Diagnosis and initial management of heart failure

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ABSTRACT

Timely diagnosis of heart failure leads to anticipated introduction of effective treatments, improved quality of life, and better outcomes. However, for many patients, diagnosis of heart failure is still made too late for a variety of reasons, including the heterogeneity and lack of specificity of its signs and symptoms, the absence of universally accepted diagnostic criteria and limited access to specialist care. Implementing and potentially expanding the use of natriuretic peptide testing for individuals at high risk can aid identification of preclinical cardiac dysfunction amenable to treatment, delay progression of disease or refute a heart failure diagnosis in equivocal cases. In addition, greater public awareness of the signs and symptoms of heart failure and how it differs from other cardiovascular diseases may lead affected individuals to seek prompt medical attention. Improving early diagnosis and treatment relies on bringing heart failure to the fore in both the public arena and the clinic.

BACKGROUND

Timely diagnosis of heart failure is important to guide disease management and improve quality of life and long-term outcomes. Current definitions of heart failure rely primarily on patient history, clinical signs such as peripheral oedema, and subjective symptoms like breathlessness on exertion that, particularly in the elderly, are common but non-specific and very difficult to detect, unless obvious.[1 2] Therefore, for many patients, a diagnosis of heart failure is made late, often leading to a prolonged hospitalisation and a high risk of death.[3] The clinical presentation of heart failure can be highly heterogeneous and recent reports emphasise that a substantial proportion of patients presenting to their primary care doctors with heart failure signs and symptoms do not undergo appropriate investigations or receive a specialist referral.[3 4] Indeed, a range of diagnostic tests – for instance, an ECG, a chest X-ray, spirometry, or blood tests – are frequently performed in primary care and help to identify other highly prevalent conditions – such as atrial fibrillation, anaemia, chronic obstructive lung disease, or a chest infection – that might cause symptoms mimicking heart failure, with which they often overlap. Initiation of therapy with a loop diuretic can also mask signs and improve symptoms, but cannot resolve the underlying cardiac dysfunction that too often remains uninvestigated and untreated until a serious cardiovascular event occurs, usually a few months later.[5 6] To rule out a diagnosis of heart failure, the European Society of Cardiology (ESC) guidelines recommend measuring natriuretic peptides in all patients in whom this diagnosis is suspected.[7] In the UK, the National Institute for Health and Care Excellence (NICE) also recommends measuring natriuretic peptides in primary care to determine the need and urgency for specialist referral and transthoracic echocardiography.[8] When natriuretic peptide levels are elevated, an echocardiogram is required to assess left ventricular systolic function, to suggest the likelihood of elevated left ventricular filling pressures with or without venous hypertension, and to exclude serious valvular disease; in other words, it guides subsequent management and therapeutic decisions.

However, many additional barriers to optimal heart failure care contribute to diagnostic delays and failures, including the lack of universally accepted diagnostic criteria, an increasing number of elderly patients living with heart failure as part of a constellation of other conditions,[9] the limited availability of healthcare professionals who have confidence and expertise in heart failure diagnosis and management,[10] and the consequent prolonged waiting time to access specialist care, which has been exacerbated by coronavirus disease 2019 (COVID-19). In this article, we will consider, in detail, strategies that might facilitate initial diagnosis and treatment.

METHODS

In January 2022, a group of experts gathered for an in-depth consideration of current practices in the diagnosis and initial management of heart failure. Following a brief presentation, we drew on our clinical and research experience to identify shortcomings in the current approaches and guidelines for early diagnosis and management. Case studies, featuring distinct presentations of heart failure in two patients, were provided to aid the discussion. We further discussed opportunities to educate the public and strategies to improve clinical practice, with the aims of hastening the diagnosis of heart failure, guiding initial treatment, and improving patient outcomes.

DISCUSSION

Considering obstacles to early clinical diagnosis and treatment of heart failure

Missed opportunities for diagnosis

In the UK, around one in every two patients receives an initial diagnosis of heart failure too late, either in the emergency department or in another hospital ward,[11–13] which is costly, stressful for patients and their families, and associated with a poor prognosis: the reasons for these findings are complex. Echocardiographic screening of the general adult population suggests that preclinical cardiac dysfunction is common and increases with ageing, particularly a dilated and dysfunctional left atrium, reflecting chronically elevated left ventricular filling pressures, and

Case study 1

Mrs Jennifer Logan, Scenario 1

- Wakes up in the middle of the night with severe breathlessness.
- Calls ambulance. Transferred to hospital.

1. **Atrial Fibrillation:** 130 bpm
2. **Blood Pressure:** 180/110 mmHg
3. Pulmonary Oedema
4. **Haemoglobin:** 11.8 g/dL
5. **Estimated Glomerular Filtration Rate:** 45 mL/min/1.73 m2
6. **Echocardiogram:** Left ventricular hypertrophy, left atrial dilation, left ventricular ejection fraction 55%, mild mitral regurgitation

Treatment on admission: valsartan, amlodipine and metformin

What would the experts do?

Acute treatment should include oxygen, diuretics, and a vasodilator. Following the acute phase, atrial fibrillation rate should be controlled with digoxin and/or beta-blocker, and risk and benefits of anticoagulation considered. Hypertension should be treated more aggressively, a mineralocorticoid receptor antagonist might be introduced, pending normal potassium levels (<5 mmol/L), and anaemia needs to be investigated. Further diagnostic tests, such as cardiovascular MRI, might be warranted if other aetiologies – for instance, cardiac amyloid – are suspected. Preferably, the patient should not be discharged without disease-modifying therapy for heart failure – such as SGLT2 inhibitor treatment once stabilised– and intervention to ensure that related risk factors, such as hypercholesterolemia and diabetes, are optimally controlled. An early follow-up visit is recommended within a few weeks from discharge.

Case study 2

Mr David Jones, Scenario 1

- Increasing breathlessness, cough and weight gain. Smoker.
- Treated with inhaled steroids and bronchodilators – poor response.
- Reassessed by GP: orthopnoea, dyspnoea and pitting oedema to thighs.
- Referred and admitted to hospital.

1. Orthopnoea, pitting oedema – sacrum and thighs
2. **Sinus rhythm:** 104 bpm
3. **Blood Pressure:** 134/84 mmHg
4. **Haemoglobin:** 13.3 g/dL
5. **Estimated Glomerular Filtration Rate:** 83 mL/min/1.73 m2
6. **Echocardiogram:** Left atrial and left ventricular dilation, left ventricular ejection fraction 34%

What would the experts do?

Prior to hospital admission, the patient should have been assessed for heart failure by measurement of NT-proBNP levels. Awareness of heart failure as a diagnostic possibility among the public, patients, and primary care physicians is important to ensure the diagnosis is not missed.

After hospital admission, the first-line treatment should be diuresis, followed by treatment with an angiotensin receptor neprilysin inhibitor (preferentially over an ACE inhibitor) and a beta-blocker. Prior to discharge, the patient should receive a mineralocorticoid receptor antagonist, with the possible addition of an SGLT2 inhibitor if there are no contraindications. This sequence represents one of the many that might have been considered and have been discussed.

Mr David Jones, Scenario 2

- Post-discharge out-patient clinic.
- Better, but still breathless on moderate exertion.
- 11.4 kg lighter compared with admission weight!

1. Oedema free
2. **Sinus rhythm:** 86 bpm
3. **Blood Pressure:** 108/68 mmHg
4. **Haemoglobin:** 14.1 g/dL
5. **Estimated Glomerular Filtration Rate:** 71 mL/min/1.73 m2
6. **Echocardiogram:** left atrial and left ventricular dilation, left ventricular ejection fraction 40%
7. **Treatment:** Furosemide 40 mg/day, ramipril 10 mg/day, eplerenone 25 mg/day, carvedilol 6.25 mg two times per day

What would the experts do?

Some experts feel that the patient is receiving appropriate care. Others recommend replacing ramipril with sacubitril/valsartan, with the possible addition of SGLT2 inhibitors, and increasing the dose of beta-blockers or adding ivabradine, to further reduce heart rate. They further recommend additional investigations to identify a potential ischaemic cause.

an increased risk of cardiovascular events such as heart failure.[14 15] Similarly, elevated plasma concentrations of N-terminal pro B-type natriuretic peptide (NT-proBNP) are highly prevalent even in asymptomatic individuals with cardiovascular risk factors and are associated with a higher risk of cardiovascular events and death.[16 17] Importantly, there is accumulating evidence to suggest that both aggressive management of cardiovascular risk factors and early identification and treatment of preclinical cardiac dysfunction might improve cardiac structure, delay progression of disease and heart failure onset and, potentially, prolong life.[16 18 19]

To reach a diagnosis of heart failure, close cooperation between the patient and the healthcare professional is required, and it relies on honest discussion, the ability to listen and understand preferences, and mutual trust. Diverse cultural or linguistic backgrounds or religious beliefs can also cause misunderstandings or influence an individual's health perception.[20] For many patients, there may be a high threshold for symptom recognition. In particular, as patients age, they may expect to experience some of the symptoms of heart failure, such as shortness of breath and fatigue, more frequently or to a greater degree. Together, these expectations could delay a request for help.[21] On the other hand, the threshold for primary care physicians to consider a diagnosis of heart failure also appears to be high. Using a database of electronic records from UK general practices, Bottle and colleagues found that 40% of patients subsequently diagnosed in hospital had already complained of signs or symptoms of heart failure with their primary care physicians, but in many of those cases (~40%) no action was taken and only one in four had been referred for further specialist assessment.[13] Due to changes in guidelines and improved local diagnostic pathways, the use of natriuretic peptide testing in suspected heart failure cases is increasing in primary care in the UK, particularly among the elderly; however, the majority of patients had not had an NT-proBNP evaluation in the 6 months prior to their initial diagnosis.[22]

Pressures on the healthcare system

Providing optimal care with scarce resources is challenging, and this has been particularly evident in the context of the COVID-19 pandemic: already-stretched health services are now facing patient backlogs, in both primary and secondary care, which are likely to persist into the near future. Primary care physicians have limited time to see each patient and there are often multiple diagnostic possibilities at first presentation with further investigations and follow-up consultations required. Most patients prefer care within their own community where possible and this helps to alleviate pressure on hospitals. However, some patients with severe symptoms of heart failure require hospital admission to access appropriate and timely care. The need to self-isolate when ill and increasing rates of anxiety, burnout, depression, and work-related stress among healthcare professionals,[23 24] exacerbated during the COVID-19 pandemic, led to staffing shortages and may discourage younger colleagues from pursuing their intended future careers. The necessity to treat patients on an outpatient basis, the increasing demand for echocardiography,[25] and the inability to access the most indicated diagnostic tests[26] will delay further accurate diagnoses and, therefore, appropriate treatments, with potential costs to patient outcomes.

More education is required to expedite heart failure diagnosis and ensure appropriate care

The high proportion of patients who are not appropriately investigated prior to being diagnosed with heart failure in hospital[22] highlights that further education might be beneficial to both physicians and patients to improve quality of care and outcomes. Greater awareness of NT-proBNP testing in primary and secondary care can aid differentiation between heart failure and conditions with similar symptoms. Diagnostic use of NT-proBNP is now central in all heart failure guidelines, but actual use of this test remains suboptimal, with regional and national differences. Educational initiatives that promote a more widespread use of natriuretic peptides are ongoing,[27] but additional research may be needed, to guide not only the use but also the interpretation of NT-proBNP results, as old age and comorbidities such as renal dysfunction, atrial fibrillation, or obesity may complicate the evaluation of intermediate levels. Electronic health records are an ideal target for audits and identification of patients at high risk, which could be assisted by using artificial intelligence. However, diagnostic codes are often inaccurate. Queries based on repeat prescriptions – for instance, prescriptions for loop diuretics – family history, or risk factors that are associated with heart failure might improve the identification of patients with preclinical heart failure who should receive NT-proBNP testing. While it is not practicable to screen all patients for NT-proBNP levels prior to the appearance of signs or symptoms of heart failure, it may be possible to survey patients with simple questionnaires to identify early warning signs. However, any enhanced screening must be undertaken with the intent and ability to make therapeutic decisions. More education is also needed in both primary and secondary care settings to increase awareness of and differentiate between heart failure phenotypes, as this distinction is essential for treatment choices and risk stratification. For those admitted to hospital with dyspnoea, the use of point-of-care lung ultrasound in emergency rooms could expedite and streamline the level and quality of care of patients with heart failure or other acute conditions.[28] Identification of bilateral, diffuse B-lines, an ultrasound sign of pulmonary congestion, even in those with a preserved left ventricular ejection fraction, might indicate the need for diuretic therapy and a cardiology referral[29] while avoiding unnecessary departmental transfers prior to establishing a final diagnosis.

In our experience, the general public is largely unfamiliar with the signs and symptoms of heart failure, and patients frequently attribute their symptoms to ageing or other pre-existing illnesses.[21] For many, the term "heart failure" can still be confused with other cardiac events, such as a heart attack or a cardiac arrest. During the past few decades, national public education campaigns have contributed to early detection of other cardiovascular conditions – such as stroke and myocardial infarction – and many forms of cancer, and, therefore, campaigns have the potential to boost awareness of early signs of heart failure among those who do not realise they are actually unwell, their carers, or their family members. The Breathless, Exhausted, Ankle swelling, Time for a simple blood test (BEAT-HF) acronym has been proposed as a simple tool to help members of the public and primary care physicians recognise signs of heart failure and act accordingly,[30] and the Pumping Marvellous Foundation, a patient-led charity, has embraced the acronym via social media. The British Society for Heart Failure is also seeking to raise awareness with its Freedom from Failure – The F Word campaign.[31] However, greater engagement and collaboration among specialist healthcare societies dealing with this condition are needed to create broader campaigns and reach a large swathe of the public, to reduce the misuse of the term in the public sphere and guide patients with undiagnosed symptoms to seek care.

SUMMARY

Although early diagnosis and appropriate initial treatment of heart failure are essential to ensure better outcomes for patients, several barriers remain to achieving these goals. Public education is critical, as many people remain unaware of the common signs of heart failure. Encouraging patients to seek intervention for symptoms and signs they may have previously dismissed – such as breathlessness, fatigue and ankle swelling – will provide greater opportunities for early diagnosis and treatment. Among medical professionals, further education is also recommended to encourage physicians to think of heart failure early in the diagnostic process for patients with suspected symptoms and signs. Improved access to and utilisation of the most appropriate heart failure diagnostic tools are also required, to take full advantage of the available scientific knowledge and offer the best quality of care to patients.

Key points

- Early diagnosis and treatment of heart failure are limited by low awareness of its signs and symptoms among the public, which could be boosted by national campaigns
- Medical professionals should suspect heart failure at the first signs and symptoms, especially among patients with long-term conditions that increase the risk of heart failure, including diabetes, coronary artery disease, atrial fibrillation, hypertension, and obesity
- Better access to and utilisation of diagnostic tools like NT-proBNP testing could aid early diagnosis and improved management of heart failure

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