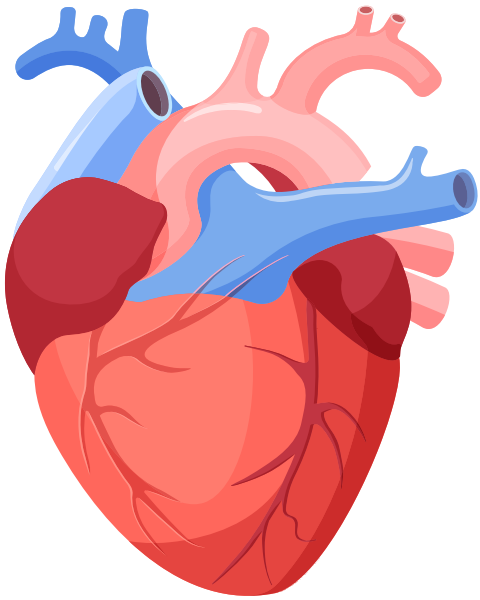
WUK BPS

Best Practice Statement

The use of compression therapy for peripheral oedema: considerations in people with heart failure

2023



An introduction to heart failure

Oedema and heart failure

Compression therapy: a practical guide

Compression in patients with heart failure: a practical understanding

A pathway for using compression therapy in heart failure

Wounds UK

BEST PRACTICE STATEMENT: THE USE OF COMPRESSION THERAPY FOR PERIPHERAL OEDEMA: CONSIDERATIONS IN PEOPLE WITH HEART FAILURE

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Wounds UK
A division of Omniamed Communications,
108 Cannon Street
London EC4N 6EU, UK
Web: www.wounds-uk.com

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EXPERT WORKING GROUP:
Jacqui Fletcher (Chair), Independent Nurse Consultant

Leanne Atkin, Vascular Nurse Consultant, Mid Yorkshire NHS Trust; Research Fellow, University of Huddersfield; Member of Legs Matter

Donna Brown, Lymphoedema Advanced Nurse; Provide CIC Community Partnerships, Mid Essex; Accelerate CIC, Accelerate Academy Associate Educator

Roo Byrom, Heart Failure Nurse Specialist, York and Scarborough Teaching Hospital NHS Foundation Trust

Garry Cooper-Stanton, Deputy Head of School, University of Central Lancashire; Clinical Nurse Specialist Lymphoedema, Doctoral Researcher, Queens Nurse

Rebecca Elwell, Trustee, British Lymphology Society; Macmillan Lymphoedema ANP and Team Leader, University Hospitals of North Midlands NHS Trust

Sam Haigh, Lead Nurse in Tissue Viability, York and Scarborough Teaching Hospitals NHS Foundation Trust

Craig Irvine, Consultant General and Vascular Surgeon, Spire Methley Park Hospital, Leeds; Honorary Senior Lecturer, Leeds University

Christine Merrick, Community Heart Failure Specialist Nurse, City Health Care Partnership CHCP

REVIEWER:
Tim Houghton, Consultant Cardiologist, Medical Director, York and Scarborough Teaching Hospital Foundation Trust

GLOSSARY:

Compression bandages: Used to treat active venous ulcers or for patients with uncontrolled oedema. Bandaging is composed of either inelastic (short-stretch), elastic (long-stretch) elements or a combination of both and should be worn continuously. Patients with complex conditions, such as lymphoedema, may require full-leg bandaging to control oedema and maintain the shape of the leg (Fletcher et al, 2021)

Compression hosiery: A form of compression for patients with chronic lower limb conditions such as oedema. The pressure generated by compression hosiery is graduated and is highest at the ankle in order to overcome the pressure in the lower limb veins on standing (Fletcher et al, 2021) – e.g. flat- and circular-knitted compression stockings

Compression hosiery kits: A form of compression used to manage and heal venous leg ulcers. They consist of two medical compression garments designed to be worn one on top of the other. They are intended to be worn continuously but the outer layer can be removed at night if preferred (Fletcher et al, 2021)

Compression wraps: A type of medical compression garment consisting of fabric sheets made of one or more inelastic components that are applied to affected limbs and secured with hook and loop fasteners

Congestive heart failure: A chronic progressive condition where the heart muscle fails to pump blood as efficiently as it should, and is characterised as pulmonary oedema relating to right-sided heart failure or lung disorder

Decompensated heart failure: Clinical syndrome where a relatively stable heart failure deteriorates, leading to a worsening of symptoms and requiring immediate therapeutic intervention

Heart failure: Clinical syndrome resulting in decreased cardiac output and/or increased intracardiac pressures at rest or under stress due to a structural and/or functional cardiac defect

Lower limb compression therapy: A management option that applies pressure on the patient's lower limb to promote blood flow and improve venous return to the heart. The beneficial effects of compression can reduce oedema, inflammation, pain and cellulitis while promoting the healing of wounds/ulcers caused by venous insufficiency (Harding et al, 2015)

Lymphoedema: A chronic condition that causes swelling in the body's tissues. It can affect any part of the body, but usually develops in the arms or legs

Peripheral oedema: Swelling resulting from excess fluid collecting in the legs, feet, arms and hands, and slows the healing of wounds and ulcers

Foreword

Heart failure affects an estimated 26 million people worldwide (Ambrosy et al, 2014), and an estimated 920,000 in the UK (Conrad et al, 2018). We are likely to see an increase in these numbers for several reasons: first, heart failure is more common in the elderly as risk increases with age, and - thanks to advances in healthcare and access to good nutrition - people are generally living longer. Due to improvements in emergency medicine and treatment, people are more likely to survive a cardiac event and go on to develop heart failure (Hobbs et al, 2002; Bleumink et al, 2004). Finally, we are seeing in practice an increased number of patients with risk factors for heart failure, such as diabetes, high blood pressure, obesity and social deprivation (Danielsen et al, 2017).

Hospitalisations due to heart failure increased by one-third between 2013 and 2019, three times faster than all other conditions, with patients staying twice as long on average (Blake, 2019). With an already overburdened NHS, it is important to diagnose, treat and manage heart failure and associated symptoms in a timely manner. Diagnosing heart failure typically involves the collaboration of healthcare professionals at all levels to conduct blood tests and refer patients for echocardiograms (Yancy et al, 2013; McDonagh et al, 2021).

Heart failure is a clinical syndrome characterised by a number of clinical signs and symptoms that can vary in severity, including shortness of breath, fatigue and weakness, rapid or irregular heartbeat and oedema. The accumulation of excess fluid in the arms or lower legs is known as peripheral oedema. The prevalence of peripheral oedema in the lower legs is rising globally in the UK and, from a patient perspective, living with oedema can negatively affect the patient's quality of life and wellbeing. Lymphorrhea and ulceration are common complications of uncontrolled/severe lower limb oedema, leading to high risk of chronic ulceration, patient suffering and financial burden on healthcare systems.

This document will address the use of compression therapy in conjunction with medical treatments to manage lower limb oedema to reduce inflammation and swelling and ultimately accelerate healing. Compression therapy typically involves the use of elastic stockings, bandages or compression wrap devices to reduce excess blood and fluid retention, aid venous hypertension and improve lymphatic insufficiency, helping to reduce oedema and inflammation (Montero et al, 2020).

Compression therapy is the gold standard of care for treating lower limb oedema and ulceration; however, uncorrected knowledge gaps and misconceptions surrounding its use for patients with heart failure can deter healthcare professionals from applying it. This document will also address common misconceptions about compression therapy and provide the information necessary to understand compression therapy's fundamental principles, as well as the value of a multidisciplinary approach that ensures that the patient receives the best care possible.

This document was developed with the following overall objectives:

- To provide an overview of heart failure and compression therapy as a treatment approach for symptoms of the condition
- To assist practitioners in appropriately assessing for, choosing and applying compression therapy when managing a patient with lower limb oedema or ulceration in combination with heart failure
- To encourage all clinical and support staff to collaborate in order to provide consistent care to patients with varying degrees of heart failure and oedema/ulceration.

An introduction to heart failure

What is heart failure?

The term 'heart failure' can be considered misleading because the heart doesn't fail completely; rather, some functionality is lost - the heart is unable to sufficiently pump blood around the body to maintain good health. This is typically due to the heart muscle becoming weaker as a result of a heart attack, high blood pressure, heart valve problems or disease such as cardiomyopathy. The most common causes of heart failure are coronary artery disease, atrial fibrillation, heart valve disease, cardiomyopathies and myocarditis (NICE, 2018).

Heart failure is a complex clinical condition with increasing prevalence due to the rising incidence of cardiovascular disease and an ageing population (Urbanek et al, 2020). Symptoms can develop quickly or gradually over weeks and months, including shortness of breath, fatigue, swelling in the legs, ankles and feet, and rapid or irregular heartbeat (Box 1). Heart failure is a clinical syndrome comprised of several subtypes and differentiating between these can be helpful in clinical practice, as the underlying structural problems with the heart will determine the type of symptoms experienced and the treatment approach required. Congestive heart failure, left ventricular (heart) failure, and right (ventricular)-sided heart failure are all types of heart failure.

Box 1. Common symptoms of heart failure (Malik et al, 2022)

- Fatigue
- Chest pain
- Palpitations
- Dyspnoea
- Swelling in the feet and ankles
- Reduced exercise tolerance
- New persistent cough
- Shortness of breath
- Fainting or feeling lightheaded

Types of heart failure

In brief, heart failure often only affects the left or right side of the heart but can affect both, and oedema is prevalent in all types of heart failure. Left-sided heart failure is associated with respiratory symptoms such as shortness of breath and fluid build-up in the lungs, while right-sided heart failure can cause fluid retention in the legs and oedema of the lower extremities or abdomen. Biventricular heart failure affects both sides of the heart and is characterised by extensive thickening of the heart muscle and can result in shortness of breath, fluid build-up in the lungs and retention of fluid in the legs/abdomen.

Heart failure can also affect how the heart moves the blood around the chambers of the heart, and can result in abnormal movement of blood both during diastolic (when the chambers fill with blood) or systolic (when chambers contract to pump blood around the body; Bozkurt et al, 2021; Figure 1). The way heart failure is classified, diagnosed, treated and monitored continues to evolve, and the measurement of a patient's ejection fraction is now commonplace. Ejection fraction is the measurement of the amount of blood pumped from the lower chambers of the heart (ventricles) each time it contracts, and it is a strong indicator of how well the heart is functioning. Ejection fraction is expressed as a percentage and is calculated by the amount of blood pumped out of the heart at each contraction (known as stroke volume) divided by the amount of blood left in the chamber during the resting period of the heart (end diastolic volume). Normally the ejection fraction is measured on the left side of the heart (left ventricular ejection fraction) and a normal ejection fraction of a healthy heart is 50–70%, with each contraction, so 50–70% of the blood will leave the ventricle and be pumped around the body. The lower the ejection fraction, the weaker the heart is pumping.

It is important to remember that not all heart failure results in abnormal ejection fraction, and in some patients this can be normal. This is referred to as 'heart failure with preserved ejection fraction' (HFpEF). In patients with HFpEF, the heart pumps a large portion of blood out of the body, but the ventricle itself holds a lower volume of blood. This is often due to thickening or stiffening of the walls of the heart (commonly caused by long-standing hypertension), so essentially the size of the ventricle is reduced, so the amount of blood pumped is reduced/deficient. Most definitions of HFpEF specify that there must be evidence of symptoms as well as structural abnormality of the heart.

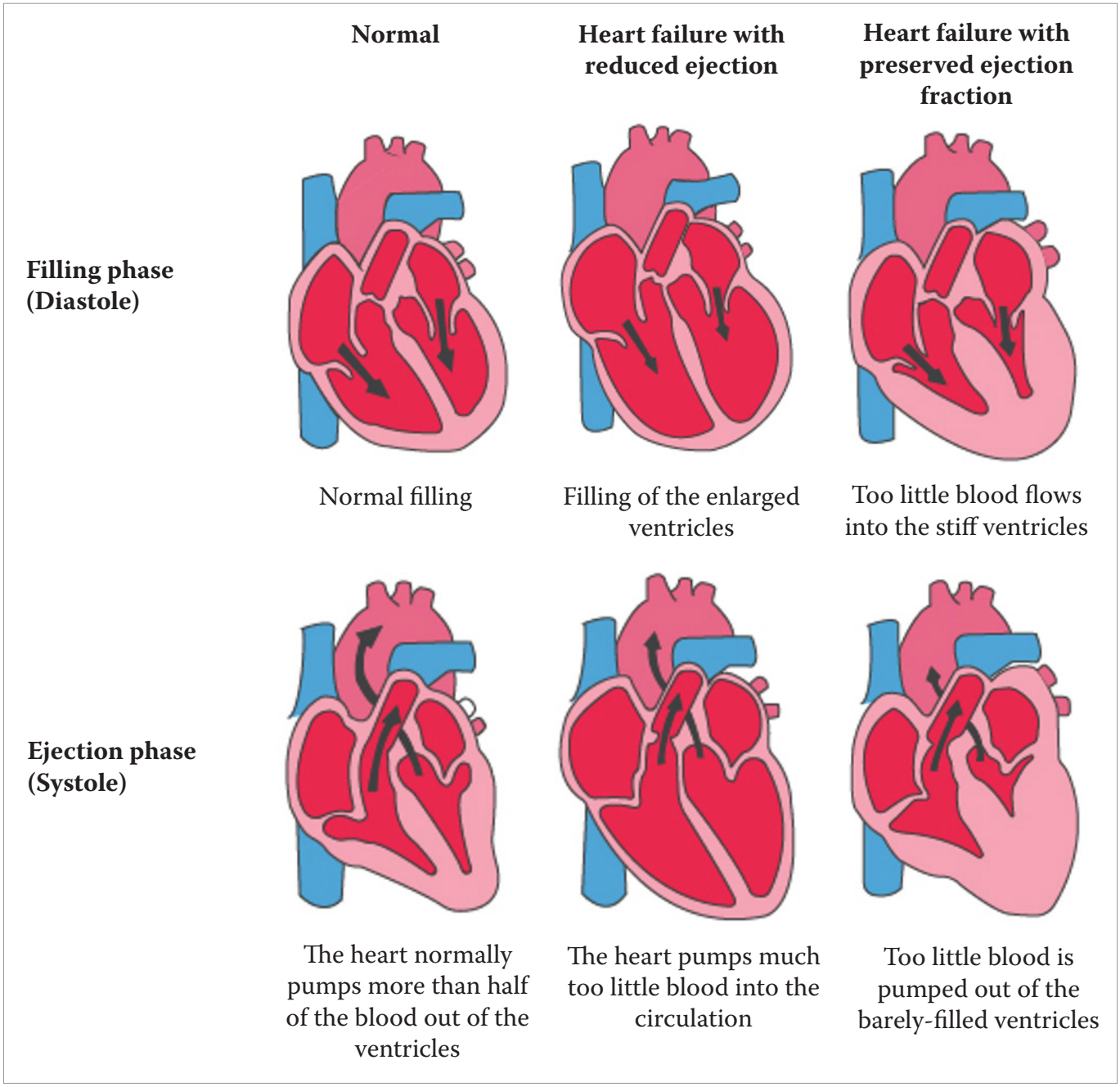

Figure 1. Subtypes of heart failure

Understanding the severity of heart failure

The degree of heart failure or loss of function is usually classified using the New York Heart Association (NYHA) categories. It categorises patients based on their symptoms during various intensities of physical activity [Table 1]. These include fatigue, dyspnoea (shortness of breath), chronic coughing, chest pain, oedema, nausea, lack of appetite, rapid heart rate and confusion. The more easily these symptoms, such as shortness of breath, appear, and the more serious they feel, the higher the stage of heart failure. The American College of Cardiology (ACC)/ American Heart Association (AHA) consider four slightly different categories of heart failure, and these can be used alongside the NYHA classification system to further refine the subtype (American Heart Association, 2019).

Chronic heart failure

Heart failure can be considered as chronic (when symptoms are relatively stable and well-managed) or acute (when symptoms arise suddenly and are initially so severe that the patient requires hospitalisation). Chronic heart failure may incur flare-ups of acute episodes, and a treatment aim is to reduce the frequency of these flare-ups and delay disease progression (NICOR, 2019). In particular, decompensation is where a structural or functional change to the heart causes it to lose its ability to eject and/or accommodate blood within physiological pressure levels.

Diagnosing heart failure

The most common causes of heart failure in the UK include heart attack, cardiomyopathy and high blood pressure (British Heart Foundation, 2022). A relatively high proportion of patients with acute heart failure may be initially diagnosed and treated in hospital cardiology units, whereas chronic heart failure may be managed in primary care. Although outcomes for people with heart failure are improved with timely identification and intervention, heart

Table 1. Classification of stages of heart failure

Heart Failure 2017 Guideline Comparison of ACCF/AHA Stages of Heart Failure (HF) and New York Heart Association (NYHA) Functional Classifications			
ACCF/AHA Stage		**NYHA Functional Classification**	
Stage A	At risk for HF but without structural heart disease or symptoms of HF	**None**	
Stage B	Structural heart disease but without signs or symptoms of HF	**Class I**	No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF
Stage C	Structural heart disease with prior or current symptoms of HF	**Class I**	No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF
		Class II	Slight limitations of physical activity. Comfortable at rest, but ordinary physical activity results in symptoms of HF
		Class III	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes symptoms of HF
		Class IV	Unable to carry on any physical activity without symptoms of HF, or symptoms of HF at rest
Stage D	Refractory HF requiring specialised interventions	**Class IV**	Unable to carry on any physical activity without symptoms of HF, or symptoms of HF at rest

failure in its earliest stages is notoriously challenging to identify, as many of its core signs and symptoms are general and develop slowly (Remes et al, 1991).

Current National Institute for Health and Care Excellence (NICE) guidelines advise complementing patient histories with a series of investigations that can indicate heart problems [Figure 2]. When there is a suspicion of heart failure, a blood test can be offered to diagnose or rule out heart failure. The heart produces natriuretic peptides, classified into two types: B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide (NT-proBNP; McDonagh et al, 2021). Elevated levels of BNP and NT-proBNP in the blood are associated with heart failure (Yancy et al, 2013; McDonagh et al, 2021); however, it should be noted that this blood test is not a definitive test for heart failure, and other conditions can raise BNP. Importantly, NICE recommends that a BNP of greater than 400 pg/mL requires an echocardiogram to indicate heart failure.

Referral for echocardiography to visualise structural abnormalities in the heart, and/or for an electrocardiogram that can detect changes in the electrical impulses of the heart are also recommended (Yancy et al, 2013). This process reflects an interdisciplinary approach, with primary care practitioners evaluating certain criteria when heart failure is suspected and cardiologists confirming a diagnosis in secondary care. Figure 2 describes recommendations from NICE for outpatients.

The impact of heart failure on everyday life

Heart failure can have a devastating impact on patient quality of life. Notably, shortness of breath, fluid retention or ankle swelling (oedema), lack of energy, fatigue, palpitations and chest pain all limit activities and affect well-being considerably. Symptom intensity and frequency varies. From the patient perspective, heart failure can be mild (in which patients experience few or no symptoms), moderate (in which

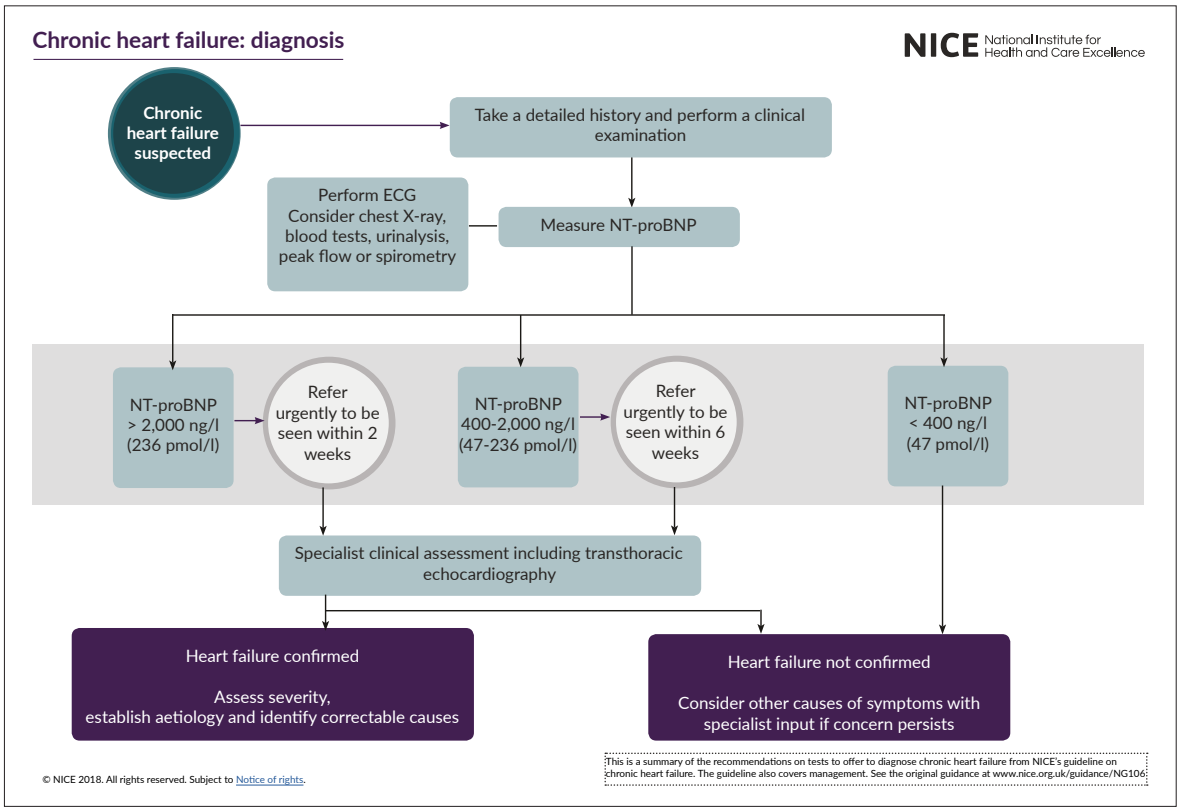

Figure 2. Proposed diagnostic pathway for heart failure in UK primary care (adapted from NICE, 2018)

BNP: B-type natriuretic peptide (BNP); NT-proBNP: N-terminal pro-B-type natriuretic peptide.

symptoms are visible, but patients can still lead normal lives) or severe (in which patients are severely disabled).

There are two key terms that reflect the severity of heart failure's impact on the patient: for those with compensated heart failure, key symptoms such as shortness of breath, tiredness and oedema are stable, minimal or absent (King et al, 2012). This is because, despite the underlying disease, the heart literally 'compensates' for damage to cardiac muscle to the extent that the patient may be partially or wholly unaware of the problem. Lower limb oedema, especially with venous incompetence, is often missed due to the patient's long-standing poor venous circulation; therefore, exploration of the upper limbs can identify worsening oedema. If a patient with relatively stable heart failure deteriorates, this is referred to as 'decompensated' heart failure, and may lead to worsening of symptoms that require medical intervention (Hajouli and Ludhwani, 2022). Figure 3 illustrates how the clinical stages of heart failure are experienced by the patient.

As the disease progresses, it becomes increasingly difficult for patients to retain their previous lifestyle; day-to-day tasks become more challenging, and physical activities become more limited in scope. Patients at the far end of the spectrum have refractory congestive heart failure, which means they do not respond to treatment and/or their symptoms worsen despite medication (Mant et al, 2009).

Management of heart failure

Cardiac rehabilitation clinics allow patients to have their medication and lifestyle reviewed, providing them with a strong

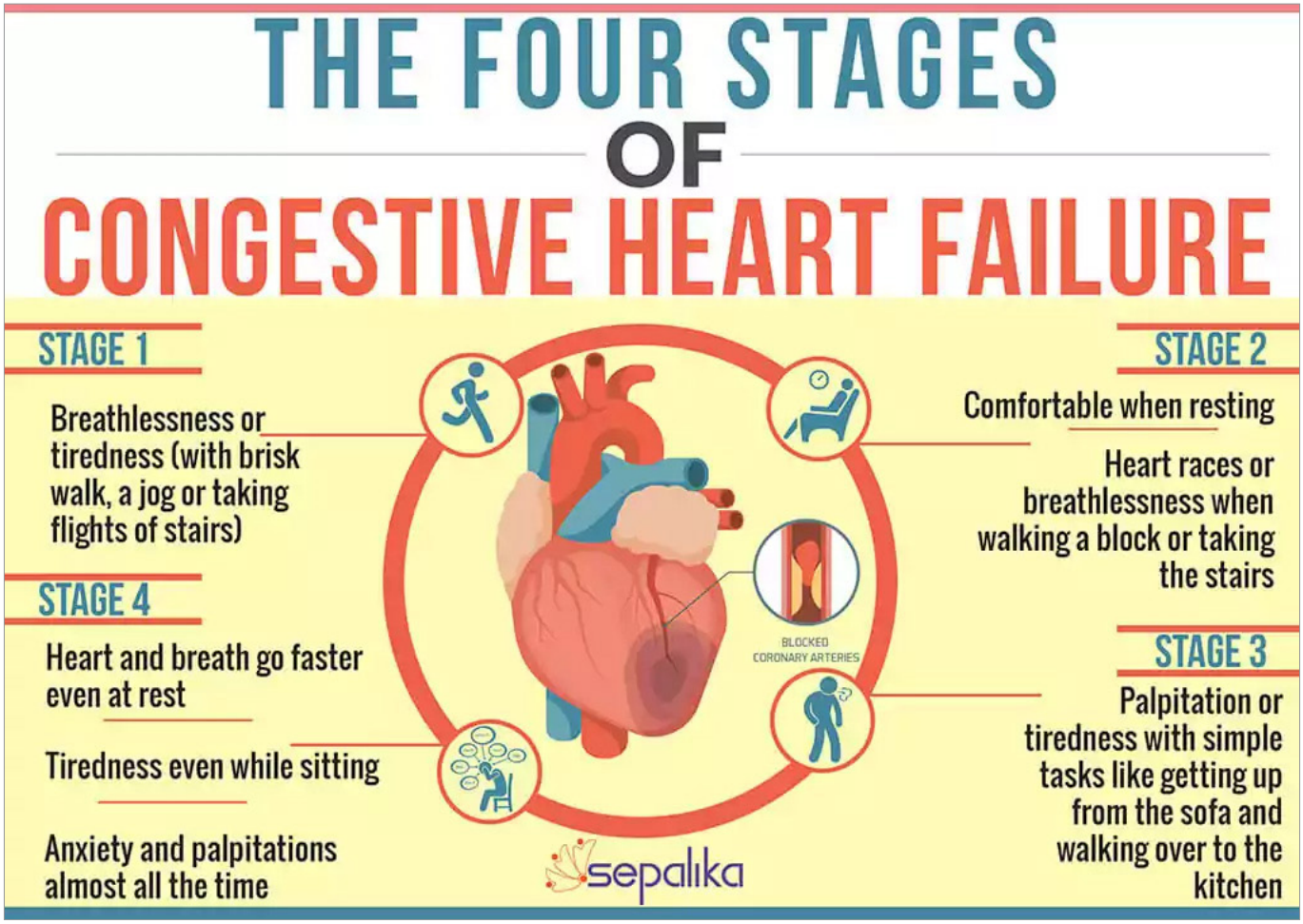

Figure 3. Symptoms of heart failure from a patient's perspective.

foundation for managing their condition. However, once the initial cardiac damage has been stabilised, patients are usually managed in primary care (Hoes et al, 1998). Here, it is increasingly recognised that nurses play a pivotal role in treating this challenging condition and supporting patients to self-manage their symptoms (Grange et al, 2005).

The cornerstones of treatment are careful monitoring, medication and lifestyle advice, all of which can be obtained in primary care. Modifying certain lifestyle factors remains the first step for patients, but many will find it difficult to make the necessary changes, and any cardiac rehabilitation programmes must be carefully tailored to the individual. Changes to diet and exercise, advice on smoking and alcohol, as well as consideration of the social and psychological impact of heart failure, are all important steps to alleviate the symptoms of heart failure in patients (Centers for Disease Control and Prevention, 2020).

Pharmacologic treatments include angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), angiotensin receptor neprilysin inhibitors (ARNi), beta-blockers (BB), mineralocorticoid receptor antagonists (MRA) and sodium-glucose contransporter-2 inhibitors (SGLT2i), as well as specialist treatments (NICE 2018). These must be managed alongside any medications for comorbidities, with a regimen tailored to the individual and taking into account drug interactions. If first-line medications are ineffective, a referral for re-assessment by a specialist and additional treatment strategies may be required. When disease progression renders less invasive methods ineffective, medical devices such as pacemakers and/or surgery may be appropriate.

Here, and in instances where heart failure becomes acute, nurses play a key role in connecting clinicians from across primary and specialist care, ensuring clear communication channels between GPs, cardiologists, other specialists and patients. Medical treatment is complemented and mediated by ongoing monitoring, which includes both basic observations (blood pressure, heart rate, weight) and BNP tests. Specific symptoms, such as oedema, may necessitate follow-ups and targeted interventions.

Challenges in heart failure

One of the greatest challenges in treating heart failure is how unique each patient's circumstances are. Involvement of the cardiology multidisciplinary team (MDT) in these patients and the escalation to the wider MDT focusing on cardiac failure can help manage these patients' complex, individualised circumstances. Not only is there a significant variation in the causes of the disease, but each case may present differently in terms of symptoms, complications and co-morbidities. For example, patients with heart failure are particularly vulnerable to oedema, and this risk is exacerbated by limited mobility, high body mass index (BMI), malnutrition, lack of blood to the veins and as a side effect of certain medications. In particular, limited mobility can lead to 'dependent oedema' in patients that sleep in chairs or sit for long periods of time.

The individual life circumstances and motivation of each patient is also important in determining how capable they are of implementing self-care strategies. In particular, there is a high prevalence of heart failure in elderly people, and additional factors associated with this demographic group may compound challenges: poverty, social isolation, cognitive decline and/or functional limitations may undermine a patient's ability for self-care and engagement.

The least effective medicine is the one that is not taken, and patient engagement is an important factor in treatment success. Multiple conditions often necessitate multiple medications, placing a strong burden of management on patients who must learn to juggle complicated regimens. Adverse interactions between drugs also increase in likelihood as the number of conditions being treated increases; primary care practitioners keep a good oversight of different factors to support a holistic approach to patient care.

Lifestyle modification, especially weight loss and smoking cessation, is a key element of managing heart failure.

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Treatment adherence, whether to a drug regimen, lifestyle programme or to compression therapy, is essential in improving outcomes. Motivating the patient to understand why they are taking a treatment course is key to improving engagement.

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Oedema and heart failure

Oedema is one of the fundamental features of heart failure [Figure 4]. A patient with decompensated heart failure may experience peripheral or pulmonary oedema, which is characterised by excess fluid collecting in the lungs, or swelling in the feet, ankles, legs, hands and arms, respectively.

Comorbid oedema with heart failure can present several diagnostic and treatment challenges in routine practice.

Recognising oedema in patients with heart failure

It is important to identify the cause of peripheral oedema thorough examination and patient history. Attention should be paid to the patient's description of their symptoms, which they can find distressing: shoes and clothing may no longer fit and, as the swelling worsens, some patients describe a feeling like 'their skin is about to burst' or complain of tightness and heaviness associated with aching pains. Factors suggesting a differential diagnosis for peripheral oedema include:

- Heart failure
- Use of certain medications, including calcium channel blockers, alpha blockers, hydralazine or testosterone
- Chronic kidney disease
- Hypoalbuminaemia
- Chronic venous insufficiency/deep vein thrombosis
- Primary lymphoedema
- Chronic liver disease
- Cellulitis
- Surgery
- Trauma
- Cancer treatment
- Obesity
- Inflammatory diseases (e.g. arthritis)
- Immobility
- Altered gait
- Palliative.

If decompensated heart failure is a likely cause of oedema, it is then important to understand what can be driving the worsening status of heart failure. Key contributing factors can include:

- Non-adherence to medication
- Excessive fluid intake
- Underdosing/non-compliance with diuretics
- Acute kidney injury
- Acute coronary syndrome
- Hypertensive emergency
- Significant arrhythmia (either new or uncontrolled)
- Infection
- Non-steroidal anti-inflammatory medication/steroids/negative inotropes/chemotherapy.

Medical treatment of oedema in people with heart failure

Loop diuretics (e.g. Furosemide) are the cornerstone of medical treatment for peripheral oedema, and unless contraindicated, should be administered alongside a patient's ongoing treatment for heart failure. Loop diuretics work by inhibiting the transport of salt and water across cells in the kidneys, causing them to pass out more fluid (Huxel et al, 2021). Early and effective treatment of oedema can reduce the need for admission, which is a key treatment goal.

Guidelines suggest starting with low doses and titrating to the minimum dose required to achieve euvolaemia (normal circulatory or blood fluid volume; McDonagh et al, 2016); however, the dosing of diuretics depends on how acute the period of decompensation is. Titration of dose should take into account patient comfort; it may be beneficial to increase the morning dose preferentially to help prevent the patient from needing to urinate during the night.

If oedema does not improve with higher loop diuretic doses, additional agents may be required, including diuretics such as thiazides; however, these drugs that are used to treat heart failure need careful

Understanding the underlying causes of both heart failure and oedema can help identify the most appropriate steps in referring a patient to specialist services.

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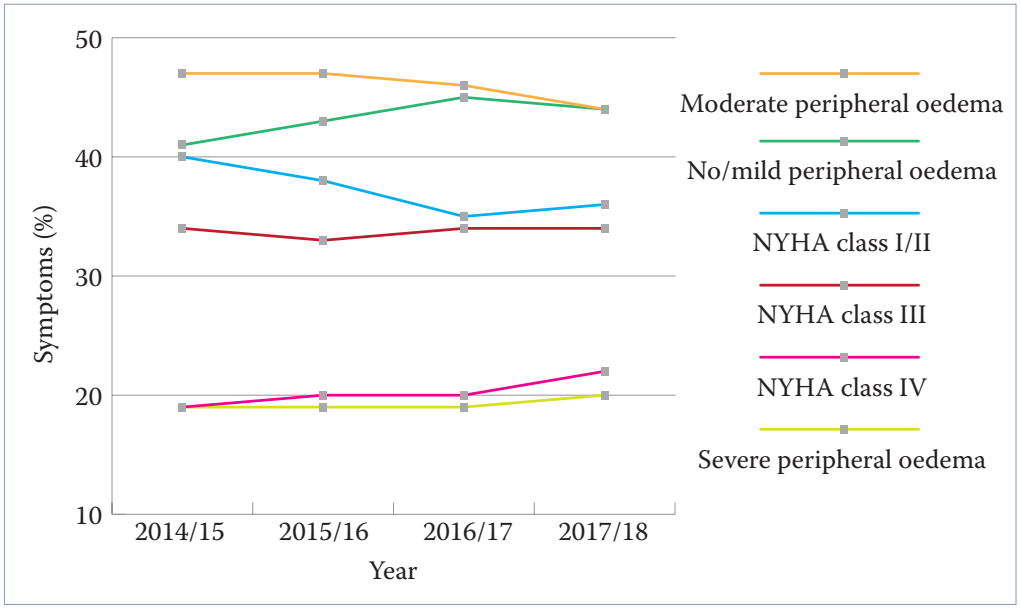

Figure 4. Trends in signs and symptoms of heart failure in the UK over the past four years. (adapted from NICOR, 2019)

consideration in patients with renal dysfunction, hypotension or hypokalaemia, and should be initiated by specialists.

Dose reduction with stabilisation of oedema is an area for discussion with the MDT – where oedema is driven by an unreversible underlying condition (such as decompensated heart failure), it may be necessary to maintain relatively high diuretic dosing (Bromage et al, 2020). Clinicians should educate patients about the link between peripheral oedema and water retention and advise them to drink normally while taking loop diuretics, and to drink enough fluid so that they're not thirsty for long periods.

Although it may appear counterintuitive for patients to drink water while they are taking medication to remove excess fluid, clinicians should advise patients about the amount of fluid they need to drink depending on their treatment and medical condition. While the specific recommended amount will vary among patients, and some individuals may even be instructed to reduce their water intake, it is essential that patients drink enough fluids to prevent dehydration.

Additionally, oedema can be a risk factor for reduced mobility, so extra measures should be taken to prevent falls in older adults.

Consequences of inadequate treatment

Uncontrolled oedema and an inadequate level of intervention increases the risk of blistering, leaking, skin fibrosis and infection; therefore, accurate assessment and timely intervention is essential. In conjunction with medical treatment, compression therapy plays a key role in managing lower limb oedema, both in patients with and without concomitant heart failure.

Discuss the side effects of diuretics with patients so they understand that they will need to use the bathroom more often, including at night. They may also feel dizzy or thirsty but they should not address this by drinking more water.

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Compression therapy: a practical guide

Focus on compression

Compression therapy is an effective management option to help improve blood return from the lower legs of patients with conditions associated with chronic venous insufficiency and/or lymphatic insufficiency. Venous insufficiency results in sustained venous hypertension, which can cause conditions such oedema, skin staining, venous eczema and ulcerations (Ousey et al, 2021).

Benefits of compression therapy

Compression therapy usually involves the use of hosiery, bandages or wraps, and is a potent anti-inflammatory device that works by decreasing venous pressure in the legs while improving venous return to the heart. It reduces inflammation and swelling by preventing blood and fluid congestion within the capillary bed. The effects of compression therapy can be significant, reducing oedema, risk of cellulitis and pain while also promoting the healing of ulcers (Harding, 2015). Other benefits of compression therapy include significant improvements to a patient's quality of life, with relieved lower limb symptoms and reduced pain (Vowden and Vowden, 2012).

Types of compression treatment

Compression therapy comes in various forms, including compression hosiery, compression hosiery kits, compression bandages and adjustable compression wraps [Figure 5]. Some compression treatments are administered by a healthcare professional, while others can be applied by the patients/family/carers. In most cases, a degree of compression will be required on a lifelong basis to control lower limb oedema.

Compression hosiery is a form of compression in patients with chronic lower limb conditions such as lymphoedema. It can also be used for the management of conditions relating to chronic venous insufficiency. In terms of stiffness, levels of compression delivered, fabric, colour, size, length, and closed versus open toe, there is a wide range of medical compression hosiery options. Compression hosiery is a single garment that can be purchased off-the-shelf or made-to-measure for the patient. The pressure generated by compression hosiery is graduated and is highest at the ankle in order to overcome the pressure in the lower limb veins on standing. Compression hosiery can be classified according to the pressure measured at the ankle (Table 2; Fletcher et al, 2021); however, there are a range of compression-based systems that vary in pressure level provided.

Flat- and circular-knitted hosiery are two different types of compression garments that differ in their material properties. Circular-knitted hosiery are produced seamlessly and spirally, and are not as dense or stiff as flat-knitted hosiery, which are made from a thicker yarn and are usually better for distorted limbs.

Compression hosiery kits are used to manage and heal venous leg ulcers. They consist of two medical compression garments designed to be worn one on top of the other, and aim to deliver 40mmHg pressure at the ankle. They are intended to be worn continuously but the outer layer can be removed at night if preferred. Hosiery kits can be made-to-measure but are generally available in off-the-shelf sizes (Fletcher et al, 2021).

Compression bandages are composed of either inelastic (short-stretch), elastic (long-stretch) elements or a combination of both. Bandaging is generally applied by a healthcare professional, should be worn continuously and is most often used to treat active venous ulcers or where oedema reduction/limb reshaping is required. Patients with complex conditions, such as lymphoedema, may require inelastic bandaging to control oedema and maintain the shape of the leg (Fletcher et al, 2021).

Compression wraps have a number of bands that are applied from the bottom to the top of the affected limb. The wrap compression system provides a high working pressure and

Images from www.jobst.com

Figure 5. Types of compression system

In most cases, compression therapy, in the form of hosiery or wraps, is required for long-term oedema treatment. While bandages generally require a healthcare professional to apply, compression wraps can be useful for oedema reduction and giving the patient an opportunity to self-manage.

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Table 2. Compression categories (NWCSP, 2021)	
Category	**Pressure (mmHg)**
Mild	≤20
Strong	≥40

low resting pressure. Compression wraps can be used for oedema reduction and deliver a prescribed level of pressure.

Patient selection and use of compression therapy in practice

Compression therapy is the gold standard treatment for chronic lower limb oedema and lower-limb wounds or leaking lower limbs. As such, it should be used in all patients unless there are specific contraindications to its use (e.g. severe peripheral arterial disease). The National Wound Care Strategy Programme (NWCSP, 2021) recommends screening all patients with lower limb oedema/ulceration for 'red flags' that may indicate the need for urgent onward referral. These red flags include acute infection of the leg or foot (e.g. increasing unilateral and rapidly spreading redness, swelling, blistering, oedema, pain, pus, heat), symptoms of sepsis, acute or chronic limb-threatening ischaemia, suspected acute deep vein thrombosis (DVT) and suspected skin cancer.

In the absence of these red flags, mild compression (up to 20mmHg) can be applied and should be considered the first-line treatment for patients with one or more wounds on the leg (British Lymphology Society, 2019; NWCSP, 2021). A full holistic assessment (including past medical and surgical history, family history and history of limb or skin trauma, current medications, concurrent illnesses, and the condition of the patient's limb, circulation and skin) should

Unless contraindicated by the presence of red flags, mild compression therapy should be applied as soon as possible in patients with oedema.

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be performed if there is any evidence of ulceration, lymphorrhea, chronic oedema or if otherwise clinically indicated (Fletcher et al, 2021; NWCSP 2021). The therapeutic aim of compression for venous hypertension is to provide the highest level of compression that the patient is able to tolerate. A minimum of 40 mmHg supplied by a 2-layer compression kit is recommended in patients with venous leg ulcers (Fletcher et al, 2021).

The most appropriate type of compression can be determined via a thorough holistic assessment and by taking into account arterial status (e.g. ankle–brachial pressure index [ABPI], toe pressure, pulse palpation), patient preferences and willingness to self-manage, as well as other patient factors, such as BMI, mobility and limb shape (Fletcher et al, 2021).

Common barriers to the use of compression therapy in patients with heart failure

There are many reasons why compression therapy may not be used to the appropriate extent in routine practice, including healthcare professionals' lack of knowledge or confidence, confusion around referral pathways, local unavailability of compression products, and lack of cooperation from the patient (Harding, 2015). A common concern of clinicians is that applying strong compression to the legs of patients with either chronic or acute heart failure will lead to a worsening of symptoms, as clinicians worry that compression overloads and pushes fluid back up towards the heart. However, clinicians should bear in mind that the physiology of using compression therapy (improved cardiac output) supports its use and the majority of research demonstrates little to no worsening of symptoms with the use of multilayer compression therapy in patients with heart failure (Shapiro, 2020).

Patient barriers

- Worries that compression therapy overloads and pushes fluid back up to the heart
- Concerns that compression therapy will worsen their symptoms
- Lack of understanding of their underlying disease/need for compression therapy
- Negative previous experience with compression therapy such as pain and exudate leakage
- Lack of access to a clinician knowledgeable about compression therapy
- Unwillingness to wear compression therapy for aesthetic or practical reasons
- Transport issues or work commitments impeding the ability to attend appointments.

Healthcare provider barriers

- Lack of knowledge in diagnosing and categorising conditions for which medical compression would be appropriate
- Lack of understanding of the benefits of compression therapy
- Lack of awareness of different compression systems
- Lack of skill or confidence in the application of compression therapy leading to suboptimal compression
- Perceived or actual fear of harm
- Insufficient contact time with patients to allow assessment and application of appropriate compression
- Unclear referral pathways for further assessment or advice if needed
- Patient's concordance to treatment/wearing compression therapy
- Lack of understanding of the application of compression using donning/doffing aids
- Wariness of clinicians to reduce oedema in areas, such as above the knee, genitals and abdomen, without robust assessment.

Healthcare system barriers

- Lack of reimbursement for compression therapy
- A wide range of options may lead to confusion about the indications and correct use for each compression therapy type

Early and effective compression therapy is crucial for improving patient outcomes because untreated oedema can result in worsening symptoms, such as blistering and ulceration, and a lower quality of life.

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- Lack of understanding by the healthcare system of the cost-effectiveness of the use of compression therapy
- No financial incentive to use compression therapy
- Specialist services are lacking for patients who require additional assessment or bespoke adaptations to compression therapy due to additional needs (e.g. peripheral arterial disease or diabetes).

Implications of untreated lower limb oedema

Lower limb oedema, left unmanaged, can significantly influence a patient's general condition and quality of life [Box 2]. Leg heaviness, pain, and restricted mobility may occur, along with local skin fibrosis, injury, fluid leakage and even ulceration. As well as lower limb pain, at-risk patients with existing lower limb venous, arterial or mixed disease may be susceptible to developing hard-to-heal ulceration. Long-term persistent swelling of the lower limbs causes changes within the subcutaneous tissues, leading to fibrosis, discolouration and chronic inflammation (Urbanek et al, 2020).

The skin on the legs of patients with lower limb oedema can be fragile, so clinicians should keep in mind the importance of skin care and how the skin's condition can affect compression choices.

Box 2. Potential outcomes of untreated oedema in patients with heart failure (adapted from Mayo Foundation, 2020; Fletcher et al, 2021; Ousey et al, 2021)

- Increasingly painful swelling
- Difficulties walking
- Stiffness
- Stretched, uncomfortable and/or itchy skin
- Increased risk of infection in affected area
- Scarring between layers of tissue resulting in fibrosis
- Decreased tissue perfusion
- Increased risk of skin ulcers
- Increased risk of deep vein thrombosis
- Cellulitis, hardening, fibrosis and other tissue and skin changes.

Compression in patients with heart failure: a practical understanding

Keep up to date with recent study findings to reduce hesitancy in use of compression from a lack of understanding.

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Despite being the gold standard treatment for patients with oedema, there is hesitation to apply this approach in people with heart failure. In many cases, clinicians view compression therapy as potentially harmful in these patients, which can arise from a misunderstanding on what happens when compression therapy is applied in patients with heart failure.

Perceptions in the use of compression therapy for people with heart failure

The main concern when beginning compression therapy for oedema in a person with heart failure is that once compression is applied, the heart could become overloaded with too much fluid (Atkin et al, 2022).
A lack of acknowledgement of the role of compression therapy in some guidelines can contribute to a lack of understanding. There is little information provided on the use of medical compression in the multidisciplinary treatment of leg oedema caused by heart failure (Urbanek et al, 2020).

Current evidence for compression therapy in heart failure

A growing body of research is demonstrating that any increase in right atrium blood pressure due to compression is temporary and is not accompanied by clinically relevant haemodynamic changes. Compression therapy is safe to use at NYHA stages I and II and should be incorporated into the routine management of peripheral oedema (Rabe et al, 2020). While some of the research that supports the use of compression therapy in patients with heart failure is not as robust as clinicians would expect, no evidence exists to suggest that compression is harmful. More evidence is needed, especially in regard to the negative and positive benefits of compression.

At more severe stages of heart failure (NYHA stages III and IV), invasive testing has shown that haemodynamic changes caused by compression are compensated for after a few minutes and usually only have a minor clinical impact. This means that compression therapy can be considered for these patients, but they should be closely monitored by the clinician for any increase or worsening of symptoms (e.g. breathlessness; Hirsch et al, 2018).
A recent review of 20 international guidelines and consensus papers published between 2009 and 2016 on venous ulcers found that only pulmonary oedema should be regarded as a contraindication for the initiation of compression therapy (Hirsch et al, 2018).

When class I and class II compression therapy (mild or moderate; 18–32mmHg) was applied to the lower legs, blood volume shifts in the legs were examined. Only a fraction of the blood compressed from the legs reaches the right atrium because of the lower vena cava's elasticity and a large number of visceral veins. The volume overload caused by a change in the cardiac output was compensated for by a temporary change in heart rate (Rabe et al, 2020); therefore, clinicians should explain to patients that they may expect to feel their heart rate increase temporarily.

Current research supports that compression therapy is not a risk factor for the majority of patients with compensated heart failure (Atkin et al, 2022; Urbanek et al, 2020); however, there is still insufficient evidence to support the safety of compression therapy in patients with severe and decompensated heart failure (Atkin et al, 2022; Saucedo et al, 2021; Box 3). More research into compression application in this patient population is required.

Understanding the need for compression therapy in people with heart failure

Without compression therapy, patients with oedema and heart failure are often left with only a superabsorbent dressing as a treatment option. This approach relies on 'mopping up' fluid rather than tackling the underlying cause of oedema with compression therapy and leaves the patient at increased risk of skin damage, recurring lower-limb wounds and ulcers. (Atkin et al, 2022).

Box 3. What is the difference between decompensated and compensated heart failure? (Atkin and Roo, 2022)

- When heart failure becomes severe enough to cause symptoms requiring immediate medical treatment, it is called decompensated heart failure
- If the patient has heart failure but their heart is still functioning well enough that they do not have symptoms, or their symptoms are easily managed, it is called compensated heart failure.

The National Wound Care Strategy Programme (NWCSP) recommends that all people with leg wounds should be treated with mild compression, in the absence of red flags, and that this should be applied as early as possible (NWCSP, 2021). The benefits of first-line mild compression have been found to outweigh the associated risks, even, unless specified 'red flags' justify delay or contraindication of compression therapy (BLS, 2019).

Choosing to not use compression therapy based on misunderstanding or perception without assessing current research is a potentially harmful approach; without compression, lower-limb oedema will not improve and leakage will likely increase, resulting in ulceration (Atkin et al, 2022). In cases where lower-limb soft tissue injuries have already occurred, the presence of heart failure with significant fluid accumulation can significantly delay healing and worsen the existing condition (Urbanek et al, 2020).

Alignment between local guidelines and the NWCSP recommendations for lower limb ulcers could help increase confidence in initiating compression therapy.

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Myths and truths of compression therapy in patients with heart failure

Until recently, a lack of guidance, insight, and evidence has underpinned a selection of myths about why compression therapy should not be considered for people with oedema and heart failure. Figure 6 considers these myths against the current research and provides support when these perceptions are challenged in the context of study findings.

Myth	Truth
Patients with heart failure should never receive compression therapy	Heart failure in itself does not constitute a contraindication for compression therapy. There is very little risk of patient harm associated with compression. However, there should be no compression for decompensated heart failure
By mobilising fluid from lower extremities, compression therapy could lead to worsening pulmonary oedema in patients with heart failure	There are few case reports confirming this possibility in the literature. In NYHA stage I and II heart failure, compression is generally possible without reservation. In NYHA stages III and IV, careful use of compression therapy is possible if there is a strict indication, clinical and haemodynamic monitoring
Compression is too risky to use in patients without obvious venous insufficiency, and it should be stopped if the patient develops acute heart failure while on compression therapy	Unless specified 'red flags' are present, the benefits of first-line mild compression have been found to outweigh the risks, even for people without obvious signs of venous insufficiency
Patients with lower limb oedema or wounds and heart failure can be treated with superabsorbent dressings rather than compression	This approach is based solely on 'mopping up' fluid rather than tackling the underlying cause and leaves the patient at further risk of skin damage and recurring lower-limb wounds
Lower limb wounds will heal without the need for compression in patients with heart failure	In cases where soft tissue defects are already present, the presence of heart failure with significant fluid accumulation can significantly delay healing or lead to worsening of the local condition

Figure 6. The myths and truths of compression therapy in patients with heart failure
NYHA, New York Heart Association

A pathway for using compression therapy in heart failure

Recently, there has been significant work undertaken to help clarify and support the appropriate use of compression therapy for oedema/ulceration in patients who have heart failure (BLS 2019; Atkin et al, 2022).

A care pathway was developed in 2022 to aid informed decision-making in the application of compression therapy to selected patients [Figure 7].

Implementing the care pathway

Aside from the contraindications and red flags against starting compression therapy, there are several 'common sense' aspects to consider. For example, applying 40mmHg pressure to both legs in the first instance could be physically uncomfortable for some patients. Some compression therapy is better than no compression, and it may be necessary to gradually build up to full compression, from 20 to 40mmHg, using a staged approach. A difference exists between someone with heart failure who is used to compression, versus someone who has not had it before, and this is acknowledged in the care pathway.

Importantly, the care pathway suggests that all healthcare professionals can assess for acute exacerbation of heart failure, but not for the different types of heart failure, which would best be performed by members of the cardiology team. When initiating compression therapy, either one or both legs can be treated and assessed. The most cautious approach would be to start compression therapy with reduced pressure (20mmHg) on both legs and slowly progress to a higher pressure, first by stepping up one leg to 40mmHg, waiting 2 weeks, then stepping up the other (Rabe et al, 2020). In some patients, starting with mild compression (20mmHg) on both legs and assessing for changes to heart failure status over 7 days to 2 weeks before increasing compression may be justified (Atkin et al, 2022). During this time, the clinician should advocate for ongoing patient education and careful monitoring of patients' symptoms.

During the observation stage, there is the opportunity to undertake a vascular assessment of risk factors and signs and symptoms/red flags, including ABPI and TBPI. An ABPI value between 0.5 and 0.8 supports the use of continued mild compression while promoting important discussion with the MDT. An ABPI of less than 0.5 would necessitate the discontinuation of compression and urgent referral to a vascular team (Atkin et al, 2022). Since evidence in practice would suggest that an ABPI of 0.8 does not always indicate that high compression can be undertaken safely, other factors may need to be considered before applying compression (Guttormsen and Smith, 2016).

Ultimately, as supported by the ongoing observations, a goal of well-tolerated compression of 40mmHg on both legs (if required) is achievable in many cases.

Best practice would support the use of compression therapy in the long-term management of oedema; however, 'something is better than nothing'. Although the evidence base for the use of compression wraps being as effective as multilayer bandaging is not as strong as compression hosiery, for the healing of patients with venous leg ulcers, they do hold certain advantages, including ease of application, enablement of supported self-care, garment adjustability as limb volume changes and minimal education for application is required.

Discontinuation of compression in heart failure

If a patient has established compression therapy (at 20 or 40mmHg) and experiences an acute heart failure episode, there may be temptation to attribute the deterioration to the compression and remove the bandaging. This is not recommended as it will increase

Figure 7. Decision-making pathway for compression therapy in patients with heart failure

Scan the QR code to see the Pumping Marvellous Symptom Checker

lower limb oedema, putting the legs at risk of blistering, leaking and ulceration. It is advised that the compression be maintained and that the patient be referred to the appropriate heart failure specialist (Atkin et al, 2022).

The role of the multidisciplinary team

It is important to improve communication among clinical teams who are assisting a patient with heart failure and oedema/ulceration. Heart failure should be identified as compensated or decompensated at general practice to aid diagnosis. The community nurse should be liaising with the general practice team to aid decision-making instead of making the decision on their own. There is an opportunity for specialist nursing groups, particularly compression-focused nurses and heart failure nurses, to exchange learnings, insights and best practices. This improves care at the point of compression initiation by helping to align treatment expectations and goals, as well as providing more perspectives on a patient's progress (or deterioration), allowing for timely and appropriate referral to specialist services.

Education and patient motivation

Encouraging the patient to take an active role in disease management is pivotal to optimising treatment outcomes. Because heart failure is a chronic disease, it is critical to slow its progression by understanding the condition and making the necessary lifestyle changes. Patients, particularly those who are overweight, should be encouraged to increase their daily movement. This can help patients prolong the period that they can perform normal daily tasks, and avoid weight gain.

Elevating limbs at home is also important for better outcomes. Elevation of the leg to hip level should be encouraged, and sleeping in a reclining chair, for example, is not a form of meaningful elevation. Care should be taken to avoid increasing the risk of pressure damage to heels.

How treatments are accepted by indivduals is reliant on patient knowledge and understanding of the long-term effects of venous disease and uncontrolled oedema, and the role of compression in the prevention and treatment of venous leg ulcers. Clinicians need to explain to patients the consequences of oedema/venous hypertension and uncontrolled oedema, provide them with sufficient information for them to understand the rationale for treatment, and remind them that compression only controls oedema and prevents leakage/ulceration if it is worn consistently.

Clinicians should also encourage patients to talk through how they are feeling and help them to understand what they need to do if their symptoms change or get worse. Pumping Marvellous is a patient-led heart failure charity that provides a traffic light symptom checker to support patients to manage a change in their symptoms and what to do if they need help (Pumping Marvellous, 2021). Pumping Marvellous also offer a peer support group that provides emotional support, friendship and advice to support people with heart failure.

The most effective way to educate and involve patients in their care strategy is to engage in motivational interviewing. This approach emphasises an exchange that does not simply tell the patient the details but encourages them to discuss why and how aspects of their care can benefit them. This can drive ownership of disease management and can be especially effective in modifying movement and diet goals.

Looking to the future and the next steps

There are still several knowledge gaps regarding the appropriate use of compression therapy in people with heart failure. While there is robust evidence to support the use of compression therapy in compensated and early-stage heart failure, there remains a need for insight and clinical updates on whether, how and when compression therapy should be used in those with end-stage and acute decompensated heart failure. Once available, clear communication of this evidence is critical in preventing new myths from emerging.

Improved treatment of patients with heart failure and oedema requires improved MDT communication. With multiple specialist services involved and conflicting perceptions about the role of compression therapy for these patients, there is an opportunity to improve experience-sharing and referral accuracy through collaboration.

Further testing and validation of the recent pathway for compression therapy in people with heart failure are required. As more practitioners use and interpret this document, it can be refined and optimised to ultimately provide a valuable decision-making resource for those involved in patient care.

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