The assessment and management of venous leg ulceration is both an expanding and challenging element of community nursing (Martin and Duffy, 2011). Venous leg ulceration is a widespread condition affecting up to 1% of the population (Callam, 1992; O’Meara et al, 2009), increasing to 3–5% in those over 65 years of age (Mekkes et al, 2003). Furthermore, one in every 50 patients over the age of 80 years will have a venous ulcer (Martin and Duffy, 2011).

Leg ulcers can result in a great deal of disability, which can last for years if not managed appropriately (Moffatt et al, 2009). They can have a serious impact on quality of life, causing pain, sleep disturbance, reduced energy, anxiety, depression and poor self-esteem, as well as disrupting social and work life (Jones et al, 2006a; Moffatt et al, 2009; Upton, 2013).

Venous leg ulceration not only has an impact on patients’ wellbeing, but also incurs significant financial costs. Posnett and Franks (2007) estimated that in the UK there are between 70–190,000 individuals with an open ulcer at any time and that 100,000 new ulcers develop annually. The cost of these ulcers is at least £168–198m annually, with most of the cost borne in primary care and community nursing services (Posnett and Franks, 2008). As leg ulcer prevalence increases with age, these costs are also set to increase in accordance with the growing elderly population.

In reality, many venous leg ulcers fail to heal over long periods of time because their diagnosis and subsequent treatment choices are inadequate (Posnett and Franks, 2009). For patients who do achieve healing, recurrence is common, with many experiencing alternating periods of healing and skin breakdown (Brown, 2013).

For all these reasons, the assessment and management of venous leg ulceration is a priority for community nursing, and knowledge of this area is vital for best practice (Nic Philibin et al, 2010).

This article will help community nurses to understand the cause of venous leg ulceration, how to identify it by carrying out a full holistic patient assessment and, according to findings, place the patient on the correct management pathway (Royal College of Nursing [RCN], 2006; Scottish Intercollegiate Guidelines Network [SIGN], 2010; White et al, 2011). In short, the importance of assessment (Assess), appropriate selection of dressings (Dress) and compression therapy (Compress).

### PATHOPHYSIOLOGY

The venous system, which transports blood from the lower legs back towards the heart, includes deep veins, superficial veins and capillaries, which provide the skin with oxygen and nutrients. Blood is partly pushed up the leg by the foot and the calf muscle pumps during walking and movement, and a series of one-way valves within the veins stop the blood from flowing back downwards and pooling in the leg.

However, problems occur if the valves stop working properly, e.g. after deep vein thrombosis/venous thromboembolism (DVT/VTE), or trauma, such as surgery or bone fracture. This can be worse if the foot and calf muscle pumps are also not working properly, as in those who are elderly or immobile. This can cause varicose veins on the surface of the leg, or damage in the deep veins hidden from view — a condition known as chronic venous insufficiency (CVI).

The constant high blood pressure in the legs causes fluid to leak out of the veins, resulting in swelling and skin damage, which may lead to venous ulceration. Healing will be difficult to achieve if this underlying cause is not recognised and managed.

Failure to identify and manage the cause of venous leg ulceration can have many negative effects, including:
- Prolonged duration of the wound
- Loss of limb
- Further deterioration in the patient’s condition and quality of life
- Increased morbidity and mortality
- A greater cost to the patient and society (Heinrichs et al, 2005; Best Practice Statement [BPS], 2008).
the journey has just got easier...

This NEW kit has a low profile skin-friendly comfort layer, plus an effective cohesive compression layer — giving your patient the freedom to wear their own footwear — while delivering therapeutic pressure for treating their leg ulcer (1, 2)

ASSESSMENT

A full patient assessment should include clinical history, physical examination and holistic assessment and should always be undertaken on patients presenting with a suspected venous leg ulcer. Continuous assessment is important thereafter to ascertain if the ulcer is progressing or deteriorating (RCN, 2006).

Patient history
Assessment should begin with a clinical history, which will help to determine if the patient has underlying venous disease which may be responsible for the ulcer. Consider:

- Any family history of venous problems
- Patient’s previous thrombogenic events such as post surgical swollen legs, pregnancy or a period of enforced bed rest
- Varicose veins
- History of DVT/VTE, phlebitis, leg or foot fracture
- Occupation (jobs involving standing/sitting for long periods of time)
- Obesity or multiple pregnancies, which may cause pressure on the venous system.

Physical assessment
The patient’s general health should also be assessed, including baseline blood pressure, heart rate, and body mass index (BMI) measurements (RCN, 2006). Physical examination should also include:

- Wound assessment
- Skin and lower limb assessment
- Vascular assessment.

However, before wound and skin assessment is carried out, any dead, non-viable/devitalised tissue, infected or foreign material from the wound bed and surrounding skin should be removed if possible. Debrisoquin® (Activa Healthcare) a monofilament debriding pad, can help to do this, making it easier to assess the condition of the wound bed (Stephen-Haynes and Callaghan, 2012; Wound Care Today, 2013).

Wound assessment
Wound and skin assessment are key components in effective wound management — for diagnosis, dressing selection and the monitoring of the wound’s progress or deterioration (RCN, 2006).

Baseline assessment of the wound’s type, size, and location should be carried out. Tissue types present on the wound bed, along with the volume of exudate, and symptoms, such as malodour and pain, should be recorded.

Wound type
The wound should be identified as being acute or chronic, and whether healing by primary or secondary intention (Eagle, 2009).

Wound size
Wound size should be measured at first presentation, then regularly thereafter to monitor the progress/deterioration of the wound. Measurements of the wound’s depth, width and length should be accurately recorded using a reproducible method to allow monitoring over time (Grey et al, 2006; Eagle, 2009; Fletcher, 2010).

Anatomical location of the wound
Wound location will give clues to its cause. A venous leg ulcer usually occurs in the medial malleolar area or gaiter area of the leg (Hayes and Dodds, 2003).

Tissue types present in the wound bed
The tissue types present in the wound bed show the wound’s status, e.g. healthy granulation tissue is pink in colour and indicates healing, while the presence of slough can provide a barrier to wound progress. The percentage of slough, necrotic, granulation and epithelial tissue on the wound bed should be recorded at each assessment to enable the progress/deterioration of the wound to be monitored (Grey et al, 2006; Eagle, 2009; Fletcher, 2010).

Wound symptoms
Assessment should consider:

- Exudate: volume, colour and viscosity of exudate
- Malodour: odour from a wound can have a huge impact on the patient’s quality of life. Causes of malodour include infection, presence of necrotic tissue and fungating lesions.
- Wound-associated pain: the patient’s experience of pain should be taken seriously and assessed using a recognised pain assessment tool, commonly a visual analogue scale (VAS). This will also provide a benchmark for the success/failure of wound and pain management. Assessment should record:
  - site of pain
  - frequency and severity
  - whether it is present all the time or intermittently.

A sudden worsening or change in the nature of pain can also indicate the presence of wound infection, or deterioration of general health.

Wound edge
The appearance of the wound edge, including any areas of swelling, may help to identify the wound’s aetiology when considered alongside the history of the patient and their wound. Arterial ulcers, for example, often appear to be punched out, while rolled edges or a nodular wound bed can indicate malignancy (Hayes and Dodds, 2003; Grey et al, 2006; Eagle, 2009).

Skin and lower limb assessment
Assessment of the condition of the skin surrounding the wound should help to determine the extent of tissue damage and offer clues to underlying pathology. It can also provide signs as to the ability of a chosen dressing to successfully manage wound symptoms such as exudate. Venous disease results in a number of skin changes and assessment should look for the presence of these, including:

- Dry, flaky skin: increasing venous pressure in the legs starves the skin of oxygen and nutrients and it can become dry and flaky. The skin also cracks and is prone to irritation, itch and allergy. It is important to document any allergies/sensitivities that the patient may have, for example, to soaps or moisturisers.
- Maceration: this occurs when the epidermis is over-hydrated and becomes white and soggy. Wound exudate, especially from chronic wounds such as venous leg ulcers can cause maceration, as can the mismanagement of large
volumes of exudate (Hampton and Stephen-Haynes, 2006).

- **Excoriation**: this is inflammation of the epidermis caused by an irritant, such as a chemical or exudate (Hampton and Stephen-Haynes, 2006).

- **Discolouration, including haemosiderin staining**: these red pigment stains, which can be seen in the lower legs of patients with venous leg ulcers, occur because venous congestion causes the capillaries to swell and leak.

- **Varicose veins, varicosities**: ankle flare describes the tiny purple veins on the medial aspect of the foot, which are caused by venous congestion and chronic venous hypertension. Ankle flare is an early warning sign of leg ulcer development. Varicose veins are the larger veins that swell as blood pressure builds up. Symptoms include discomfort and pain, especially after standing for extended periods. The location and severity of any varicose veins should be noted.

- **Chronic oedema**: this is classed as swelling of the limb that has lasted longer than three months. It is often caused by venous failure and lymphatic overload. The accumulation of fluid and proteins leads to swelling, skin changes and fibrosclerosis. Baseline measurements of the ankle circumference are important and should be repeated at a consistent time of day (preferably first thing in the morning) and on the same point on the limb.

- **Lipodermatosclerosis**: this refers to dry, hard red skin that develops in patients with venous insufficiency due to lack of nutrients and reduced oxygen exchange. It can make the leg take on the shape of an ‘inverted champagne bottle’.

**Vascular assessment**

It is important to assess the blood supply to the legs in patients with ulceration before any compression is applied. If compression, the gold standard of treatment for venous leg ulcers (Cullum et al, 2006), was applied to legs in patients with arterial insufficiency, pressure damage, limb ischaemia and even amputation could result (RCN, 2006; SIGN, 2010). Nurses should be trained in the use of Doppler, with evidence suggesting that competency results in the effective use of compression (Ruston, 2002).

**Measurement of the ABPI**

Measuring the patient’s ankle brachial pressure index (ABPI) with a handheld Doppler can help to confirm or exclude the presence of arterial disease, and is included in national guidelines as part of leg ulcer assessment (Clinical Resource Efficiency Support Team [CREST], 1998; RCN, 2006; SIGN, 2010). It is a fundamental part of leg ulcer assessment and should always be performed by a competently trained clinician (Beldon, 2010).

Measurement of ABPI is a simple, non-invasive vascular assessment technique that assesses the presence and degree of arterial disease by comparing the ankle and brachial systolic blood pressures (Marshall, 2004).

If the systolic readings are the same, or just slightly different, there is unlikely to be significant arterial disease in the legs. However, if the ratio between the two readings is significant, the arterial flow in the lower limb may be compromised to a degree that compression therapy would be risky. For example:

- **Pressures of 0.5–0.8 indicate significant arterial impairment** (0.5 = 50% reduction in arterial blood flow)
- **Pressures of 0.6–0.7 can have compression, provided an experienced clinician is involved in the assessment and applies the compression. Inelastic bandage systems, for example Actico®, can be used due to the lower resting pressure**
- **Pressures of 0.8–1.3 are suitable for compression** (people with venous ulcers tend to have an ABPI of 0.8 or greater, [RCN, 2006]).

ABPI forms part of overall patient assessment and should not be used in isolation. If the results do not tally with those from other findings, further investigations will be needed and an appropriate referral should be made.

**Holistic assessment**

Leg ulceration can negatively impact on patients’ quality of life and wellbeing (Franks and Mozart, 2001; Gray et al, 2011). Alongside diagnosing and treating the ulcer, clinicians should always explore how the patient is feeling and offer empathy and compassion. Areas to consider include:

- Feelings of depression (Jones et al, 2006)
- Immobility
- Lack of social life and/or social isolation (Stephen-Haynes, 2010)
- Pain (Briggs and Nelson, 2010; Price et al, 2008)
- Loss of independence
- Poor sleep pattern
- Mood disorders (Upton et al, 2012)
- Wound symptoms, such as exudate leakage and odour (Snyder, 2006).

It is important to discuss with patients how their quality of life is affected by venous leg ulcers, as this can have an impact on their concordance with treatment. Building a good rapport will reassure patients that they can openly discuss any anxieties that they may have about treatment or outcomes (Foster and Hawkins, 2005; Palfreyman, 2008).

**MANAGEMENT**

Having confirmed the cause of an ulcer, a management plan should be decided upon, in agreement with the patient and their family/carers. The priorities are:

- To address the underlying cause of the ulcer
- To improve the wound bed
- To improve factors that could delay healing, such as malnutrition, poor mobility, lack of belief in treatment
- To prevent complications such as infection or contact dermatitis
- To maintain good skin care regimens
- To maintain healing once achieved and prevent ulcer recurrence.
When it has been established that the ulcer is venous in origin (i.e. ABPI of more than 0.8–1.3), it should be treated with a combination of compression therapy, exercise and elevation of the limb, all of which help to aid venous return to the heart.

Management should focus on self-care and empowering patients to lead as normal a life as possible (Brown, 2013). While healing is realistic for many patients, recurrence is likely if compression is discontinued following ulcer healing. It is important that patients understand this, otherwise they may refuse to wear hosiery once their ulcer has healed (Brown, 2013). Encouraging self-care, such as wearing compression hosiery, leg elevation, ankle exercises and moderate exercise such as walking, will help reduce recurrence. A good skin care regimen will also help to maintain skin integrity.

### Compression therapy

Compression therapy using bandages or hosiery controls oedema and reverses venous hypertension by:

- Supporting the veins, reducing distension, thus improving blood flow, and thereby freeing congestion in the capillaries and veins and in turn reducing oedema
- Increasing blood flow, which results in improved skin condition as more nutrients are delivered to the tissue
- Facilitating the action of the calf muscle pump
- Relieving symptoms and improving the healing rates of venous ulcers (Moffatt et al, 2007).

These results are best obtained through the use of graduated compression therapy. This means the highest pressure is delivered at the ankle, gradually reducing at the knee. Short working pressure peaks of >60mmHg result in short duration, intermittent closure of the deep veins which, in much the same way as the valves of the vein normally work, are thought to reduce venous reflux and lower venous hypertension (World Union of Wound Healing Societies [WUWHS], 2008).

The amount of pressure applied is determined by La Place’s law (Figure 1). This dictates that the firmer the bandage, the higher the pressure, the larger the limb, the lower the pressure and the smaller the limb, the greater the pressure.

Practitioners applying compression should have an in depth knowledge of the variety of bandages and hosiery available, their individual properties, as well as the effects of the patient’s limb size and mobility on the amount of compression delivered.

### Empowering patients/concordance

Clinicians should always consider patients’ lifestyles and activity levels, as well as cultural/religious factors. They should also allow patients to choose the type of compression product they would like to use. This will encourage concordance with treatment (WUWHS, 2008).

High compression, multilayer bandaging is the most suitable treatment for venous ulcers (SIGN, 2010). Once the ulcer has healed, compression should still be applied as the underlying aetiology is still present. If oedema is present, bandaging can be used to reshape or reduce the volume of the limb, so that the patient can be fitted for hosiery to maintain the condition of the limb and prevent deterioration (Linnitt, 2012).

### Compression products include:

- Elastic/long-stretch bandages
- Inelastic/short-stretch bandages ~ cohesive
  ~ non-cohesive
- Compression hosiery, including leg ulcer hosiery kits
- Intermittent pneumatic compression (IPC) therapy.

#### Elastic/long-stretch bandages

Elastic or long-stretch bandages are usually applied at 50% stretch to ensure a determined amount of compression. To achieve accurate pressures, the bandage needs to be applied correctly as per the manufacturer’s instructions and should consider the ankle circumference. Bandages provide similar levels of compression, regardless of patient activity. Elastic systems thus deliver constant pressure to the limb as there is little difference between their working and resting pressures (Figure 2).

### Laplace’s law

In brief, this law explains how the sub-bandage pressure will rise with increasing bandage tension and the number of bandages applied, but decrease with increasing limb circumference and bandage width (Moffatt, 2007). The following calculation shows the pressure exerted by the bandage:

$$ P = \frac{T \times N \times \text{constant}}{C \times W} $$

In brief, this law explains how the sub-bandage pressure will rise with increasing bandage tension and the number of bandages applied, but decrease with increasing limb circumference and bandage width (Moffatt, 2007). The following calculation shows the pressure exerted by the bandage:

- **High compression, multilayer bandaging**
- **Inelastic/short-stretch bandages**
- **Elastic/long-stretch bandages**

Inelastic/short-stretch bandages are designed with little or no elasticity to form a relatively rigid covering over the limb. When the calf muscle changes shape on walking it presses against the non-stretch bandaging, thereby increasing the efficacy of the calf muscle pump. Inelastic bandages can provide pressure peaks even during small ankle flexions (WUWHS, 2008), making them suitable for many immobile patients (Charles et al, 2009). These bandages have therapeutic working and lower resting pressures, which provide effective ulcer healing and oedema control (Franks et al, 2004), as the pressure adapts around the patient’s everyday movements. They are thus more comfortable to wear, especially at night. Cohesive short-stretch bandages provide up to seven days’ wear.

#### Inelastic/short-stretch bandages

Inelastic/short-stretch bandages are designed with little or no elasticity to form a relatively rigid covering over the limb. When the calf muscle changes shape on walking it presses against the non-stretch bandaging, thereby increasing the efficacy of the calf muscle pump. Inelastic bandages can provide pressure peaks even during small ankle flexions (WUWHS, 2008), making them suitable for many immobile patients (Charles et al, 2009). These bandages have therapeutic working and lower resting pressures, which provide effective ulcer healing and oedema control (Franks et al, 2004), as the pressure adapts around the patient’s everyday movements. They are thus more comfortable to wear, especially at night. Cohesive short-stretch bandages provide up to seven days’ wear.

### Compression hosiery

Compression hosiery, which must be worn daily, is used as maintenance therapy once ulceration has healed,

<table>
<thead>
<tr>
<th>Type of Compression Hosiery</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastic/long-stretch</td>
<td>Enables the pressure on the limb from the bandage itself, while the patient is at rest or supine</td>
</tr>
<tr>
<td>Inelastic/short-stretch</td>
<td>Provides pressure peaks even during small ankle flexions (WUWHS, 2008), making them suitable for many immobile patients (Charles et al, 2009)</td>
</tr>
</tbody>
</table>

### Figure 1

**Laplace’s law of sub-bandage pressure.**

### Figure 2

**Resting and working pressures.**

<table>
<thead>
<tr>
<th>Pressure Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting</td>
<td>The pressure on the limb from the bandage itself, while the patient is at rest or supine</td>
</tr>
<tr>
<td>Working</td>
<td>The pressure created when the limb is moving and muscles contract against the bandage</td>
</tr>
</tbody>
</table>

---

**References:**


---

**La Place’s Law:**

$$ P = \frac{T \times N \times \text{constant}}{C \times W} $$

Where:

- **P** = sub-bandage pressure
- **T** = tension
- **N** = number of layers
- **C** = circumference
- **W** = width of bandage
and where oedema is present, to maintain limb volume reductions achieved by bandaging. Hosiery can also be used as an alternative to compression bandaging if concordance becomes an issue, perhaps because of difficulty in wearing normal footwear. However, this is only possible if the ulcer is producing low to moderate volumes of exudate. Alternatively, made-to-measure garments can be considered. Hosiery is often more cosmetically acceptable, particularly to younger patients.

Hosiery is available as thigh-high stockings, below-knee stockings and unisex socks. British Standard and European Class hosiery are available in three classes. The level of compression applied is expressed in millimetres of mercury (mmHg) (Table 1).

<table>
<thead>
<tr>
<th>Table 1: British Standard and European Class hosiery compression classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Standard</td>
</tr>
<tr>
<td>Class 1</td>
</tr>
<tr>
<td>Class 2</td>
</tr>
<tr>
<td>Class 3</td>
</tr>
</tbody>
</table>

British Standard hosiery is suitable for patients with venous problems without oedema.

Hosiery kits are also available. These comprise two stockings, one worn on top of the other. The combined compression allows leg ulcer healing without the bulk of bandages.

Frequency of application
The frequency of bandage changes will need to fit in with the patient’s lifestyle and work. Hosiery may be more appropriate for younger patients who are unable to attend frequent appointments. Clinicians should also be competent in performing different bandaging techniques (Mear and Moffatt, 2002), and in measuring and fitting for compression hosiery. New, online resources such as a Hosiery Sizer app (Activa Healthcare) can help to ensure that the correct size is chosen.

Patients can be offered hosiery made of various textiles and with different elastic properties, depending on the patient’s lifestyle and the required level of compression.

Intermittent pneumatic compression (IPC) therapy
This boot-like system is attached to the leg and connected to a pump, which applies pressure to inflate and deflate the boot from the ankle to the knee. These varying pressures help to speed up venous return and reduce oedema. Between treatments, compression hosiery or bandaging is necessary, otherwise oedema will return and venous pressure increase (Moffatt, 2004).

Exercise and elevation
As well as compression therapy, patients should perform exercises facilitating ankle movement and flexing the calf muscle pump (SIGN, 2010). They should also be encouraged to elevate the legs above hip level whenever possible, reducing pressure and draining oedema from the veins (Dix et al, 2004).

Skin care
Managing the peri-ulcer skin is an important part of any leg ulcer care plan. Common skin problems with venous ulcers include:
- Eczema
- Allergic contact dermatitis
- Irritant contact dermatitis
- Hyperkeratosis.

Regular washing of the legs is important as patients often develop thick layers of dry skin, or hyperkeratosis (SIGN, 2010). This dead tissue should be safely and atraumatically removed after cleansing (Whitaker, 2012). A safe and easy method to do this is with Debrisoft, which gently and effectively removes hyperkeratosis. These debridement pads can also be used by patients themselves as part of their skin care regimen (Fidock and Jones, 2013).

Dry skin is a particularly common sign of venous ulceration and the use of emollients may be needed. It is important to apply any substance to the leg in the direction of hair growth to avoid inflaming hair follicles. Skin care should be continued once healed to maintain skin integrity, but beware of use of products that affect hosiery.

Wound management
Although most ulcers heal after the application of compression, some fail to progress. In this case, wound bed preparation can identify factors in the wound bed that are delaying healing. The clinician can then aim to stimulate the healing process (Falanga, 2004).

Dressings that perform well under compression, while also managing the wound’s symptoms should be chosen. For example, if a large amount of exudate is present, the dressing should be able to absorb and retain fluid under compression to prevent maceration of the surrounding skin.

Pain
Pain can be particularly intense at dressing changes (European Wound Management Association [EWMA], 2002; Price et al, 2008). Leg ulcer pain ranges from the acute pain caused by ischaemia or infection, to the aching caused by oedema (Jones et al, 2006b). It is vital that dressings are carefully selected and that the limb is treated gently. In some cases, compression can help to relieve pain by reducing oedema and supporting the limb. Analgesia should be prescribed where appropriate.

Psychosocial considerations
Leg ulcers can result in social isolation, due to pain or the odour of leaking wounds. The emergence of Leg Clubs and leg ulcer clinics has gone some way to address this problem, as they offer a friendly environment with the opportunity to have legs washed and dressed (RCN, 2006).

Preventing recurrence
Healing leg ulcers can take time and recurrence rates are high. Rippon et al (2007) found in a literature review that after two years of treatment with compression bandaging, approximately 20% of venous leg ulcers were still unhealed.

Recent developments in technology have led to greater
choice in compression hosiery, with more fabrics, sizes and colours being available. This has led to an improvement in patient concordance (Dowsett, 2011), which helps to prevent recurrence.

Ongoing assessment and attendance at leg ulcer clinics and patient education are vital to maintain healthy legs.

CONCLUSION

Venous leg ulcers are a common problem in the community, with which nurses should be familiar if they are to combat the pain, social isolation and depression that accompany this debilitating condition.

It is important that community nurses know how to assess, diagnose and treat leg ulcers, as well as being familiar with the different types of compression available.

If community nurses apply the information contained in this article, as well as completing the online test (www.jcn.co.uk/learning-zone/), they will be better equipped to provide evidence-based care and advice for patients living with venous leg ulceration.

Acknowledgements

This learning zone has been supported by an unrestricted educational grant from Activa Healthcare. The Assess, Dress, Compress concept has been developed and proposed by Activa as a useful tool in the management of venous leg ulcers. For further e-learning resources, visit: http://www.activahealthcare.co.uk/e-learning-zone/

REFERENCES


Brown A (2013) Self-care support in leg ulcer services should be the priority. Nurs Times 109(4): 11


Charles H, Hofman D, Anderson I, Williams
AF (2009) Short stretch bandages can assist wound healing and reduce oedema in immobile patients. J Wound Care 18(1): 39


