8.5.1 Compression systems

Compression systems are categorised according to the amount of support applied to the leg. The description from the manufacturer may not accurately reflect the level of compression applied as other considerations will influence the pressure level. For example, the extent to which the bandaging or hosiery system has been used (for example, number of times it has been washed), the application technique and the skill of the clinician applying the compression system, shape and circumference of the leg.118

Sub-bandage pressures are proportional to the strength of the applied compression system. Sub-bandage pressure can be measured in the gaiter area (approximately 8 cm above the ankle bone) in both the standing and lying positions to gauge the stiffness of the compression. The difference between lying and standing pressures is referred to as the static stiffness index (SSI). Higher SSIs (usually considered to be above 10 mmHg) indicate a more inelastic compression system that produces a higher level of compression when standing and a lower pressure when resting.119

<table>
<thead>
<tr>
<th>Compression system</th>
<th>Also referred to as</th>
<th>Description and function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-component system</td>
<td>Two-, three- and four-layer bandaging (4LB)</td>
<td>A compression system with more than one layer or aspect. Most bandaging systems include at least a padding layer and bandages so are classified as multi-component systems. Can also refer to a system that consists of several layers using a combination of elastic and inelastic bandages (i.e. 4LB system). This system is also available as a kit.</td>
</tr>
<tr>
<td>Inelastic compression bandages</td>
<td>Short-stretch bandages</td>
<td>Bandages with minimal or no elastomers. Low extensibility and high stiffness (high SSI). Low resting pressure and high working pressure.</td>
</tr>
<tr>
<td>Single-component bandage system</td>
<td></td>
<td>Compression bandaging system that has only one layer or aspect to the system. Most bandage systems currently used in practice include a padding layer and so are not described as single-component systems.</td>
</tr>
</tbody>
</table>
Medical-grade compression hosiery

Tubular stockings, compression stockings, multi-layer hosiery systems

Available in a range of compression levels. International consensus on compression scales is lacking and different scales are used around the world. Two scales and/or classifications of compression hosiery commonly used by Australian and New Zealand manufacturers include:

**Scale one:**
- extra light (5 mmHg)
- light (15 mmHg)
- mild (18–24 mmHg)
- moderate (20–40 mmHg)
- strong (40–60 mmHg)
- very strong (>60 mmHg)

**Scale two:**
- Class I
- Class II
- Class III
- Class IV

Unna boot

Unna’s boot

Although there are several systems referred to as Unna’s boot, it is commonly a gauze bandage impregnated with zinc paste under a cohesive inelastic bandage.

Pneumatic compression

Pump compression

Pressure is applied via a boot inflated by a machine either continuously, intermittently or in sequential cycles.

**Practice points**

- A general rule is that higher pressure is better than lower pressure and some pressure is better than no pressure.

- Incorrectly applied compression systems may not be effective or may cause tissue damage. Clinicians and patients require education and experience to ensure that bandaging is applied correctly and achieves an appropriate level of compression.121 (recommendation 8.6.2)

- There is minimal evidence to suggest that there is a superior compression system. Moderate- and low-quality RCTs suggest that:
  
  - a single-component bandage compression system is less effective than 4LB122,123
  
  - different variations of 4LB systems are as effective as each other122,123
  
  - two-layer, medical-grade compression hosiery is more effective than inelastic (short-stretch) bandaging122
  
  - medical-grade compression hosiery is comparable to multi-layer bandaging systems in its effectiveness124
  
  - when using two- or three-layer component compression systems, an elastic component is more effective than an inelastic component122
- two- and 4LB systems have similar effectiveness\textsuperscript{118,125}
- pneumatic compression is as effective as bandaging systems.\textsuperscript{126}

- In the absence of any good-quality evidence supporting specific compression systems, the Expert Working Committee recommends that choice of a compression system should be made in consideration of:
  - shape and size of the leg
  - patient tolerance and preference
  - clinician experience in application
  - the environment (for example, temperature)
  - ease of application and removal
  - access to systems
  - presence of other disease
  - level of activity/weight bearing cost.

- There is insufficient evidence on the most effective degree of compression required to achieve healing. The Expert Working Committee’s consensus is that efficacy is related to the pressure of compression and should be attained through a garment designed for VLU management.

- There is no evidence to show anti-embolic stockings will heal VLUs.

- Consider the shape of the patient’s leg and comfort in selecting a compression system. For example:
  - unusually shaped legs may require custom-made, medical-grade compression hosiery
  - some patients benefit from additional support in particular areas (for example, the foot arch and
  - posterior medial malleolus region)
  - adaptations such as the Southland Snail\textsuperscript{127} or stasis pads can provide localised supplemental pressure over the ulcer area to flatten wound edges and ensure pressure is applied evenly.

- A sub-bandage pressure gauge can be used to determine the effectiveness of the bandaging application; however, ongoing monitoring of sub-bandage pressure does not influence the effectiveness of the bandaging.\textsuperscript{121}

- There is some evidence that medical-grade compression hosiery is associated with less pain than compression bandaging.\textsuperscript{122}

- Compression stockings, socks and bandages should be replaced regularly. For most patients this will be two to three pairs of stockings or socks per year. Bandages should be applied, cared for
and laundered according to manufacturer’s instructions and replaced when bandaging integrity is compromised.

- Various devices and styles of stocking are available to assist in the donning and doffing of compression hosiery.

**Evidence summary**

One good-quality SR\(^{118}\) reported the results from seven moderate- and low-quality RCTs investigating the effect of compression bandaging compared with usual care (primary dressing). The trials used different methods and compression techniques over different periods of time and results were not suitable for pooling. In one trial (n=36) Unna’s boot was found to be more effective than a polyurethane foam dressing for completely healed ulcers after 12 months (RR 2.30, 95% CI 1.29 to 4.10, p=0.0047). In one trial comparing 4LB to usual care (n=36) compression therapy was related to greater healing at three months (RR 4.0, 95% CI 1.35 to 11.82, p=0.01). Another trial (n=36) found 4LB was no different to usual care for complete healing rate at 12 months (RR 1.18, 95% CI 0.96 to 1.47, p=0.12); however, post-hoc analyses adjusting for patient age and baseline ulcer condition found healing was faster in the compression group. In a larger trial (n=200) comparing 4LB to standard care, there was significantly (p=0.06) faster healing in the participants receiving compression. A trial comparing short-stretch bandage (SSB) to usual care (n=53) found greater numbers of complete healing at three months in those receiving compression (71% vs 25%). The other trials were small, had uneven groups and were at a high risk of bias.\(^{118}\)

A second, good-quality SR and meta-analysis\(^{123}\) supported these findings. This earlier review\(^{123}\) identified eight trials, five of which are reported by O’Meara et al.\(^{118}\) Pooled results from three trials showed no statistically significant difference between Unna’s boot and other methods of compression (OR 5.8, p=0.16).\(^{123}\) (Level I evidence)

One good-quality, crossover RCT (n=81)\(^{125}\) reported the effectiveness of two-layer bandaging compression system compared with 4LB in complete VLU healing. The trial was designed to measure the difference in bandage slippage. Although there was less bandage slippage for the two-layer bandaging system, there was no significant difference in ulcer healing rates. Patients preferred the two-layer bandaging system. The trial was sponsored by a product manufacturer.\(^{125}\) (Level II evidence)

One moderate-quality RCT\(^\text{126}\) (n=16) investigated the effectiveness of intermittent pump compression compared with compression bandaging. The researchers reported no significant difference between groups in ulcer size or leg volume, with both groups achieving a significant reduction (p<0.012) in ulcer size after six months. The trial was inadequately powered and did not report on adverse events.\(^{126}\) (Level II evidence)

One low-quality SR\(^\text{121}\) reported on studies investigating training of nurses applying compression bandaging. The review included three pre-test, post-test trials that assessed the amount of pressure applied. The three small studies reported that clinical bandaging skills could be improved through education programs; however, the effects may not be sustained beyond 10 weeks. None of the trials were randomised or adequately powered.\(^\text{121}\) (Level I evidence)