

# Best Practice Statement for compression hosiery

The use of compression hosiery requires adequate knowledge on the part of the practitioner to enable the selection of appropriate products, and a working partnership with patients to promote concordance with treatment. A Best Practice Statement has been developed which sets out a number of key statements in order to guide the practitioner to the most appropriate compression hosiery products when preventing the occurrence and recurrence of venous leg ulcers. Here, an overview of the Best Practice Statement is given.

Alison Coull, Michael Clark (on behalf of the Steering Group)

## KEY WORDS

Compression hosiery  
Guidelines  
Best practice statement  
Practitioner knowledge  
Product selection

The use of compression hosiery has been widely recommended and proven to be effective in the prevention and treatment of a number of conditions. Compression hosiery, including socks, stockings, and tights, can be used as a preventative measure against:

- ▶▶ Complications in the post-phlebotic limb
- ▶▶ Deep vein thrombosis (DVT) (Tomgren, 1980)
- ▶▶ Varicose ulcers (Campbell, 2002)
- ▶▶ The recurrence of venous leg ulcers after healing of the initial wound (Fasiadis *et al*, 2002).

It can also be used to reduce lymphoedema in the lower leg (Badger *et al*, 2000) and to facilitate healing of venous leg ulcers (Mayberry *et al*, 1991). Although guidelines on the management of leg ulcers (Royal College of Nursing, 1998; SIGN, 1998) include the use of

Michael Clark is Senior Research Fellow, Wound Healing Research Unit, Cardiff University, Cardiff Medicentre, Cardiff; and Alison Coull is Lecturer Practitioner, Department of Nursing and Midwifery, University of Stirling, Stirling

compression hosiery, to date there have not been specific practice guidelines relating to its general use.

The development of best practice statements relies on the consensus of a group of decision-makers, ideally including experts, front-line clinicians, and patients, who carefully consider the evidence and decide on its implications. A UK Best Practice Statement (BPS) on Compression Hosiery in the prevention and management of venous leg ulcers is currently nearing publication (Wounds UK, 2005).

The use of compression hosiery requires adequate knowledge on the part of the practitioner to correctly identify, measure, and fit appropriate hosiery. It also involves working in partnership with patients and carers to explain the need to wear compression hosiery; to promote compliance with recommendations; and, to encourage patients to take ownership of their treatment.

This article outlines the key components of the BPS on the use of compression hosiery in the management of venous leg ulcers, and sets out a number of key statements relating to the following areas:

- ▶▶ The knowledge of health care professionals in relation to compression hosiery
- ▶▶ The classification of compression hosiery

- ▶▶ Appropriate conditions for the use of compression hosiery
- ▶▶ Factors involved in selecting an appropriate product
- ▶▶ Fitting and application of compression hosiery
- ▶▶ Education of healthcare professionals, patients, and carers.

## Key aspects of compression hosiery

Compression hosiery has a therapeutic effect on prolonged venous hypertension by supporting the superficial veins and counteracting raised capillary pressure. Compression hosiery reduces oedema by maintaining skin integrity and preventing further deterioration in the leg. Wearing compression hosiery impacts upon venous dynamics (Hafner and Junger, 2000). It has been shown to improve microcirculatory parameters and decrease capillary filtration and oedema (Goodwin, 2001). However, the pressure exerted varies according to the brand of hosiery (Hafner and Junger, 2000). This should be considered when selecting a product for treatment. Generally, higher levels of compression (20–30mmHg) have a greater effect upon venous insufficiency than lower compression (12mmHg) (Wang *et al*, 1995). Compression hosiery is also available in a variety of styles including below- and above-knee (Porteous *et al*, 1989; Berridge *et al*, 1999).

## Compression levels

The classification of compression hosiery is based on the amount

of pressure exerted. Two of the technical standards used to define compression levels of hosiery are British Standard (BS-6612, 1985) and the Draft European Standard (ENV 12718, 2001). Each of these standards sets out different test methods to be used to provide repeatable measures of the compression applied by compression hosiery. All of these test methods focus upon *in vitro* pressure measurements made between the hosiery and a model leg. While *in vitro* pressure measurements are important when helping manufacturers to design, build and then classify their products, there is little information about how well the *in vitro* pressure measurements match the compression applied to human legs.

From the pressure measurements performed under any of the national or draft European standards, compression hosiery is then classified, typically into three groups providing mild, moderate or strong compression (Table 1). However, the threshold marking the boundaries between mild, moderate or strong compression differs according to which standard is used.

For example, Class II compression hosiery products are claimed to apply pressures between 18–24mmHg at the ankle (BS 6612; 1985) but, if classified under the draft European standard, would have to apply 23–32mmHg to qualify. Therefore, to fully understand the amount of compression likely to be applied by any product, the practitioner needs knowledge of both the class of compression and the standard under which the classification was made. Currently, only British standard compression hosiery is available in the UK community on prescription. In the UK acute sector, European standard hosiery may be prescribed. Table 2 illustrates the compression levels and NHS provision for a number of available products.

**Static and dynamic stiffness of compression hosiery products**

The British Standard BS 6612 (1985) defines the stiffness of a compression hosiery product as being ‘a measure of the change in applied compression which occurs when the ankle (or calf, thigh or hip) girth is increased or decreased.’ This measure can be called the static stiffness with dynamic stiffness marking the

changes in the compression applied as the leg changes its circumference during walking (Stolk et al, 2004). Although currently not included in the classification of compression hosiery, these measurements have a potentially important role. For example, two Class II compression hosiery products may provide similar pressures to the leg at rest, but, if one product is ‘stiffer’ than the other, then the pressures applied during walking will be much higher in the case of the ‘stiff’ hosiery product (Partsch et al, 2004). If compression hosiery products are to be fully characterised into a meaningful classification for practitioners and manufacturers, then the classification may, in future, be based on both the level of compression applied and the ‘stiffness’ of the product.

**Best Practice Statement**

If practitioners are to select the appropriate product for individual patients, it is imperative that they have an understanding and knowledge of the characteristics of these products and their associated aids. Not only do the products have different characteristics, but also the needs of each individual patient differs in terms of their underlying condition and requirements of compression hosiery.

A knowledge and understanding of the principles of compression hosiery and the plethora of available products is also vital. Additional training and knowledge of the aids associated with compression hosiery may increase the number of patients able to apply their own hosiery. These aids include stocking donors, Chinese slippers, talcum powder and rubber gloves (Edwards and Moffatt, 1996). The BPS also includes an appendix listing useful hosiery application aids.

**Classification of compression hosiery**

Currently there are no international standards for compression classes. The practitioner should have an understanding of the purpose of different levels of compression (Table 1), such as the UK (community) and European (hospital) classes (Table 2) (Maylor, 2001). They also need to ➤

**Table 1**

**Recommended pressures for the treatment of venous disorders**

Class	Support	Recommended ankle pressures (mmHg)	Clinical indications
<b>British standard</b>			
I	Light	14–17	Superficial or early varices
II	Medium	18–24	Varices of medium severity, ulcer treatment and prevention of mild oedema
III	Strong	25–35	Gross varices, post-thrombotic syndrome, gross oedema, ulcer treatment prevention
<b>EU standard</b>			
I	Light	18.4–21.1 mmHg	Mild varices, venous hypertension in pregnancy, heaviness and fatigue in leg
II	Medium	25.2–32.3 mmHg	Pronounced varices, moderate oedema, inflammation of superficial veins after resolution of mild ulceration
III	Strong	36.5–46.6 mmHg	Severe varicose veins, post-thrombotic syndrome, pronounced oedema, prevention of venous ulcers
IV	Heavy	Over 59 mmHg	Lymphoedema, elephantiasis

Adapted from: Kunimoto B, Cooling M, Gulliver W et al, 2001

understand the anticipated risks and therapeutic benefits of the different levels of compression.

In general, the types of compression hosiery can be divided according to the BS 6612 classification and subdivided as:

- ▶▶ Two-way stretch, standard elastic yarn, circular knit, nylon
- ▶▶ One-way stretch, seamless finethread
- ▶▶ Lightweight elastic net (closed- or open-heel).

The garments available for use in the prevention and treatment of varicose veins are now restricted to thigh stockings and below-knee stockings. Anklets (socks) and kneecaps are also available in class II and class III compression profiles, although they are supplied primarily for sports injuries, strains and other non-varicose conditions (Whitley, 2002) and, as such, are not part of the BPS. Hosiery may be full-footed or have open toes. The use of modern fibres has also increased patient acceptability, as has the range of hosiery colours.

**Factors involved in the process of selection**

Figure 1 sets out an algorithm for the assessment and treatment of patients. All individuals who may require compression therapy must be fully assessed. Venous disease can be identified and classified according to numerous systems. Foremost among these are the clinical, etiologic, anatomic, pathophysiologic (CEAP see Table 3) classification system (Kistner et al, 1996; revised by the American Venous Forum, Eklof et al, 2004) and the venous clinical severity score (VCSS: Ricci et al, 2003). The purpose of clinical assessment is to identify variables that influence the selection of compression hosiery. This, in part, relates to discussion with the patient, examination of past medical history, hosiery usage history, diagnostic test results including vascular/Doppler assessment, skin condition and allergies. In general, except in the presence of ischaemia or similar conditions (Franks et al, 1995), more severe venous disease or insufficiency requires greater compression therapy. Thus, the compression increases

with disease severity (Vandogen and Stacey, 2000). Patients with oedema may require compression bandage therapy before using hosiery (Foldi et al, 1985).

Vascular assessment should be repeated in accordance with the European Wound Management Association (EWMA) 2003 and the Scottish Intercollegiate Guidelines Network (SIGN), 1998 according to patient condition (Figure 1). All diabetic patients, and those with reduced mobility or who are immobile, patients with a previous ABPI of less than 0.9 or who develop symptoms of claudication, should have at least three-monthly Doppler assessments. Patients with a reducing ABPI should have more frequent checks. Mobile patients without ulcers who are in compression and have no complications should have a vascular assessment that includes Doppler performed yearly.

Assessment results must be documented in the patient case notes and include past medical history, hosiery history, test results including vascular/Doppler assessment, skin condition and allergies, leg measurement and clinical signs of disease. Relevant hosiery history, sensitivity history, and any patient preferences may also be recorded. The assessment for hosiery recorded in the case record should also be timed carefully to avoid any unnecessary delay in provision for the patient.

**Size of limb**

Product selection requires an accurate measurement of the limb, and should be undertaken using appropriate tools such as a measurement chart and recorded in the patient's notes. Measurements for flat knit and custom-made hosiery will require specific documentation outlining measurements at points dictated by the different manufacturers. To ensure an exact fit, the limb should be free from oedema. Oedematous legs may be unsuitable for hosiery if the individual has thin fragile skin, or has not had compression bandaging applied to reduce the oedema (Foldi et al, 1985).

The ideal time to obtain measurements is preferably early

**Table 2**

Compression levels for different products

UK Class or standard	Provision	Examples	Class 1	Class 2	Class 3
	FP10 / GP 10	Activa Credalast Duomed Scholl Surepress Comfort 2-layer (class 3 only)	14–17	18–24	25–35
European Class		Jobst Ulcer Care Medi range Sigvaris Venosan* Credenhill Juzo	20–30 mmHg*	30–40 mmHg*	40–50 mmHg*
	FP10/GP10	Jobst Ulcer Care 2-layer system		40mmHg	
<b>RAL Compression classes</b>		<b>US Compression classes</b>			
1	18–21mmHg	8–15mmHg support			
2	23–32mmHg	15–20mmHg			
3	34–46mmHg	20–30mmHg			
4	>49mmHg	40mmHg			

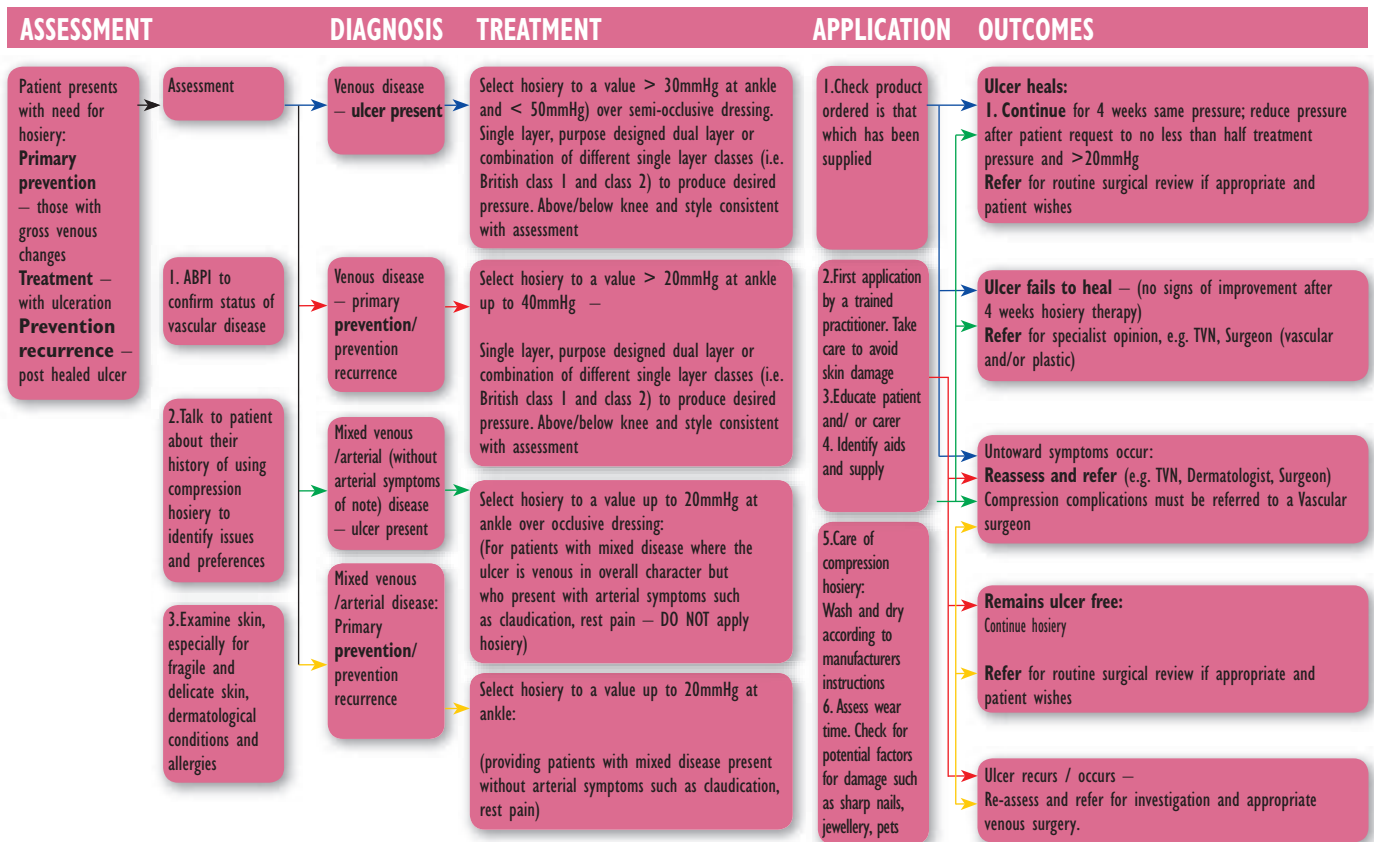


Figure 1. Assessment and treatment pathway.

morning, immediately after removing compression bandage therapy, or, after a period of limb elevation.

Made-to-measure hosiery will be required when:

- ▶▶ The client has an unusual shaped limb, or any of the measurements are proportionally large or small
- ▶▶ The measurement around the malleoli is particularly wide
- ▶▶ Flat-bed knit is required for lymphoedema.

**Factors other than limb size**

Product selection should not be solely determined by the size and shape of the leg. It may be influenced by other factors, including patient choice and type of material, e.g. cotton rich. When patient choice and preference are considered, concordance to recommended treatments is more likely to be achieved and maintained (Johnson, 2002). Practitioners should have the knowledge and understanding to be able to explain to patients how flat knit, circular knit and custom made products are produced, and the rationale for recommending the

appropriate hosiery. Consideration should be given to whether the patient requires hosiery for each leg, and an appropriate prescription issued for the correct number of items required.

Open-toed hosiery is preferred in the following circumstances:

- ▶▶ Arthritic, or clawed toes
- ▶▶ When the client prefers to wear a sock over the top
- ▶▶ When the client is wearing two layers of hosiery, the inner layer must be open-toed
- ▶▶ To enable the use of specific hosiery aids
- ▶▶ If a client has problem with fungal foot infections.

**Skin condition**

In order to minimise the risk of adverse events or skin breakdown, skin condition should also be considered when selecting the appropriate product. Considerations include:

- ▶▶ Dermatological sensitivities to materials
- ▶▶ Use of ointments and creams
- ▶▶ Fragility of skin due to use of steroids

- ▶▶ Fragility of skin due to recent healing
- ▶▶ Need to take hosiery off to apply creams/treatments.

Higher levels of compression may not be tolerated in patients with especially fragile skin due to difficulties with application. Other factors include: sensitivity to materials (Lycra®, and other elastic materials), skin conditions, (e.g. fragility in patients with rheumatoid arthritis), steroid therapy, newly-healed ulcers, and the need for concurrent use of dermatological ointments and creams which can affect hosiery viability. Where compression bandages have been used to heal the ulcer, this management should continue for at least 2–4 weeks before application of hosiery to allow skin to strengthen.

**Fitting and care of hosiery**

The first application of hosiery should be undertaken and/or supervised by a responsible and competent practitioner trained in hosiery application. This will ensure that the patient or carer understand the process, and that

**Table 3**

CEAP classification of chronic lower extremity venous disease (Porter and Moneta, 1995)

Mark	Definition
C	Clinical signs (grade 0–6), supplemented by (s) for symptomatic and (a) for asymptomatic presentation
E	Etiologic classification (congenital, primary, secondary)
A	Anatomic distribution (superficial, deep, or perforator; alone or in combination)
P	Pathophysiologic dysfunction reflux or obstruction, alone or in combination)
<b>Class</b>	Clinical signs
0	No visible or palpable signs of venous disease
1	Telangiectasia, reticular veins, malleola flare
2	Varicose veins
3	Oedema without skin changes
4	Skin changes ascribed to venous disease (pigmentation, venous eczema, lipodermatosclerosis)
5	Skin changes (as defined above) in conjunction with healed ulceration
6	Skin changes (as defined above) in conjunction with active ulceration

hosiery application and removal can be carried out safely and comfortably (Fasiadis et al, 2002). By supervising the first application, the practitioner can also assess whether the patient has the cognitive ability to apply the recommended hosiery and ensure that concordance is achieved. Supervision also helps to identify any further application aids that may be required, which were unforeseen earlier in the assessment process. Newly-fitted hosiery should be checked one week after fitting. Patients should then be reviewed on a regular basis, normally every 3–6 months (Figure 1), to determine the continued appropriateness of the compression strategy and to encourage continued use (Bradley, 2001; Flanagan et al, 2001; Fasiadis et al, 2002).

**Wear time**

Wear time for compression hosiery needs to be assessed on an individual basis. Generally, patients wearing compression hosiery need to be advised to remove it at night, and reapply first thing in the morning before any swelling occurs. Regular changes of compression hosiery facilitate skin observation, are hygienic and maintain optimal skin condition (Armstrong, 1997; Bradley, 2001). Removing hosiery also allows the use of emollients, which may help to maintain skin condition (Brown and Butcher, 2005). Where this is not possible, it may be acceptable to extend wear time up to a maximum of seven

days. Damaged or defective hosiery should be reported to the practitioner and replaced.

**Care of hosiery**

To achieve the anticipated lifespan of the product, hosiery should be cared for and renewed according to the manufacturer's instructions. Practices that may damage hosiery should be avoided, such as contact with oil-based emollients, chemicals, and excessive heat on washing and drying. Patients and carers should be provided with the appropriate information in accessible formats to cover all aspects of the use and care of compression hosiery. This should include information on how to renew and replace hosiery.

**Conclusion**

In developing the current BPS for compression hosiery, the authors have attempted to provide an evidence-based set of guidelines. While some of the recommendations are currently unsupported in the literature, they are supported by the clinical experience of the healthcare professionals involved in developing this statement, and by the extensive number of reviewers who were consulted. Where published evidence is available, this has been provided as a reference in the text, and it is recommended that those interested in achieving a best standard for the use of compression hosiery consult the cited publications. **WUK**

Steering group: Bale S, Collier M, Hopkins A, Kingsley A, Lindsay E, Vowden K

The Wounds UK Best Practice Statement was produced with the help of an educational grant from Scholl.

**References**

Armstrong S (1997) Compression hosiery. *Prof Nurse* 12(7 Suppl): S10–1

Badger CM, Peacock JL, Mortimer PS (2000) Multilayer bandaging plus compression hosiery was better than hosiery alone for unilateral lymphoedema of a limb. *Cancer* 88: 2832–37

Berridge DK, Mercer et al (1999) A pilot study comparing the use of below-knee and above-knee graduated stockings in patients with superficial venous incompetence. *Phlebology* 14: 12–16

British Medical Association and Royal Pharmaceutical Society of Great (2005) *British National Formulary* 49 (BNF).

British Standard 6612 (1985) *Specification for Graduated Compression Hosiery*. ISBN 0580144879. The Stationery Office, London

Bradley L (2001) Venous haemodynamics and the effects of compression stockings. *Br J Community Nurs* 6(4): 165–75

Brown A, Butcher M (2005) A guide to emollient therapy. *Nurs Stand* 23(19): 68–75

Campbell B (2002) New treatments for varicose veins. *Br Med J* 324(7339): 689–90

Edwards L, Moffatt C (1996) Tissue viability. The use of compression hosiery in the care of leg ulcers. *Nurs Stand* 10(31): 53–6

Eklöf BR, Rutherford B, et al (2004) Revision of the CEAP classification for chronic venous disorders: consensus statement. *J Vasc Surg* 40(6): 1248–52

European Wound Management Association (2003) *Understanding Compression Therapy*. MEP Ltd, London: 17

Fasiadis N, Godby C, et al (2002) Preventing venous ulcer recurrence: the impact of well leg clinic. *Phlebology* 17: 134–6

Flanagan M, Rotchell L et al (2001) Community nurses, home carers' and patients' perceptions of factors affecting venous leg ulcer recurrence and management of services. *J Nurs Manag* 9(3): 153–9

Franks PJ, Oldroyd MI et al (1995) Risk factors for leg ulcer recurrence: a randomized trial of two types of compression stocking. *Age Ageing* 24(6): 490–4

Hafner HM, Junger M (2000) The haemodynamic efficacy of six different compression stockings from compression class 2 in patients suffering from chronic venous insufficiency. *Phlebology* 15(3–4): 126–30

- Johnson S (2002) Compression hosiery in the prevention and treatment of venous leg ulcers. *J Tiss Viab* **12**(2): 67–74
- Jull A, Mitchell N, Arroll J et al (2004) Factors influencing concordance with compression stockings after venous leg ulcer healing. *J Wound Care* **13**(3): 90–2
- Kunimoto B, Cooling M et al (2001) Best practices for the prevention and treatment of venous leg ulcers. *Ostomy Wound Manage* **47**(2): 34–46, 48–50
- Mayberry JC, Moneta GL et al (1991) The influence of elastic compression stockings on deep venous hemodynamics. *J Vasc Surg* **13**(1): 91–9; discussion 99–100
- Maylor ME (2001) Accurate selection of compression and anti-embolic hosiery. *Br J Nurs* **10**(18): 1172–84
- O'Hare L (1997) Scholl compression hosiery in the management of venous disorders. *Br J Nurs* **6**(7): 391–4
- Pah-Lavan Z, Hampton S (2004) Jobst opaque compression hosiery in the management of venous disease. *Br J Nurs* **13**(17): 1050–54
- Partsch H, Winiger J et al (2004) Compression stockings reduce occupational leg swelling. *Dermatol Surg* **30**(5): 737–43; discussion 743
- Porteous MJ, Nicholson EA et al (1989) Thigh length versus knee length stockings in the prevention of deep vein thrombosis. *Br J Surg* **76**(3): 296–7
- Porter JM, Moneta GL (1995) Reporting standards in venous disease: an update. International Consensus Committee on Chronic Venous Disease. *J Vasc Surg* **21**(4): 635–45
- Ricci MA, Emmerich J, Callas PW et al (2003) Evaluating venous disease with a new venous severity scoring system. *J Vasc Surg* **38**(5): 909–15
- Royal College of Nursing (1998) The management of patients with venous leg ulcers. Recommendations for assessment, compression therapy, cleansing, debridement, dressing, contact sensitivity, training/education and quality assurance, RCN Institute, Centre for Evidence-Based Nursing, University of York and the School of Nursing, Midwifery and Health Visiting, University of Manchester: 28
- Scottish Intercollegiate Guidelines Network (1998) *Care of chronic leg ulcer*. SIGN, Edinburgh. Available online: [www.sign.ac.uk/pdf/sign26](http://www.sign.ac.uk/pdf/sign26)
- Stolk R, Wegen van der-Franken CP et al (2004) A method for measuring the dynamic behavior of medical compression hosiery during walking. *Dermatol Surg* **30**(5): 729–36
- Torngren S (1980) Low dose heparin and compression stockings in the prevention of postoperative deep venous thrombosis. *Br J Surg* **67**(7): 482–4
- Vandogen Y, Stacey MC (2000) Graduated compression elastic stockings to reduce lipodermatosclerosis and ulcer recurrence. *Phlebology* **15**: 33–7
- Wang CL, Tang FT et al (1995) [A comparison of compression stockings of different pressures with lower leg edema in spinal cord injury or lesions patients]. *J Formos Med Assoc* **94** suppl 2: s149–s55
- Whitley L (2002). Graduated compression therapy. *Patient Care in Community Practice — A handbook of non-medicinal healthcare*. RJ Harman, Pharmaceutical Press: 63–78