Venous and lymphatic disease both result in skin changes to the lower limb. These range from early disease signs such as mild oedema and dry skin, to varicose veins, leg ulceration and chronic oedema in the later stages. Patients at all stages of disease progression are commonly encountered in the community and compression hosiery plays a key role in the prevention and management of skin changes. Its use can:

- Delay lower limb disease progression in patients with known risk factors for lymphatic/venous disease, e.g. a family history of leg ulceration (Bianchi, 2013; National Institute for Health and Care Excellence [NICE], 2013a)
- Delay disease progression in patients with mild skin changes that are an early sign of diseases such as mild oedema and varicose veins (Bianchi, 2013)
- Heal uncomplicated venous leg ulcers as effectively as 4-layer bandaging (Ashby et al, 2013)
- Prevent skin breakdown in patients with healed venous leg ulcers (Nelson and Bell-Syer, 2012)
- Maintain a reduction in limb volume that has been achieved with intensive bandaging in patients with chronic oedema (International Lymphoedema Framework [ILF], 2006)
- Provide support to the lymphovenous system during pregnancy (NICE, 2010)
- Prevent the development of deep vein thrombosis (DVT) in patients with reduced mobility (NICE, 2013b).

**HOW HOSIERY WORKS**

Hosiery works by compressing the lower limb so that when the calf muscle pump contracts on moving, it is met with resistance which helps to squeeze the blood in the veins of the lower leg upwards. On relaxation of the calf muscle, hosiery helps to close faulty valves in the veins, preventing blood backflow. Together, these actions improve venous return, helping to relieve congestion of blood and lymph in the lower limb, which, if left untreated, result in skin changes such as ulceration and chronic oedema (Torra i Bou and Moffatt, 2008; Bianchi, 2013).

Each patient’s suitability to wear hosiery must be determined during assessment, which requires an understanding of the different products available to make the right choice for the individual patient (Gray, 2013).

**DIFFERENT TYPES OF HOSIERY**

In the UK, both circular and flat-knit hosiery are available as either ready-to-wear or made-to-measure garments. Flat-knit describes the process of producing a garment as a flat piece of fabric, which is then stitched together, whereas circular-knit garments are produced as a tube (Clark and Krimmel, 2006; Lay-Flurrie, 2011).

Most made-to-measure garments are flat-knit because distortion of limb shape, e.g. in patients with severe chronic oedema, can be accommodated during the stitching process.

Flat-knit garments are made from a thicker yarn than circular-knit, resulting in a stiffer fabric that is better for distorted limbs, as it is less likely to cut into the skin during wear. This may be due to poor measuring and fitting, or the patient’s condition could have changed.

The finer, seamless finish of circular-knit hosiery may make it more cosmetically acceptable and comfortable, but some wearers may experience problems such as rolling or digging in (Clark and Krimmel, 2006; Lay-Flurrie, 2011).

Hosiery garments should be classified or categorised by the type of yarn used in construction and the level of compression delivered (Clark and Krimmel, 2006) — standard methods exist for testing/defining the latter.

The two main types of compression hosiery used in the UK are:

- **British Standard**
- **European Class.**

British Standard compression garments are made from fine, light fabrics in a wide range of colours and styles. For this reason, many patients find them more acceptable and easy to wear, which may help with concordance to treatment (Timmons and Bianchi, 2008).
Making your Hosiery Selection Happier

- Works out sizes
- Recommends hosiery by condition
- Shows the hosiery ranges at a glance

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In limbs with a graduated shape, British Standard compression garments provide effective compression to heal venous leg ulcers and maintain healing. However, they are only suitable for patients with mild venous oedema (Timmons and Bianchi, 2008).

If moderate to severe oedema is present, European Class compression hosiery can be used to prevent deterioration, once limb volume has been reduced and stabilised using bandaging. The greater stiffness of European Class garments encourages lymphatic movement and reabsorption of lymph (Timmons and Bianchi, 2008).

Once the decision has been made to use British Standard or European Class compression hosiery according to the presence or absence of oedema, the appropriate class of garment should be selected.

### Different classes of hosiery

Compression hosiery is divided into classes according to how much compression it delivers at the ankle (measured in mmHg), with Class 1 garments delivering the least compression, and Class 3 the most. However, the amount of compression delivered in each class varies depending on whether the garment is British Standard or European Class compression hosiery (Table 1).

<table>
<thead>
<tr>
<th>Class</th>
<th>British Standard</th>
<th>European Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14–17mmHg</td>
<td>18–21mmHg</td>
</tr>
<tr>
<td>2</td>
<td>18–24mmHg</td>
<td>23–32mmHg</td>
</tr>
<tr>
<td>3</td>
<td>25–35mmHg</td>
<td>34–46mmHg</td>
</tr>
</tbody>
</table>

The class of hosiery should be selected according to the severity of symptoms, with more severe symptoms requiring a higher class of compression. However, all compression-related decisions should only be made following thorough patient assessment.

### PATIENT ASSESSMENT

#### Holistic assessment

Holistic assessment should be carried out to look for factors that may point to underlying venous/lymphatic disease, such as a family history of leg ulceration or known risk factors, such as DVT or previous surgery to the limb.

Contraindications, such as ischaemia or immobility, should be considered. If the patient already wears hosiery, consider if the garment meets their needs. For example, application aids can be prescribed to help them don/doff compression garments, colours or patterns can be chosen to aid concordance by matching clothing at different times of the year (i.e. summer), and styles selected to improve concordance (e.g. grip tops or tights, etc).

#### Vascular assessment

Before making any decisions regarding hosiery choice, it is recommended that all patients should receive a vascular assessment. Doppler ultrasound should be used to confirm or exclude the presence of arterial disease in patients, especially those who are being fitted with any Class 2 compression garments or above.

The use of compression on patients with arterial disease can lead to significant damage or even loss of limb. Patients with an ankle brachial pressure index (ABPI) of <0.8 or >1.3 require specialist referral. If the presence of oedema prevents an effective Doppler ultrasound being carried out, specialist referral should be made before applying compression (Timmons and Bianchi, 2008).

#### Limb shape

Limb shape is a key factor in determining the patient’s suitability for compression hosiery. The limb should be graduated from ankle to below knee for compression to be effective. If the limb shape is distorted, hosiery will not deliver adequate compression and may result in damaging the limb.

In such cases, made-to-measure garments should be recommended. Padding should be used to obtain a graduated shape and bandaging applied to deliver compression in severe cases (Clark and Krimmel, 2006).

#### Skin assessment

Skin changes with or without oedema?

The skin should be examined to look for changes associated with lymphovenous disease. In the early stages of disease, these may include tired, aching legs, mild varicose veins, and venous dermatitis. These changes may be accompanied with or without oedema.

#### Varicose veins

Enlarged or swollen veins are dark purple or blue in colour, and are usually twisted and bulging in appearance. They tend to develop on the back of the calf, or on the inside of the leg.

Varicose veins are often hereditary and there are a number of factors that can increase their chances of developing, including:

- Pregnancy
- Occupation, e.g. standing for long periods of time
- Injury to the legs
- Being overweight
- Age — vein elasticity is gradually lost with age.

#### Leg ulcers: with or without oedema?

A recent randomised, controlled trial (RCT) has shown that leg ulcer hosiery kits are as effective as 4-layer bandaging in healing leg ulcers in some patients (Ashby et al, 2013). Kits consist of two layers of compression hosiery, an understocking and over-stocking which, when combined, deliver therapeutic compression.

Although they have the advantage of being less bulky than bandaging, they are only suitable for the management of uncomplicated, healing venous leg ulcers, with mild oedema that are producing a small volume of wound exudate.

If wounds are large/heavily exudating and requiring a bulky
Hosiery is thus contraindicated and padding and bandaging will be needed to restore limb shape until the wound has reduced sufficiently in size.

If the wound is on a healing trajectory, producing a small volume of wound exudate but accompanied by moderate to severe oedema, a European Class compression hosiery kit may be more appropriate, as the stiffer fabric will aid lymphatic return, thus helping to contain the swelling.

Again, if the limb is not graduated in shape, bandaging should be used instead of hosiery.

Healed ulcers: with or without oedema? Once the ulcer has healed, recurrence should be prevented with long-term use of hosiery, since this has been shown to better reduce leg ulcer recurrence than no hosiery at all (Nelson and Bell-Syer, 2012).

Again, it is important to consider if oedema is present on the limb, since the presence or absence of swelling and its severity should influence compression hosiery choice. If oedema is severe, bandaging may need to be used to reduce limb volume to a point where it is stabilised.

At this stage, or if oedema is moderate, European Class hosiery may be used to contain the swelling. If no or minimal oedema is present, a British Standard compression garment can be used to prevent skin breakdown.

Chronic oedema
European Class compression garments have been manufactured to have a stiffer profile. This is ideally suited to containing limb expansion with oedema, and is why European Class hosiery is listed in the (Part 1XA appliances) lymphoedema garments section of the Drug Tariff.

Patient mobility/dexterity
Hosiery application can be difficult and patients and/or their carers must be able to apply and remove garments themselves. Hosiery can be worn 24 hours a day for up to seven days, when indicated by the prescriber.

When removing, it is important to gently peel off the garments and not to roll them. Hosiery kits can aid application, as the inner layer can be easy to put on and provides a smooth surface for the outer layer (Anderson, 2013). Aids also exist to make application easier.

Tips for fitting hosiery:
- Ensure hosiery is put on first thing in the morning before the legs are too swollen
- Use a foot powder to help slide the hosiery over the feet
- Avoid using ordinary talcum powder, which can clump to form balls if the feet are damp
- Wearing rubber gloves may help fingers to grip the hosiery.

NHS prescriptions
British Standard and European Class compression hosiery Classes 1, 2 and 3, below-knee and thigh-length, are available on NHS prescription. The prescription should also specify the following details:

- Type of garment
- Compression class
- Hosiery length (European Class hosiery only)
- Quantity.

Not all stock sizes of compression hosiery work off the same hosiery charts, and so it is important to always refer to the ‘relevant brand’ measuring chart. For example, Activa Healthcare have an online Hosiery Selector and a mobile APP, which work out the sizes.

Caring for compression hosiery
If compression hosiery is washed, dried and stored correctly, it can be used for approximately three months, or 100 washes. Patients are sometimes prescribed two pairs of hosiery, allowing one pair to be washed while the other pair is worn.

This means that both pairs will need replacing after six months. When issuing a prescription for hosiery, the following advice should be given:

- Look out for foot problems, such as rough skin or sharp toenails that could cause damage to the hosiery
- Regularly check hosiery for signs of wear or damage that may affect its compression.

Patient preference
It is well known that patients with leg ulceration and/or chronic oedema can find it difficult to tolerate compression for a number of reasons, including reduced mobility, or social pressures, such as an inability to carry out work.

Working with the patient to find a suitable garment greatly improves concordance (Gray, 2013).

Limb measurement
Once a type and class of garment have been selected according to all assessment findings, the limb should be measured to determine which size of compression product is required. Measurement guides are provided by the manufacturer but always include ankle circumference.

Off-the-shelf sizing charts fit a wide range of patients and the rule of thumb is that off-the-shelf compression hosiery sizes will generally fit 80% of patients.

If the limb is graduated in shape but larger than standard hosiery sizes, made-to-measure hosiery garments may be ordered to fit.

It is always important to remember:
- Measurements should be taken as early in the morning as possible, before the patient has been standing for long periods of time.
- Measurements need to be taken next to the skin to ensure accuracy.
- Patients who require compression hosiery for each leg must have both legs measured because they may be different sizes.

REASSESSMENT

Hosiery choice should be reassessed regularly, or each time the patient requires their replacement pairs. A change in wound healing status,
What’s your next step?

In order to use the knowledge you have gained from this article to inform your continuing professional development (CPD), you should take the following steps before logging onto the website (www.jcn.co.uk/learning-zone/) to take the learning zone test:

Reflect
Why is compression hosiery choice important?
What factors should influence compression hosiery choice?
What is the significance of the presence or absence of oedema?
Do you understand the different types of hosiery available?

Evaluate
Do you understand the importance of compression hosiery selection? What can you do to ensure that you are well informed on the compression products available when visiting patients in the community?

Act
Read the article when you have a spare few minutes in the day.
Make some notes on what you have learned, then visit the online test (www.jcn.co.uk/learning-zone/) to complete this subject.
The whole test, which involves reading this article and answering the online questions, should take you 90 minutes to complete.
Finally, download your certificate to show that you have completed the JCN e-learning unit on compression hosiery as part of your CPD portfolio.

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**REFERENCES**


