specialist nurse/CHFN
- Symptomatic patient
- University links + integrated research

- Community-based diagnostics
- Primary care services
- Community cardiology clinic
- Palliative care

- Private health care/diagnostics providers
- Community rehabilitation programmes
- Community-based diagnostics
- Palliative care

- Palliative care
- Advanced HF services (HA)

Comprehensive integrated HF MDT service design

- Hospital HF ‘team’ activities:
  - IP + OP Management (in hospital vs day hospital)
  - Clinical trials (HF trials)
  - Cardiac rehabilitation
  - Home care

- MDT communications:
  - HF MDT
  - Cardiology
  - Medicine
  - Rehabilitation

- Evaluation
  - Symptom evaluation + risk assessment
  - Core diagnostics and imaging
  - ICC for Genomics
  - Cardiac pathology
  - Cardiac catheterisation + haemodynamics

- Management:
  - Hospitalised HF
  - Outpatients
  - Primary + secondary care

Components of heart failure review

- Acquired vs inherited cardiomyopathy
  - Cardiomyopathies
  - Familial arrhythmia
  - Myocarditis
  - Congenital heart disease
  - Syndromic disorders
  - Neuromuscular disease
  - Inherited metabolic syndromes

Colleen K McIlvennan, and Larry A Allen BMJ 2016; 353: bmj.i1010
Integration of palliative care and heart failure

Team based palliative care

CASE 1
Case 1

- 35 year old gentleman SOBOE, PND and orthopnoea, pedal oedema
- Hx depression and paranoid psychosis
- SHx: prior substance misuse
- Father died with DCM aged 64 years
- Bloods: renal function normal but deranged LFTs, troponin 0.04, BNP >2000, DCM screen (CK, ANA/ANCA/ferritin, virology etc) negative, genetics pending
- ECG: LBBB

Assessment and work up

- To assess symptoms and confirm diagnosis
- Establish aetiology
- Assess severity
- Commence appropriate treatment (to treat cause and prognostic medical therapy)
- Consider risk assessment
  - Arrhythmia/SCD, thrombus/thromboembolic risk
- Consider family screening

ECG - LBBB
Diagnosis and outcome

- Angiogram confirmed in part ischaemic cardiomyopathy but with probable confounding familial DCM
- Commenced on prognostic therapy
  - ACEi, BB, MRA (subsequently entresto ± ivabradine), anticoagulation for thrombi
- Under close review for optimisation of prognostic HF medications
- Referred for CRTD for primary prevention
  - CRTD if broad QRS
- Genetic testing in view of FHx
- Referred for assessment for transplantation
- CHFN FU, cardiac rehab, vaccinations
- **still intermittently smoking…and psychiatric illness is a potential contra-indication to Tx**
Case 2:

- 63 year old lady complex ischaemic cardiomyopathy, previous CABG 4 and CVA
- Moderate-severe LVSD, new severe MR and TR (retracted PMVL)
- Refractory pulmonary oedema with slow offloading despite high dose diuretics
- Morbid obesity, diabetes on insulin with macro and microvascular complications
- PVD with angioplasties, CKD, OSA (CPAP), high BMI (Weight 97 kg)
- Poor prognosis, not for intubation – and not a candidate for transplantation in view of her significant co-morbidities, turned down locally for surgery
Investigations

- **Bloods:** urea 30, creatinine 147-157. Normocytic anaemia with essentially normal iron studies, hyponatraemia (sodium 130 - 127)

- **ECG:** Sinus rhythm rate 84 bpm, left bundle branch block QRS duration 146 ms, T-wave inversion high lateral leads

- **RHC Pressures (mmHg):**
  - RA 21/20/17 (mean RAP 17 mmHg)
  - PA 79/31/51 (mPAP 51 mmHg)
  - Wedge 25/48/34 (wedge 34 mmHg with v-wave to 48)
  - RV 78/15/21 mmHg
  - BP 109/57 MAP 68 mmHg (systemic non-invasive)

- **Saturation:** PA 34%

- **MPS:** no reversible ischaemia – so not for PCI/intervention

Indicators for transplant referral

- Two or more admissions for treatment of decompensated HF within the last 12 months
- Persistent clinical evidence of overt heart failure after optimised medical treatment
- Calculated SHFM score indicating a ≥20% 1-year mortality
- Echocardiographic evidence of right ventricular dysfunction or increasing pulmonary artery pressure on optimal treatment (aim to refer before the PA systolic pressure exceeds 50 mmHg)
- Anaemia, involuntary weight loss, liver dysfunction or hyponatraemia attributable to heart failure
- Deteriorating renal function attributable to heart failure or inability to tolerate diuretic dosages sufficient to clear congestion without change in renal function (aim to refer before creatinine clearance falls below 50 ml/min or the eGFR falls below 40 ml/min/1.73 m2)
- Significant episodes of ventricular arrhythmia despite full drug and electrophysiology/device treatment
- Increasing plasma BNP or NT-proBNP levels despite adequate HF treatment

Management

- Diuresed extensively and ascitic drain
- Not a candidate for transplantation or AF ablation
- Attempted to seek compassionate use of MitraClip - did not qualify for RESHAPE HF 2 study
- Deteriorated and referred for palliative management
- Discharged home with palliative supportive care
Indicators of approaching end stage HF

- SHFM >20% 1 year mortality
- RV dysfunction (before PAP >50mmHg)
- Low Na
- Low Hb
- Abnormal LFTs
- Worsening renal function
- High / rising BNP
- Low peak VO2

Banner N et al. Heart 2011;97:1520-1527

Seattle HF model

- N=1125
- LVEF 0.21
- NYHA 3.6
- validated in 9942 pts
- Higher score associated with SCD
- Can assess effect of interventions

Case 3:

- 81 year old lady seen in AAU - 'fluid overload' - weight 127kg
- Diagnoses:
  1. Heart failure, NYHA class III
  2. Severe LV systolic dysfunction (LVEF 30%)
  3. Moderate aortic stenosis, AVA 1.0 (low flow, low gradient, absent S2)
  4. CKD IV - creatinine 200
  5. T2 Diabetes
  6. Gout
  7. Hypertension
  8. Osteoarthritis
  9. Obesity BMI 35 to 40
  10. Prior stroke
- Drug Hx: Ezetimibe 10 mg, insulin Humulin, Linagliptin 5 mg, Warfarin, Allopurinol, Bisoprolol 6.25 mg once a day, Gliclazide 80 mg twice a day, Digoxin 0.25 mcg, Bumetanide 2 and 1 mg.
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  1. Heart failure, NYHA class III
  2. Severe LV systolic dysfunction (LVEF 30%)
  3. Moderate aortic stenosis, AVA 1.0 (low flow, low gradient, absent S2)
  4. CKD IV - creatinine 3.0
  5. T2 Diabetes
  6. Gout
  7. Hypertension
  8. Osteoarthritis
  9. Obesity BMI 35 to 40
  10. Prior stroke
- Drug Hx: Ezetimibe 10 mg, Insulin Humulin, Linagliptin 5 mg, Warfarin, Allopurinol 300 mg once a day, Gliclazide 80 mg twice a day, Digoxin 0.25 mcg, Bumetanide 2 and 1 mg.

Case 3:

- Imaging: CXR

Case 3:

- Bloods:

Note: renal function has improved with diuresis
Case 3:

- Stubborn diuresis - what action to take?
- Increase diuretics - iv loop, with additional metolazone ± BFZ to aid diuresis
- Close monitoring of Sx, weight and renal function and BP
- Addition of MRA to maintain potassium (not with ACEi given her AS)
- Daily weights to ensure loosing 1kg per day
- Postural BP to guide diuresis
- Review of AS to guide need for intervention
- Haematinics - given iv iron (ferrinject) as ferritin <100 (or Ferritin 100-300) and T-Saturations <20%. (This has a symptomatic benefit in HF. Oral iron is not well absorbed in this context)

Case 4:

- 56 year old previously fit and well prisoner, presented 28/1/18 with CP and Q waves V1-V4. Trop >50,000
- Dx? Taken directly to the cath lab: Occluded LAD
  Rx thrombectomy and DES
- Proximal CTO RCA
  Backfilling from Cx and collaterals left untreated
Case 4: TTE the next day

• Severe LVSD, significant MR. BP remained low, hypoxic but discharged.
• Presented the next day with SOB, hypoxia, pyrexia and raised inflammatory markers.
• CXR - Thoughts?
• Represented...

Case 4:

• Re-presented 6/2/18 with worsening SOB and pulmonary oedema.
• Referred to HF team - Rx iv diuretics and iv tazocin.
• Chest symptoms improved, oxygen requirements fell, inflammatory markers declined but blood pressure was always rather low - Not for beta blockade...
• Short runs of NSVT and 19/2/18 VT arrest on the ward - 1x shock and adrenaline with rapid recovery - given amiodarone
• Further VF arrest on 21/2/18 at 4am > shocked, with BP falling to around 60/40 and rising lactate and anuria with pulmonary oedema and required an FiO2 of 50% via Airvo.
• IABP inserted and a Swan-Ganz via his RIJ. His initial R heart measurements were PA sats 45%, PA 49/27/37, PCWP mean 27, CVP mean 10. He was treated with 15mg/h furosemide with amiloride to maintain K+
• Over the next 24-48h he improved fairly quickly. He passed 5-6l urine/day, urea and creatinine fell. His BP rose to around 105/70. The IABP was weaned and removed on 25/2/18. The Swan removed on 26/2, and the final measurements were PA 25/17 (23) 54%, PCWP 18, CVP around 0, CO 3.8 (therm). Weaned O2, able to lie flat.
• His furosemide was reduced to 7.5mg/h.
• 2 runs of slow monomorphic VT overnight, 5-10min long, around 100-105 bpm, asymptomatic, self-terminating. His renal function deteriorated and K rising - now a little dry but stopped amiloride.
Case 4:

Weight 79.3kg, 10kg drop.
Height 180cm.

Medications:
- Amiodarone 200mg tds (Day 5)
- Aspirin 74mg
- Atorvastatin 80mg
- Bisoprolol 1.25mg
- Clopidogrel 75mg
- Dalteparin 15000u (treatment dose for sluggish LV flow)
- Eplerenone 50mg
- Ezetimibe 10mg
- Furosemide 7.5mg/h
- Ramipril (vasodilation & prognostic)

Bloods:
- Cr 108 (risen from 94)
- Ur 11 (risen from 8.7)
- Na 132
- K 5.2
- WCC 14.39 (stable), neut 9.3
- CRP 26 (falling steadily)
- Hb 113
- Plt 211
- Alb 28
- Alk phos 83
- ALT 19
- Bil 12

Outcome:
- LVEF 15%, severe functional MR, spontaneous contrast - anti coagulated
- QRSd 110 - 120ms (ICD pending)
- Virology perfumed
- Blood group AB+
- Accepted by Papworth for VAD/Tx
  - What if he hadn’t have been accepted for a VAD
  - A VAD is only a bridge to Tx...

Conclusions
### Treatment options

- Diuretics for relief of congestion and fluid retention
- Salt, weight, exercise, smoking, alcohol, cholesterol, HTN, DM, anaemia, CKD, pregnancy vaccinations, driving

- Sacubitril-Valartan

- Revascularisation

- Rehabilitation

- AF/Anticoagulation

- RRT

- Palliation

### Updates in HF

- Guideline-driven diagnostic and therapeutic pathways
- Complex but need to place emphasis on prevention and optimisation of evidence-based HF care
- Break down the barriers that prevent us delivering quality HF care and think about how we better integrate palliative services for joint collaborative working
- Develop strategies to provide care closer to home
- Improve accessibility to services and engage our patients
- Provide quality, personalised care that is patient-centred, responsive and seamless across the care network

### Palliative care challenges in HF

- Uncertain disease trajectory and prognosis
- Siloed care and poor communication
- Lack of knowledge
- Overlay of comorbidity and frailty
- Life saving devices and complex trade-offs
- Limited evidence base
- Barriers to having 'the conversation'
  - Concern that hope will be taken away
  - Are we sure that everything that can be done has been done?
  - Complexity of ensuring whole team are in agreement
  - Emergency situations
  - Difficult access to advanced communication skills training

We need to tackle this together

- Develop an integrated palliative: heart failure MDT approach to care that focuses on communication, share decision making, advanced care planning and relief from symptoms
- Integrates psychological and spiritual aspects of care
- Enables a support system to help families cope during illness and bereavement
- Palliative care has applications across the stages of HF

NATIONAL INSTITUTE FOR CARDIOVASCULAR OUTCOMES RESEARCH (NICOR)
www.ucl.ac.uk/nicor/audits/heartfailure
National Annual Heart Failure audit 2015/16

How to arrange more experience in HF

- Consider a placement with the HF team in hospital or the community to shadow us
- Become a palliative care link with the HF team locally
- Looking to develop accreditation in HF
- Attend the BSH (British Society of HF) conference in March/November
- Help us learn as it’s never too early to raise the subject of advance care planning or device deactivation – the more frequently it is mentioned, the better
- If we wait for the ‘right time’ we will probably be too late

How to seek advice from the HF team?

- Know your local HF teams – hospital and community (esp CHFN)
- Telephone/email advisory support
- Know where to find your local protocols for managing HF (intranet, ESC/NICE guidelines (www.escardio.org)
Seek advice from your HF team

- If you need advice for any reason
- To answer a question, no matter how trivial
- If you feel that someone would benefit from cardiologist (HF specialist) or HF specialist nurse input
- If someone seems to have improved
- If someone would benefit from cardiac rehabilitation or further education (or to attend a programme such as ‘living with HF’ programme at Sobell House)
- If someone has questions that you do not feel appropriate to answer yourself
- If you need help with someone’s device


Please may I ask for your help?

- Prioritising HF research questions
- Please complete our HF questionnaire:
  - https://4o2bvy4f0.optimalworkshop.com/optimalsort/ahfpsp
- Looking for volunteers (patients, carers, health care workers) to attend a (free) workshop in Birmingham on 13th Feb (travel reimbursed) to help prioritise research questions
- Please let me know if interested:
  eleanor.wicks@ouh.nhs.uk


Thank you

Any questions?
Where to find further resources

- National heart failure audit
- National Institute for Health and Clinical Excellence (NICE) Guidance
- Chronic heart failure (August 2018)
- Chronic heart failure quality standard (June 2011)
- Acute heart failure: diagnosing and managing acute heart failure in adults (October 2014)
- ESC HF guidelines (2016)
- ACCF/AHA Guidelines (2013)
- Quality Standards - Chronic heart failure (2011)
- NHS England: Monitor - 2015/2016 Heart Failure Best Practice Tariff (BPT) proposed if specific criteria are met