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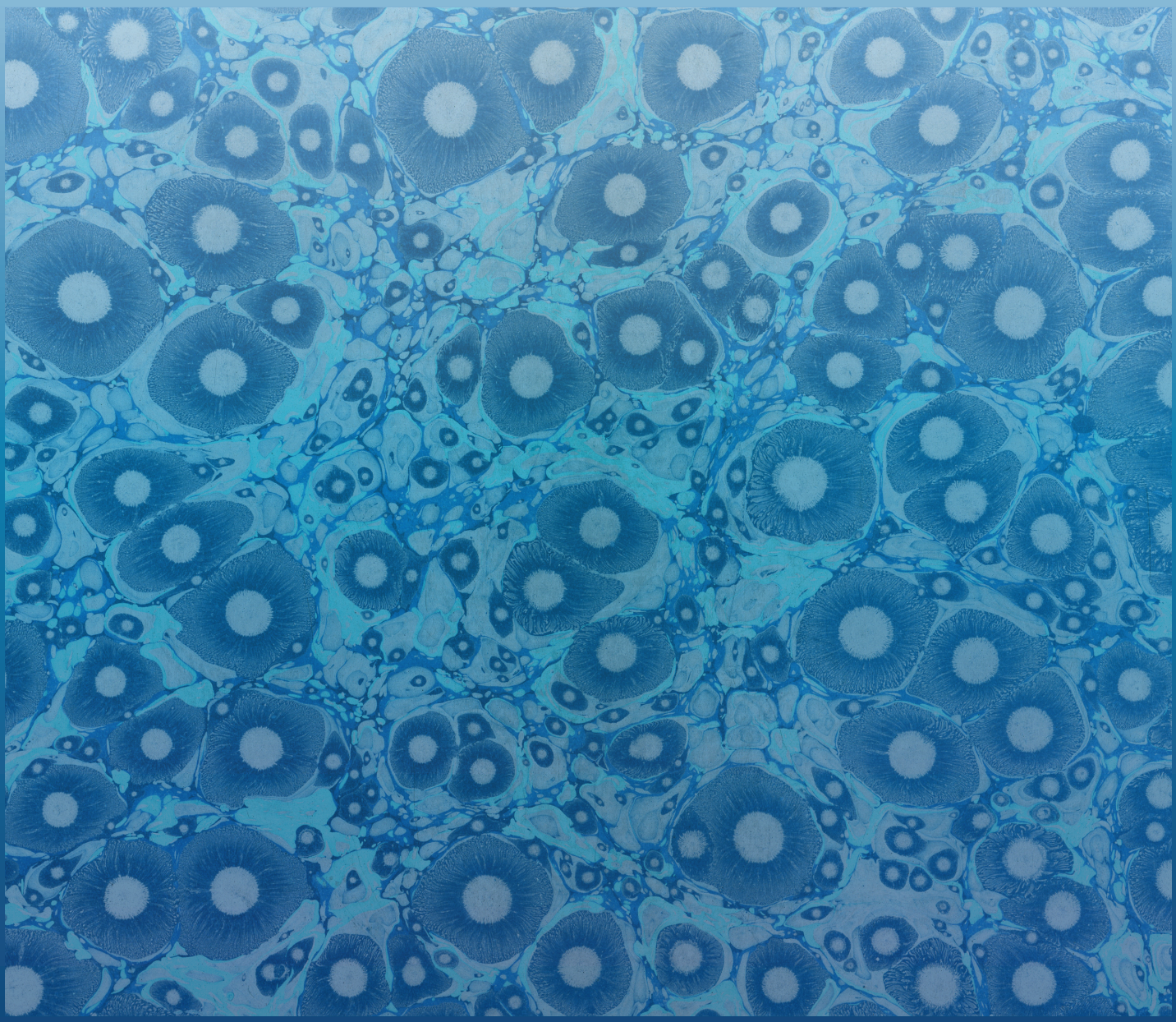

Practical issues in applying compression garments and wraps for management of lymphoedema

Endorsed by

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Foreword

Lymphoedema is a chronic disorder of the lymphatic system, with an estimated prevalence of up to 250 million people affected worldwide (Hill et al, 2023). Despite this significant prevalence, there has been a historical delay in providing timely treatment and effective patient education. This lack of urgency in lymphoedema care has arisen from insufficient knowledge about the condition and limited knowledge among healthcare professionals about managing lymphoedema effectively. Furthermore, the lack of accessible information has exacerbated the problem, leading to the development of a number of myths surrounding lymphoedema pathophysiology and treatment. The aim of this consensus document is to identify the barriers that the lymphoedema healthcare force currently faces in the UK and to create an easy-to-access document for primary and secondary care professionals to increase their confidence in managing lymphoedema in their routine practice.

In developing this consensus, there was a unanimous agreement among the expert panel that a significant unmet need lies in increasing awareness of the basic science behind lymphoedema and the mechanism of its treatment via compression therapy; addressing this issue and the prevailing myths about lymphoedema treatment can improve healthcare professionals' awareness and confidence in their capability to manage the patient in front of them.

Therefore, the aim of this consensus document is two-fold: to bust lymphoedema myths and share practical tips for common problems that lymphoedema practitioners may encounter in their daily practice, regardless of their experience level. The document aims to explain lymphoedema pathophysiology and the science behind compression therapy. The document then provides a case for effective and consistent preventive measures in people at risk of lymphoedema, explains the basic principles of choosing a suitable compression therapy garment and reiterates how, despite the initial cost of lymphoedema treatment materials, the long-term impact of timely intervention is beneficial and cost-effective for both patients and the healthcare system.

Building on the basics from the Lymphoedema Framework (2006), this consensus aims to provide a reference point for healthcare professionals (HCPs) to develop intuitive thinking in basic management of lymphoedema. The goal is to empower HCPs in confidently identifying and supporting a patient who has had lymphoedema for some time and requires straightforward treatment, rather than urgent care.

This document is not intended to provide detailed, step-by-step guidelines and algorithms for lymphoedema treatment. For that purpose, we have referred throughout to suitable guidelines and scientific literature.

Jacqui Fletcher, Chair

Glossary

Anchoring filaments: the thread-like structures that anchor the lymphatic capillary cells to the surrounding muscles/extracellular matrix; when muscles move (e.g. due to exercise, activity and movement), the 'pull' on the anchoring filaments helps open the lymphatic capillary to absorb and move lymph from that area

Capillary endothelial cells: the cells that form the single-layer wall of lymphatic capillaries

Chyle-filled lymphangiectasia: blockage of lymph vessels with chyle (typically with lymph and emulsified or free fatty acids in the small intestine)

Chyluria: appearance of lymphatic fluid in urine, turning urine to a milky white colour

Elasticity: a measure of the stretch of compression garments

Graduated compression: the gradient of compression applied to a part of body (typically the limbs) to move excess fluid towards parts of body with a still-functional lymphatic system

Lymphatic aplasia: absence of lymphatic vessels

Lymphatic hyperplasia: rapid growth of lymphatic cells that typically occurs in response to infections or antigens

Lymphorrhoea: the leakage of lymph in a lymphoedema-affected part of the body, which increases the risk of skin complications and infection

Pitting: the appearance of a mark if pressure is applied (via fingers, hand or any object) on the skin of a patient with lymphoedema. Pitting indicates recent fluid accumulation; non-pitting lymphoedema is typically a sign that the disease has progressed to fibrosis

Resting pressure: the pressure that a compression therapy tool applies to a patient's body when they are resting in a supine position

Static Stiffness Index (SSI): the difference between the pressure exerted by a compression therapy tool when the patient is standing versus resting

Therapeutic compression: a compression pressure applied to a lymphoedema patient's body, based on that patient's needs

Working pressure: the pressure that a compression therapy tool applies to a patient's body during exercise, activity and movement (e.g. walking)

What is lymphoedema and how does it occur?

To effectively apply the available tools for treatment, a healthcare professional (HCP) must understand how lymphoedema occurs and how its therapy reduces the disease symptoms. The following guidance provides information relevant to every HCP, whether an experienced lymphoedema specialist/practitioner or any other healthcare personnel working in a clinical setting with no access to lymphoedema services.

Lymphoedema is a distinct condition from lipoedema, though the latter is still often perceived as an oedematous condition; however, this perception must change because lipoedema is a consequence of the build up of adipose tissue, and not build-up of fluid (Bertsch et al, 2020).

The lymphatic system

Lymphoedema occurs due to malfunctioning lymphatic system drainage. The lymphatic system is an exchange and transport network throughout the body that moves fluid, macromolecules and cells, and provides immunity from pathogens [**Figure 1**; National Insititute of Health (NIH), 2023; National Cancer Institute (NCI), 2023]. It is made up of lymphatic capillaries, lymph vessels, lymph nodes and a variety of cells, plexuses and organs. This document will not go into detail of the structure of the lymphatic system and will instead focus on the parts of the lymphatic system that are relevant to lymphoedema.

What is lymph and why should excess be removed from tissues?

There are three main functions of the lymphatic system: return of the interstitial fluid that has leaked into the interstitial tissue space, scanning this fluid for any potential pathogens, and absorbing and transporting fats and fat-soluble vitamins to the venous system (NCI, 2024). The overall function of the lymphatic system is to

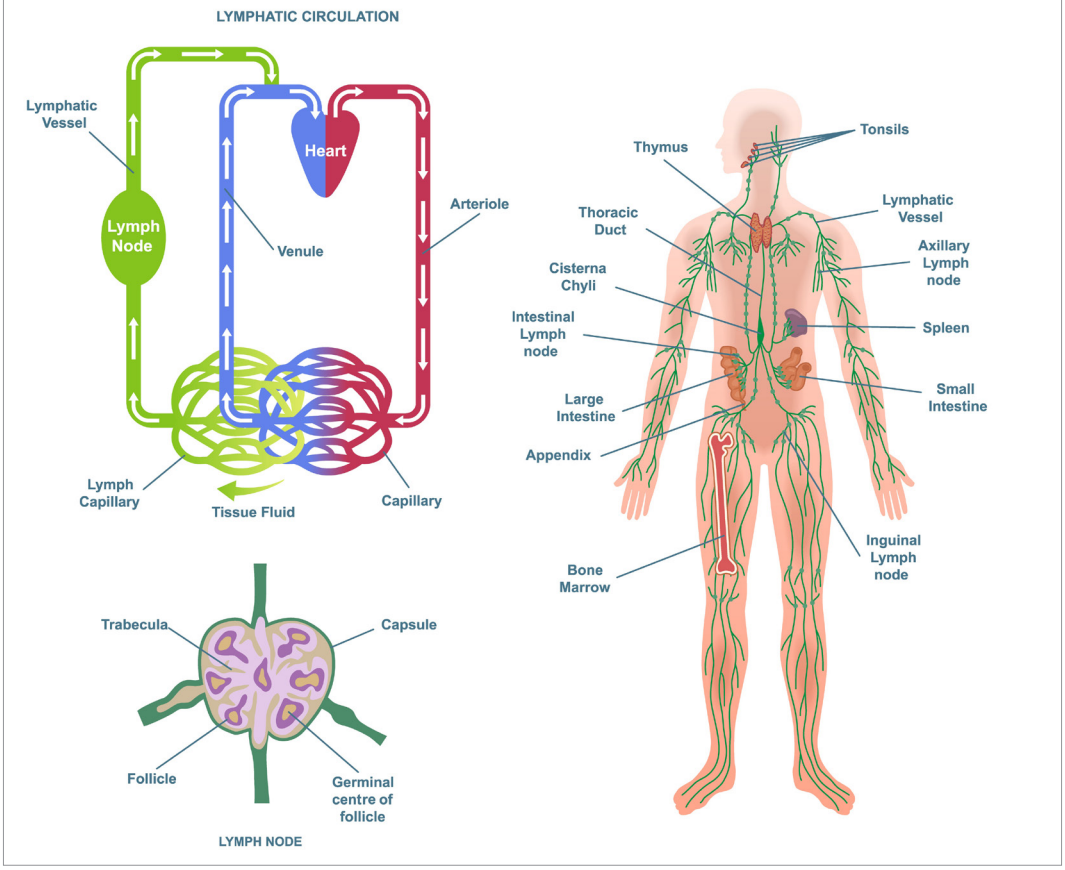

Figure 1: The lymphatic system is a fluid collection system spread all over the human body; the left-hand image shows how plasma fluid leaked by the blood capillaries into the interstitial tissue space is taken up by the lymph capillaries and eventually dropped back into the blood via venules; the right-hand image depicts the overall structure of the lymphatic system across the body.

What is lymphoedema and how does it occur? *(Continued)*

maintain a normal physiological environment and elements of the lymphatic system are present in nearly every tissue in the human body (Breslin et al, 2018; Mortimer and Rockson, 2014). Throughout the body, blood capillaries 'leak' fluid and proteins into the interstitial space. This fluid build-up needs to be removed and returned into the circulatory system constantly because, otherwise, blood volume and pressure will reduce significantly, bringing the vascular system to a halt; the physiological environment of tissues will also change, impairing their normal function. The lymphatic capillaries soak up this extra fluid and other macromolecules and, through a network of lymph vessels, return it to the blood via the venous system (**Figure 1**; Breslin et al, 2018; NCI, 2024).

How do the lymphatic capillaries remove extra interstitial fluid?

Blood moves through the body due to the pumping action of the heart. However, the lymphatic system does not work in a similar way because, unlike the vascular system, the movement of fluid through the lymphatic system does not occur in a circulatory fashion – lymphatic fluid is taken through the lymphatic capillaries and eventually transported to the blood after it has been filtered by the lymph nodes and some of the lymph organs along the way for presence of any pathogen (Breslin et al 2018; NCI, 2024).

The lymphatic capillaries have a specialised cellular structure whereby single cells are arranged in an overlapping manner, almost like 'roofing shingles' **[Figure 2]**. These cells are connected to the extracellular matrix through anchoring filaments. One end of each cell or 'shingle' has a flap-like structure that opens in only one direction (Angeli and Lim, 2023). Due to the lack of musculature, this flap-like structure will only open when the filaments that anchor the lymphatic vessels to the surrounding structures (e.g. skin, muscles and fascia) are pulled due to movement (Angeli and Lim, 2023). This one-way opening ensures that, once the lymph capillary has collected the extra fluid from the interstitial space, the fluid does not leak back even as fluid pressure builds up inside the capillary **[Figure 2].** Along with this excessive fluid, lymphatic capillaries also absorb any lymphocytes, pathogens, cell debris, and other plasma components such as proteins. This fluid, now called 'lymph', is then moved into collecting lymphatic vessels via a one-way valve that,

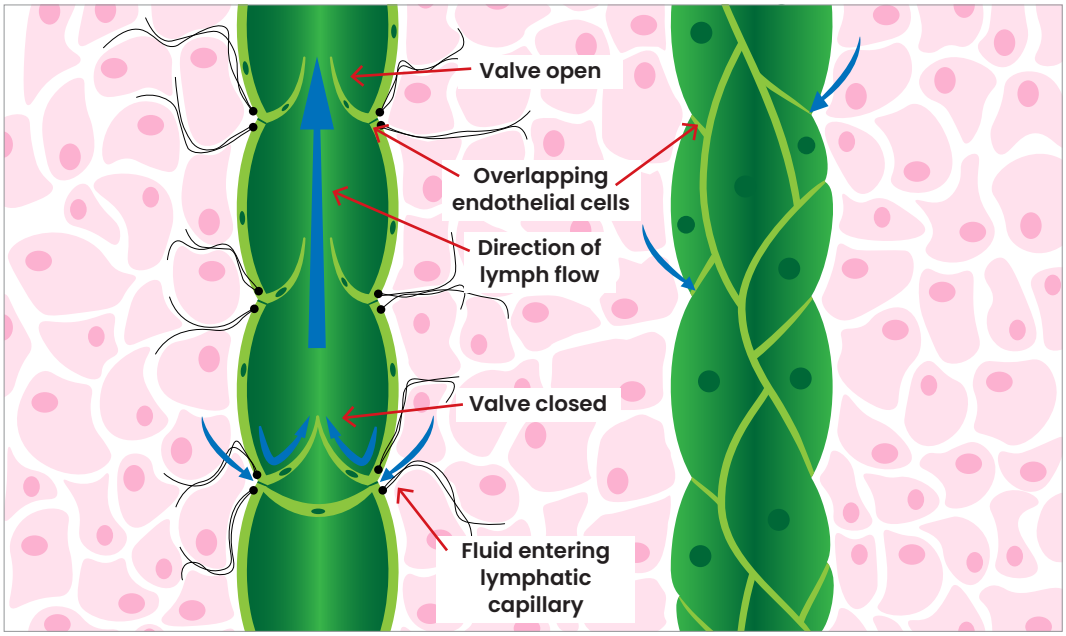

Figure 2: The overlapping arrangement of the endothelial cells in the lymphatic capillaries. The left-hand image shows the cross-section of the lymphatic capillary (shown on the right). The thread-like structures (black) depict the anchoring filaments tethered to the surrounding extracellualr matrix (pink).

again, ensures the lymph collected from the surrounding tissues flows in one direction; this valve prevents the backflow of lymph as it moves into the next segment due to peristaltic muscle activity in the vessel wall, which pushes the lymph forward (**Figure 2**; Wolf et al, 2023; Angeli and Lim, 2023; Breslin et al, 2018; National Institute of Health [NIH], 2023).

Lymphoedema – a manifestation of impaired lymphatic system

If the lymphatic system is damaged, overwhelmed or is not formed sufficiently and, therefore, fails to adequately perform its fluid collection function (see page 8 for further information on the reasons for this failure), this results in accumulation of this fluid in tissues – known as 'lymphatic fluid stasis'– causing swelling and inflammation – i.e. lymphoedema [**Figure 3**; Brown et al, 2023; National Library of Medicine (NLM), 2024a]. This inflammation triggers several pathways that eventually lead to growth of fat cells and fibrosis in the affected area, which further add to swelling (Breslin et al, 2018). For a HCP aiming to tackle lymphoedema, it is very important to understand the underlying cause and the progression of lymphoedema in each patient, because the cause as well as the changes in the affected area will dictate therapy decisions.

Typically, lymphoedema occurs in the limbs but other body areas can also be affected, including the neck, head, breast and genitalia. **Table 1** shows the impact on patients when the three main functions of the lymphatic system fail in lymphoedema. The symptoms of lymphoedema significantly impact patients, both physically and psychologically, as the swollen body part reduces their mobility and affects body image (Fu et al, 2013). Patients also experience pain and discomfort and become vulnerable to cellulitis/erysipelas, often requiring antibiotics (Keast et al, 2015).

If the lymphatic system fails to function adequately due to a congenital condition, the resultant lymphoedema is called 'primary lymphoedema'. If the lymphatic system is damaged secondary to diseases in which lymph nodes or lymphatic vessels are destroyed or removed due to infection or radiotherapy

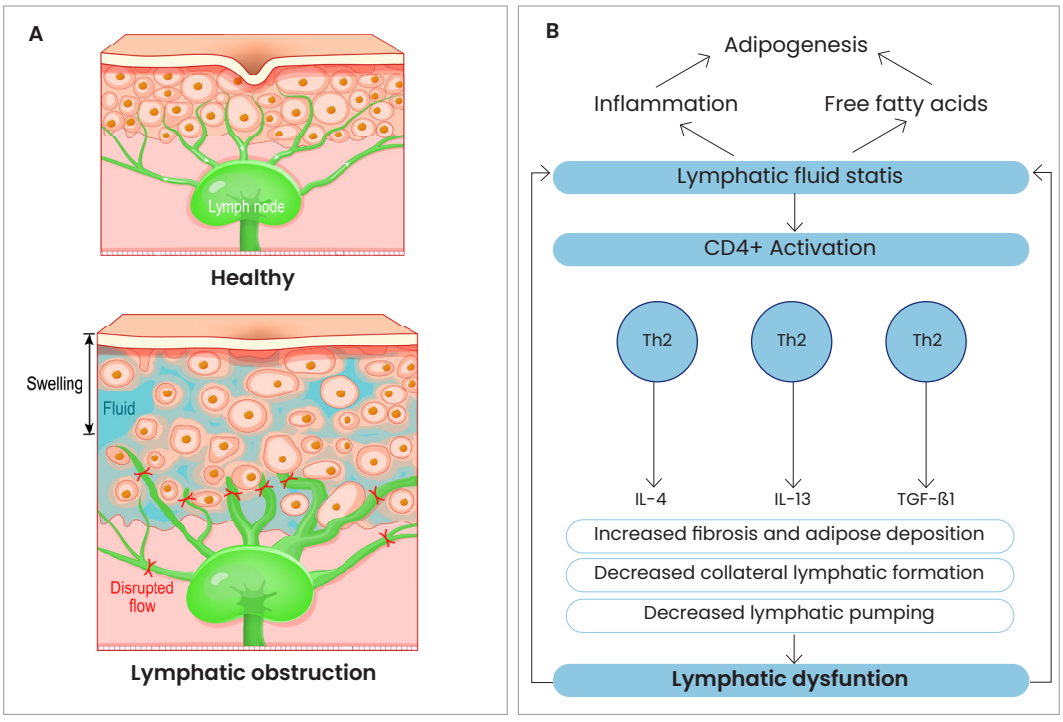

Figure 3: A. The excess fluid accumulation and molecular pathways involved in lymphoedema that cause swelling, the most visible lymphoedema symptom;
B. progression of lymphoedema following initial lymphatic damage (Ly et al, 2017; Brown et al, 2023).
Abbreviations: CD4, cluster of differentiation 4; IL, interleukin; TGF-ß1, transforming growth factor-beta 1; Th2, T helper cell type 2.

What is lymphoedema and how does it occur? *(Continued)*

(e.g. during treatment for prostate or gynaecological cancers), it is called 'secondary lymphoedema' (NLM, 2024a). Secondary lympohoedema can also occur as a result of conditions (e.g. kidney and/or heart disease) that overwhelm, and therefore result in failure of, the lymphatic system (Baker and Cantley, 2023; Houck et al, 2020). There is also evidence that obesity plays a key role in the development of a form of secondary lymphoedema termed 'obesity-induced lymphoedema' (OIL). The risk of lymphatic dysfunction increases with increased body mass index (BMI). Individuals with OIL may remain in a cycle of weight gain and lymphatic injury, whereby, as BMI increases, lymphoedema worsens, ambulation becomes more difficult, and BMI further rises (Rockson, 2021; Sudduth and Greene, 2022). Secondary lymphoedema also occurs as result of a mosquito-transmitted infection called 'filariasis', which is endemic in some parts of the world and one of the main contributors to the global lymphoedema prevalence. Please refer to the Global Alliance for Elimination of Lymphatic Filariasis (GEALF, 2024) for resources on filariasis.

Table 1: Manifestation of lymphatic system failure in lymphoedema (adapted from BLS, 2023; NLM, 2024b).

Function of lymphatic system	Implications of impaired function for patient/impact on body
Maintenance of fluid balance by collection and transport of fluid from tissue spaces back to circulation	Peripheral swelling, which does not lessen overnight or with elevation
Nutrition by fat absorption from the gut and transport to circulation	Impaired lymphatic system in the digestive track affects absorption of fat and fat-soluble vitamins
Immunity and defence by removal of dying or mutant cells, transporting antigens and immune cells, generating immune responses to infection and malignant cell antigens	Swelling may initially be soft and pitting. Over time, and without treatment, the interstitial fluid is replaced by fibrosis and adipose tissue, which is unevenly distributed and pitting is difficult or impossible to identify. An inflammatory response causes subcutaneous tissues to become thickened and increasingly firm. These thickened tissues may cause deep folds to develop (e.g. at the ankle). Appropriate treatment will minimise common complications, such as: • predisposition to cellulitis, which in turn further damages the superficial lymphatic vessels • skin becoming dry and cracked as cellular particles that would normally be removed from the interstitial spaces draw moisture from the skin • lymph blisters developing, becoming fibrosed over time, giving a 'warty' appearance • areas of lymph leakage or lymphorrhoea through cracks in the skin.

The list above is not exhaustive, and other symptoms may also be present in some patients. However, the symptoms listed above can help healthcare professionals differentiate lymphoedema from other forms of oedema.

MYTH

Lymphoedema and chronic oedema are two distinct disorders and can only be treated by relevant specialists.

TRUTH

Because lymphoedema is a chronic, currently incurable condition, it is also sometimes referred to under the umbrella of chronic oedemas. Often, chronic oedema is seen as different from lymphoedema and the effective treatments established in lymphoedema are not undertaken. However, the same principles of therapy apply to both oedema and lymphoedema and often the underlying disease involves overlapping malfunction involving lymphatic systems (e.g. both lymphatic and venous system are impaired in obesity). Chronic oedema, regardless of the initial cause, indicates there is a degree of lymphatic failure that needs to be addressed.

Lymphoedema prevalence and risk factors

In a study conducted by Moffatt et al (2016), the crude prevalence of chronic oedema was estimated to be 3.93 per 1000, with the incidence rising with increased age. Due to its high prevalence and under-treatment, lymphoedema has been described as a hidden epidemic (Keast et al, 2015). Currently, it is estimated that approximately 120–250 million people could be affected by lymphoedema worldwide (Hill et al, 2023; International Lymphoedema Framework [ILF], 2020).

Table 2 summarises the potential causes of secondary lymphoedema and can be used to identify at-risk patients before lymphoedema becomes advanced. It is crucial to understand the underlying cause of lymphoedema to assess if the lymphatic system is indeed damaged or only overwhelmed, and whether the cause of lymphoedema can be treated. Effective identification of patients at risk of lymphoedema relies on awareness of the causes of lymphoedema and associated risk factors, and is critical for implementation of preventive strategies and self-monitoring. Patients, carers and HCPs should be aware that there may be a delay of several years from a causative event to the appearance of lymphoedema (International Society of Lymphology [ISL] 2020; Watts and Davies, 2016). Furthermore, it is important to understand the potential cause of lymphoedema when treating a patient post-diagnosis so any exacerbation may be controlled in time.

Stages of lymphoedema and their impact on therapy decisions

As lymphoedema pathophysiology is still under investigation, the stages of its progression have been historically less defined and there is an unmet need to revisit its staging once the molecular mechanisms behind its progression are identified and matched with clinical manifestations (Brown et al, 2023). However, the International Society of Lymphology staging provided in **Table 3** is a widely used staging method.

Each lymphoedema stage is associated with some hallmark anatomical changes in the affected area and it is imperative that the lymphoedema practitioner considers the stage of lymphoedema when planning treatment, because the anatomical differences between stages dictate what therapy strategy must be employed. Currently, the International Society of Lymphology (2020) staging is the most widely used lymphoedema staging system (**Table 2**; Sudduth and Green, 2022;

What is lymphoedema and how does it occur? *(Continued)*

Brown et al, 2023). It is important to remember that the presentation may not fit entirely into one of these stages; furthermore, when using this staging to decide the treatment course, it is also imperative that patient preferences/goals and comorbidities are taken into account.

As per this system, early lymphoedema stages (stages 0 and I) manifest differently to chronic lymphoedema in terms of their fluid state and response to treatment (Brown et al, 2023).

This means that therapy decisions must be tailored to the lymphoedema stage for each patient. Recent studies have shown that, once lymphatic damage has occurred, players from the inflammatory pathways (e.g. cluster of differentiation 4+ (CD4+) T cells; see **Figure 3**) have key roles in disease progression (Brown et al, 2023). As shown in **Figure 3** and **Table 2**, when lymphoedema progresses, fatty tissue formation occurs in stages II and III; at this stage, the swelling in the affected part of the

Table 2: Causes of secondary lymphoedema (International Society of Lymphology (ISL), 2020; Sudduth and Green, 2022).

Types of damage/disorders that cause secondary lymphoedema	Example(s)
Trauma and tissue damage	• lymph node excision • radiotherapy • burns • varicose vein surgery/harvesting • large/circumferential wounds • scarring
Malignant disease	• lymph node metastases • infiltrative carcinoma • lymphoma • pressure from large tumours
Venous disease	• chronic venous insufficiency • venous ulceration • post-thrombotic syndrome • intravenous drug use
Infection	• cellulitis/erysipelas • lymphadenitis • tuberculosis • filariasis
Inflammation	• rheumatoid arthritis • dermatitis • psoriasis • sarcoidosis • dermatosis with epidermal involvement
Endocrine disease	• pretibial myxoedema
Immobility and dependency	• dependency oedema • paralysis • obesity
Factitious	• self-harm

Table 3: The stages of lymphoedema as per the International Society of Lymphology (ISL) guidance (ISL, 2020)	
ISL stage 0	A subclinical state where swelling is not evident despite impaired lymph transport. This stage may exist for months or years before oedema becomes evident
ISL stage I	This represents early onset of the condition where there is accumulation of tissue fluid that subsides with limb elevation. The oedema may be pitting at this stage
ISL stage II	Limb elevation alone rarely reduces swelling and pitting is manifest
ISL late stage II	There may or may not be pitting as tissue fibrosis is more evident
ISL stage III	The tissue is hard (fibrotic) and pitting is absent. Skin changes such as thickening, hyperpigmentation, increased skin folds, fat deposits and warty overgrowths develop

body may still look quite similar to swelling that occurs due to the accumulation of fluid in stages 0 and I. However, it is important for HCPs to remember that the swelling in stages II and III is caused by both excessive fluid and build-up of fatty scar tissue (fibrosclerosis); this necessitates a different lymphoedema treatment approach and expectation of treatment outcome than when the swelling is due only to excessive fluid build-up (stages 0 and I).

There is emerging evidence that gut microbiome plays a role in the activation of inflammation, which plays a vital and detrimental role in many chronic diseases. A limited diet, which is high in processed, high-fat content and lacks varierty of plants, creates an inflammatory reaction following eating and digesting these types of foods (Spector et al, 2020). As the lymphatic system is responsible for removing dietary fats via the villi in the small intestine, adding them to the blood system to be processed in the liver (NCI, 2023), it is highly likely that diet is a contributing factor to the long-term management of lymphoedema; however, detailed research with gut microbiome and lymphoedema has not yet been published.

Treating lymphoedema

Lymphoedema may affect many parts of the body, including lower limbs. As evident by its pathophysiology, lymphoedema is distinct from other disorders that affect the lower limb, such as venous leg ulcers (VLUs), although some of its treatment, such as compression therapy, may appear similar and it may coexist with VLUs.

When treating lymphoedema, it is important to remember the structure of the endothelial cells in the lymphatic capillaries and the filaments anchoring these cells to the extracellular matrix (**Figure 2**). As muscles move (e.g. due to exercise, activity and movement) the anchoring filaments exert a pull on the capillary cells and this opens the cells to let the lymph enter the capillaries (Angeli and Lim, 2023).

Lymphoedema treatment requires a multifactorial approach known as 'decongestive lymphatic therapy' (DLT; National Health Service [NHS], 2023). Aimed at reducing lymph build-up and swelling, DLT consists of the following components:

1. **Compression therapy:** Compressing the affected area using garments, such as stockings, wraps or bandages (or a combination of these), to reduce capillary filtration, increase lymphatic drainage, move fluid from compressed areas towards areas with functional drainage and to break down fibrosclerotic tissue. The stiffness of the fabric can influence the amount of oedema that is able to form, as it provides a stronger wall around the limb. The aim of this treatment is to provide a high working pressure (using the muscles against the fabric to promote lymph return) and low resting pressure
2. **Skin protection:** Due to increased lymph fluid and change in normal physiological conditions (e.g. decrease in nutrition, inflammatory processes and physical pressure), the skin in the lymphoedema-affected area becomes vulnerable to infections (e.g. cellulitis) and a good skincare regimen is essential to ensure skin integrity and cleanliness
3. **Exercise/activity/movement:** This helps improve drainage by contracting the muscles in the affected area (e.g. leg) whose force then pushes the lymph into the lymphatic capillaries and through the vessels.

Additionally, manual lymphatic drainage (MLD) is a method largely used for mid-line lymphoedema and less so for limbs. It is a massage technique in which a HCP massages the affected area to physically move the fluid into lymph capillaries and towards areas of the body with better lymph drainage. Patients are encouraged to take on simple lymphatic drainage (SLD) to help with the swelling. Empirical evidence of measurable clinical benefit of MLD is lacking. Its inclusion in treatment must be determined for individual patients following a thorough assessment and only continued if there is clear clinical benefit determined (BLS, 2024).

This consensus focuses on the main component of DLT in routine lymphoedema care: compression therapy. Not only it is the most commonly employed lymphoedema treatment, there are a number of myths associated with it, potentially affecting the confidence of some HCPs, but especially those in community care, who have no access to a lymphoedema specialist to refer their patients and, therefore, have to plan and administer at least the initial treatment themselves. Using the following guidance, a community care HCP can identify and support a 'typical' patient with lymphoedema – i.e. a patient who has had lymphoedema for some time (mild to moderate) and requires long-term treatment but not specialist care (which should be provided by specialists to people with complex/severe lymphoedema). However, there are certain lymphoedema cases that should ideally be seen and treated by a lymphoedema specialist via referral. These cases include: swelling of unknown origin, mid-line lymphoedema (i.e. head, neck, trunk, breast, genitalia), paediatric patients with oedema that appears chronic, primary lymphoedema and lymphoedema cases within families.

MYTH

Compression therapy can 'compress' the lymphatic vessels to the point where lymph flow stops altogether.

TRUTH

There is a common misconception (see Figure 3) that the inlet in the lymphatic capillaries is pressure-opened and, because it is a system that is impaired in lymphoedema, the capillary inlets require a 'push'. Compression therapy garments provide this push, so lymphatic capillaries can absorb the excess liquid.

If there is no referral service available in the area, HCPs should gather sufficient evidence to warrant an out-of-area referral, or complete an incident form (e.g. for patients with significant, increasing lymphoedema): these actions can lead to investment in the local area for providing these services. In the meantime, all HCPs should be able to give basic advice about skincare, exercise, activity and movement, and positioning. Cellulitis/suspected cellulitis needs immediate referral to specialists, who must have the ability to assess and prescribe antibiotics as appropriate.

How does compression therapy work?

Compression therapy has several beneficial effects on the lymphatic system (ILF, 2020):

- It decreases the load of excessive fluid on lymphatic cells
- It provides the pressure that the built-up interstitial fluid needs to re-enter the lymphatic vessels (see **Figures 2 and 3**)
- When anchoring filaments are pushed by the pressure of compression therapy or pulled by the stretch of muscles and surrounding tissues **(Figure 2)**, their increased tension further increases the flow of fluid to the lymphatic capillaries from the interstitial space
- Combined with exercise, activity and/or movement, it forms a wall for the muscles to work against, increasing the pumping effect, which propels the lymph through the lymphatic vessels
- It decreases inflammatory cytokines, which helps break down the excessive build-up of fatty scar tissue, further decreasing the swelling caused by fibrosclerosis.

In addition to the impact on the lymphatic system, compression therapy also affects the venous system via mechanisms that improve outcomes in lymphoedema (ILF, 2020):

- It increases the tissues' hydrostatic pressure, which decreases net plasma filtration and less build-up of fluid
- It reduces blood volume in the leg and the subsequent leakage of plasma to the interstitial spaces.

Current understanding of how compression works in patients with chronic oedema/lymphoedema remains inadequate. Some of the conclusions and, therefore, compression-associated myths in lymphoedema are derived from research on venous disease (ILF, 2020). It is important to dispel these myths and employ compression therapy to its full potential.
It is important to note that early intervention can help reduce the risk of cellulitis and lymphorrhoea.

Different ways to apply compression in lymphoedema

Overall, the objective of applying compression garments is to promote circulatory and lymphatic function, reduce pain associated with fluid build-up and prevent accumulation and spread of oedema (All-Ireland Lymphoedema Guidelines, 2022). Therefore, compression

therapy must be adapted to each patient's needs. The type of compression therapy administered will be influenced by the stage of lymphoedema.

Compression garments are available for varying compression levels, ranging from low (14mmHg) to very high (>35mmHg) compression (Elstone et al, 2021). Unfortunately, the standard defining the level of compression and class varies from country to country and depending on the individual manufacturing company, which can lead to confusion.

It is important to know how to assess compression pressure that a garment can exert on the patient's body – i.e. the dose of compression pressure. This compression 'dose' can be estimated by using the Static Stiffness Index (SSI), a classification originally used for compression bandages, and not for compression garments; however, as there is currently no way of accurately measuring the 'stiffness' of compression garments, SSI can provide an estimate. It is important to remember that information about SSI is not typically provided by most compression garment manufacturers and only the compression class is specified on the packaging. However, an understanding of SSI in the section below can help HCPs understand the concept of compression dosage.

Static Stiffness Index (SSI) – the compression therapy dose

SSI is the pressure that a compression garment exerts on a patient's body in real time (Partsch et al, 2016). It is calculated as 'the difference between the pressure at standing and the pressure in the supine resting position' (Partsch et al, 2016). It is important to remember that there are limited clinical data on accurate SSI assessment in lymphoedema and, in lymphoedema patients, SSI should be used as an indication of the stiffness of fabrics.

When the SSI of a compression garment is measured, the garment is applied on the patient's body and, without changing the position of this garment, the resting (patient lying flat or legs-up, with relaxed knee and ankle) and standing (~3 minutes after standing from the resting position) pressures are measured. Subtracting resting from standing pressure provides the SSI value for this garment in that body position (Partsch et al, 2016). This measurement cannot be performed in routine clinical settings and is only provided here to explain the concept of SSI measurement.

It has been shown that the average peak pressure of compression applied when standing is only slightly lower than the peak pressure when the patient is walking. Therefore, the standing position's pressure is a reliable indicator of walking pressure (Mosti and Mattaliano, 2007). It is important to remember that this SSI value for the same compression garment will be different between individuals if their anatomy and muscular strength is different. This is because a compression garment will provide a higher SSI value when applied to a normal leg with strong muscles compared with a leg with abundant fat tissues or with lymphoedema. Although the circumference of the applied garment does not change (because it is not elastic), the circumference/shape of the body part changes as it accommodates the change in muscle shape, creating a higher pressure. In summary, different tissue types and presentations will have different outcomes.

In the following section, practical advice is provided on compression therapy garment applications, aimed at HCPs with only basic training in lymphoedema compression therapy (All-Ireland Lymphoedema Guidelines 2022); for more detailed discussion on the types of garments available, please refer to ILF (2020).

Types of compression garments

Depending on the diagnosis complexity and patient needs, compression garments can be broadly divided into off-the-shelf (OTS) or made-to-measure (MTM; All-Ireland Lymphoedema Guidelines 2022).

OTS garments: These products are usually applicable for low-level compression in patients with non-complex lymphoedema (e.g. patients

who have a normal limb shape and no urgent referral needs to a lymphoedema specialist), although some OTS garments are also available for high-level compression (see pages 27 and 31 for information on urgent referral needs). These patients can be assessed and managed by a community or primary care HCP who has training in measuring for OTS garments and who is able to provide appropriate advice to the patient on their condition, including exercise, activity and movement as well as skincare routines. It is important to remember that using an OTS garment on a limb that does not present within the ranges for the measurements of that garment will alter the graduation of the pressure.

MTM garments: If a patient with lymphoedema is experiencing a lymphoedema-induced shape distortion or if their natural anatomical shape does not fit the manufacturer's standard parameters (e.g. due to obesity or congenital abnormalities), compression therapy can be provided with an MTM garment adapted as per the individual patient's needs. However, this is an intervention which should ideally be undertaken by a lymphoedema practitioner/specialist who can assess the need and take measurements to select the appropriate MTM garment. If the distortion improves, the patient can be considered for an OTS garment. Measuring for custom garments may also be available via the local formulary for use in mild to moderate cases.

If shape distortion is due to reasons other than oedema, the patient does not typically need an assessment via a lymphoedema specialist or treatment with MTM garments.

Table 4: Overview of types of compression devices and their applications

Elastic garment		
Circular-knit garments	Seamless, thinner; have more stretch	Better tolerated by patients; more likely to cause problems where there are skin folds; suitable for patients with minimal shape distortion and may improve tolerance of application so the patient can then be advanced to a firmer fabric
Flat-knit garments (commonly knitted flat and seamed; no circumferential bands)	Thicker, firmer; generally more rigid and apply higher pressures than circular-knit garments	More suitable when there are skin folds and/or significant distortion of the limb because flat-knit garments will be less likely to fold with the skin Note that several soft/not-stiff flat-knit options are now also avaialble, providing a range of compression, from low to high
Inelastic garments		
Wrap systems	Bulky in structure, which can limit practicality for daily use; available with Velcro fastening, which allows ease of application	Provide varying levels of compression and can be useful if there is a dressing on the limb that would be disrupted with donning and doffing of compression garments. Easier for patient to self-apply (patients with mobility and dexterity issues find these easier to apply)
Bandaging	Multi-layered inelastic bandages; typically have a liner, padding layer and a bandage layer	Mainly used in the intensive phase of treatment for lymphoedema; can also be used when de-bulking and reshaping, and when the legs leak lymphorrhoea

Many MTM garments are available with a variety of fastening options such as Velcro straps and zips to aid donning and doffing and hence improve patient comfort. It is important to note that new compression innovations are continually being produced so it is worth contacting manufacturers or local formulary for advice.

Based on the structure and stiffness of the fabric, compression garments can be divided into four types outlined in **Table 4** (All-Ireland Lymphoedema Guidelines, 2022). It is important to note that compression garments are developed with materials with a range of elasticity – the higher the elasticity, the lower the pressure the garment will apply on the patient's body.

Choosing the right type of garment can initially be a baffling and overwhelming choice. A good starting place for all HCPs is their local formulary because compression therapy experts in the local area will have selected suitable products, listing first choices and criteria for selection. Furthermore, training is likely to be available for the products listed on formulary; company representatives can also be a useful source of information and will often help with selection and measurement of garments, if needed. Local lymphoedema services can also provide guidance and advice. Clinicians can obtain copies of manufacturers' catalogues and familiarise themselves with the ranges to begin to understand the available options. Successful compression therapy usually requires creative thinking, as it is important to match the patient's therapeutic need for compression with their ability to don and doff the garment, tolerance of compression and, most importantly, motivation and personal goals. This process often requires clinicians to be tenacious, working collaboratively with the patient to meet their needs.

Advances in compression therapy

DLT is considered the main treatment for lymphoedema and there is adequate scientific evidence behind its positive impact in cancer patients who can receive earlier intervention because they are a known at-risk population (Donahue et al, 2023; Da Cuña-Carrera et al, 2024; de Sire et al, 2022). A recent lymphoedema systematic review focused on international guidelines found that compression therapy is consistently employed by HCPs alongside decongestive therapy, skincare, self-lymphatic drainage massage and exercise (Torgbenu et al, 2023).

Recent advances in biomedical engineering, imaging and biomaterials have led to development of compression materials that contain both inelastic materials to provide compression and an added layer of electroactive shape-memory materials within the garment that can provide graduated compression (Barnhart et al, 2024).

Combined with the evidence emerging from biological studies of lymphoedema stage markers, there are a number of tools that can be used to facilitate earlier intervention, especially if lymphoedema patients are assessed correctly and appropriate compression has been applied.

Making lymphoedema compression therapy decisions in everyday community primary care

How to choose from the compression toolkit

Of the lymphoedema treatment components within DLT, compression therapy is considered most important in making a long-term impact on the life of a patient, as it can help control lymphoedema progression and prevent deterioration into worse outcomes, such as infections, e.g. cellulitis (Keast et al, 2015). Lymphoedema patients are mostly seen by frontline HCPs (with many of these HCPs unfamiliar with lymphoedema) and, when referrals are not possible, these HCPs are also responsible for care delivery for lymphoedema patients. A compression therapy toolbox can be thought of as a cupboard **[Figure 4]** – it includes various types of compression options and contains a patient assessment tool. Whenever a HCP sees a patient, they should think of this theoretcial cupboard, use the assessment tool and start adapting various types of compression garments from their cupboard to tailor the treatment to the patient. It is crucial to understand that compression therapy is based on a systemic approach: a HCP should not only think of the patient's lymphoedema-affected body part, they must also consider a range of holistic factors unique to each patient so they can plan the objectives of a treatment plan tailored to this patient's needs. These factors are listed in **Table 5**.

Most people affected by lymphoedema are complex patients that require individualised care and will benefit in some way from a compression therapy intervention. When faced with a patient with complex lymphoedema, it is naturally more challenging for junior lymphoedema practitioners and other clinicians

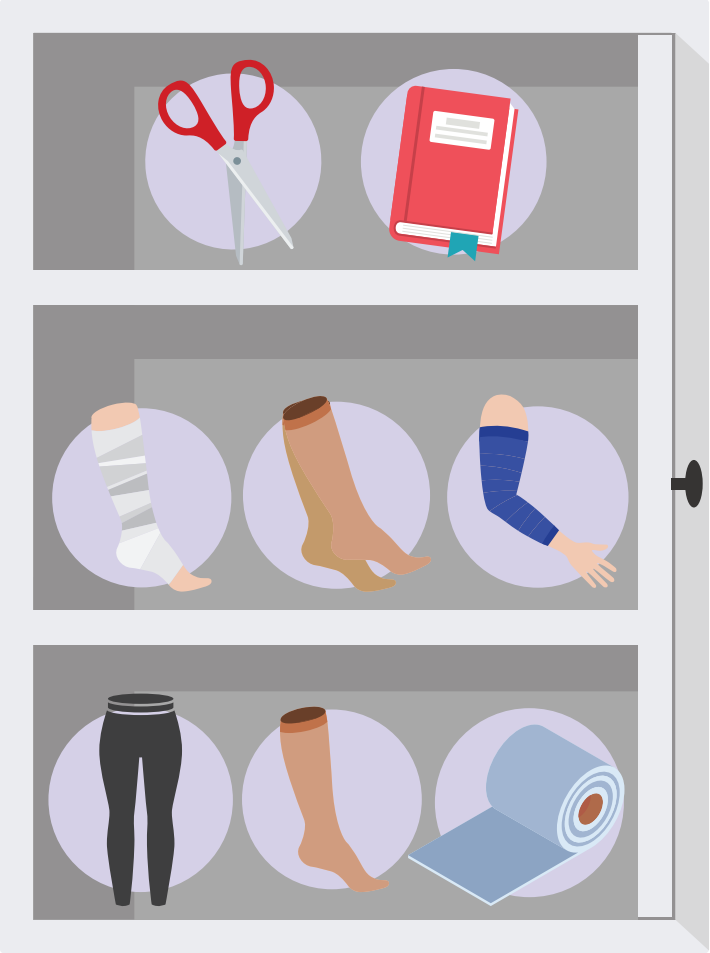

Figure 4: The theoretical cupboard of a HCP treating lymphoedema, depicting the variety of compression garments and tools that can be used when tailoring compression therapy to a patient.

Making lymphoedema compression therapy decisions in everyday community primary care *(Continued)*

Table 5: The questions every HCP must ask upon seeing a new patient with lymphoedema	
Questions to ask	
1	What is the cause of lymphoedema in this patient? Is it primary lymphoedema or secondary?
2	How does the cause of lymphoedema in this patient affect their lymphatic system and the tissues in the affected area? What is the stage of lymphoedema?
3	Does the patient have a wound? If yes, the patient will need a wound care plan and consideration for onward referral to leg ulcer management service, if available
4	What comorbidities does this patient have? Do these comorbidities contribute to/ exacerbate their lymphoedema in any way (e.g. obesity)? Are these comorbidities being actively managed?
5	Is it possible to manage the cause of lymphoedema as well as the lymphoedema itself, so the treatment via compression therapy can be more effective? The cause of lymphoedema may need to be managed with HCPs from other specialities (e.g. renal, cardiac or cancer)
6	What is the patient's goal for their compression therapy? For example, do they only wish to be able to put their shoes on because they have so many comorbidities that they cannot set a more realistic goal than this; do they wish to be able to work and have a more active life? Will they need/be willing to accept a more aggressive approach in their compression therapy?
7	How long have they had lymphoedema? Think about the stages of lymphoedema: a patient who has suffered from lymphoedema for 6 months is more likely to receive greater benefits from compression therapy than a patient who has had lymphoedema for 20 years
8	What is the extent of compression that this patient can tolerate? Is it possible to start with a lower-compression plan and 'titrate' up to more therapeutic compression as deemed suitable? This may help the patient get used to and stay engaged with their compression therapy
9	What tools are available within your local toolbox? What combinations of these tools are most appropriate for this patient and at which stage of the plan?
10	What will the effect be of compression therapy plan on this patient – do the intended objective and potential outcomes align with patient's goals? If not, is the patient willing and able to engage?
11	What is the patient's overall build: which parts of your toolkit can be used for the affected limb/body area for this patient? What parts of the kit will be needed for treating the body areas immediately above and below the main affected region?
12	Is the patient on multiple medications? Is the patient taking any medication that can block lymphatic system function? For example, calcium channel blockers can impede lymphatic function (Pal et al, 2022). Rather than starting compression therapy, can this be reviewed by a multidisciplinary team (MDT) to see if lymphatic function can be improved?

Table 5: The questions every HCP must ask upon seeing a new patient with lymphoedema (Continued)	
Questions to ask	
13	Consider lifestyle factors that may impact lymphoedema via inflammatory pathways or by improving lymph removal. Think about how these factors will change after commencing compression therapy for this patient. For example: • Patient mobility: what is their current level of mobility and what level do they wish to achieve after therapy? • Does the patient sleep well at night, and sleep in bed? If not, why not? • Other lifestyle factors: daily exercise/activity/movment, diet and smoking status
14	Is the patient able to cope with the pace of your treatment plan? For example, If the plan aims to remove 5 litres of fluid from a patient's body within 5 days, will the patient be able to cope with this fast change once back at their home (e.g. they may not have a downstairs toilet facility, or they may have limited mobility due to other reasons)? Or, the patient may initially only be able to cope with a calf-length compression garment but you have planned to use a garment on their whole leg. Remember that patients are more likely to be engaged with their treatment if the plan aligns with their needs/coping level
15	Was compression therapy applied because the patient had a wound? Was lymphoedema the underlying cause of the wound? If yes, compression therapy must be reviewed and then continued as a wound prevention plan even when the wound has healed; the patient should be educated about this need to continue even after healing

A HCP must explore all different types of compression and their applications on different parts of the body and then tailor a treatment plan to each patient's needs. This tailored approach is essential because, not only are no two lymphoedema patients the same, a whole-body approach towards lymphoedema treatment is required, as patients who need whole-body lymphoedema care tend to be unique and complex patients. This is why it is important to understand the science behind lymphoedema pathogenesis and compression therapy to ensure best outcomes.

MYTH

Compression therapy can damage the blood vessels in a patient's body, so the lower the compression level, the better.

TRUTH

Human anatomy has ensured the network of vessels is adequate for each area in the body. For example, though apparently small in size, the toe has a vast network of arteries, veins and lymphatics. As well as knowing the underlying physiology, the key to being a safe practitioner is having an understanding of how much pressure the product is applying in an area and how much pressure is exerted in that area when products are layered (e.g. overlap of a bandage by 50% gives two layers, even if just one bandage is used). Lower levels of compression can lead to ineffective treatment, which can cause other potential problems.

Making lymphoedema compression therapy decisions in everyday community primary care *(Continued)*

to be sure of the optimal treatment plan. However, they may still be able to take actions that can move the patient in the right direction while waiting for specialist care. Some of these actions may include:

- Being an advocate for the patient: think of the actions that can safely be implemented while/if waiting for specialist advice
  - Start first aid care or management in some form: e.g. pain killers can help reduce pain (and the cause of pain should be investigated because, although lymphoedema tends to cause discomfort, acute pain must be promptly investigated as it is not likely to be directly related to lymphoedema); a low-pressure stocking can help the patient receive some relief and get used to the feel of compression while also potentially decreasing disease progression
- Considering the patient's lifestyle: take their medical history and note their lifestyle, especially their level of activity. Is the patient spending a long time in a certain position (e.g. sitting in a chair)? Will putting the patient in a bed help reduce the swelling?

To further increase the confidence of less experienced clinicians and more junior lymphoedema specialists, it is important to understand some terminologies that are, sometimes, incorrectly used and cause confusion when working with lymphoedema patients and leg ulcer patients.

Common confusing terminologies prevalent in the lymphoedema therapy realm

There are a number of medical terminologies used by compression therapy practitioners that are applicable to lymphoedema only and distinct from limb wound care terminologies:

1. The 'gold standard of compression therapy pressure' is a term that frequently causes confusion when a HCP aims to treat lymphoedema. This is potentially because the national guideline has set 40mmHg as the new gold standard for compression to manage venous disease (NWCSP, 2023). However, it is crucial to remember that, in lymphoedema care, there is no gold standard for compression pressure that HCPs must adhere to. However, if the patient has a wound, it is encouraged to work with tissue viability and lymphoedema services together. The objective is to optimise compression levels according to the patient's needs, including their psychological needs. For example, sometimes the HCP must start at a lower pressure level than they deem suitable, because the patient may not yet be ready to experience a high level of pressure on their body. In other words, the gold standard in lymphoedema therapy is defined as 'what a patient needs' and can lie anywhere between 20 and 90mmHg.
2. Similarly, despite the prevalent confusion among HCPs, the terms 'medical compression' and 'therapeutic compression' in fact refer to the same lymphoedema treatment – i.e. a compression level suited to a patient's needs. What may be 'therapeutic' compression for one patient may lead to lack of tolerance in another patient if not tailored. Furthermore, these two terminologies may refer to any compression therapy tools (e.g. bandages, socks, stockings and other compression devices) regardless of the compression these tools can achieve. In other words, any compression that is tailored to a lymphoedema patient is their 'therapeutic' or 'medical' compression.
3. Another confusing term is 'graduated compression'. It is important to remember that 'graduated compression' occurs when a graduated, or a gradient of, pressure, is applied to the patient's lymphoedema-affected limb. The aim of this type of compression therapy is to encourage the emptying and movement of accumulated lymph fluid from the affected area towards the centre of the body where the lymphatic system is still functional. The graduation of pressure is achieved by the changing diameter of the limb. Other than limbs, graduated compression is not realistically achievable anywhere in the body (e.g. consider the structure of head, neck and genital areas – can you realistically apply a gradient of pressure in these areas?). It is also worth noting that graduated compression

in lymphoedema treatment is distinct from the graduated compression used for other limb disorders, such a venous leg ulceration or deep vein thrombosis. This is because the underlying disease mechanisms and the aim of treatment are different. In lymphoedema, the aim of treatment is to 'push' the excessive fluid into lymphatic capillaries and back to the areas of body with a still-functioning lymphatic system. In other disorders, the aim of graduated compression is to increase blood flow back to the heart against hydrostatic pressure by providing pressure via the compression garments that almost act like an extra layer of muscles in providing increased pressure on blood vessels. It is worth noting that use of graduated compression may not be possible in some lymphoedema cases. For example, if a patient's leg is swollen to the extent that it needs to be 'manually evened-out', no gradient can be achieved until the swelling goes down.

Offsetting the cost of untreated lymphoedema

In the past decade, the cost of compression therapy systems has escalated; simultaneously, population exercise, activity and movement levels have dropped, increasing lymphoedema complications and complicating management. However, the cost of compression therapy can be offset by the cost of complications of untreated lymphoedema: this offset will be a cumulative result of preventing the expenses of wound bandages, infection treatments, patient's overall deterioration, comorbidities and burden on HCPs and healthcare systems.

MYTH

Regarding compression, HCPs treating lymphoedema follow the exact same guideline as lower limb specialists.

TRUTH

The compression values used in lymphoedema treatment can be entirely different to the compression values used by other wound care specialists. It is up to the discretion and experience of the HCP treating lymphoedema to decide what is best for their patient.

MYTH

Lymphoedema specialists use graduated compression for all patients.

TRUTH

Lymphoedema compression therapy may or may not involve graduated compression; the decision to choose either uniform or graduated compression depends on the patient's needs.

Making lymphoedema compression therapy decisions in everyday community primary care *(Continued)*

MYTH

Compression therapy in lymphoedema cannot be started without ankle-brachial pressure (ABPI) assessment.

TRUTH

This statement is only true for lower-limb lymphoedema patients. In these patients, HCPs must perform vascular assessment to ensure that ABPI values are in line with recommended guidelines and the wound care plan is safe for that patient (National Wound care Strategy Programme (NWSCP), 2023). Patients receive delayed treatment because no ABPI is taken or an accurate ABPI value cannot be obtained. The NWSCP guideline suggests that compression therapy with up to 20mmHg can be started before an ABPI is performed.

MYTH

To squeeze large amounts of lymph fluid out of a lymphoedema-affected part of the body, high amounts of compression pressure must be used.

TRUTH

The lymphatic capillaries are small but highly efficient – capable of moving up to 8 litres of fluid per day (Moore and Bertram, 2018); therefore, high pressure is not required to move large amounts of fluid through them.

MYTH

Lymphoedema patients who have lymphatic aplasia or hyperplasia due to their primary lymphoedema need little compression pressure for their compression therapy to be effective.

TRUTH

A very high level of compression is typically needed in these patients. However, the level of compression should be tailored to patient's needs (e.g. paediatric patients).

MYTH

The focus of compression therapy should be on the point of swelling.

TRUTH

Compression should be considered beyond the point of swelling and not just up to the point of swelling. It is important to consider and pre-empt the impact of a compression technique on the areas adjacent to swelling. Additionally, pre-therapy assessment should examine the whole body of a patient to ensure there is no other area that might benefit from compression.

MYTH

Compression therapy dries the skin in the compression garment-wrapped area, making it fragile and itchy.

TRUTH

It may appear that the skin has dried post-compression. Compression shrinks the skin, kicking-off the dead skin cells. These skin cells trapped between the skin and the compression fabric/device may cause itching and irritation (hence the redness), making it important to employ routine skin care via emollients and creams. See **Box 1** for practical tips of skincare in lymphoedema.

Box 1: Skincare regimen

A routine skincare regimen is very important with lymphoedema compression therapy because there is an appearance of excess 'skin shedding' in the area where a compression garment has been applied, leading many people to believe that compression therapy has 'dried' their skin. However, this phenomenon happens because the garment wrapping prevents routine shedding of dead skin cells. To overcome this issue, the following steps should be taken:

- Compression hosiery should be removed regularly and skin washed to remove dead skin cells (the garment should be washed inside-out so all dead skin cells are thoroughly removed), before re-applying the washed garment the right way round
- Following washing, emollients/creams should be applied that do not contain lanolin (lanolin decreases skin breathability, causing irritation)
- HCPs should ensure that patients are fully aware of any fire hazards and have read all product labels from the Medicine and Healthcare products and Regulatory Agency

It is paramount to reiterate to patients the importance of engagement with their compression therapy to ensure they put their compression garment back on after each washing.

Assessment for compression therapy

Patient assessment in everyday community primary care

A structured patient assessment tool should be utilised in routine practice to create a compression therapy plan tailored to each individual lymphoedema patient. Additionally, there are specific patient populations that require additional considerations when being assessed for compression therapy. **Table 6** provides an overview of these additional considerations.

Lymphoedema management in older adults

Older adults (aged ≥65 years) often have several comorbidities and the HCP has to consider their differential diagnoses as well as the limiting factors for any lymphoedema treatment (Piller, 2013; Konecne and Perdomo, 2004). Specifically, an older person may have one or more comorbidities that also contribute to oedema or lymphoedema, such as heart failure or venous insufficiency. Due to limited capacity, it may also be harder to manage compression therapy, exercise, activity and

Table 6: Unique challenges and recommended practical steps for specific patient populations (Piller, 2013; Konecne and Perdomo, 2004; Sudduth and Greene, 2022; CLSIG, 2018; All-Ireland Lymphoedema Guidelines, 2022).

Patient population	Unique challenges	Solutions
Older adults (aged ≥65 years)	• Multiple comorbidities • Reduced capacity for exercise, activity and movement • Other diseases that may cause oedema • Frailty and care needs • Polypharmacy to treat other healthcare needs	• Think about contraindications (e.g. deep venous thrombosis) • Decrease treatment time to improve engagement with treatment (e.g. leave compression on for less time or use something that is quicker to apply) • Recommend easier exercises • Only use minimal bandaging layers • Consider care setting in your treatment plan: home versus care home • Pay attention to patient safety • Review polypharmacy • Take additional care of the skin, which may be frail
Bariatric	• Obesity contributing to lymphoedema progression • Lack of/reduced activity and movement • In extreme cases, 'massive localised oedema'	• Consider weight loss initiatives (e.g. a weight management programme) • Consider polypharmacy (e.g. is the patient receiving medication(s) that may impact their lymphoedema?) • Refer to lymphoedema services
Paediatric	• Immature lymphatic system that is still undergrowing growth • Impact of lymphoedema on overall growth • Need to involve family/ carers • Impact on mental health	• Refer urgently to lymphoedema speciality who should rule out differential diagnoses and confirm and manage lymphoedema

movement regimens. **Table 6** recommends potential solutions to these challenges.

Lymphoedema in obese people

In obese (bariatric) patients, there occurs a circle of complications whereby obesity (BMI >40) impairs the lymphatic system and leads to lymphoedema and, in turn, lymphoedema exacerbates obesity by impairing the patient's activity and movement level, and capacity to lose weight (Sudduth and Greene, 2022). **Table 6** lists specific compression therapy considerations in this patient population.

Lymphoedema in the children and young people

Lymphoedema treatment for children and young people follows the same principles as that for adults, but planning and provision is adapted in consideration of the maturing lymphatic system, growth and development of the child or young person, the acceptability of treatment to the child or young person and the family unit, and the psychosocial impact of lymphoedema for the child or young person (Children's Lymphoedema Special Interest Group [CLSIG] 2018). Due to the complexity of these considerations, urgent assessment by lymphoedema specialists is strongly recommended, along with more rigorous, routine reviews (CLSIG, 2018; All-Ireland Lymphoedema Guidelines, 2022). Refer to **Table 6** to review the unique challenges and recommendations in this population.

Challenging anatomical positions

Although lymphoedema is more common in limbs, it may be harder to treat in other areas of the body due to the difficulty of fitting compression garments on these anatomical positions **[Table 7]** and the lack of methods that can measure the pressure exerted by these garments once fitted (British Lymphology Society [BLS], 2023). This type of lymphoedema occurs in areas that lie on an imaginary straight line passing through the body – head, neck, trunk, breast and genitalia – giving it the name 'mid-line lymphoedema'.

In more recent years, there has been a significant overall improvement in the UK in managing lymphoedema after breast cancer treatment: due to the increased awareness of lymphoedema risk in this population, clinicians in all clinical settings are much more familiar with the need to refer cancer patients to lymphoedema specialists, resulting in these improved outcomes. This example of success can be repliacted in other at-risk populations by taking preventative measures.

Management of mid-line lymphoedema

Mid-line lymphoedema should be managed by lymphoedema practitioners/specialists and should actively involve both patient and the MDT; community care can also be included in this team, as appropriate. Taping techniques are used for patients with mid-line lymphoedema and patients can be taught by an appropriately qualified practitioner to apply these techniques.

When to refer a patient to lymphoedema services?

Although it is unlikely that there is a lymphoedema patient who cannot be treated in some way and generally well-trained and motivated clinicians should be able to manage uncomplicated cases without requiring to refer, it is likely that some patients should only receive treatment at a specialist lymphoedema service. Patients presenting with complex lymphoedema may need specialist lymphoedema input; all HCPs should be able to recognise this and refer the patient, but they should also provide general advice on skincare (reducing risks of cellulitis), exercise, activity and movement, and positioning. It is important to remember that a person without severe lymphoedema and with a leg wound may not be eligible for referral to lymphoedema services and may instead be referred to the local leg ulcer services.

Table 8 summarises the indications for referral.

Assessment for compression therapy *(Continued)*

Table 7: Managing mid-line lymphoedema	
General principles	
All mid-line lymphoedema	The treatment plan should be tailored to each patient's needs and any treatment approach should be based on a thorough assessment of the individual to determine if a clinical benefit is likely. Note that, sometimes, the patient may not tolerate compression therapy and manual lymphatic drainage (MLD) may be the only management option possible. Based on above, the following elements of care should be considered in management: • daily skincare • exercise, activity and movement • massage – MLD and/or simple lymphatic drainage (SLD) • compression with bandaging, compression garments and individualised foam pads • self-monitoring
Additional recommendations specific to anatomical positions	
Truncal lymphoedema (chest, back, abdomen, buttocks, breast or genitalia)	• May appear with or without limb involvement and usually appears secondary to cancer or cancer treatment. Therefore, its management should involve surveillance of cancer presence or recurrence
Breast lymphoedema	• Prevention and early diagnosis should be the focus in breast lymphoedema • MLD and SLD are part of treatment • Use suitable bras (including sports bras) with minimal seams, Lycra foundation garments or custom-made garments to apply • Use medium compression • Try to soften tissue thickening by using customised foam pads
Genital lymphoedema (also see Noble-Jones et al, 2019)	• Highly incapacitating; extremely difficult to manage • Crucial elements of management: - Monitoring for signs of infection - Scrupulous skincare • MLD and SLD are recommended here as important treatment components • When coexisting with lower limb lymphoedema, treatment of lower limb swelling may exacerbate genital oedema – in this situation, clearance of the core lymphatics through MLD is particularly important • In either sex, surgical lymphoedema management may sometimes be necessary • In women: management usually requires custom-made compression garments with anatomically contoured stasis pads to treat thickened and swollen areas (the use of sports garments containing Lycra may also work for women: this decision is highly individual-based and there are several different approaches that can be adapted as per the clinician's experience and patient's needs) • In men: multi-layer lymphoedema bandaging (MLLB) may be used and self-bandaging taught. Depending on the degree of swelling, supportive close fitting shorts containing Lycra (e.g. cycle shorts) may be a useful alternative to ready-to-wear or custom-made scrotal supports or compression garments
Head/neck lymphoedema	• Often a complication of cancer or secondary to tissue damage in this area • MLD and SLD are key elements of treatment • Low-pressure compression may be applied using bandaging or custom-made garments • Low-density foam pads can be used to apply localised pressure. Compression should never be applied to the neck area • Surgical management of eyelid lymphoedema may be considered

Table 8: Indications for referral to a lymphoedema service

Special group	Factors complicating management	Management difficulties
• swelling of unknown origin • mid-line lymphoedema (head, neck, trunk, breast genitalia) • all children with chronic oedema • primary lymphoedema • lymphoedema in family members	• obesity • limited mobility • concomitant arterial disease • concomitant diabetes mellitus • concomitant venous insufficiency with ulceration • long-term complications due to surgery or radiotherapy • severe papillomatosis, hyperkeratosis or other chronic skin condition • severe foot distortion/ bulbous toes • sudden increase in pain or swelling of lymphoedematous site (this requires referral for medical review as likely due to causes other than lymphoedema) • hylous reflux (e.g. chyluria, chyle-filled lymphangiectasia) • neuropathy • functional, social or psychological factors	• compression garment fitting problems • failure to respond after 3 months' standard treatment • wound that deteriorates or is unresponsive after 3 months' treatment • recurrent cellulitis/erysipelas

Setting lymphoedema care objectives

There are no standard compression therapy pathways available in lymphoedema management that present a simple algorithm to guide decision-making based on a patient's height, build or other physical assessments. The decisions in lymphoedema practice are unique, just as each patient is. Therefore, the objectives of care can be stratified as:

- Clinical objective: for example, reduction in volume of lymphoedema or circumference, whichever is being measured; prevent skin breakdown; minimise infection risk; compliance with compression therapy
- Patient objective: for example, improvement in quality of life (via improved mobility and patient comfort); empowerment because lymphoedema is a long-term condition and the patient needs to be empowered to manage this as much as possible

Clinical effectiveness of a lymphoedema treatment plan can be defined as 'achieving objectives based on that patient's needs', even if the patient's objective is only to be able to wear a favourite shoe again.

Box 2: Conditions that absolutely contraindicate compression therapy (International Lymphoedema Framework [ILF](2020) (Fletcher et al, 2023)

- Untreated deep venous thrombosis in the affected limb
- Severe neuropathic pain
- Severe bone pain
- Acute decompensated heart failure
- Decreased sensation, numbness in affected limb (e.g. spinal cord compression, brain metastases): proceed with caution and careful monitoring (not treating lymphoedema may result in deterioration and complications)
- Severe peripheral arterial disease

Objectives: improving mobility, comfort and effectiveness

The best practice management of lymphoedema has a holistic, multidisciplinary approach that should include the following objectives and actions:

- to enhance lymphatic and venous flow: use exercise, activity and movement
- to reduce limb size/volume and improve subcutaneous tissue consistency through compression and/or massage, and to maintain improvements: reduce swelling and maintain the reduction. Swelling reduction is achieved through a combination of compression (e.g. MLLB and/or compression garments) and exercise, activity and movement with or without lymphatic massage (MLD, SLD or other compression techniques).
- optimise the condition of the skin, treat any complications caused by lymphoedema and minimise the risk of cellulitis/erysipelas: use lymphoedema skin care regimens
- avoid factors that may exacerbate lymphoedema: reduce risk as much as possible
- manage pain and provide psychosocial support
- reduce the risk of skin trauma from poor movement and handling

Patients may require referral to a lymphoedema speciality **[Table 8]**, or for assessment of coexisting medical, functional or psychosocial problems. Successful management of lymphoedema relies on patients and carers playing an active role.

When lymphoedema cannot be treated – contraindications and other barriers

The vast majority of lymphoedema patients are suitable for compression therapy. An experienced lymphoedema practitioner knows how to use the range of products available – or adapt a combination of them – as per patient needs.

Despite the expanse of possibilities within lymphoedema compression therapy, there are certain situations where it is contraindicated. See **Box 2** for a list of these conditions.

Patient-level barriers to compression therapy – quality of life considerations and managing expectations

An unengaged patient is one who is facing a barrier that a lymphoedema practitioner may be able to remove. If a patient is willing to engage with or is capable of tolerating compression levels that the clinician may consider sub-therapeutic, patient engagement in the long-term is a better objective to be followed, starting with lower compression pressure, and gradually increasing as the patient gets used to the treatment. However, this liberty of building up to a compression target is not applicable in the case of primary lymphoedema patients where the HCP has to take immediate action to reduce the lymphoedema as soon as possible. In this case, the key is to communicate with the patient the gravity of the situation and ensure

Box 3: Patient barriers that may result in lack of engagement, and how to manage them

- Typical phrases heard from patients: "I had a bad experience with hosiery"; "(compression garment) was too uncomfortable"; "(compression garment) was too hot"
- Actions for HCPs to increase engagement:
  - Using positive messaging, explain the 'why' of compression therapy in a prescriptive but honest way – explain that this disease is incurable but manageable if long-term therapy is undertaken
  - Follow up with patients so any issues can be resolved as soon as they arise; make adaptations as soon as needed
  - Make the patient the master of their fate: explain that, despite your extensive experience, compression therapy is hard to get right the first time but there are many options that can be adapted with mutual agreement
  - For 'compression-naïve' patients, consider the impact of the weather (e.g. starting treatment in winter rather than summer), start small (e.g. for an obese patient uncomfortable with stockings, consider a compression wrap), and explain that lymphoedema is incurable but symptoms can be improved
  - Consider the professional needs of the patient (e.g. a nurse who is experiencing lymphoedema after cancer treatment, or a builder whose job involves climbing scaffolding). Offer alternatives: they can wear garments on upper limbs (nurse), smaller wraps, or nighttime compression garments (builder)
  - Consider patient's skin tone: Consider the colour of the hosiery as per the patient's skin tone to make them feel comfortable

they understand how important it is to start with the appropriate compression pressure immediately. **Box 3** summarises typical barriers that may result in a lack of patient engagement.

How to facilitate effective self-care

Patient education is a key factor in better self-care in lymphoedema. Patients should be educated honestly (using a variety of techniques and different resources to suit the patient's learning style) and engaged as much as possible, with positive messaging; they should also be advised on next steps if any alarming symptoms develop. When transitioning to self-management, the patient should be educated on the following components of their care plan, with support from the clinician, social care or relatives:

- skincare
- exercise/activity/movement, elevation and weight reduction
- use of an inelastic adjustable compression device
- SLD
- compression garments +/- MLLB
- self-monitoring for complications
- treatment adjustment according to fluctuations

MYTH

Some lymphoedema patients do not like compression therapy.

TRUTH

These patients may not have understood the gravity of their condition and how compression therapy can be adapted, and may not have been offered all the therapy options. It is the role of the HCP to communicate this and offer choice. The HCP must communicate with positive messaging that compression therapy is a lifelong need that can be made comfortable if the patient works with their HCP.

Special management pathways in lymphoedema care

Palliative management

For these patients, the objective of management is to improve patient comfort, reduce pain, and encourage independence and mobility; the objectives do not necessarily include reducing lymphoedema volume. Therefore, the patient will receive active but modified lymphoedema care. Below is a summary of recommendations for compression therapy in palliative patients based on their physical and psychological needs (ILF, 2020):

- Aim at improving comfort and function, not necessarily volume reduction
- Compression pressure may need to be reduced by removing layers or decreasing tension of bandage application
- Low resting pressures are better tolerated
- Skin may be very friable and may require frequent reviews
- Extra padding may be needed for vulnerable areas of pressure
- Limb positioning may enhance the effects of bandaging
- Minimal levels of compression can reduce or eliminate lymphorrhoea (bandaging is considered the most effective treatment for lymphorrhoea [BLS, 2022a])
- Control of other symptoms will enhance the tolerance of compression

Managing lymphoedema in people with special needs

Lymphoedema patients with learning difficulties, dementia or other co-existing disabilities may require an approach that is tailored to their special needs. For example, they may need assisted self-care. It is important to work with patient support workers, family members and other primary care specialists (e.g. learning disabilities specialist) to provide optimal care for this group of patients. Consider employing suitable resources for patient with literacy problems or language barriers.

Managing lymphoedema in a multidisciplinary setting

Podiatrists play a crucial role in lymphoedema management in a MDT (e.g. when a patient develops ingrown nails or fungal infections; request for biomechanical assessment as, often, gait is altered in these patients). Similarly, it is important to include the diabetes management team for a patient with diabetes who has lymphoedema and recurrent cellulitis, because it will be harder to control an infection in this patient group without help from the diabetes team. Other specialist teams to include in lymphoedema treatment can be weight management specialists, nurses, tissue viability specialists, leg ulcer services, occupational therapists, clinical psychologists, physiotherapists, oncologists and vascular or renal specialists.

Crisis management

There are several crises that a clinician treating a patient with lymphoedema may need to manage:

1. Cellulitis: in a patient with cellulitis, it is imperative to treat the cellulitis crisis first, and then restart compression therapy as soon as possible; it may also be possible to consider using a wrap while the patient is receiving cellulitis treatment. It is also critical to avoid the risk of skin breakdown, because that increases a patient's risk several-fold (BLS, 2022b).
2. Lymphorrhoea is another crisis regularly seen in lymphoedema care because, typically, less knowledgeable clinicians may simply put a dressing under the compression garment, leading to saturation of the compression garment. To avoid this, lymphorrhoea should be dealt with as a wound. It is also important to note that the compression garment can go back on even when lymphorrhoea has not stopped completely. However, lymph is acidic in nature and should be washed off routinely, followed by skin cleansing and emollient application to protect the skin. Note that lymphorrhoea will not stop without compression therapy so treatment should be based on appropriate dressings and wraps/compression bandaging.
3. If a compression garment has rolled or has formed a tourniquet or is digging in or marking the skin, this should be considered

a crisis due to failure of the compression garment and the risk of skin damage. The patient should be provided with a better-fitted garment.

4. A sudden, unexplained increase in swelling should be assessed urgently. This can be due to serious causes unrelated to lymphoedema, such as malignancy or a side-effect of medications.
5. Any new pain that feels different from before compression therapy was started must be investigated. Consider removing compression therapy until this review has taken place.
6. In people undergoing elective surgery, it must be ensured that the patient restarts compression therapy as soon as possible after surgery.
7. In cases of trauma/fractures and lacerations or rash – review the patient and adjust as per their needs.
8. Fungal infection should be treated promptly and people who bite their nails should be informed of the potential danger of developing infection.
9. If a patient is travelling, they should be aware of insect bites, travel strains on their body and the potential impact of heat and humidity on their compression therapy plan.

MYTH

The lymphatic system only deals with the 10% volume of the liquid from the tissue spaces; the rest is removed by veins.

TRUTH

It is 100%. Excess fluid in the tissue spaces is not absorbed by the venous system. Collecting excess fluid from the interstitium is the sole responsibility of the lymphatic system (Mortimer and Rockson, 2014; Rossitto et al, 2019).

MYTH

Compression should be removed at night.

TRUTH

No, people in bandages wear compression at night (Whitaker, 2016; Chohan et al, 2022). Garments and specialist, night-compression garments play an important role over 24-hour management programmes. However, this management should be based on specialist HCP advice.

Conclusions and summary

In the UK, there is a significant unmet need for frontline clinicians to understand lymphoedema disease mechanism and progression. Without understanding lymphoedema pathogenesis, treatment options and the patient journey, it is hard for clinicians to devise a suitable, individualised therapeutic regimen, especially with compression therapy, which, despite being the mainstay of lymphoedema treatment, is still poorly understood and implemented. Therefore, there is a need to educate all clinicians involved in the care of patients with or at risk of lymphoedema. The aim of this consensus is to help clinicians identify lymphoedema disease process and risk factors, and understand the basic principles of compression therapy concepts and applications in different patient populations; it provides practical steps that frontline clinicians at all levels can follow to understand how to manage the disease in any patient who may present with lymphoedema.

Lymphoedema is a lifelong and irreversible condition; however, it can be managed effectively with early and appropriate intervention and by considering each individual as unique, as therapy can be tailored to their specific needs, comorbidities, lifestyle, and treatment goals. There is a need to empower clinicians to confidently identify symptoms, assess disease state and start the care process even in severe cases where case escalation must take place. Within the UK, successful early intervention in breast cancer care settings has shown how appropriate education has helped clinicians to identify lymphoedema early and promptly refer patients to a lymphoedema practitioner. There is a need to devise and implement similar pathways for other at-risk populations across the country.

Educating patients to empower them in taking control of their lymphoedema management and staying engaged with their therapy is also a crucial long-term goal in lymphoedema treatment. It is important that clinicians identify individual, patient-level barriers that may hinder the achievement of optimal outcomes. Using positive messaging, treatment adaptation is key to successful patient engagement in lymphoedema, and should be based on each patient's lifestyle, disease stage and routine needs of the patient. For certain challenging lymphoedema positions in the body and for people with significant comorbidities or specials needs, it is important that lymphoedema management is performed as part of a MDT; this can also help ensure that clinicians feel supported and confident in their decision-making, especially during crisis management.

The long-term costs of lymphoedema complications for both patients and the National Health Service can be off-set by early intervention to protect patients from risks of ulcers and infections and improve their quality of life.

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