

Hypertension to heart failure

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- HTN is one of the most important preventable causes of premature morbidity and mortality in the UK.
- Major risk for stroke, heart attack, heart failure, CKD, cognitive decline and premature death.
- Untreated HTN can lead to a progressive rise in BP.
- Vascular and renal damage can culminate in treatment resistant state.

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Hypertension

Primary (essential) hypertension

- No identifiable cause
- Can develop gradually over many years
- May be hereditary

Secondary hypertension

- Caused by underlying condition
- Tends to appear suddenly
- Causes higher blood pressure than primary hypertension
- Various medications

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Stages of HTN

Stage 1 hypertension
Clinic blood pressure is 140/90 mmHg or higher **and** subsequent ambulatory blood pressure monitoring (ABPM) daytime average or home blood pressure monitoring (HBPM) average blood pressure is 135/85 mmHg or higher.



Stage 2 hypertension
Clinic blood pressure is 160/100 mmHg or higher **and** subsequent ABPM daytime average or HBPM average blood pressure is 150/95 mmHg or higher.



Severe hypertension
Clinic systolic blood pressure is 180 mmHg or higher **or** clinic diastolic blood pressure is 110 mmHg or higher.

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Underlying Conditions for Secondary Hypertension

- Obstructive sleep apnoea
- Kidney problems
- Adrenal gland tumours
- Thyroid problems
- Certain congenital blood defects
- Medications such as birth control pill, cold remedies, decongestants, analgesia and some prescription drugs
- Illicit drugs such as cocaine and amphetamines
- Alcohol abuse
- Depression, anxiety and stress

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Risk Factors for Hypertension

- Age
- Race
- Family history
- Overweight or obesity
- Lack of exercise
- Smoking
- Salt intake
- Low potassium levels
- Vitamin D deficiency
- Alcohol abuse
- Stress
- Chronic conditions (CKD, diabetes and lung disease)
- Pregnancy

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Symptoms

- Used to be known as the “silent killer”
- Often no signs or symptoms of the underlying hypertension, even at high level readings.
- May sometimes present as headaches, SOB and nosebleeds.
- Symptoms are not specific and can vary from person to person

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Normal Values

- Systolic 120 to 140 mmHg
- Diastolic <85 mmHg



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Diagnosis

- Annual health check for population > 40 years
- High risk for blood pressure between 18 to 35 years should be checked annually
- Look for underlying conditions or risk factors which may precipitate HTN
- Check BP in both arms (if difference >20 mmHg, repeat measurement)
- Ensure you use the appropriate sized cuff
- If diagnosed with raised BP 140/90 or higher, take the best of three readings
- Offer ABPM and HBPM if 140/90 or higher
- Manage conservatively i.e. lifestyle changes
- Start treatment immediately for severe HTN (ie systolic >180 mmHg and diastolic >110 mmHg)
- Monitor for control
- Medications

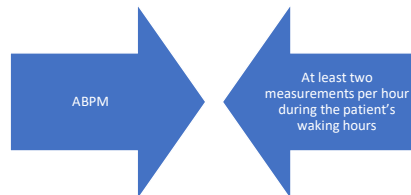
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Diagnosis

- Measure in both arms
- If difference in readings > 20 mmHg, repeat measurements
- If the difference in 2nd measurements remain > 20 mmHg, repeat measurement in the arm with the higher reading
- BP 140/90 or higher, take a second measurement during the consultation
- If 2nd measurement substantially different from first BP, take a third measurement
- Offer ABPM to confirm diagnosis (offer HBPM if unable to tolerate ABPM)
- Severe hypertension then consider anti-hypertensive drug therapy and carry out investigation for target organ damage ie CKD, retinopathy, LVH, CVD risk

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BP Measurements



- HBPM
- Two consecutive measurements taken whilst seated, at least one minute apart
- BP recorded twice daily ie morning and evening
- Measurements for at least four to seven days

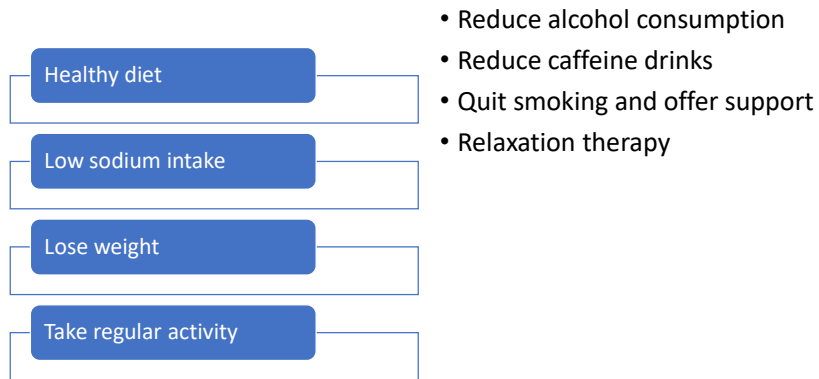
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Target organ damage

- Urine sample for albumin, creatinine ratio and haematuria
- Blood sample for glucose, electrolytes, creatinine, eGFR and cholesterol levels
- Examine fundi for retinopathy
- 12 lead ECG

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Lifestyle changes



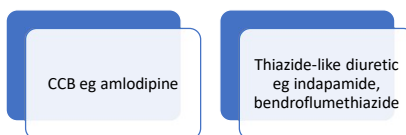
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Drug therapy

Age > 55 yrs

- ACE eg Ramipril
- ARB eg losartan
- Thiazide-like diuretic
- Beta blocker eg bisoprolol (not used to treat HTN, but considered for young people with intolerance to ACE and ARB, pregnancy and high sympathetic drive)
- Aldosterone antagonist eg spironolactone

Age > 55 yrs (African or Caribbean)



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What is Heart Failure?

- Heart failure (HF) can be a very debilitating condition affecting more than 900,000 people in the UK annually. This is due to structural or functional abnormalities which impair the pumping action of the left ventricle. As a result of this, patients may present with either left ventricular systolic dysfunction (LVSD), or HF with preserved ejection fraction (HFPEF). Evidence suggests that the majority of patients treated for LVSD, are commonly caused by coronary artery disease (CAD) and myocardial infarction.

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HTN to HF

- Increase in cardiac afterload in a hypertrophic myocardium together with increased peripheral vascular resistance, has an increased burden on the myocardium. Due to increased workload of the myocardium in HF, hypertension also contributes to ischaemia by increasing myocardial oxygen demand. Also, abnormalities in the electrolyte balance, water and neuro-hormonal activation plays a key role in the process from hypertension to HF. During hypertrophy and HF, there is an increase in activity of the renin-angiotensin-aldosterone system and B-adrenoceptor activity.

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What Causes Heart Failure?

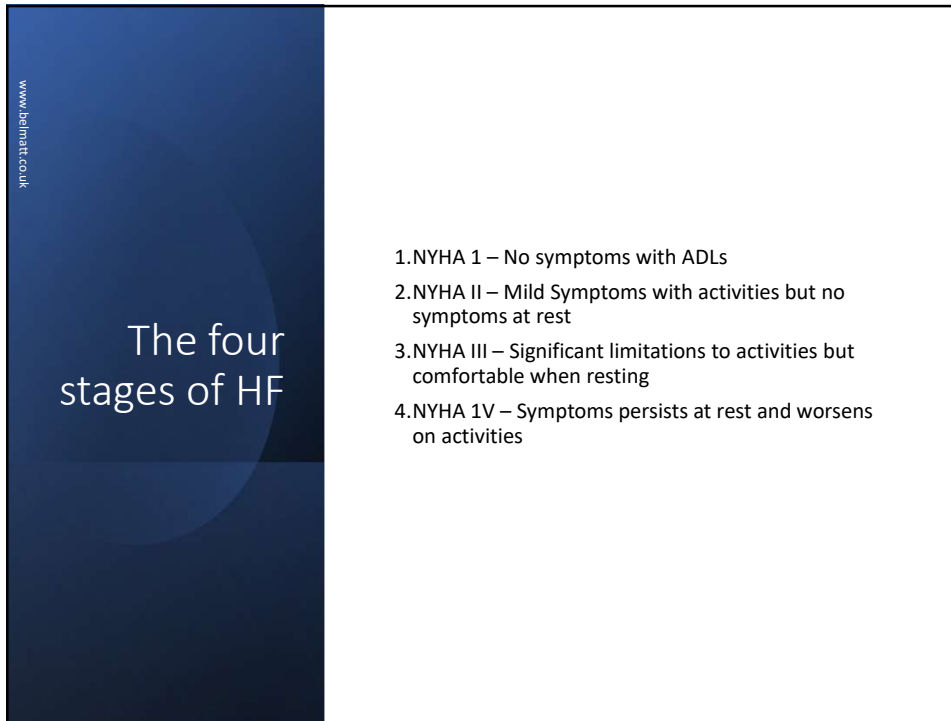
- Heart Attack – Damage of the heart muscles
- High blood pressure
- Cardiomyopathy disease of the heart muscle
- Virus Infection in the heart
- Heart Valve problems
- Drinking too much alcohol
- An irregular heart rate (Arrhythmia)
- Anaemia
- Thyroid gland disease

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Heart Failure in Older Patients

1. Coronary Artery Disease (CAD)
2. Hypertension
3. Valvular Heart
4. Cardiomyopathies
5. Diabetes
6. Chronic Lung Diseases
7. Medications and Treatments
8. Comorbidities

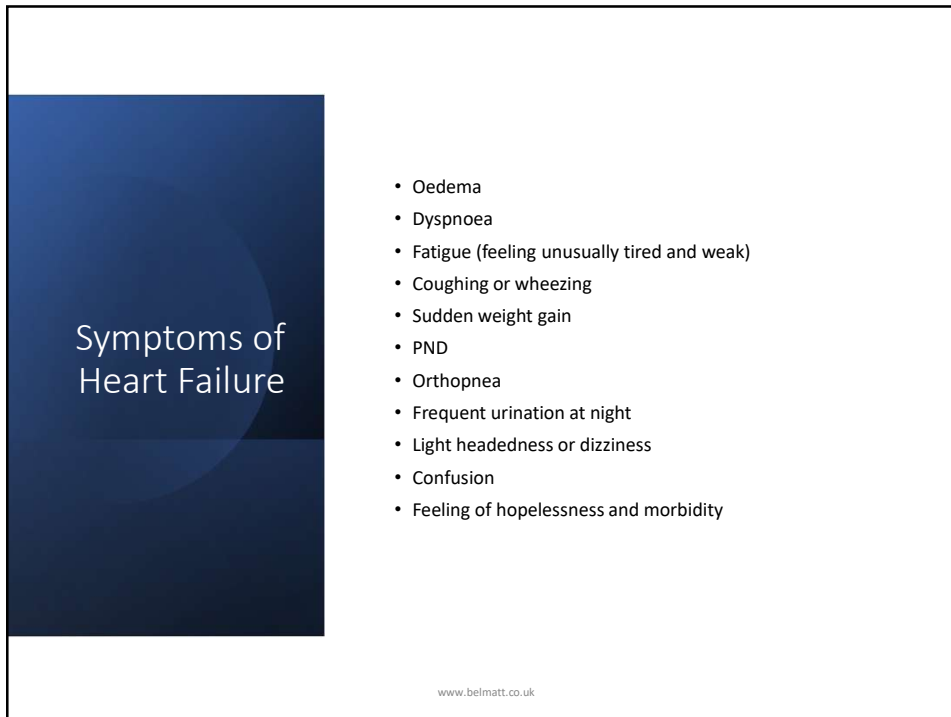
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The four stages of HF

1. NYHA I – No symptoms with ADLs
2. NYHA II – Mild Symptoms with activities but no symptoms at rest
3. NYHA III – Significant limitations to activities but comfortable when resting
4. NYHA IV – Symptoms persists at rest and worsens on activities



Symptoms of Heart Failure

- Oedema
- Dyspnoea
- Fatigue (feeling unusually tired and weak)
- Coughing or wheezing
- Sudden weight gain
- PND
- Orthopnea
- Frequent urination at night
- Light headedness or dizziness
- Confusion
- Feeling of hopelessness and morbidity

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1. **Shortness of Breath (Dyspnoea):** The most common symptom of heart failure is exertional or paroxysmal nocturnal dyspnoea. Older patients may report increased difficulty breathing during physical activity or while lying flat. They may describe a sensation of breathlessness, rapid breathing, or the need to sleep with multiple pillows for better breathing.
2. **Fatigue and Exercise Intolerance:** Older patients with heart failure often experience persistent fatigue and reduced tolerance for physical activity. They may feel exhausted even with minimal exertion and may have difficulty performing routine tasks or activities they previously managed easily.
3. **Fluid Retention and Oedema:** Peripheral oedema, particularly in the lower extremities, is frequently observed in older patients with heart failure. They may have swollen ankles, legs, or feet. Additionally, fluid retention can lead to weight gain and increased abdominal distension.
4. **Orthopnea:** Older patients with heart failure may have difficulty breathing while lying flat. They may experience orthopnea, a sensation of breathlessness that improves when sitting upright or propped with pillows.

Heart Failure in Older Patients

Symptoms of Heart Failure in Older Patients



Paroxysmal Nocturnal Dyspnea: Older patients with heart failure may wake up suddenly during the night with severe shortness of breath, coughing, and a sense of suffocation. This symptom, known as paroxysmal nocturnal dyspnea, can be a distinctive feature of heart failure.



Cough: Chronic cough, often accompanied by white or pink frothy sputum, can be present in older patients with heart failure. The cough may worsen at night or with activity.



Decreased Exercise Tolerance: Older patients with heart failure may notice a decrease in their exercise capacity. They may become easily fatigued during physical activity or experience rapid heart rate and shortness of breath with exertion.



Altered Mental Status: In severe cases of heart failure, older patients may experience confusion, disorientation, or changes in mental status. This may be due to reduced blood flow and oxygen supply to the brain.

Perform a thorough physical examination, paying particular attention to the following:

- Vital Signs: Measure the patient's blood pressure, heart rate, respiratory rate, and oxygen saturation.
- Jugular Venous Pressure (JVP): Assess the JVP to evaluate for elevated pressure, which can indicate fluid overload and right heart dysfunction.
- Auscultation: Listen to the heart sounds for any abnormal sounds, including murmurs, gallops, or extra heart sounds. Pay attention to any signs of pulmonary congestion, such as crackles (rales), in the lung fields.
- Peripheral oedema: Examine the lower extremities for the presence of pitting oedema, which can indicate fluid retention.
- Hepatomegaly and Ascites: Assess the liver for enlargement and palpate the abdomen for the presence of ascites, which can occur in advanced stages of heart failure.
- Lower Extremity Veins: Look for the presence of dilated or engorged veins in the legs, which can be a sign of venous congestion.

Physical Examination

1. Functional Assessment

- Evaluate the functional capacity and limitations of the patient.
 - Assess their ability to perform activities of daily living (ADLs) and exercise tolerance.
 - Functional assessment tools, such as the 6-minute walk test, can provide objective measures of exercise capacity.
1. Comorbidity Evaluation: Consider the presence of comorbidities that may contribute to or complicate heart failure management, such as chronic obstructive pulmonary disease (COPD), renal dysfunction, diabetes, or anemia. These conditions may require additional evaluation and management.

Functional Assessment

INVESTIGATION

- BNP or NTproBNP
- FBC
- ELECTROLYTES
- ECG
- ECHOCARDIOGRAM
- CHEST XRAY
- Cardiac MRI

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Diagnostic Tests:

- Depending on the clinical presentation and findings from the history and physical examination, additional diagnostic tests may be necessary to confirm the diagnosis of heart failure. These may include:
- Chest X-ray: This can reveal signs of pulmonary congestion, such as interstitial edema, pleural effusion, or cardiomegaly.
- Electrocardiogram (ECG): Assess the ECG for any signs of arrhythmias, conduction abnormalities, or evidence of previous myocardial infarction.
- Echocardiography: This non-invasive imaging test provides detailed information about the structure and function of the heart, including assessing left ventricular ejection fraction, valvular function, and wall motion abnormalities.
- Transoesophageal echocardiogram: This is carried out with an endoscope via the oesophagus to investigate for thrombus, valvular function, shunts, cardiac infection.
- B-type Natriuretic Peptide (BNP) or N-terminal pro-BNP (NT-proBNP) levels: These blood tests can help support the diagnosis of heart failure and assess its severity.

BNP and NTproBNP

- B-type natriuretic peptide (BNP) and N-terminal pro b-type natriuretic peptide (NT-proBNP) are substances that are produced in the heart and released when the heart is stretched and working hard to pump blood. Tests for BNP and NT-proBNP measure their levels in the blood in order to detect and evaluate heart failure.

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BNP and NTproBNP

- BNP is actually produced primarily by the left ventricle of the heart (the heart's main pumping chamber). It is associated with blood volume and pressure and with the work that the heart must do in pumping blood throughout the body. Small amounts of a precursor protein, pro-BNP, are continuously produced by the heart. Pro-BNP is then cleaved by the enzyme called corin to release the active hormone BNP and an inactive fragment, NT-proBNP, into the blood.
- A level between 400 and 2000 ng/L should have TTE and specialist referral for HF.
- A measurement of NT-proBNP >2000 ng/L should be urgently referred to HF specialist within 2 weeks for treatment with TTE.

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How Do We Manage Heart Failure?

Adjusting medications to suit the patient and treat heart failure effectively to manage symptoms

Teaching the patient to manage the condition by:

- *Eating a healthy heart diet – (low salt and fat)*
- *Managing your fluid balance including monitoring weight*
- *Stop Smoking*
- *Limiting alcohol intake*
- *Take regular activity*

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HF

- Angiotensin II is an important initiator of extracellular remodelling, which contributes to the pathogenesis of atherosclerosis and cardiac hypertrophy (Georgiopoulou et al, 2012). Early initialisation and titration of ACE inhibitor, together with beta-blockade and neuro-hormonal antagonist are recommended in the treatment of HF.

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Main Drugs in Heart Failure

- **ACE inhibitors** – They lighten the workload of your heart and easier for your heart to pump blood around your body . (*Ramipril, Lisinopril, Enalapril, Perindopril, Captopril*)
- **ARB** - entresto
- **Beta blockers** – Prevent the heart from beating too quickly and too forcefully.(*Bisoprolol, Carvedilol, Atenolol, Metoprolol*)

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Main Drugs in Heart Failure

Diuretics (Water pills) – Help your kidneys get rid of excess fluid by making you pass more urine. (*Furosemide, Bumetanide, Metolazone, Bendrofluazide*)

Aldosterone antagonist – Gets rid of excess fluid by passing more urine. (*Eplerenone, Spironolactone*)

Digoxin – Slows down and strengthens your heartbeat, helps control irregular heart rhythms and helps your heart pump blood around your body efficiently.

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Medication management in Older Patients



- The medication management for heart failure in older people generally follows similar principles as in younger individuals, but there may be some considerations due to age-related changes, comorbidities, and medication tolerability. Here are some key points to consider regarding medication choices for heart failure in older people:
- Start Low, Go Slow: Older patients are often more susceptible to medication side effects and may have altered drug metabolism. It is important to start medications at lower doses and gradually increase them as tolerated, closely monitoring for any adverse effects

Medication in Heart Failure



Angiotensin-Converting Enzyme Inhibitors (ACE inhibitors): Medications such as enalapril, lisinopril, or ramipril are used to inhibit the effects of angiotensin-converting enzyme, leading to vasodilation, reduced fluid retention, and improved cardiac function.



Angiotensin Receptor Blockers (ARBs): Drugs like losartan, valsartan, or candesartan block the action of angiotensin II, resulting in similar effects as ACE inhibitors. ARBs may be used as an alternative if ACE inhibitors are not tolerated.

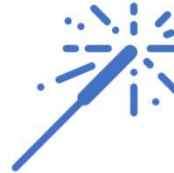


ACE Inhibitors and ARBs: Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) are commonly used in older patients with heart failure, as they can improve symptoms and outcomes. However, caution is needed to monitor for potential hypotension, electrolyte imbalances, and renal function changes.

Medication: Beta Blockers



Beta-Blockers: Medications like carvedilol, metoprolol succinate, or bisoprolol are beta-blockers that reduce heart rate and blood pressure, leading to improved cardiac function, decreased workload on the heart, and better outcomes in heart failure patients.



Beta-Blockers: Beta-blockers, such as carvedilol, metoprolol succinate, or bisoprolol, are beneficial in older patients with heart failure. However, careful monitoring is required for any signs of bradycardia, heart block, or low blood pressure, as older patients may be more susceptible to these side effects.

Other Medication

1. Digoxin: Digoxin is a medication that increases the strength of heart contractions and helps control heart rate in certain cases of heart failure. It is often used in patients with heart failure and atrial fibrillation.
2. Ivabradine: Ivabradine is a medication that specifically slows down the heart rate without affecting blood pressure. It can be used in patients with heart failure and reduced ejection fraction who have symptoms despite optimal medical therapy.
3. Sacubitril/Valsartan: This medication is a combination drug that combines sacubitril, a neprilysin inhibitor, with valsartan, an angiotensin receptor blocker. It is used in patients with heart failure and reduced ejection fraction to reduce the risk of cardiovascular death and hospitalization (patients intolerant to ACE, ARBs)
4. SGLT2 for patients with diabetes, HF and kidney impairment/CKD

Diuretics and MRA's

Diuretics: Diuretics, such as furosemide or hydrochlorothiazide, are commonly used to relieve fluid overload in older patients with heart failure. However, it is important to monitor renal function, electrolyte levels (especially potassium), and orthostatic hypotension.

Mineralocorticoid Receptor Antagonists (MRAs): Drugs such as spironolactone or eplerenone help block the effects of aldosterone, a hormone that can contribute to fluid retention and cardiac remodeling. MRAs can reduce symptoms and improve survival in patients with moderate to severe heart failure.

Mineralocorticoid Receptor Antagonists (MRAs): MRAs, such as spironolactone or eplerenone, can be used in selected older patients with heart failure to reduce morbidity and mortality. However, renal function and potassium levels should be closely monitored, as older patients may have an increased risk of hyperkalemia.



Polypharmacy

Medication Interactions and Polypharmacy: Older patients with heart failure often have multiple comorbidities and may be taking multiple medications. It is important to assess for potential drug interactions and carefully evaluate the risks and benefits of adding new medications to the existing regimen.

Individualized Approach: The management of heart failure in older patients should be individualized, taking into account their overall health status, functional capacity, cognitive abilities, and preferences. Shared decision-making with the patient and their caregivers is crucial in optimizing medication therapy.

Pacemakers

- Biventricular pacemakers (CRT-P)
- Biventricular with ICD (CRT-D)
- ICD

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Other management of care

- Revascularisation
- Cardiac Rehabilitation
- Palliative Care

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Indications for CRT

1. Older patients with heart failure and reduced ejection fraction may benefit from CRT if they have evidence of electrical dyssynchrony, such as a widened QRS complex on an electrocardiogram (ECG) or left bundle branch block.
2. CRT can help improve cardiac function, reduce symptoms, and potentially increase survival in selected patients.
3. Consideration should be given to the patient's functional capacity and quality of life. Pacemaker therapy, including CRT, is most beneficial in patients who have significant heart failure symptoms that limit their daily activities and impair their quality of life.



CRT and ICD

1. CRT aims to synchronize the contractions of the ventricles in patients with electrical dyssynchrony, which occurs when the electrical signals that coordinate the heartbeat are delayed or disrupted. In older patients with heart failure, CRT can improve ventricular function, increase cardiac output, and reduce symptoms such as shortness of breath and fatigue.
2. Implantable Cardioverter-Defibrillator (ICD)
Therapy: Heart failure patients, including older individuals, are at an increased risk of life-threatening ventricular arrhythmias, such as ventricular tachycardia and ventricular fibrillation. An ICD is designed to monitor the heart's rhythm continuously and deliver an electrical shock (defibrillation) if a dangerous arrhythmia is detected, effectively terminating the abnormal rhythm and restoring normal heart function.

Combined benefits

1. Combined Benefits: By combining CRT and ICD functions in a single device (CRT-D), older patients with heart failure can benefit from the advantages of both therapies. CRT improves cardiac function and reduces heart failure symptoms, while the ICD component provides protection against sudden cardiac death by promptly treating life-threatening arrhythmias.
2. Simplified Management: Using a single device for CRT-D therapy eliminates the need for two separate devices (CRT and ICD) and reduces the overall burden of device implantation and subsequent follow-up. This approach simplifies management and decreases the risk of potential complications associated with multiple device implants.
3. Mortality Reduction: The combination of CRT and ICD therapy has been shown to improve survival outcomes by addressing both electrical dyssynchrony and potential life-threatening arrhythmias.

Conclusion

- Accurate diagnosis of heart failure is crucial.
- Medication Management:
- Lifestyle Modifications
- Fluid Management
- Comorbidity Management
- Regular Follow-up and Monitoring
- Palliative Care and Advanced Care Planning
- Interdisciplinary Collaboration

The management of heart failure in older patients requires a person-centered approach that balances the optimization of heart failure therapies with individual patient goals, preferences, and quality of life. Regular reassessment and adjustment of treatment strategies are essential to ensure the best possible outcomes for older patients with heart failure.

Questions



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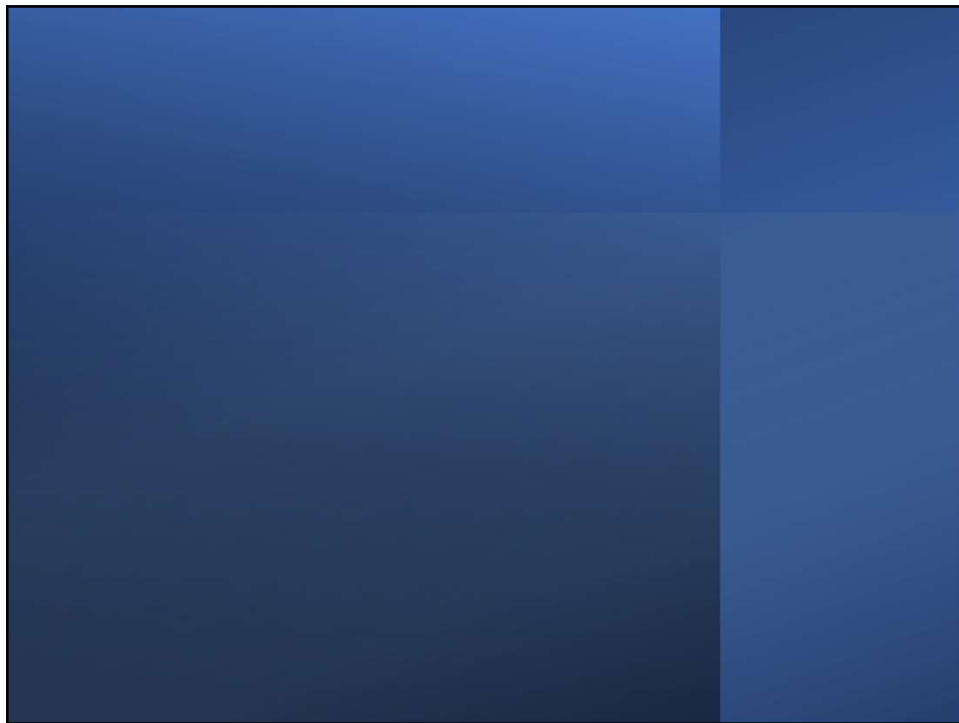
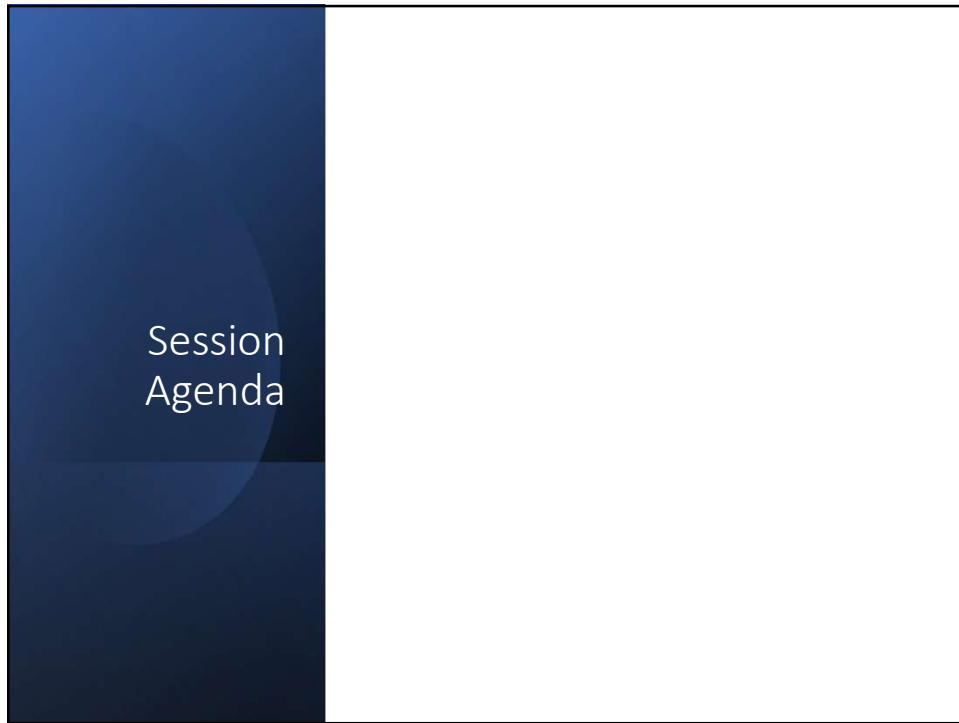
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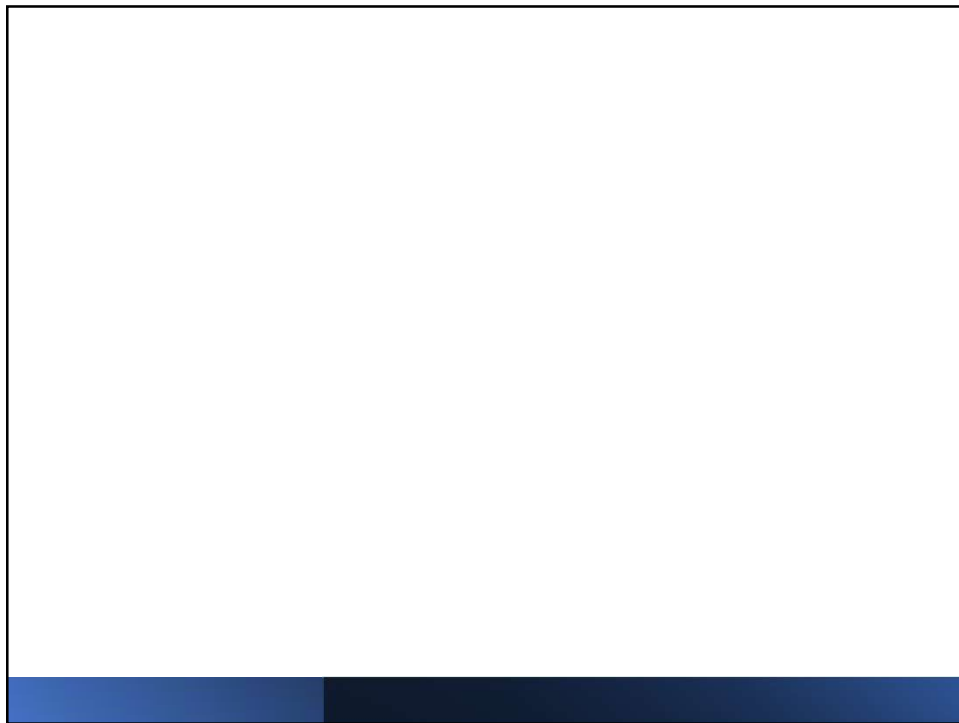
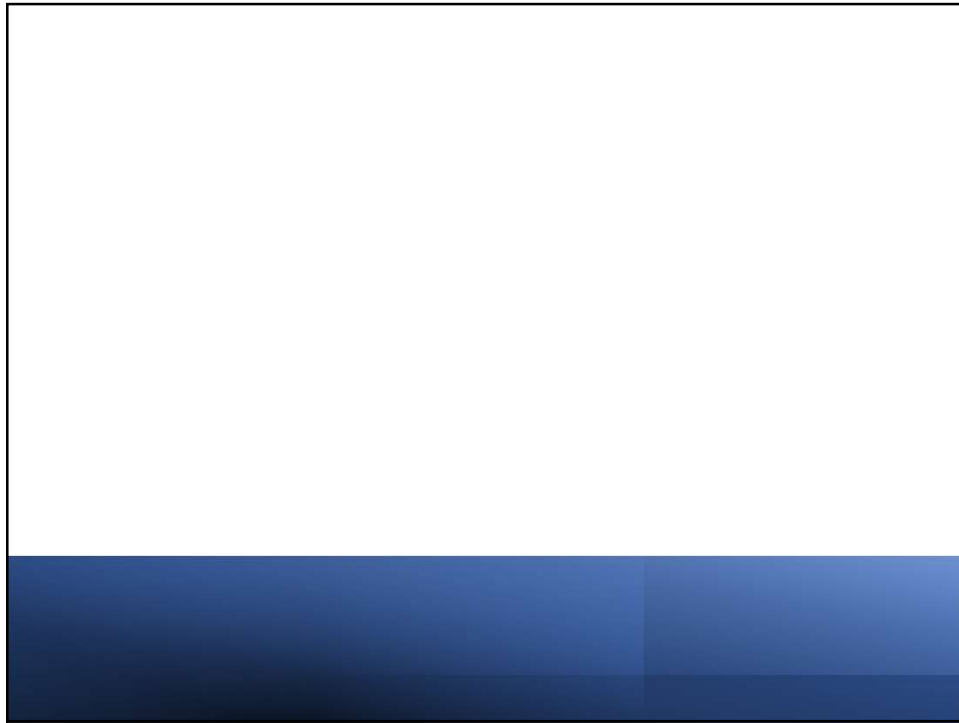


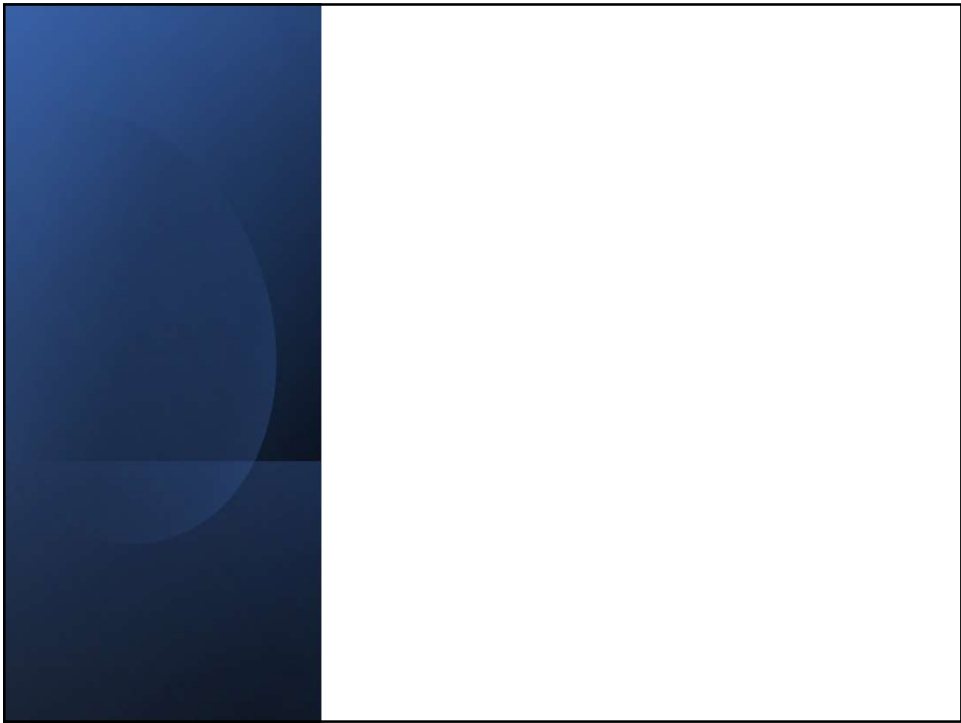
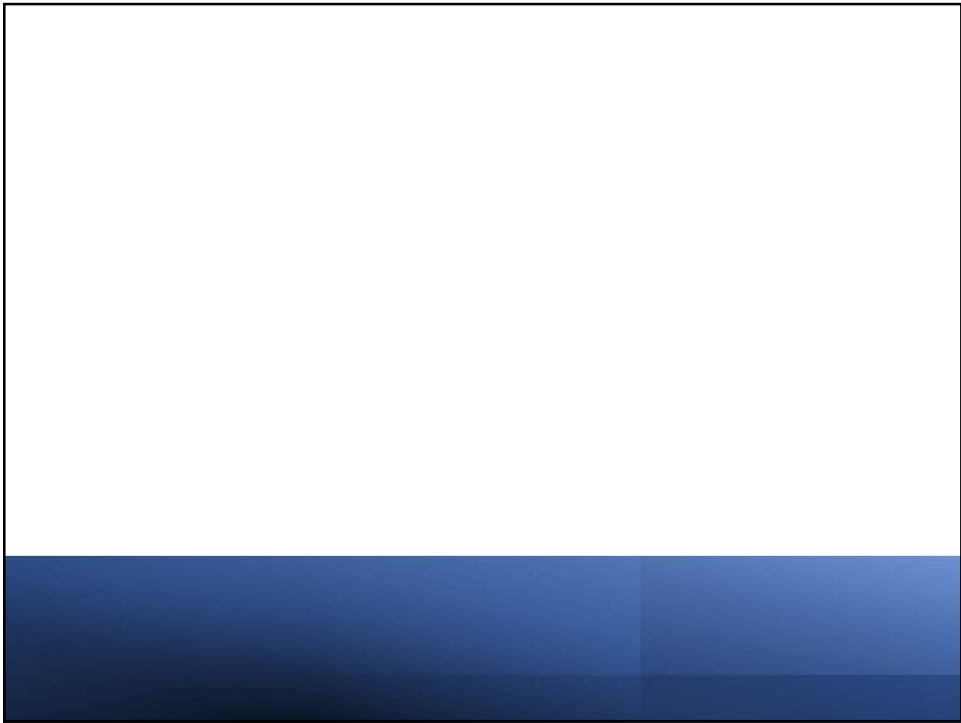
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