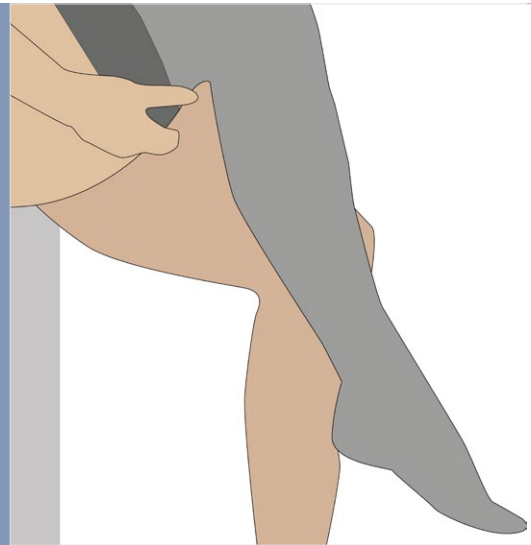


Best Practice Statement

Compression hosiery: A patient-centric approach

2021



THIRD EDITION

Understanding medical
compression hosiery
construction

Individualised
hosiery selection

Shared decision-making

**BEST PRACTICE STATEMENT:
COMPRESSION HOSIERY:
A PATIENT-CENTRIC
APPROACH
(3RD EDITION)**

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Document summary

- Medical compression is an effective and powerful therapy.
- Compression hosiery has evolved considerably over the last few years and is now a progressive therapy that exists beyond Compression Class I and Class II British Standard hosiery.
- It is important to be familiar with the National Wound Care Strategy Programme (2020) guidelines and follow the recommendations in practice.
- It is important to be familiar with the types of compression therapy used in clinical practice, the conditions that can be treated, and the garments available on local formulary.
- It should be possible to find compression therapy for everyone with a thorough holistic assessment and taking into account individual patient preferences.
- Effective communication and shared decision-making between the clinician and the patient and/or caregiver are key to identifying the 'best' hosiery for the patient and to ensuring concordance with care. Listen and understand their concerns, expectations and motivations with regard to their presenting condition(s). Avoid using terms the patient may not understand.

Foreword

The third edition of the *Best Practice Statement on Compression Hosiery* focuses on improving the patient experience of medical compression hosiery for the lower leg, which include socks and stockings, by understanding the patient's perspective and fostering a patient–practitioner partnership for supported self-management.

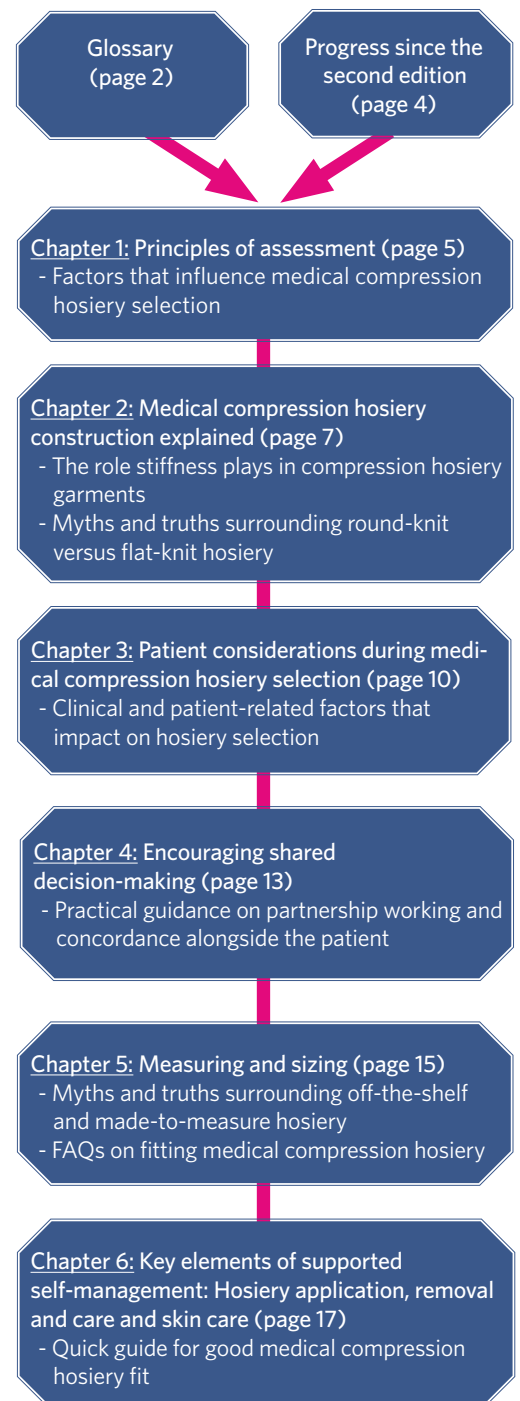
It is often easy to label a patient 'uncooperative' or 'non-concordant' if the outcomes of treatment are not as anticipated. However, it is unlikely that any patient is truly non-concordant, rather, they have not yet received the right treatment, education, support and follow-up for their individual needs. Clinicians should employ a positive, confident, competent and knowledgeable attitude when discussing medical compression therapy with patients, which may help to influence the patient to become interested and engaged with their treatment.

The COVID-19 pandemic has accelerated initiatives towards greater patient and carer supported self-management (NHS England and NHS Improvement, 2020). Consultations have increasingly been undertaken by telephone and video call, and patients have been able to text or send photos directly to their clinician. Evidence shows that when people are supported in self-management, they benefit from better health outcomes, improved experiences of care and fewer unplanned care admissions (NHS England and NHS Improvement, 2020). A growing number of people with wounds are willing to participate in supported self-management if they are given the right support and tools (Adderley, 2020).

An Expert Wound Group met online to discuss the advances in medical compression hosiery since the second edition of the *Best Practice Statement: Compression Hosiery* (Wounds UK, 2015) and to agree on Best Practice Statements to guide compression hosiery selection for patients. **Best Practice Statements** are accompanied by **Patient Expectations** to encourage shared decision-making and foster a supportive patient–practitioner partnership at every stage of care.

The document is designed to be simple and user-friendly, and to put the patient at the centre of assessing for, selecting, prescribing and delivering care with medical compression hosiery.

Jacqui Fletcher OBE, Chair



Glossary

Ankle–brachial pressure index (ABPI): A screening tool to determine the presence and extent of peripheral arterial disease (PAD). The result of the ABPI rules out PAD, but it does not confirm whether a patient will benefit from compression therapy – meaning that an ABPI cannot diagnose venous insufficiency or the cause of oedema.

Chronic venous insufficiency (CVI): A condition whereby blood pools in the veins, straining the walls of the vein and making it difficult for blood to return to the heart from the legs. It can be caused by venous hypertension or venous obstruction/occlusion, such as a deep vein thrombosis.

Compression: A treatment whereby the application of external pressure counteracts the loss of capillary fluid by squeezing fluid into the veins and lymph vessels. Compression therapy improves venous return to the heart and initiates a variety of complex physiological and biochemical effects involving the venous, arterial and lymphatic systems. The effects of compression can be dramatic, reducing oedema and pain while promoting healing of ulcers caused by venous insufficiency (Harding et al, 2015).

Compression bandages: A type of medical compression garment that is composed of either inelastic (short-stretch) elements, elastic (long-stretch) elements or a combination of both. Bandaging is most often used to treat active venous ulceration and should be worn 24 hours a day. Bandaging can also be used for ongoing maintenance, for those unable to tolerate hosiery or those with complex conditions such as lymphoedema, especially when the legs are large and have skin folds. For these patients, full-leg bandaging may be required to control oedema and maintain the shape of the leg (Anderson and Smith, 2004).

Compression classes: The pressure measured at the ankle is used to classify medical compression hosiery into compression classes (e.g. 1, 2, 3). The stiffness of the compression hosiery material affects the compression class.

Compression hosiery: The most widely used form of compression in the long-term

management of lower limb lymphoedema and oedema. Hosiery can also be used to manage conditions associated with CVI (NICE, 2012). Medical compression hosiery options vary in stiffness, levels of compression delivered, fabric, colour, size, length, and whether they are closed or open-toe. Medical compression hosiery is a single garment and can be selected off-the-shelf or made-to-measure for the patient.

Compression hosiery kits: A type of medical compression therapy most commonly used for the management and healing of venous leg ulceration. Kits consist of two medical compression garments designed to be worn one on top of the other. Hosiery kits are designed to be worn 24 hours a day but the outer layer can be removed at night, although this is not essential. Hosiery kits are most commonly available in off-the-shelf sizes but can also be made-to-measure.

Compression standards: National and international standards for medical compression hosiery have been developed to ensure compression stockings and socks meet certain technical parameters, such as testing methods, yarn specification and durability (Lymphoedema Framework, 2006). There are a variety of quality standards against which compression hosiery can be categorised:

- **British Standard Compression (Specification 40; BS 661210):** The British Standard for compression hosiery has three classes that indicate the level of compression provided by the garment. BS40 measures the compression delivered by the medical compression garment at the ankle, knee and top of thigh and has a 3-month guarantee (Partsch, 2003).
- **German RAL (GZ 387/1) Standard:** The German standard is measured at 5cm increments up the garment to ensure graduation and has a 6-month guarantee (Földi and Földi, 1983).
- **French Standard (ASQUAL) (AFNOR NF 30.102A):** The French Standard is measured at the ankle (Levick, 2003).

Compression wraps: A type of medical compression garment considered for the management of lymphoedema and other disorders of the circulatory system. Available in a variety of forms, these devices consist

of fabric sheets made from one or more components with limited extensibility. The wraps are applied to affected limbs and held in place with hook and loop fastenings (Thomas, 2017).

Interface pressure: The pressure between the skin and the compression garment. Measuring pressure at the interface during both lying and standing indicates how the compression garment reacts to muscular activity. The interface pressure was previously described as the sub-bandage pressure.

Lymphoedema: The accumulation of fluid in the tissue spaces. It may present as swelling of one or more limbs and may include the corresponding quadrant of the trunk and other areas, e.g. head, neck, breast or genitalia. It arises from congenital malformation of the lymphatic system (primary lymphoedema), or damage to lymphatic vessels and/or lymph nodes (secondary lymphoedema) due to cancer treatment, infection, inflammation, venous diseases, obesity, trauma and injury (Lymphoedema Framework, 2006). Lymphoedema is a progressive disease of four stages: latency stage (stage 0), mild stage (stage 1), moderate stage (stage 2) and severe stage (stage 3) (International Society of Lymphoedema, 2016).

Oedema: Swelling caused by the accumulation of fluid in the extra-vascular tissue. Oedema usually affects the feet, ankles and legs, although it can occur anywhere in the body. The cause of oedema should be identified before beginning treatment. Bilateral oedema is indicative of systemic conditions such as cardiac failure, protein reduction and venous insufficiency, standing or sitting in the same position for too long, eating a large amount of salty foods, being overweight, being pregnant, malignancy or taking certain medicines. Unilateral oedema is more often due to local causes, such as deep vein thrombosis or cellulitis.

Chronic lower limb oedema is a persistent, abnormal swelling of the leg. Chronic oedema has an ongoing effect on the viability of the skin leading to complications, such as infection,

cellulitis, fluid leakage and ulceration (Bianchi et al, 2012; Harding et al, 2015). Chronic oedema can be considered a surrogate marker for lymphoedema.

Static Stiffness Index (SSI): The difference between standing and resting pressure characterises the efficacy of a specific compression garment to narrow the venous lumen and encourage venous return (Partsch et al, 2016). The Dynamic Stiffness Index (DSI) is the change in the pressure between the limb and garment (interface pressure) when a person activates their calf muscle through movement, such as walking or exercise. The DSI demonstrates the garment's ability to resist calf muscle expansion and to generate working pressure increases. The higher the SSI and DSI, the stiffer the garment.

Stiffness: A measure of flexibility and the ability of the bandage or hosiery to oppose the muscle expansion during contraction (Mosti, 2012). The yarn used and the technique employed to knit the fabric will impact the stiffness of the fabric. The less stiff the material, the lower the pressure peaks during exercise. Inelastic bandage and multi-layer bandage systems generally have a higher SSI when compared to compression hosiery (Vowden et al, 2020).

PROGRESS SINCE THE SECOND EDITION

Clinicians should stay updated with evidence and guidelines on the use of medical compression therapy. Clinicians should be familiar with the different types of compression systems and know when and how to access and use them. Failure to provide a patient with appropriate care should be seen as a harm.

Best Practice Statement

Medical compression is an active therapy and will help to reduce your symptoms. You should expect your clinician to be confident, competent and enthusiastic about medical compression. They should be familiar with different types of compression (e.g. compression hosiery, stockings, bandages and wraps), so that they can offer treatments that suit you.

Patient expectation

Since 2015 and the second edition of the Best Practice Statement there have been the following areas of progress in medical compression therapy.

National Wound Care Strategy Programme guidance

In England, the National Wound Care Strategy Programme (NWCSP, 2020) has produced recommendations for the immediate and necessary care of patients who have one or more wounds below the knee. The recommendations include guidance on wound and skin cleansing, application of a simple low-adherent dressing and the use of mild graduated compression for leg wounds if there are no red flags to contraindicate compression (Box 1).

Medical compression is a powerful, active therapy that is part of the toolkit for the management of chronic oedema, lymphoedema and venous insufficiency. In the absence of red flags (Box 1), mild compression (around 20mmHg at the ankle) should be considered the first-line initial treatment for people who have one or more wounds below the knee and not on the foot (NWCSP, 2020). The patient should receive a full holistic assessment if clinically required or if there is evidence of venous and/or lymphatic disease, with a view to increasing the level of compression within 14 days. This is clear national guidance that healthcare professionals should encourage compression uptake among patients; failure to provide a patient with appropriate care may be seen as a harm.

Increasing range of medical compression hosiery

Compression hosiery has evolved considerably over the last few years and is now a progressive therapy that goes beyond Class I and Class II British Standard hosiery. There is now a greater variety of medical compression hosiery available in terms of style, which increases the expectations of what can be achieved for patients. However, variations in styles can lead to inconsistency in the way medical compression garments are selected and prescribed (NICE, 2012). Patients may attend appointments having already looked at the options online, but it is important to remember that not all medical compression hosiery are available on every Trust's formulary. Therefore, clinicians should be familiar with the garments that they have available in order to select the most appropriate garment for the patient.

NHS Long-Term Plan

The NHS Long-Term Plan (2019) is a commitment to facilitating measurable improvements in population health and to reduce health inequalities. In wound care, the NWCSP (2020) recommends greater awareness of the importance of early intervention of compression therapy or endovenous intervention. This is to be achieved through greater public awareness (e.g. public-facing campaigns such as Legs Matter <https://legsmatter.org>) and community, primary care, vascular, tissue viability and lymphoedema services promoting the same prevention and early intervention messages.

Box 1. National Wound Care Strategy Programme (2020) guidance for people with leg and foot wounds

People with leg and foot wounds should not be treated with compression if they have any of the following red flags:

- Acute infection of leg or foot (e.g. increasing unilateral redness, swelling, pain, pus, heat)
- Symptoms of sepsis
- Acute or chronic limb-threatening ischaemia
- Suspected acute deep vein thrombosis
- Suspected skin cancer.

If red flags are present:

- Treat suspected infection in line with NICE (2020) antimicrobial guidelines
- Immediately escalate to relevant clinical specialist
- For people in the last few weeks of life, seek input from their other clinicians to agree an appropriate care plan.

CHAPTER 1: PRINCIPLES OF ASSESSMENT

Selecting the correct medical compression hosiery should be based on a thorough assessment of the patient's presenting symptoms and knowledge of how the products work.

Best Practice Statement

Assessment for medical compression should include full assessment of your limb, other conditions, home life, personal preferences, your willingness to be involved in care, and your ability to apply and remove medical compression hosiery.

Patient expectation

Medical compression hosiery is the most widely used form of compression in the long-term management for a number of conditions, including lower limb lymphoedema and oedema, and conditions associated with chronic venous insufficiency (CVI: NICE, 2012). Venous disease can be categorised using the CEAP classification (Lurie et al, 2020; Table 3, page 12) to differentiate between mild (thread veins or telangiectasia) and severe (chronic skin changes/ skin discolouration/ulceration). Untreated CVI can also lead to oedema formation. There are many causes of chronic oedema, but they largely fall into four main categories:

- Lymphoedema (both primary and secondary)
- Lipoedema
- Dependency oedema
- Lymphovenous or phlebolymphoedema (Green and Mason, 2006).

Many of the signs and symptoms of chronic oedema — including dermatitis, distortion of limb shape, episodes of cellulitis, development of hyperkeratosis, non-pitting when pressure is applied and hyper-pigmentation of the skin — may be indicative of these potential venous or lymphatic conditions. Therefore, it may be difficult to differentiate between venous and lymphatic diseases, highlighting that a full, holistic assessment is required for patients with chronic oedema (Wounds UK, 2015).

An accurate assessment of the patient, their preferences, the severity of the disease progression, and any complications or comorbid conditions will inform the treatment pathway and compression garment selection. If garments are to be used safely, all patients need to be able to report concerns they have with their medical compression hosiery; this is especially important where there is neuropathy or cognitive impairment. The provision of compression hosiery relies on the patient's protective sensation and their ability to recognise problems; where this may be an issue, more regular review of the patient may be required.

Holistic assessment

A detailed history should include past medical and surgical history, family history and history of limb or skin trauma. Current medications (e.g. ACE inhibitors, immunosuppressants, steroids), concurrent illnesses and the patient's limb, circulation and skin should also be assessed to identify the cause of venous insufficiency or chronic oedema and underlying disease process (Lymphoedema Framework, 2006).

The NWCSP (2020) offers guidance on the key elements of assessment that will guide first-line intervention and provides red flags for when compression therapy should not be initiated (Box 1, page 4).

Vascular assessment

The ankle-brachial pressure index (ABPI) result along with the patient's history and other elements of the assessment process can be used to rule out the presence of significant peripheral arterial disease (PAD). There is a common misconception that garment selection relies solely on the compression class or mmHg and the result of the ABPI.

MYTH

The ABPI result will indicate the compression class or level that the patient requires.

TRUTH

Compression up to 20mmHg can be applied in the absence of red flags without any form of arterial assessment (NWCSP, 2020). An ABPI assessment is recommended before commencing compression therapy greater than 20mmHg. The role of the ABPI assessment is to screen patients to rule out PAD. Compression selection should be based on the clinical assessment, patient expectations and aim of compression therapy in combination with the ABPI result.

Instead, the results of the ABPI may influence compression selection, and, it is important to remember that, in the presence of significant PAD, compression therapy can be dangerous and should only be used at the recommendation of a vascular specialist. For more information on the role of ABPI, see *Best Practice Statement: Ankle–brachial pressure index (ABPI) in practice* (Wounds UK, 2019a).

If an ABPI cannot be obtained, for instance, the patient is unable to lie flat, or has oedematous legs, pain, fragile skin or calcified vessels, the arterial supply needs to be assessed in other ways, for example toe pressure, pulse auscultation and pulse palpation. If it is not possible to obtain an ABPI initially due to oedema, then it may be helpful to apply compression therapy at 20mmHg to manage the oedema and attempt to obtain an ABPI the following week.

The BLS (2019) Position Document offers further guidance on how to assess limbs in the presence of oedema.

Treatment plan

Results from the mediven® observational study found that patients’ individual factors were rarely taken into account when prescribing medical compression garments (Schwahn-Schreiber et al, 2016). Just as medication dosage is prescribed according to the needs and characteristics of the individual, selection of compression therapy should be based on careful assessment of the patient’s individual needs and condition identified in the holistic assessment, taking into consideration patient choice (Figure 1).

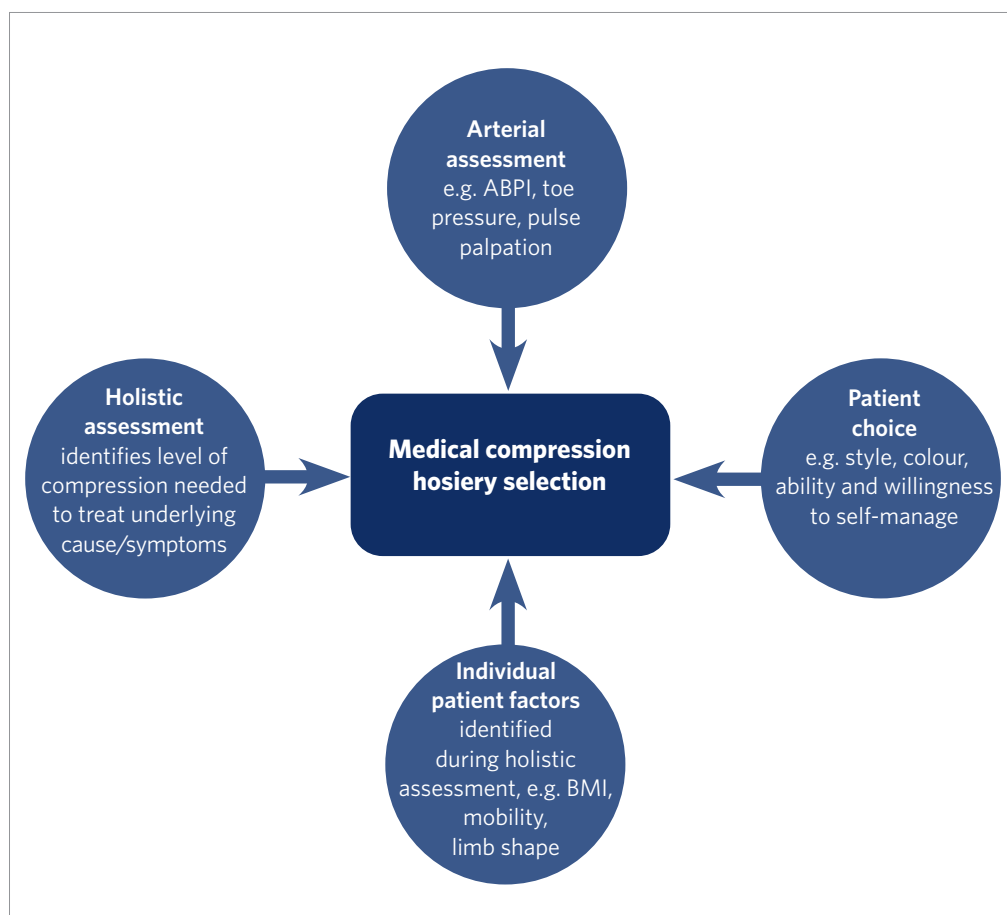


Figure 1. Factors that influence medical compression hosiery selection.

CHAPTER 2: MEDICAL COMPRESSION HOSIERY CONSTRUCTION

Practitioners should understand the range of medical compression hosiery garments available and understand how the construction of the garment affects clinical efficacy.

Best Practice Statement

Using language you understand, the clinician should be able to explain to you the different medical compression hosiery garments available and help to find the best garment to suit your individual needs.

Patient expectation

Medical compression hosiery must be selected based on the outcomes of the holistic assessment, patient preferences and the goals of treatment. Product selection should also take into account limb size and shape, skin condition, allergies and sensitivities, patient considerations (e.g. dexterity, psychosocial issues) and the garment itself.

Construction of compression hosiery

The type of yarns and knitting techniques used to manufacture medical compression hosiery affects the stiffness or elasticity of the garment. The material used to make compression garments is produced by knitting two types of yarn together:

- Inlay yarn – produces the compression
- Body yarn – delivers the thickness and stiffness of the knitted fabric (Clark and Krimmel, 2006).

The arrangement of the inlay and body yarn will produce either flat-knit or round-knit fabric, which impacts on the material's properties and indications for use (Table 1, page 8). Flat-knit fabric tends to be relatively thick, stiff and inelastic, which lets it lie across skin folds without cutting into the skin. Flat-knit is usually used for 'made-to measure' garments because it can be more readily adapted to limb shape distortion. 'Off-the-shelf' medical compression hosiery is available in standard sizes and tends to be manufactured from round-knit fabric.

MYTH

Flat-knit medical compression hosiery should be used as a 'last resort' for patients as they are difficult to measure patients for and mistakes are expensive and wasteful.

TRUTH

Flat-knit medical compression hosiery often requires a few more measurements, but, for patients with chronic oedema/lymphoedema, it is the optimal therapy and should be considered once the initial reducible oedema has been decreased.

Elasticity and stiffness – How compression works

Inelastic compression systems generally have a higher Static Stiffness Index (SSI) compared to elastic compression systems. Stiffer compression systems have higher working pressure peaks and can be more comfortable than more elastic garments with a lower SSI as they support the leg and provide 'strong wall stability'.

Conversely, the leg muscles contract and change shape during walking and exercising, so compression garments have to provide some elasticity to allow this movement while still supporting calf action and counteracting the gravitational effect of standing.

MYTH

Stiffer medical compression hosiery is sometimes perceived as uncomfortable.

TRUTH

Stiff or inelastic medical compression hosiery provides higher working pressure peaks while the patient is walking or exercising but is comfortable at rest.



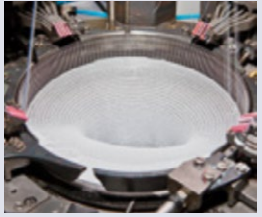

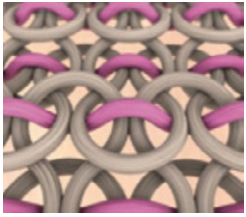
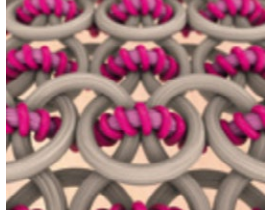
Compression standards

Medical compression hosiery is a medical device, so it is measured against set criteria to describe the support or compression applied to the lower leg. Standards provide confidence about the quality and life span of a product. It is important to know how long a product is able to give therapeutic levels of compression to avoid putting patients at risk of sub-standard care (Lymphoedema Framework, 2006). For medical compression hosiery, there are three internationally recognised quality compression standards – British Standard, German RAL Standard and French Standard (Table 2, page 9).

There is no independent quality European standard, but the German RAL Standard is widely accepted as the basic requirement

2. MEDICAL COMPRESSION HOSIERY

Table 1. Features of round-knit and flat-knit medical compression hosiery

Feature	Round-knit compression hosiery	Flat-knit compression hosiery
		
Seam	Seamless	With seam
Manufacturing		
Knit	Knitted on a round cylinder	Knitted in flat rows
Stitches per row	Constant	Variable
Shape	Shaped by variable mesh size and pretension of the inlaid elastic thread	Shaped by variable number of stitches with the elastic thread laid in
Stretch	High	Low
Thread structure		
Elastic thread	Not covered	Covered
Working pressure	Low	High
Effect	Effect on veins to improve venous return	Primary effect is to increase tissue pressure Secondary effect is on the veins to improve venous return
Measurement	When measuring the patient's limb, measure the surface circumferences	When measuring the patient's limb, there is a degree of interpretation required as the garment is designed to sculpt the limb rather than necessarily match the size and shape presented
Uses	Generally used for off-the-shelf hosiery, although it can be used for made-to-measure hosiery	Commonly used for made-to-measure hosiery
Indications	Typically for patients who have venous insufficiency or mild lymphoedema Most suitable where there is no or minimal limb distortion due to oedema (Anderson and Smith, 2014)	Typically for patients who have chronic oedema/lymphoedema due to the action on the limb, and its ability to be knitted to fit any limb shape If round-knit is causing problems for the patient, consider flat-knit, which can be more comfortable and easier to apply

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for certifying medical compression stockings (BSI Standards Publication, 2018). Clinicians should check that the medical compression hosiery they are using has a quality standard as this will guarantee the stocking offers the correct 'dosage' of mmHg and that it delivers consistent graduation of pressure levels, i.e. higher at the ankle, and reducing throughout the length of the stocking.

Compression class

The elasticity and stiffness of the textile has a great impact on the haemodynamic efficacy of a garment (Bjork and Ehmann, 2019). The stiffness of the compression hosiery material affects the compression levels exerted by different types and classes of hosiery. The compression measured at the ankle is used to classify the hosiery into compression classes; however, the pressure range used to define each class varies between the different standards, and different techniques are used to measure the levels of compression (Lymphoedema Framework, 2006) (Table 2). As a result,

when selecting medical compression hosiery, more emphasis should be given to the compression dosage (mmHg) required for the patient's individual needs rather than the compression class of the garment.

MYTH

When choosing a medical compression garment, the compression class and compression dosage (mmHg) are the most important aspect to consider.

TRUTH

In most clinical situations, it is important to consider a holistic approach (e.g. BMI, limb shape, disease severity, patient preference and ability) before deciding what medical compression hosiery garment will provide the right compression dosage (mmHg) for the patient.

Table 2. Classes and standards of medical compression hosiery

Compression class	Compression standards		
	British standard 40 (BS 661210) 3-month guarantee (Partsch, 2003)	French Standard (AFNOR NF 30.102A) (Levick, 2003)	German Standard (RAL GZ 387/1) 6-month guarantee (Földi and Földi, 1983)
Class 1 mild compression	14–17mmHg	10–15mmHg	18–21mmHg
Class 2 moderate compression	18–24mmHg	15–20mmHg	23–32mmHg
Class 3 strong compression	25–35mmHg	20–36mmHg	34–46mmHg
Class 4 extra strong compression	Not available	>36mmHg	>49mmHg

CHAPTER 3: PATIENT CONSIDERATIONS DURING MEDICAL COMPRESSION HOSIERY SELECTION

The patient's clinical presentation and preferences should be assessed during hosiery selection (e.g. presence of oedema, venous insufficiency and their body size, limb shape, size and shape of foot and manual dexterity).

Best Practice Statement

Your clinician should identify the medical compression hosiery that is best for your clinical individual needs. Your compression garment should be comfortable to wear. If it is uncomfortable, an alternative garment should be chosen.

Patient expectation

Different types of hosiery should be used at different stages of disease progression, depending on the conditions and symptoms present, and whether or not oedema is present. Compression garments are not a 'one-size-fits-all' prescription.

Role of compression in oedema

Any form of oedema (i.e. oedema, chronic oedema or lymphoedema) is a cause of concern, and patients with oedema should seek help as soon as possible and not wait until issues have developed. Patients with signs and symptoms of lymphatic insufficiency should be prescribed appropriate hosiery as early as possible to manage the underlying condition and prevent disease progression (Anderson and Smith, 2014). Without appropriate treatment to reduce the oedema, the affected tissues become progressively hard, fibrosed and non-pitting, and the oedema fails to reduce on elevation. Patients with oedema will have an altered leg shape, which may include large skin folds especially around the ankle and knee making it difficult to ascertain where the knee joint is. This can be exacerbated if the individual is overweight.

In patients with chronic oedema, the key function of hosiery is ongoing maintenance (Wounds UK, 2015). Compression combined with exercise increases lymph flow and venous return, thus reducing the volume of oedema. In addition, compression increases the blood flow into the microcirculation, which may improve wound healing and help soften thickened or 'woody' tissues (Elwell, 2014). A made-to-measure medical compression hosiery garment may be more practical for people with oedema as it can be measured to the patient's limb size and shape.

Toe oedema

Toe oedema can be a natural occurrence in chronic oedema, but it can also be induced by incorrectly applied compression bandaging that leaves the toes, and often the forefoot, vulnerable without compression (Elwell, 2014). Oedema management requires ongoing maintenance, so if toe oedema is initially resolved with bandaging, the patient will need to be monitored and compression continued with compression hosiery.

Medical compression hosiery is available as open-toe or closed-toe garments. In the close-toe option, the toe compartment of the hosiery does not provide sufficient compression at the tip, but it does provide containment. It is important to protect the toes; this can be achieved through the use of toe gloves or caps, depending on the extent of the oedema, patient choice and ability to apply (Elwell, 2014). Toe gloves can be used with open-toe or closed-toe hosiery.

Open-toe hosiery is frequently considered easier to apply due to the fact they are often supplied with a 'silk-like slipper' device to aid application. A patient may require open-toe hosiery because:

- The patient has arthritic or clawed toes
- The patient has a fungal infection
- The patient prefers to wear a sock over the compression hosiery
- The patient has a long foot size compared with calf size (hosiery with longer foot-size options are available, if necessary)
- The patient requires regular podiatry/chiropody appointments
- There is no oedema present in the toes, and the patient prefers open-toe hosiery (NICE, 2012).

Role of medical hosiery for patients with venous insufficiency

The therapeutic aim of compression for venous insufficiency is to provide the highest level of compression possible that is tolerated by the patient. National guidelines (NWCSP, 2020) suggest the use of 2-layer compression kits that offer a minimum of 40mmHg as first-line, cost-effective treatment of venous leg ulceration.

Compression hosiery is most commonly used by patients with venous insufficiency for either primary prevention or post-ulcer healing to control oedema and reduce venous hypertension.

People with healed venous leg ulcers and no symptoms of arterial insufficiency should be prescribed medical compression hosiery and reviewed 6-monthly for replacement compression garments and ongoing advice about prevention of recurrence (SIGN, 2010; NWCSP, 2020).

Patient-related factors

Ultimately, the hosiery selected should be the patient's choice. The practitioner's job is to explain the available options and direct the patient towards the clinically optimal choice. One of the most important factors with regard to hosiery selection, partnership-working and concordance is understanding the patient's motivations and what is important to the patient in their life.

The practitioner should listen to the patient and identify and understand the issues that may result in non-concordance (Wounds UK, 2015). Figure 2 summarises the patient-specific factors that should be taken into

account when deciding which medical compression hosiery to use.

Table 3 (page 12) offers suggestions for medical compression hosiery and additional treatment to manage the symptoms of venous insufficiency and oedema/lymphoedema. There are tools available that can help guide hosiery prescribing, for example, The Hosiery Hunter[®] tool focuses on the patient's disease progression and clinical symptoms, BMI and limb shape (Wounds UK, 2019b).

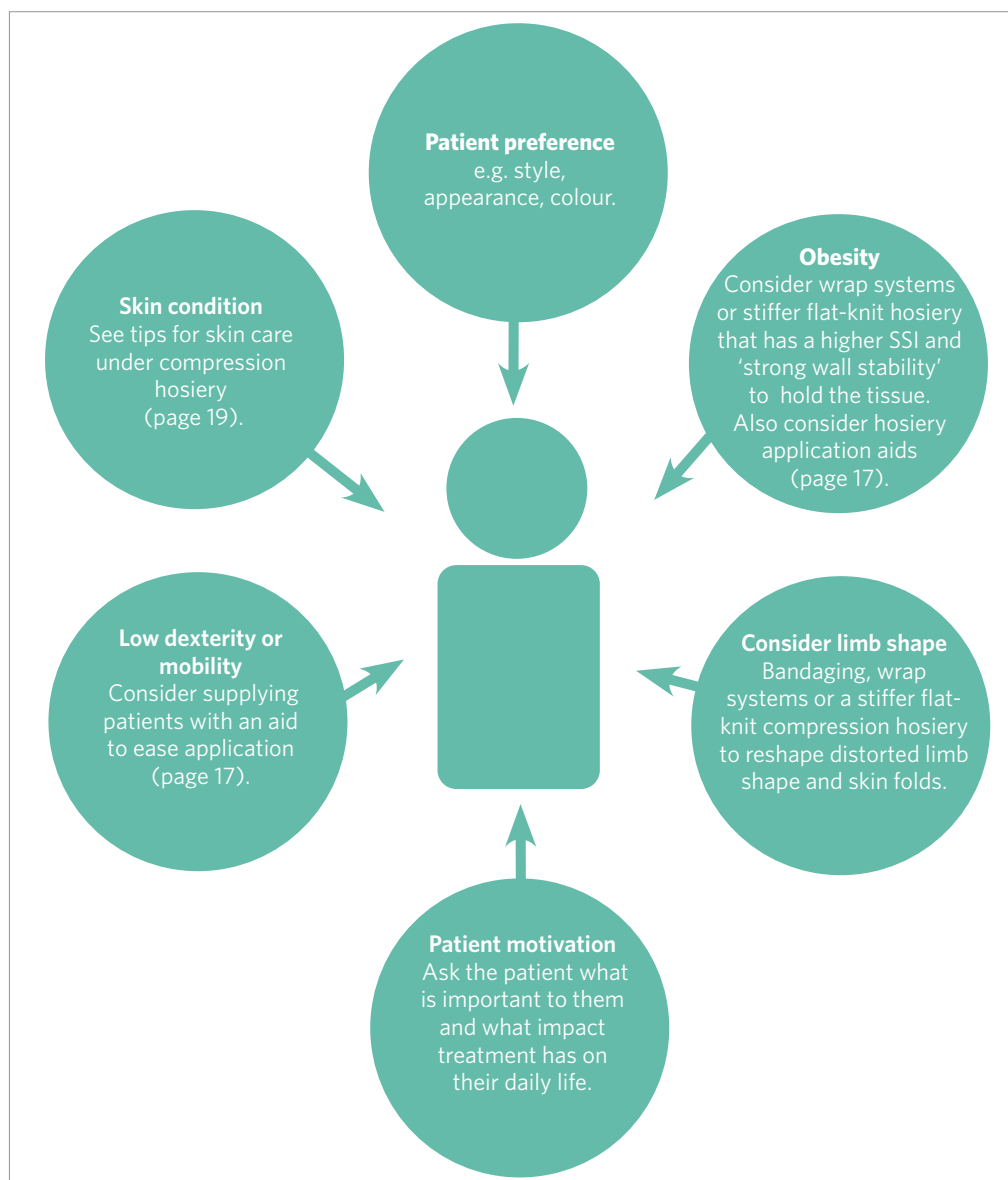


Figure 2. Patient factors to consider during garment selection.

3. PATIENT CONSIDERATIONS

Table 3. Suggestions for medical compression hosiery and additional treatment for venous insufficiency and oedema

	Clinical indications	Medical compression hosiery suggestion	Additional treatment suggestions
Venous insufficiency: CEAP classification (Lurie et al., 2020)	C0 No visible or palpable signs of venous disease C1 Telangiectasias or reticular veins	No treatment required	No treatment required
	C2 Varicose veins C2r Recurrent varicose veins C3 Oedema	<ul style="list-style-type: none"> ■ Round-knit, off-the-shelf, RAL Standard compression ■ CCI 1 (18–21mmHg) or CCI 2 (23–25mmHg) may be most appropriate ■ For patients who do not fit in standard sizes, made-to-measure round-knit RAL Standard options should be considered. If there is significant shape distortion, flat-knit, made-to-measure hosiery in CCI 1–3 should be considered. 	<ul style="list-style-type: none"> ■ Daily skin care and emollient regimen to maintain skin integrity ■ Simple ankle/calf exercises to enhance the calf muscle pump function ■ Increased activity/mobility, such as short walks or water exercises (e.g. walking in shoulder-high water, aqua-aerobics or aqua-cycling, but not swimming). A GP gym referral scheme may be available in some areas ■ Limb elevation on resting ■ Weight loss/maintenance (referral to dietitian or bariatric services) ■ If oedema is venous related and is persistent or worsening, patients should be seen by a vascular specialist to explore venous intervention to aid symptoms (NICE, 2021).
	C4 Changes in skin and subcutaneous tissue secondary to CVD C4a Pigmentation or eczema C4b Lipodermatosclerosis or atrophie blanche C4c Corona phlebectatica C5 Healed ulcer	<ul style="list-style-type: none"> ■ Round-knit, off-the-shelf, RAL Standard compression ■ CCI 2 (23–25mmHg) may be most appropriate ■ For patients not fitting in to standard sizes, round-knit, made-to-measure, RAL Standard hosiery should be considered. 	<ul style="list-style-type: none"> ■ Daily skin care and emollient regimen to maintain skin integrity ■ Simple ankle/calf exercises ■ Avoid sitting with leg dependant/sleeping in the chair at night-time; this may undermine all compression treatment/management ■ Increasing activity/mobility, such as short walks or water exercises (e.g. walking in shoulder-high water, aqua-aerobics or aqua cycling, but not swimming). A GP gym referral scheme may be available in some areas ■ Limb elevation on resting ■ Consider simple/manual lymphatic drainage.
	C6 Active venous ulcer C6r Recurrent active venous ulcer	<ul style="list-style-type: none"> ■ 2-layer compression hosiery kit or compression bandaging providing a combined 40mmHg should be used. 	<ul style="list-style-type: none"> ■ As above for chronic oedema/lymphoedema stage 0–2 ■ Weight loss/maintenance (referral to dietitian or bariatric services).
	Chronic oedema/lymphoedema stage 0–2 (latency, mild or moderate)	<ul style="list-style-type: none"> ■ Round-knit, off-the-shelf, RAL Standard compression may be suitable in early stages ■ Flat-knit, made-to-measure, RAL Standard hosiery should be considered in most cases ■ CCI 1–4 may be most appropriate according to the holistic assessment of the individual and their circumstances. 	<ul style="list-style-type: none"> ■ Daily skin care and emollient regimen to maintain skin integrity ■ Simple ankle/calf exercises ■ Avoid sitting with leg dependant/sleeping in the chair at night-time; this may undermine all compression treatment/management ■ Increasing activity/mobility, such as short walks or water exercises (e.g. walking in shoulder-high water, aqua-aerobics or aqua cycling, but not swimming). A GP gym referral scheme may be available in some areas ■ Limb elevation on resting ■ Consider simple/manual lymphatic drainage.
Oedema classification (International Society of Lymphology, 2016)	Chronic oedema/lymphoedema stage 3	<ul style="list-style-type: none"> ■ Flat-knit, made-to-measure, RAL Standard compression hosiery with a high SSI is often the most suitable ■ CCI 3 (35–45mmHg) or CCI 4 (>49mmHg) may be most appropriate; however, CCI 2 (23–35mmHg) may be considered according to the holistic assessment of the individual and their circumstances. 	<ul style="list-style-type: none"> ■ As above for chronic oedema/lymphoedema stage 0–2 ■ Weight loss/maintenance (referral to dietitian or bariatric services).

CCI: Compression class, CVD: Cardiovascular disease.

CHAPTER 4: ENCOURAGING SHARED DECISION-MAKING

The clinician should be confident in their own knowledge of medical compression to confidently explain the impact of compression hosiery. During consultations, explore the patient's individual ideas, concerns and expectations of compression therapy.

Best Practice Statement

You should expect to be involved in making joint decisions about your care, feel able to voice your concerns and be reassured that changes can be made to your care if required. Your clinician may ask whether you have family/ carers who would like to take part in the care plan if you need extra support.

Patient expectation

Patient adherence to compression therapy is often poor, but it is unhelpful to label patients as intentionally non-adherent (Green and Jester, 2019). Rather than dismissing the patient as non-adherent to treatment, instead listen to the patient's concerns and motivations with regard to the presenting condition. To help to facilitate shared decision-making, use language that is appropriate for the patient and create an open, accepting environment that allows the patient to share their own story.

It is acceptable to discuss compromise, as this may keep the patient engaged and can help ease patients into accepting long-term treatments, such as medical compression hosiery. Patients also need to be aware that their choice cannot always be fully accommodated, and that there may have to be some balance between clinical need and patient preference. Treatment can be modified to use a lower compression if high compression is not tolerated at first, but discussions should include the fact that as tolerance builds over time, compression levels may also be increased. Practitioners and patients alike should understand that compression is an ongoing treatment that needs to be worn long-term, just as long-term medication regimens should be adhered to.

MYTH

Wearing compression is always for life.

TRUTH

Some conditions such as lymphoedema require compression therapy for life, others, such as varicose veins, may be surgically treated and may not require life-long therapy. For patients with chronic oedema and venous insufficiency where intervention is not suitable, medical compression therapy is a life-long therapy.

The focus of compression treatment is to slow disease progression, but it can be difficult for the patient to imagine what will happen if they do not wear compression. A way of promoting concordance with compression therapy is to ask the patient to consider the future with regard to their lower limbs and to discuss the possible consequences of not wearing compression therapy, i.e. What might occur if they choose not to wear it? What could life be like in a few years' time?

During appointments, explore with the patient other avenues that will aid treatment and make compression more tolerable, such as skin care, elevation, activity, weight loss, access to support groups. Ask questions that might not be directly related to compression therapy itself, but might help to identify areas where the patient could be supported. Box 2 includes areas of discussion for clinician and patient to help inform compression selection.

'Best' garment for the patient

The 'best' garment for the patient is the garment that they will use and wear correctly. To identify the best garment for the patient:

- 1. Listen and explore:** Explore the patient's understanding, concerns and hopes related to medical compression hosiery (Box 2).
- 2. Assess:** Assess the limb and patient to determine the most appropriate medical compression hosiery clinically (see Chapter 2).
- 3. Consider patient ability:** Consider the patient's ability to apply compression hosiery, for example their manual dexterity and their body size and shape.
- 4. Check fit:** Check how the medical compression hosiery fits on the leg(s).
- 5. Patient preference:** Ask the patient if they are happy with the appearance and fit of the medical compression hosiery.

Box 2. Questions to ask the patient during medical compression hosiery selection: gathering information and encouraging adherence

- What do you understand about the condition in your leg(s)?
- Have you used medical compression garments before?
 - If yes, how did they affect your day-to-day lifestyle?
- What are your priorities for treatment?
- Do you feel confident in applying and removing your hosiery?
- Is there someone who can help you apply/remove your medical compression garments?
- Are you happy with the medical compression hosiery's colour? Pattern? Texture? Softness? (This is especially important to ask as summer approaches, so patients have medical compression they are comfortable with when wearing lighter/shorter clothing).
- Would you prefer open- or closed-toe medical compression hosiery?
- Do you have at least two pairs of medical compression hosiery? (Patients must wash and wear pairs alternately, and not keep one pair 'in good shape' for later).

MYTH

If the patient refuses to wear medical compression hosiery, there is nothing more that can be done for the patient.

TRUTH

If the patient refuses to wear medical compression hosiery, listen to the patient's concerns and why they feel they cannot wear compression hosiery. Consider with the patient whether the expectations of care need to be modified. The expectations of care should be agreed between the clinician and patient before treatment begins and revisited during treatment.

MYTH

Wearing medical compression hosiery is uncomfortable.

TRUTH

Patients with venous and lymphatic disorders should always feel more comfortable when wearing medical compression hosiery than when they are not.

Supporting patients at home

To successfully support your patient to care at home, they need to have understanding of:

- The reasons why hosiery has been prescribed
- A well-fitting garment, skin care and how to apply and remove the garment
- The expectations of care
- When they should contact the clinician and the 'red flags'
- The emergency contact details of who to contact if issues arise
- When and how to re-order hosiery

Patients may also benefit from keeping a self-care journal and being provided with where to access online patient resources (e.g. Legs Matter campaign: www.legsmatter.org/help-information/resources) or advice leaflets designed for patients (e.g. www.lymphoedema.org).

CHAPTER 5: MEASURING AND SIZING

Limbs should be measured and medical compression hosiery prescribed according to the manufacturer's own measuring guide, as sizes vary according to manufacturer. There are tools available to support clinicians to measure and identify the correct compression garment for the patient.

Best Practice Statement

You should expect your clinician to measure both of your legs so that you can be prescribed appropriately sized medical compression hosiery.

Patient expectation

Medical compression hosiery is only effective if the patient's limbs are measured accurately and the garment is applied correctly. Medical compression measured and prescribed inaccurately can lead to tissue trauma/pressure damage particularly if the fabric rolls during wear or is too tight and digs into the skin (Robertson et al, 2014). These experiences may stop the patients wanting – or being able – to continue with treatment.

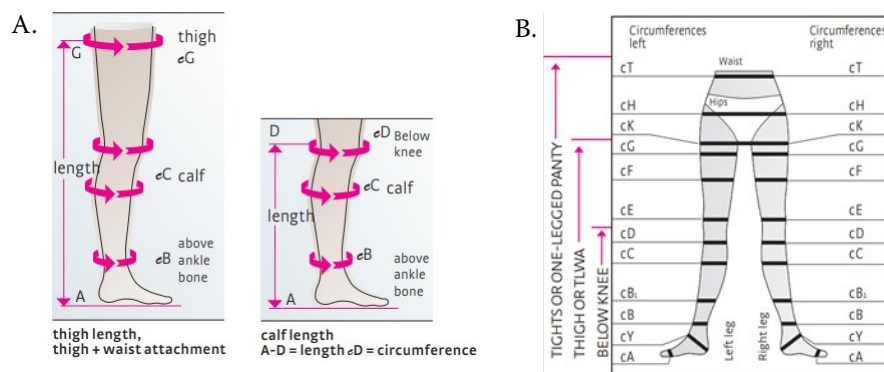
Limbs should be measured and hosiery prescribed according to each manufacturer's own measuring guide, as sizes vary according to manufacturer. Every effort should be made to reduce oedema before hosiery is measured. In some cases, bandaging may be required during the intensive management phase to help reshape the limb, reduce limb volume and/or treat the ulcer. Once oedema has reduced, patients can be measured for medical compression hosiery that will deliver sufficient

pressure to control their limb on an ongoing basis. After measurement, it is important to continue with compression bandaging until the patient's compression hosiery garment is available. Box 3 includes tips for hosiery measurement.

If a patient does not fit the measurements on the manufacturer's sizing chart for standard, off-the-shelf sizes, 'made-to-measure' medical compression hosiery should be prescribed. Made-to-measure can be considered first line for chronic oedema and larger limbs with a uniform shape, i.e smaller at the ankle, increasing in size up the leg. Where skins folds are present compression bandaging will be required first to achieve reduction and reshaping. If fitting is not accurate, hosiery will fail to prevent oedema, maximise ulcer healing or prevent recurrence, and will increase the risk of skin damage complications (Wounds UK, 2015).

Box 3. Tips for hosiery measurement (Wounds UK, 2015)

- Use the correct measuring guide for the brand of medical compression hosiery to be prescribed, as each manufacturer will vary
- Take measurements as early in the morning as possible, when oedema is at a minimum (see below for common measurement points for A) off-the-shelf; and B) made-to-measure compression hosiery)



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- Take measurements directly against the skin to ensure accuracy (use a skin marker to ensure accuracy and reproducibility)
- Take measurements for both leg, as they may differ in size
- Take measurements when the patient is sitting down, with feet flat on the floor
- If the patient has skin folds due to oedema or the limb is particularly misshapen, a specialist flat-knit garment may be required. This will require specialist assessment.
- Ask the patient to wear their medical compression hosiery to the next appointment so that the fit can be re-evaluated.

The practitioner should prescribe a minimum of two, but preferably three pairs of medical compression hosiery (one to wash, one air drying and one to wear) every 6 months (3 months for British Standard compression hosiery), to ensure the effectiveness of compression. This is regardless of the type of compression or class. Prescriptions should be clearly and thoroughly specified to ensure accurate dispensing.

When a new prescription is required, the patient must be re-measured. If the patient has a current medical compression prescription, it should be continued until the new prescription is ready. If the weight of the patient reduces or increases, this is likely to change the size of the limb. Old, worn hosiery should be handed back to the clinician when the patient receives a new prescription to prevent the patient wearing old 'comfy' medical hosiery. Some hosiery manufacturers a wide range of

colour and options on prescription, which may support concordance. Patients may be given details of websites where they can re-search the hosiery products further online.

MYTH

The patient only ever needs two pairs of medical compression hosiery.

TRUTH

It would be beneficial to the patient if clinicians prescribed a minimum of two pairs of medical compression hosiery every 6 months (3 months for British Standard). Some patients may be able to purchase more pairs privately if they are given the full details of the garment.

Fitting

FAQs

The patient has previously found compression uncomfortable and doesn't want to try again - what do I do?

If the patient did not tolerate compression in the past, it does not mean that they will not be able to tolerate compression ever again. If the hosiery is not comfortable, it is not the right choice for this patient right now. Talk to the patient again and listen to their concerns.

What if the hosiery digs in at the top around the knee?

Check that the garment is not overstretched and that placement is correct (the top band should sit two fingers' width from the crease of the knee). If the size and the placement are correct, it may be beneficial to change the fabric. Contact your local TVN/lymphoedema specialist if unsure.

What if the compression hosiery is too tight?

Ensure patients understand that a larger garment size will not make the garment feel less tight, and that this will reduce the effectiveness of the treatment. Less elastic garments may be useful if this feeling persists.

What if the top of the compression hosiery is rolling?

Check that the garment is the correct size/measurement and ensure placement is correct (with the top band sitting two fingers' width from the crease of the knee). If the size

and placement are correct, it may be beneficial to suggest using a garment with a different style or a stiffer fabric. If the hosiery are thigh-length garments and the hosiery fit has been checked, consider using an adhesive designed to adhere compression garments to the limb.

How will I know that the compression garment is working?

Compression therapy will help with limb volume reduction and leg comfort. If the leg was initially swollen and the medical compression hosiery starts to loosen and fall down after a few weeks, this could be a positive sign that treatment is working. You might have to order a smaller-sized stocking initially, depending on the condition you are treating and until the limb is stable. The patient should know who to contact if the garment is getting loose quickly, and that this is not a sign that the compression therapy has worked and is no longer required.

What if the garment starts to fall down?

Garments that continue to fall down cannot provide therapeutic compression. If the garment fits and the fabric is the correct type for the condition being treated, the use of a body glue, or addition of a top band, may help to keep the garment in place.

CHAPTER 6: KEY ELEMENTS TO SUPPORTED SELF-MANAGEMENT: HOSIERY APPLICATION, REMOVAL AND CARE, AND SKIN CARE

The practitioner who measured, selected and prescribed the medical compression hosiery should guide the patient through first application, and discuss how to apply and remove the hosiery, how to manage skin care under compression and how to take care of compression hosiery. If this is not possible, another qualified, skilled practitioner should guide the patient.

Best Practice Statement

The clinician who measured and prescribed your medical compression hosiery should show you how to apply (don) and remove (doff) the hosiery, and provide you with advice on how to care for your limb, skin and garments. If you do not understand any part of what has been said, you should ask for further explanation.

Patient expectation

Hosiery application (donning) and removal (doffing)

Even if the patient is experienced with compression hosiery, they should not independently apply compression hosiery for the first time or if the prescription has changed. The practitioner should demonstrate donning and doffing, then help the patient practise until they are competent at applying and taking off compression hosiery on their own. Showing how to apply and remove the hosiery and what constitutes a good fit when a carer is present is beneficial (Box 4).

Box 4. Quick guide for good medical compression hosiery fit

- Hosiery should fit well and not feel loose
- Hosiery should not be twisted, rolled or folded down
- Hosiery should sit two fingers' width below the knee crease, or four fingers' width below the gluteal fold in thigh-length garments
- The fabric should be evenly distributed over the length of the garment
- Hosiery should not pinch the skin or cause pain
- If numbness or pain occurs while wearing medical compression, it should be removed and reported to the clinician who prescribed the compression hosiery
- Hosiery should not cause shortness of breath.

It is important to explain that compression hosiery application is a new skill, which may require patience and practice in the early phase of treatment. Patients should ensure they set aside time in their daily routine and their environment is suitable to apply/don and remove/doff their hosiery. Instructions to apply thigh-length hosiery without a fabric or rigid aid are shown in Figure 3, page 18.

If a patient finds it difficult to don their hosiery, a hosiery application aid can help. Application and removal aids are typically either fabric or rigid. A fabric compres-

sion stocking aid is usually made from a slippery fabric, which is designed to make it easier to slide compression hosiery over the foot and leg. Patients will still need to be able to bend to reach their feet with fabric aids. Rigid aids typically provide a frame that lets the patient step into hosiery or pull up garments without bending to reach the floor (Dilks and Green, 2005). There are many different aids available, which should be chosen according to each patient's physical needs (Table 4, page 19).

Other aid options include non-slip mats, roll-on adhesives and roll-on membranes. Wearing rubber gloves with soft interior linings can aid grip during application and removal of all types of compression stockings.

MYTH

Hosiery application and removal aids are not available on the NHS.

TRUTH

Clinicians who prescribe compression hosiery should ensure that they are familiar with the aids that are available on FP10 locally and advise patients accordingly.

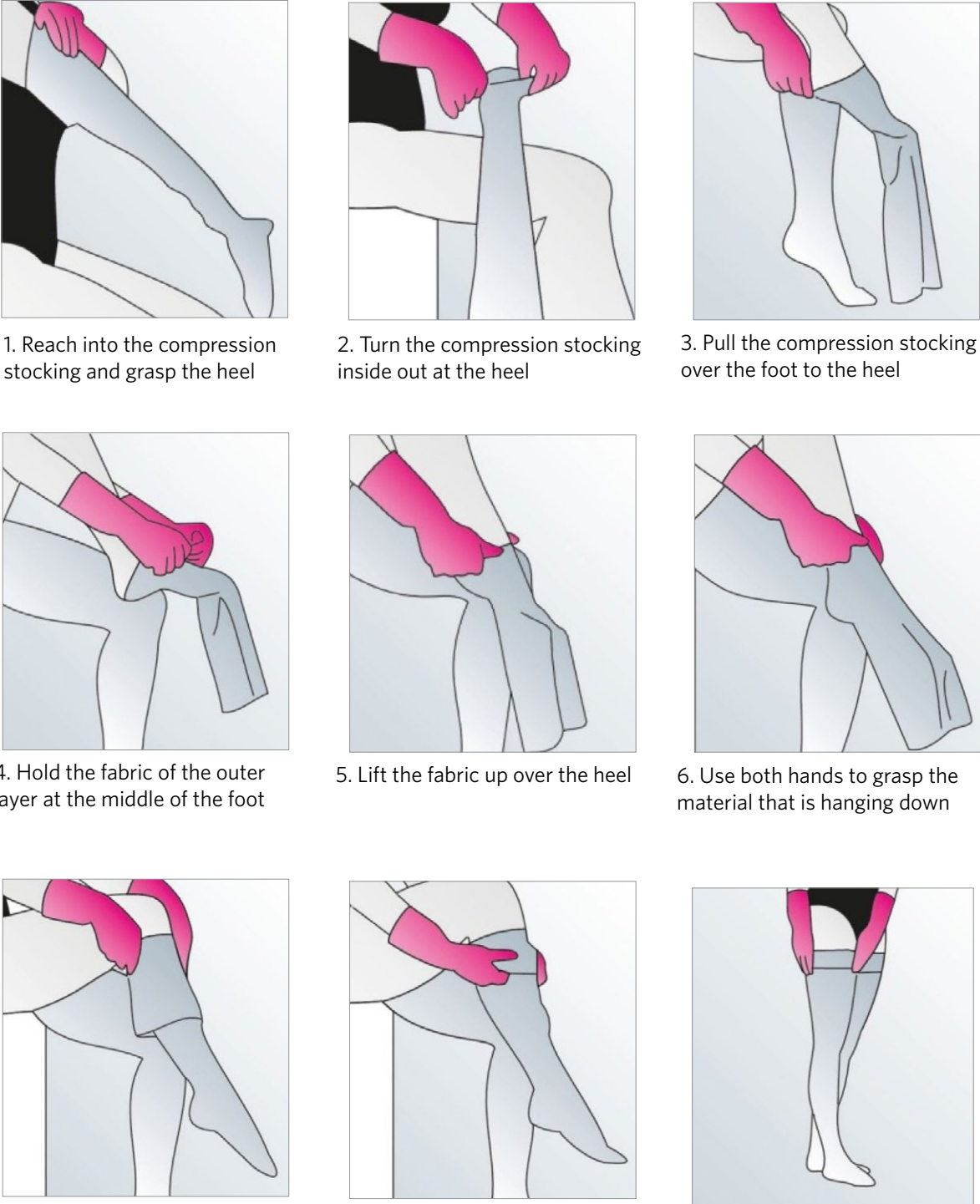
Application & removal FAQs

Can the patient wear compression while they sleep at night?

It is preferable that the patient wears medical compression hosiery throughout the day and removes them at night, allowing for the skin to be routinely checked for compression damage and to be moisturised. However, if the patient sleeps in a chair, they should wear medical hosiery throughout the night to prevent the legs from swelling. Patients with complex lymphoedema may be advised to wear a garment overnight.

6. HOSIERY APPLICATION, REMOVAL AND CARE

Applying compression hosiery



1. Reach into the compression stocking and grasp the heel
2. Turn the compression stocking inside out at the heel
3. Pull the compression stocking over the foot to the heel
4. Hold the fabric of the outer layer at the middle of the foot
5. Lift the fabric up over the heel
6. Use both hands to grasp the material that is hanging down
7. Distribute the fabric evenly over the calf and in stages up to the knee
8. Lift the fabric up over the knee
9. Check the complete compression stocking for the correct fit and even distribution of material over the limb

Figure 3. Instructions to apply thigh-length medical compression hosiery without a fabric or rigid aid. Images used with permission of medi UK©.

Table 4. Main examples of hosiery application and removal aids

Fabric applicators	Rigid applicators
Fabric applicators work similarly to slide sheets. They are made of slippery material to assist with application of hosiery. They can be used for open-toe and closed-toe hosiery, and are compactable and transportable.	Rigid applicators often comprise of a frame with a semi-circular tube to assist with opening the medical compression stocking to allow for easier application. These types of frames often have long handle options and may assist those who have difficulty bending forward to and reaching their foot.
<p>Miscellaneous:</p> <p>Anti-slip mats: Anti-slip mat to aid application and removal of hosiery</p> <p>Gloves: Rubber gloves with soft interior linings to aid grip during application and removal of all types of compression stockings</p> <p>Roll-on adhesive: Helps hosiery 'stick' to the limb and can be washed off with water</p> <p>Rolling compression aids: The hosiery is folded down over the flexible, donut-shaped aid, which is then slid up or down the leg to apply or remove the hosiery.</p>	

Hosiery care

Patients will largely be responsible for keeping their compression hosiery in good condition, so it is critical that they receive advice to maximise the life and effective-

ness of the garment until the next prescription. Providing written information that patients can refer to on an ongoing basis is essential.

Hosiery care FAQs

How does the patient clean their medical compression hosiery?

Compression garments can generally be worn for a maximum of 3 days before washing. Most compression hosiery can be laundered daily in a washing machine at 40°C; fabric softener should not be used. Check with the manufacturer's information for specific hosiery care.

If the compression is laddered, should it still be worn?

No, if the compression hosiery is damaged in any way it loses its structural integrity and must be replaced.

Can the patient exercise or swim in medical compression hosiery?

Wearing compression garments encourages good muscle pump action, and therefore is very beneficial to wear during activity. If the

patient wants to swim wearing hosiery, after swimming, the hosiery should be taken off, rinsed to remove chlorine or saltwater, and cleaned and dried as soon as possible.

Should hosiery be worn in the hot summer months?

When it is hot, the body may swell more readily; therefore, wearing compression hosiery is required in warmer months and climates. Some compression technologies have incorporated breathability and climate control into their designs, making the limb feel cool in the summer and warm in the winter. Other techniques, such as spraying cold water onto the garment to cool the limb can be effective (the 'wicking' ability of some fabrics will ensure this dries off quickly). Check with the manufacturers if you have questions.

Skin care under compression

CVI, oedema and lymphoedema affect the skin integrity, so patients with these conditions have an increased risk of skin infection (Harding et al, 2015). Skin care is therefore a priority for these patients, so providing the patient with simple-to-follow instructions on how to care for their skin at home is integral to supported self-management:

- Ensure legs are dry before putting on medical compression hosiery.
- Avoid applying emollients (e.g. lotions or creams) just before application of hosiery, as they can make the garment harder to put on. Applying emollients 20 minutes before medical compression application can reduce the difficulty.
- Apply skin care products (e.g. emollients, topical corticosteroids) in the evening, after removing hosiery for bed.
- Check daily for skin changes, including on the legs, toes/nails and space between the toes.
- Hosiery should be applied first thing in the morning, when oedema is at its lowest levels, to help avoid skin damage and limb expansion.
- Gently elevate legs when resting to reduce pooling of oedema that can result in skin damage (high elevation is not necessary).
- Keep physically active to the fullest extent possible, depending on each patient's specific situation. Follow guidance for ankle exercises for CVI, oedema and lymphoedema if possible.

Skin care FAQs

When should the patient remove their medical compression garments?

If possible, the patient can remove their hosiery daily to inspect the skin for any breaks, signs of infection (e.g. increased temperature or tenderness) and rashes or fungal infections (e.g. tinea pedis), or the early signs of pressure damage. Particular attention should be given to areas of reduced sensation, such as under skin folds and between the toes.

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