Chronic WOUNDS

AN OVERVIEW OF COMPRESSION HOSIERY

Compression therapy is considered the gold standard treatment for conditions such as recurrent leg ulcers, varicose veins, venous eczema and lymphoedema. It is important therefore that healthcare professionals have a comprehensive knowledge of the compression products available to ensure that patients have access to a range of choices.

Graduated compression can reverse venous hypertension, facilitate venous return, and improve lymphatic drainage (Moffatt, 2008). Compression therapy is considered the gold standard treatment for recurrent leg ulcers, early stages of venous disease, varicose veins, venous eczema and early signs of lymphoedema.

Early intervention with compression prevents disease progression, including progressive chronic oedema and skin changes. It reduces the increasing risk of cellulitis, and improves the quality of life in leg ulcer sufferers. Use of compression can prevent recurrence of leg ulceration.

Compression therapy is a conservative measure, not a curative therapy. It cannot cure venous hypertension or varicosities, but it can reduce the symptoms and prevent disease progression. In most cases, patients will need compression therapy for life, with the exception of pregnancy.

There are many different systems to choose from, including compression bandaging, compression hosiery and compression wrap systems.

Studies have shown that healing rates are equally effective between patients receiving compression using a four-layer-bandage system, and those using two-layer hosiery (Ashby et al, 2014).

It is important, therefore, that healthcare professionals are knowledgeable about the products available to ensure that patients have access to a range of choices.

Compression hosiery may be used when leg ulceration is present or when healing has been achieved. The key determinants of whether compression stockings are an option are the amount of exudate from open wounds and limb shape. Compression stockings can be applied over a non-bulky dressing.

Graduated compression hosiery as opposed to compression bandaging may promote more independence and self-care in users, and they may be more cost effective.

Assessment

It is essential to carry out and document a full holistic assessment before applying any compression therapy. The practitioner needs to identify the underlying cause of any leg ulceration, decide on appropriate management of the limb, and identify if specialist referral is required.

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The assessment should include a full medical history, including cardiac and neurological problems. It is essential to assess the patient for indicators of arterial compromise, including:

- Painful leg cramps
- Numbness or weakness in the legs
- Wounds to the toes, particularly black, dry wounds to the foot
- Cold or dusky legs or feet.

The best practice guideline from Wounds UK (2015) emphasises the importance of not delaying assessment, recommending that "patients should receive a comprehensive assessment within 10 working days of presentation with symptoms to establish the underlying aetiology of venous or oedema-related skin changes." It adds that "when deemed urgent, assessment should be carried out within 3 working days."

An ankle-brachial pressure index (ABPI) measurement should be carried out using a Doppler ultrasound probe before prescribing and applying any compression system, including stockings (Royal College of Nursing [RCN], 2006; Scottish Intercollegiate Guidelines Network, 2010). The ABPI is used to exclude arterial insufficiency.

Referral to a tissue viability nurse specialist or leg ulcer nurse specialist should be made if the ABPI is less than 0.8, greater than 1.3, or if there is no improvement in healing after 12 weeks (RCN, 2006). Referral should be urgently made to a vascular specialist if the ABPI is less than 0.5, or the patient has any acute symptoms of leg pain. Referral to dermatology should be made if malignancy suspected. The recommended level of compression depends on the condition being treated and the ABPI measurement. This assessment should be repeated every 6 to 12 months as long as compression therapy is being used.

The National Institute for Health and Care Excellence (NICE, 2012) recommends:

- ABPI <0.5: Do not apply compression, because severe arterial disease is likely. Seek specialist vascular assessment.
- ABPI 0.5–0.8: Apply no more than light (class 1) compression because arterial disease is likely and compression may further compromise arterial blood supply.
- ABPI 0.8–1.3: Compression stockings are safe to wear.
- ABPI >1.3: Compression should be avoided because high ABPI may be due to calcified and incompressible arteries. Seek specialist vascular assessment.

Assessment of wounds or leg ulcers should be carried out, including odour, exudate levels, inflammation or infection to the wound, and pain levels should be noted. Appropriate dressings should be prescribed to manage the wounds.

All people with diabetes presenting with foot or toe wounds should be referred to the multidisciplinary foot team (NICE, 2015a).

People with a history of deep vein thrombosis are not precluded from compression therapy (NICE, 2015b).

### Box 1. Contraindications to compression therapy.

- Suspected or proven peripheral artery disease, from history, Doppler assessment or Duplex scan.
- Severe peripheral neuropathy.
- Allergy to components of the stocking material.
- Extensive congestive cardiac disease.
- Local skin problems, including recent skin graft, oozing dermatitis, and severe cellulitis.
- Extreme deformity of the limb, preventing a correct fit.
Limb assessment includes establishing the site and degree of any swelling, before compression is commenced.

**Hosiery choices**

Hosiery choice is based on the holistic assessment and the treatment goal. Selection should consider the limb shape, limb measurements, availability and patient choice. It is necessary to carefully assess the limb to ensure the correct type and class of compression is prescribed.

Compression hosiery is constructed in two ways, circular knit or flat knit. The difference between the two constructions is significant, in the strength and in the quality of materials used.

Circular knit garments are knitted continuously on a cylinder, producing a seamless garment that is generally more cosmetically pleasing. These garments are suitable for most patients. The disadvantage is that they may allow oedematous or lymphoedematous limbs to swell.

Flat knit garments are knitted flat on a machine, then sewn together, which means they have a seam. They are stiffer, with less elastic, so they bridge skin folds and areas of swelling. They are appropriate for patients with chronic oedema, lymphoedema or fatty limbs.

Compression, including hosiery, is measured in mmHg (similar to blood pressure measurement). There are different pressure values for the classes of graduated compression hosiery and lymphoedema garments (Table 1), with the former using the British standard (British National Formulary, 2017) and the latter the European classification.

The pressure achieved is affected by many factors — the elasticity and stiffness of the material, the size and shape of the user, and their level of mobility.

The choice of compression depends on the underlying condition (NICE, 2012):

- Varicose veins: class 1 or 2 stockings, depending on the severity of the varicose veins
- Venous eczema: class 1 or 2 stockings
- Superficial thrombophlebitis: class 1 or 2 stockings
- Lipidermatosclerosis, atrophie blanche, and healed venous leg ulcers: class 2 stockings, or class 3 if response is inadequate.

Reassessment of the limb and the efficacy of the stockings used offers opportunities to adjust the compression if necessary. If leg swelling is not resolving, and the person has been wearing the hosiery, consider increasing the level of compression. If there is evidence that the circulation has deteriorated, or the skin compromised, consider reducing the level of compression.

**Measure the limb accurately**

It is essential that graduated compression hosiery is measured accurately and fitted properly to prevent complications. Hosiery should not roll down or cut into the person’s skin. Incorrect measurements can result in trauma, discomfort and possible ulceration.

All aspects of the person’s lifestyle, dexterity, independence, and ability should be considered, and should inform the decision about the appropriate hosiery to prescribe. Patient involvement at this stage will allow them to make an informed choice and may increase adherence with long-term therapy.

Measurements vary between manufacturers — each has their own fitting guide. Measurements should be taken early in the morning, or after a period of compression bandaging, if the person has any leg swelling. Severely swollen legs may first require a period of compression bandaging.

Take the measurements with the person standing if possible, particularly if thigh-length hosiery or tights are required. The tape measure should be snug but not stretched tight. The measurements should be documented. Both legs should be assessed and measured as each may require a different prescription.

Three measurements are generally required for below-knee stockings:

- The ankle at the narrowest point above the ankle bone.

### Table 1. Compression levels of British and European stockings (British National Formulary, 2017).

<table>
<thead>
<tr>
<th>British standard (compression hosiery)</th>
<th>European standard (lymphoedema garments)</th>
<th>Pressure</th>
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</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>Class 1</td>
<td>14–17 mmHg</td>
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<tr>
<td>Class 2</td>
<td>Class 2</td>
<td>18–21 mmHg</td>
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<td>Class 3</td>
<td>Class 3</td>
<td>23–32 mmHg</td>
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<tr>
<td>Class 3 super</td>
<td>Class 4 super</td>
<td>34–46 mmHg</td>
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<tr>
<td>Class 4 super</td>
<td>Class 4 super</td>
<td>49–70 mmHg</td>
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<tr>
<td>Class 4 super</td>
<td>Class 4 super</td>
<td>60–90 mmHg</td>
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</table>
The calf at its widest point.

The base of the heel to just below the knee. Measure following the contours of the leg, but check with the manufacturer’s measuring criteria.

Additional measurements are required for thigh-high stockings or tights:

- The widest part of the thigh.
- The length from the base of the heel to the gluteal fold.

Made-to-measure garments are more costly and seldom required. In 95% of cases, measurements are likely to fall within the manufacturer’s standard sizes (NICE, 2012). Where measurements are significantly different, made-to-measure garments should be prescribed. These will require additional measurements, which will be detailed in the manufacturer’s guidance.

**Stocking selection**

Compression hosiery is available in a choice of styles, colours, texture and designs.

All types of compression stockings are available in below-knee and thigh-length varieties. Below-knee stockings are the preferred choice for most people (NICE, 2012). When prescribed for varicosities, the stocking should reach the highest level of the varices and extend 5 cm above. Thigh-length stockings should be considered if there are severe varicose veins above the knee or swelling extending above the knee.

Consider whether a one-piece stocking is required, or two-piece system — liner and stocking.

Stockings are available in fully footed or open-toe styles. There are many reasons for using open-toe stockings:

- Personal choice.
- The user wears a sock over the stocking, or a liner beneath it.
- The user has arthritic toes or fungal infection.
- The user requires regular podiatry interventions.
- The user has a long foot compared with their calf size.

The product type, class and manufacturer of the compression stocking prescribed should be documented in the patient’s notes.

Hosiery generally lasts at least 3 months if cared for in accordance with the manufacturer’s instructions. Two garments per limb are usually prescribed, with a combined wear time of 6 months.
The patient should be reassessed before prescribing new supplies, including a repeat ABPI measurement to check for the development of arterial disease. Leg size can change, so it is important to measure the leg at regular intervals to ensure that a correctly fitting stocking is being prescribed.

For these reasons, stockings are not added to patient records on repeat prescription.

**Assess the patient’s ability to apply stockings**

Application of hosiery is very difficult for many people. It is essential to recognise the patient’s limitations. They may have limited hand movement or poor dexterity.

It is essential to establish how the user will manage to apply their stockings to increase adherence and effectiveness of the compression therapy. There may be a family member, friend or carer assisting with this procedure. The patient or person applying the stocking may require a device or aid to facilitate application of the stocking.

Many devices and application aids can be used:

- Rubber gloves, including specialised gloves with rubber non-slip grips.
- Chinese slipper devices, often supplied with open-toed stockings.
- Slides and glides, useful for open and closed-toe stockings.
- Gutter frame devices, useful for stockings and tights.
- Rolly application aids.
- Floor-based donner aids, available to purchase or from orthotic departments.
- Use of a liner (10 mmHg) helps an outer stocking glide on more easily.

Compression hosiery needs to be kept dry. Devices for showering or bathing may be required if the wearer is leaving their hosiery in place for several days.

**Education and advice**

Patients should be given details of who to contact if they have any problems with their stockings and told when to return for reassessment and future supplies of stockings.

Patients need to know when they should seek urgent medical advice, including if they experience symptoms of deteriorating arterial circulation (calf or foot pain; or cold, pale, dusky toes or feet).

Pinched or painful skin when using the stocking may be due to increased leg swelling. The user needs to return and be measured gain. Complications can be overcome by refitting the stockings, changing the material used, applying an emollient, reducing the degree of compression, or switching from circular to flat knit.

A patient may become frailer and less able to apply the stockings. They may need to be reassessed for different stockings or aids to assist with application.

In order for stockings to be effective, they need to be cared for properly. Manufacturers recommend washing at 40°C, and drying naturally, away from direct heat. Stockings are usually removed at night. They should be reapplied in the morning, before swelling occurs.

If patients are unable to manage removing them in the evening, they can be worn for up to 7 days (NICE, 2012).

Patients should be given advice about leg self-management to prevent disease progression. Walking improves calf pump function and will improve the efficacy of the stockings.

When seated, foot elevation overcomes the effects of gravity and helps to reduce oedema. Ankle and foot flexion massages the calf and improves the effects of the compression.

When stockings are removed, the patient should be advised to check their feet and legs for any wounds or signs of chafing from the stockings. This is also the time to use an emollient to the skin to keep it supple, so explain this and suggest a suitable product.

**Conclusion**

Compression therapy is considered the gold standard treatment for conditions, such as recurrent leg ulcers, varicose veins, venous eczema and lymphoedema.

Complications when using compression hosiery are preventable if patients are assessed, measured and fitted properly. Prevention of skin damage is minimised when accurate measurements are taken.

Adherence and acceptability of compression hosiery therapy is improved if the prescriber is knowledgeable and confident in measuring and selecting the most appropriate stockings, and if the user is enabled to make decisions that fit with their lifestyle.

**References**


British National Formulary (2017) *Compression Hosiery and Gar-