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THE LEG CLUB HANDBOOK

Leg Ulcers and their Healing: Essential Information for Practitioners using the Lindsay Leg Club Model

Revised in 2016
by Sylvie Hampton
MA, BSc (Hons), DpSN RGN

Contents

Introduction

The handbook has been introduced as a working document to ensure all staff working in Leg Clubs have a reference book that is both simple and instructive. This manual provides informative, educational material that is underpinned by evidence-based practice. It offers the clinician a rationale for the holistic approach to wound-based care, and is a reference resource for pre- and post-registration students visiting a Leg Club. It is impossible to acknowledge all of those who made the psychosocial Leg Club Model a reality and success. However, I would like to express a special thank you to my husband for his continuous and unfailing support through every stage of the project, from its inception to today's widespread implementation of Leg Clubs in the UK and overseas.

We have witnessed many changes in wound management education over the past four decades, and a current emphasis on nurses attaining an in-depth understanding of both theoretical and practical aspects. In 1994 I was privileged to obtain educational sponsorship to further my education by undertaking a four-month training programme in leg ulcer management at the Battersea Central Mission leg ulcer clinic working under the guidance of Dr Stanley Allen, Sister Pam Evans and the volunteer team. Through his dedication and example, I was inspired to take the late Dr Allan's social patient centred approach to holistic wound management into my community nursing practice. The concept of the 'Leg Club model' was born.

It is impossible to acknowledge each and every person who has helped make the Leg Club model a reality and success but I would like to mention a just few.

ACKNOWLEDGEMENTS

Our community nursing teams in particular have shown commitment, endurance and support in assisting me to make the Leg Club model a reality. I would like to thank the patients (members), volunteers, communities and healthcare industry who supported me from the outset. Without this collaborative partnership I would not have been able to open the first Leg Club in 1995.

My sincere thanks goes to the nursing teams and volunteers who work hard to ensure the Leg Club model continues to thrive, and the committed board of Trustees for their dedicated time. To them, and to the multitude of others, who have shared this experience and given me their constructive advice and encouragement, I offer my sincerest thanks.

Ellie Lindsay OBE

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Foreword

Chronic venous insufficiency (CVI) occurs in a relatively large proportion of the population: 9.4% of men and 6.6% of women (Ruckley et al, 2002). It is associated with significant morbidity, high cost of health care, loss of productivity and reduced quality of life. Lower extremity ulcers related to CVI have been estimated to affect 0.2–1% of the population in developed countries (Franks et al, 2003; Simka and Majewski, 2003). It is disappointing that this proportion of the population should be suffering poor quality of life when many of these wounds could be healed, and when there are many research-based guidelines designed to increase standards in leg ulcer management and treatment.

It has been inspiring to see that a former district nurse overcame all the odds in order to develop a new concept in leg ulcer treatment and prevention that is both revolutionary and radical and a service that is being taken up in Australia, Germany as well as the UK. This nurse, Ellie Lindsay OBE, identified that patients need to have ownership of their wounds and their care, and developed the Lindsay Leg Club Model. The essential element to the Model is patient participation and ownership of their care where each is a Leg Club Member and not a 'patient'. Each Leg Club Member is given access to leg care whether for an established ulcer, pre-ulceration advice or for post-healing ulcer care. Admission to the Club is through GP or district nurse referral or by self-referral. The Club is organised by the Leg Club Members, who also help with fundraising.

Audit is an extremely important part of the Lindsay Leg Club Model, and this is undertaken with the assistance of the Leg Club Members who also help with analysing the audit results. Some Leg Clubs produce newsletters, where members are able to write about their experiences and pass valuable advice and information on to other Leg Club Member.

Through audit, it has been shown that Leg Clubs significantly increase healing outcomes and reduce re-ulceration. This is thought to be largely due to higher concordance of Leg Club Members, resulting from the ownership of their own care, and the focus and high educational level of the practitioners who are involved in providing the care.

The Lindsay Leg Club Model is the future of leg care around the world and is being embraced enthusiastically by practitioners throughout the UK Australia and Germany. The concept provides evidence that one nurse, with a strong conviction and dedication and the ability to stretch boundaries, can make a difference to patient care. This should be a lesson to all nurses and healthcare providers.

Sylvie Hampton **MA, BSc (Hons), DpSN, RGN**

Leg Club Philosophy

Operating as a partnership between clinicians, GP practices, the local community and patients, Leg Clubs provide research-based holistic leg ulcer management by addressing both the social and medical aspects of patient need. Care is delivered in a social, non-medical environment that facilitates socialisation and peer support, and empowers patients to participate in, and take ownership of, their treatment. Prevention of reoccurence of leg ulcers is also a key element of this model.

AIMS OF THE LEG CLUB:

- To deliver research-based wound management in a friendly, non-threatening social environment.
- To provide an environment for staff development and a teaching resource for research-based wound management.
- To provide an environment where Leg Club Members can meet and feel comfortable and relaxed in the company of friends with similar conditions.
- To offer high healing rates in leg ulcers due to the commitment and knowledge of the practitioners.

OBJECTIVES:

- To empower Leg Club Members to become stakeholders in their own treatment, promoting a sense of ownership and involvement.
- To meet the social needs of isolated patients by providing a mechanism for social interaction, empathy and peer support.

Nurse education, reflection and sharing of best practice can overcome barriers to Leg Club Members becoming more involved in their own individualised wound management and treatment. The role of the Leg Club is to promote an environment of collaborative working, open communication and knowledge sharing.

Introduction

This handbook covers the diagnosis, assessment and treatment of leg ulcers. It is not the purpose of this guide to cover the biology of the skin and soft tissues of the leg, or the stages of wound healing, given the wide availability of other guidance upon these topics. Wound assessment will only be reported where this touches directly upon leg ulcer care; however, it is important to consider that all wounds should be assessed holistically.

Holistic assessment is vital – looking at the Leg Club Member as a whole, as an equal, rather than as a condition or a patient. Unless all the medical and psychological problems are addressed, the wound is unlikely to improve. Reduced food intake, difficulties with breathing, uncontrolled and undiagnosed diabetes for example, are factors that can affect wound healing.

Components of Holistic Assessment

A number of different factors can increase a person's risk of chronic venous leg ulceration. It is important at the outset to sit with the Leg Club Member and investigate the following:

- **Age of the wound**: The age of the wound will have an implication for healing times. A wound that is 50 years old will not heal at the same rate as a wound that is 50 weeks old.

- **Medical status:** Rheumatoid arthritis; diabetes; heart disease; multiple sclerosis; chronic obstructive pulmonary disease; atherosclerosis; Buerger's disease (peripheral vascular disease found in smokers who started smoking young); cancer; venous stasis; inflammatory diseases, including vasculitis, lupus scleroderma or other rheumatological conditions; varicose eczema; dermatitis. Medical conditions, such as high cholesterol, heart disease, high blood pressure, sickle cell anaemia, and bowel disorders. Also, immune disorders and anaemia will have an impact on the wound. Consider differential diagnosis, eg. squamous cell carcinoma (can arise in venous ulcers – suspect any wound with rolled edges), drug abuse by injection or through 'skin popping', renal failure and hypertension (treated or untreated).

- **Medication:** Certain medication can adversely affect wound healing. Chemotherapy, steroid therapy, even aspirin, can alter the status of wound healing — some cardiovascular drugs can contribute to leg oedema and altered circulation. Sometimes drugs can improve the possibility of wound healing. It has been suggested that pentoxifylline could be effective in the treatment of leg ulcers, either in addition to compression therapy, or as sole treatment when compression therapy is not effective.

- **Extrinsic factors:** Unrelieved pressure, bacterial colonisation, dressing sensitivities/allergies.

- **Inappropriate dressing selection:** Wounds are often 'managed', not treated. Increasing the amount of bandaging around the foot 'manages' exudate, for example, and malodour can be 'managed' by placing an ordinary charcoal dressing on the wound. However, these conditions can be therapeutically treated by the educated practitioner, and such 'management' must then become obsolete.

- **Smoking:** Carbon monoxide and toxins in cigarette smoke can have a dramatic effect on wound healing, delaying or impeding improvement in wound status.

- **Nutritional status:** Wound healing requires as much as double, or triple, the normal calorific requirements. Undernourished patients, or those who do not compensate for protein lost through exudate, will have delayed wound healing. It is vital they have plenty of calories and protein to prevent the body from utilizing protein for energy. Vitamin C and Zinc can be obtained in tablet form and should be considered.

- **Pain and anxiety:** Pain can have an effect on healing as there is a physiological stress response which causes vasoconstriction, delaying healing.

- **Social problems:** There are hypotheses in the community that some patients will deliberately delay healing by non-compliance, removing the dressings in-between visits, to ensure that the community team will continue to attend, thus providing ongoing social contact. If patients are preoccupied with their wounds, they may develop dressing rituals and interfere with prescribed treatment. Many patients living in isolated communities commonly treat themselves using old-fashioned remedies, such as medicated ointments and herbal remedies, while for many older people there is a strong belief that, 'if your ulcer heals, you die'. Therefore, effective communication is an essential part of nursing excellence. By the Leg Club team empowering their Leg Club Members it enables them to share all their concerns and to be equal partners in the process of their care, facilitating the disclosure of sensitive and/or emotional issues with the nursing staff and, where appropriate, between fellow members.

Identifying the Cause of the Leg Ulcer

It has been estimated that 70% of ulcers are venous in origin, 10% are arterial, 10–20% mixed arterial and venous disease, (Farah, RS., Davis. MDP. Venous Leg Ulcerations: A Treatment Update Current Treatment Options in Cardiovascular Medicine. April 2010, Volume 12, Issue 2, pp 101–116; Ballantyne, S., Sarkar, PK. (2000). Management of leg ulcers *Postgrad Med J* ;76:674-682) with the remainder comprised of diabetes (5–8%), vasculitis (2–5%), lymphoedema (1%), and trauma (2%) (Pannier, F., Rabe, E. (2013). Differential diagnosis of leg ulcers. Phlebology. Mar;28 Suppl 1:55-60).

The proportion of people with leg ulcerations shows an increase with age, and is thought to be less than 1% under the age of 60 and 2.6% between 61 and 70 years, with a further increase in those over 80. (Agale, SV. (2013), Chronic Leg Ulcers: Epidemiology, Aetiopathogenesis, and Management. Ulcers Volume 2013; Franks PJ., Barker J., Collier M., Gethin G., Haesler E., Jawien A., Laeuchli S., Mosti G., Probst S., Weller C. (2016). Management of Patients With Venous Leg Ulcers: Challenges and Current Best Practice. J Wound Care. Jun;25 Suppl 6:S1-S67).

The total annual NHS cost of managing 2.2 million patients with a wound was estimated to be £6.0 billion. Morbidities were estimated to be £5.3 billion. Of this, £2.1 billion and £3.2 billion was associated with managing those wounds that healed and remained unhealed respectively. (Guest, J., Ayoub, N., McIlwraith, T., Uchegbu, I., Gerrish, A., Weidlich, D., Vowden, K., Vowden, P. Health economic burden that wounds impose on the National Health Service in the UK. BMJ Open. 2015; 5: e009283). Venous leg ulcers cost £168-198m per year (MacGregor, L. (ed) (2013.)Making the case for cost-effective wound Management. Published By: Wounds International).

Current reports indicate that financial costs associated with leg ulcer management are approximately at 1.3% of the healthcare budget in the UK. Holistic assessment of a patient's wound is possibly the single most important constituent of healing a wound, and will lead to rational decision-making. The wound itself, and type of dressing to be used, should be the last consideration, and discovery of all factors affecting healing should precede examination of the wound. It is also important to discover, and understand, the patient's own perception of wound problems, particularly as this is rarely the wound itself. They will identify pain, excessive exudate and malodour as problems that they wish removed from their lives: all of which are easily dealt with if there is holistic assessment and understanding of the processes, both intrinsic and extrinsic, that affect wound healing.

Healthcare professionals trained in leg ulcer management should undertake the assessment process and clinical investigations, and a full assessment should also be performed for those Leg Club Members who are experiencing a re-occurrence. Leg Club Members should undergo Doppler ultrasound measurement of ankle brachial pressure index (ABPI). This will ensure detection of arterial insufficiency.

Health care assistants and/or assistant practitioners may contribute to application of a bandage regime where competencies have been completed under the supervision of a registered nurse.

Tissues surrounding the wound are red	Up to 3 days post-injury this is inflammation	Stage 1: Best left to heal. Surgical wound can have the dressing removed 24–48 hours post- operatively
Tissues surrounding the wound are red Club member feels unwell	Could be a clinical infection	Swab only if clinical infection suspected as present
Black	Necrotic wound	Requires debridement. Sharp debridement by TVN or nurse deemed competent. Autolytic debridement with moist dressings.
Yellow	Sloughy wound (Yellow fibrous)	Could be fibre (not a problem can be left) Or: slough that can contain bacteria – (must be removed with absorbent or antibacterial dressings)
Green	Colonised (Pseudomonas)	Swab only if clinical infection present. Often helped with silver dressings
Brown/grey	Possibly colonised	May require cadexomer iodine, honey, silver or PHMB dressings
Red	Granulating	Requires protection only. Hydrofibres, foams etc.

Doppler Assessment & Vascular Assessment

The Doppler assessment determines the ratio of ankle to brachial (arm) systolic pressure. The normal ankle systolic pressure is the same as, or slightly higher than, the brachial pressure. Application of compression therapy to a limb with undetected arterial insufficiency can be dangerous. To ensure reliability of readings and the safety of subsequent treatment, Doppler assessment should only be carried out by nurses who have undertaken the relevant course and who are competent in the procedure.

The newer Doppler equipment often will diagnose and provide full information in minutes, whereas the hand held Doppler can take (and should take) over an hour to complete.

The Hand Held Doppler equipment comprises a transducer (probe), which is attached to an audio unit with volume control. The transducer detects the blood flow, which is converted to audible sound by the audio unit. The transducer should be used in conjunction with a coupling gel, which aids the transmission of ultrasound.

Doppler probes are labelled according to the frequency of the sound they produce. A frequency between 4 MHz and 8 MHz is needed to detect flow of blood in the superficial and deep vessels of the leg.

Healthy arteries have a strong pulsatile sound which, in young adults, usually consists of a triphasic sound. As increasing age reduces the elasticity of the arteries, the triphasic sound is lost and a biphasic sound can now be detected. As atheroma is laid down over the arterial walls, the wall of the artery becomes thickened, the lumen smaller, and the artery loses elasticity. In severely 'furred' arteries, all elasticity is lost and the sound will be monophasic, resembling the bark of a dog or sound of a steam engine when heard through the Doppler. The practitioner's recognition of the normal pulsatile sound is important, as it helps to form the diagnosis.

Veins give a continuous 'whooshing', 'roaring' sound on Doppler detection, with no distinguishable pulsation. The sound is a little like wind in the trees. This sound alters as the patient breathes in and out which can be demonstrated by placing the probe over a vein in the crook of the arm and then breathing in and out. This is known as intrathoracic pressure which 'suctions' the blood from the lower body to the heart.

If there is doubt distinguishing between an arterial and venous signal at the ankle, then one should squeeze the foot. If the noise is coming from a poor artery, the sound will stop during squeezing. In microcirculatory disease, the arterial sound will be stronger from the lateral aspect of the foot, in front of the small toe.

Squeezing the toe will turn the patch white under the finger pressure. This should reflush within 3 seconds. Longer than 7 seconds indicates a microcirculatory insufficiency.

An oximeter can be used on the toe. Placing it over the toe prior to bandaging then post bandaging, should show an increase in the oxygen levels. A decrease indicates the bandage is too firm. An increase shows the effectiveness of the bandaging.

The foot should be felt for temperature. Cold may indicate a cold day although it may indicate vascular disease.

For an exercise test, the Leg Club Member should be standing up and asked to perform rapid heel raises until their legs are tired. Immediately following this, they should be helped back onto the couch/chair. The brachial and ankle systolic pressures in both legs should be measured again as quickly as possible. This is the 'exercise test'. If at this time the ABPI is still within normal limits, then arterial disease is excluded. However, if there is a significant fall in the ABPI, arterial disease must be suspected. Referral to the general practitioner is advised, who may then refer on to the vascular surgeon.

How to Obtain a Doppler Reading

Measurement of the resting ankle brachial pressure index (RABPI) is a reliable way to detect arterial insufficiency.

Coupling gel should be applied to the skin directly over the area of an artery, ie. the posterior tibialis or dorsalis pedis (see below). The transducer should then be placed on the gel at about a 45˚ angle (Figure 1). The transducer should be gently moved in the gel until a strong pulsatile sound is heard.

Once the appropriate pulse is detected, place the sphygmomanometer cuff around the ankle above the malleoli. If an ulcer is present, put a piece of polythene film over it, underneath the cuff. If this is too painful, place the correct size cuff (ie. 80% of limb circumference) proximal to the ulcer. Inflate the cuff, keeping the transducer/ gel where a strong pulse can be heard. Once the pulse signal disappears gradually deflate the cuff until it reappears. This will ascertain the systolic ankle pressure. This should be done in both legs. Check the reading twice and record. Measure the brachial systolic pressure in the right arm, using the Doppler. Ideally this should be repeated in both arms, as a significant difference in brachial pressures may indicate occlusive disease. Alternatively, feel the radial pulse in both arms to check that they are equal. Check the reading twice and record.

CALCULATION

The ABPI is calculated by dividing the brachial systolic pressure into the ankle systolic pressure.
Example: Ankle 120 mmHg, divided by brachial 140 mmHg = ABPI of 0.85

ABPI = Ankle systolic pressure
A Brachial systolic pressure B

Figure 1: Obtaining a Doppler reading

Procedure	Rationale
Ensure patient is lying flat and feels comfortable and relaxed for 20 minutes. Explain the procedure to the patient	To obtain correct blood pressure and to reassure patient
Measure brachial blood pressure in both arms	Use highest brachial pressure to compare with highest blood pressure in each leg to calculate resting ankle brachial pressure index (RABPI)
If there is an ulcer, it must be covered with a cling film or sterile dressing towel prior to Doppler measurement	To protect the wound, prevent pain, prevent infection, reassure the patient
Secure the sphygmomanometer cuff above the ankle. Locate foot pulses by palpation	To confirm presence/ absence of arterial disease and obtain blood pressure. Not reliable in patients with diabetes and where calcification of the vessels may be present

Interpretation of ABPI

ABPI	Status	Action?
>1.2 (1.3 and above)	May have severe atherosclerosis that prevents the cuff from compressing the artery.	Refer to vascular unit. Do not use compression
1.0 to 1.2	Normal	Safe to receive compression
0.9–1.0	Within normal limits	Safe to receive compression
0.8–0.9	Mild or mixed arterial insufficiency	Safe to receive compression, but check every 3 months
0.7–0.8	Mild/moderate arterial insufficiency	Probably not safe to receive compression. Refer to vascular unit for decision on compression or treatment
0.5–0.7	Arterial insufficiency	Refer to vascular unit. Do not use compression
0.5–< 0.5	Severe ischaemia	Refer immediately to vascular unit

Leg Club Members with greatly elevated ABPI (refer to local guidelines) should be considered for vascular disease (the lumen may be falsely open as a result of atheroma).

The blood pressure should be taken in each arm and each leg and then divide the ankle (A) by the brachial (B) – easily remembered as A over B. if normal, division of the ankle and brachial should be a value of 1.0.

Leg Club Members with an ABPI of 0.8 or greater may have compression bandaging. All patients with an ABPI of less than 0.8 should be referred to the local vascular unit, or as stated in provider service guidelines. In the case of low ABPI above 0.7 could have reduced compression recommended by a TVN.

Critical ischaemia occurs when the ABPI is < 0.5. Symptoms include intermittent claudication and, in severe ischaemia, patients sometimes have associated rest pain or gangrene. Leg Club Members can present with apparent symptoms of arterial impairment, ie. give a history of intermittent claudication, but on Doppler assessment, the ABPI appears within normal limits. In cases such as this, the recognition of the normal pulsatile sound is again important. In addition, the ABPI should be measured again after the patient has exercised (as above).

USING THE DOPPLER PROBE (important points to remember)

- Use a good 'blob' of coupling gel
- Incline the Doppler probe at a 450 angle toward the heart as this will identify arteries located beneath veins and will pick up the best signal
- Move the probe slowly across the expected line of the artery
- If a signal cannot be heard, try again just a little proximally or distally, moving the probe across the expected line of the vessel
- If the leg is ulcerated, cover the ulcer with a sterile piece of polythene film or dressing towel, before applying the cuff
- All patients found to have reduced pressure indices should be re-examined at 3-monthly intervals, or if symptoms change.

Locating the Foot Arteries

DORSALIS PEDIS

Imagine a line drawn between the great and second toe, to midway between the medial and lateral malleoli. The dorsalis pedis is found approximately halfway along this line (Figure 2).

POSTERIOR TIBIALIS

Having identified the medial malleolus, the posterior tibialis is located just behind the bone at the 3 o'clock position. Manual palpation of foot pulses is not always easy. The presence of oedema or induration may make them difficult to locate. Care should also be taken that it is the patient's pulse you are feeling, not your own.

For accurate location of foot arteries use the Doppler vascular flow detector.

Having first completed a thorough physical and social/psychological assessment of the patient, measuring the ABPI using the Doppler is the ultimate tool to exclude arterial impairment, before applying graduated compression. It is important that the Doppler should confirm findings from the physical assessment. (Beware of the artificially elevated ABPI previously described.)

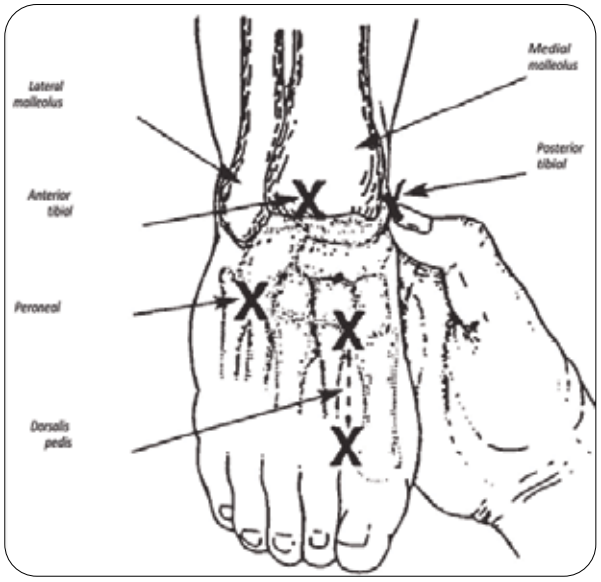


Figure 2: Foot arteries

Figure 3: Feeling foot pulses

Problems and errors may arise if:

- The cuff is repeatedly inflated or inflated for long periods
- This can cause the ankle pressure to fall
- The cuff is not placed at the ankle
- Ankle systolic pressure is not measured, pressure recorded is usually higher than ankle pressure
- The pulse is irregular or the cuff is deflated too rapidly
- The true systolic pressure may be missed
- The vessels are calcified (associated with diabetes), the legs are large, fatty or oedematous, the cuff size is too small, or the legs are dependent
- Inappropriately high reading will be obtained
- Central systolic pressure may influence the 'normal' range for the ABPI (Carser DG. Do we need to reappraise our method of interpreting the ankle brachial pressure index?. J *Wound Care* 2001; 10(3): 59-62.)

Doppler Assessment in Diabetes

Accurate diagnosis and exclusion of arterial disease is particularly difficult in patients with diabetes. For this reason, the practitioner's recognition of normal pulsatile sound is important.

On general assessment of the patient with diabetes, the assessor may suspect evidence of arterial disease from the history of pain or look of the ulcer. However, Doppler examination of the patient's ABPI may produce a result greater than 1.0. This may not, however, be the true reading, as patients with diabetes can present with an artificially elevated ABPI as a result of calcification in the arteries. A practitioner who is experienced and well able to distinguish between normal and abnormal pulsatile sound would be suspicious of the unexpectedly normal ankle pressure index in such a patient. This falsely high reading is only found in a small proportion of patients with diabetes.

It is important to consider the whole presenting picture. Do the signs and symptoms indicate arterial or venous disease?

If, after thorough assessment, the practitioner is still in doubt as to whether to apply compression, it should be avoided and the patient referred for a thorough vascular assessment in the vascular unit.

If the signs and symptoms indicate venous disease only, and providing there is not a marked peripheral neuropathy, compression would be indicated if the ABPI is > 0.8.

Gross oedema may also cause artificially elevated readings, due to the fact that the arteries cannot be compressed.

Management of Venous Leg Ulcers

Extensive research has shown that compression therapy, for example, compression hosiery, short-stretch (inelastic), or four-layer (elastic), long-stretch bandaging, is the 'gold standard' treatment option for venous leg ulceration (Slone-Rivera, N., Stephanie C. Wu, SC. (2012) Guide To Compression Dressings For Venous Ulcer. Podiatry Today. 25(2) 61-9). These methods of compression increase venous return, allowing the lower extremity tissues to recover from the effects of venous hypertension and offering a faster healing rate. Graduated compression therapy is cost-effective with fast healing rates — 40–80% of ulcers heal within 12 weeks.

Compression therapy not only has a central role in the treatment of active venous ulceration, but also a prophylactic one in the prevention of venous ulcer occurrence or recurrence. The hardest part for some of our Leg Club Members will be accepting that, following diagnosis of venous insufficiency, the garment must be worn for life if the desired effect and prevention of recurrence is to be achieved. This is helped by the ability to discuss it with other Leg Club Members during the meetings.

Holistic assessment of the Leg Club Member, along with education of the practitioner, leads to safe application of compression bandages. Incorrectly applied bandages can cause an increase in the size of an ulcer, and may lead to amputation of limbs with a poor blood supply.

Elastic and Inelastic Compression Therapy

RATIONALE

Graduated, multi-layer, high compression bandage systems (including short-stretch regimens with adequate padding), that are capable of sustaining compression for at least a week, should be the first line of treatment for uncomplicated venous ulcers. A full assessment, which includes a Doppler ultrasound reading, must be undertaken before application of compression therapy.

It is important that the practitioner has an understanding of the different types of compression bandages available, how the bandage works, and the correct method of application. Compression bandaging is a skill and requires instruction and practice to perfect the technique.

In the healthy leg, the calf muscle pump squeezes the veins and forces the blood upwards towards the heart. Valves in the veins prevent backflow of blood from the deep veins to the superficial veins. Deep vein thrombosis, thrombophlebitis, and varicose veins are all examples of conditions that cause interruption of blood flow and may cause damage to the valves, allowing backflow of blood.

Failure of the calf muscle pump due to venous incompetence, paralysis, or immobility, results in venous hypertension — which, in time, results in oedema and skin changes such as induration, staining, eczema, atrophie blanche and, finally, ulceration.

Graduated and sustained compression is the most important intervention in reversing this process and in reducing the fluid loss from the wound. External support counteracts venous hypertension by allowing the superficial veins to empty into the deep veins, where the calf muscle pump can encourage return of blood to the heart.

Graduated pressure from ankle to knee, exerting 30–40 mmHg pressure at the ankle, is considered the desired treatment for most venous ulcer sufferers. A bandage that is applied at a constant mid-stretch tension (50% of the bandage tension) will produce graduated compression.

REMEMBER:

- Compression should not be applied when the ABPI is less than 0.8 (see local provider service guidelines), and should only be used in patients with diabetes where arterial disease has been excluded.
- When a compression bandage is applied, the pressure generated is determined principally by the tension in the fabric, the number and width of compression bandage layers applied, and the circumference of the limb. The relationship between these factors is broadly governed by Laplace's Law (Figure 4).

P = sub-bandage pressure
T = tension of the bandage
C = circumference
N = number of bandage layers
W = width of the bandage

$$P = \frac{TXN}{CXW}$$

Applied pressure is directly proportional to the tension in a bandage, but inversely proportional to the circumference of the limb to which it is applied, ie. sub-bandage pressure increases with bandage tension and decreases as the leg circumference increases.

Figure 4: Laplace's Law

COMPRESSION BANDAGING GUIDE FOR VENOUS LEG ULCERS

- Compression bandages should only be applied by a trained and competent practitioner.
- Compression can be applied by a well-trained Health Care Assistant
- The ankle circumference is used as a guide for the numbers/type of bandage layers.
- The width of bandages will be determined by the size of the leg and the bandage system used.
- Padding to protect bony prominences is required to prevent excess pressure.
- Most bandages are applied in a spiral form, overlapping the preceding layer by 50%.
- Each turn of the bandage should be of equal tension.

Multi-Layer and Four-Layer Elastic Compression Bandaging

There are a variety of multi-layer systems. They all tend to have 3–4 layers and include elastic or inelastic compression bandages, to be cohesive or adhesive, crepe bandages or padding layers, and/ or a combination of these. The components in each system are different and have different extensibility. The elastic bandage provides sustained compression, and the cohesive/ adhesive inelastic bandage offers rigidity and enhances the calf muscle pump function. The concept of multi-layer is that pressure is applied in layers, giving an accumulation of pressure. Manufacturers' instructions need to be followed when applying multi-layer bandages.

Four-layer (or multi-layer) compression bandaging has been shown, over many years, to result in high healing rates. The four layers each have differing properties and together produce 40 mmHg at the ankle, graduating to 17 mmHg below the knee. This pressure is maintained until the bandage is removed, usually at one week. In the four-layer system, the elastic layers are applied with tension from the base of the toes. Failure to apply tension and, therefore, equivalent pressure over the foot, can result in the rapid accumulation of oedema over the dorsum of the foot. However, this may create a tourniquet effect around the ankle when extension is applied. Excessive pressure should be avoided, and precaution taken in patients who are underweight or who have orthopaedic foot deformities, such as hallux valgus (bunion).

- **Layer 1: orthopaedic wool:** Before the application of the orthopaedic wool, a light cotton tubular bandage next to the skin may offer protection to patients who are prone to varicose eczema. Orthopaedic wool provides a layer of padding that protects areas at risk of high pressure, such as the foot and ankle. Bandage slippage and pressure can result in damage to the Achilles tendon, so this area must be well protected. The tibial crest is often subjected to high levels of pressure, with evidence of pressure damage on bandage removal. Simple methods, such as pleating the orthopaedic wool, or the addition of a strip of wool over the area, can provide extra protection.

- **Layer 2: crepe bandage:** This is the least effective layer as it simply adds extra absorbency and smooths down the orthopaedic layer prior to the application of the two outer compression bandages.

- **Layer 3: elastic extensible bandage:** This is the first of the two outer elastic bandages. It is a highly extensible bandage that provides a sub-bandage pressure of approximately 17 mmHg when applied at 50% extension with a 50% overlap, using a figure-of-eight technique. In 'champagne-shaped' limbs, the figure-of-eight application can be widened to aid conformability. If greater pressure is required over an oedematous calf, this can be achieved in the following ways:

  - increasing bandage extension, although care must be taken not to exert too much pressure
  - increasing overlap
  - applying additional layers of bandage. Similarly, in patients with thin limbs, the pressure can be reduced by decreasing bandage extension. The wide extensibility curve (ability to stretch) in these bandages allows for flexibility on application, but again, practitioners must take care not to decrease the pressure to an ineffective level.

- **Layer 4: elastic cohesive bandage:** This layer provides the higher level of compression (sub-bandage pressure approximately 23 mmHg) and must not be over-extended. Bandaging should extend over the upper portion of the gastrocnemius muscle to prevent slippage. The cohesive layer should not be applied in direct contact with the skin because of the risk of latex allergy. Some systems incorporate a latex-free outer layer. The two outer elastic bandages, when used in combination, provide a sub-bandage pressure of approximately 40 mmHg.

The choice of primary dressing used beneath the compression bandages has been shown to have little effect on ulcer healing rate. Therefore, inexpensive, non-adherent primary dressings can be used.

There are excellent compression wraps like Ready Wrap, Juxta-Lite, Juxta cures and Farrow Wrap. These are all made from strips of fabric, sewn together, with a piece of Velcro at the end of each strip. The fabric only stretches a short way and performs like a short-stretch bandage. These wraps are very simple to apply and do not require the education or the dexterity that is required in order to apply compression hosiery or bandages.

Figure 5: A wrap that is easily applied and simple to teach which provides the required graduated compression

MODIFICATIONS TO THE FOUR-LAYER BANDAGE SYSTEM BASED ON ANKLE CIRCUMFERENCE (sub-bandage pressure of approximately 40 mmHg applied to all limbs)	
Ankle circumference less than 18 cm	2 or more orthopaedic wool 1 crepe 1 elastic conformable 1 elastic cohesive
Ankle circumference 18–25 cm	1 orthopaedic wool 1 crepe 1 elastic conformable 1 elastic cohesive
Ankle circumference 25–30 cm	1 orthopaedic wool 1 high compression bandage (approximate pressure 35 mmHg*) 1 elastic cohesive
Ankle circumference > 30 cm	1 orthopaedic wool 1 elastic conformable 1 high compression bandage (approximate pressure 35 mmHg*) 1 elastic cohesive

*Increase in ankle circumference reduces sub-bandage pressure applied.

KEY POINTS

- Venous ulceration should be treated with compression bandages to achieve a pressure between 30 mmHg and 40 mmHg at the ankle, graduating to half that pressure
- Reduce venous hypertension and increase deep venous return
- Protect bony prominent parts with orthopaedic wool
- Re-bandage according to reduction of leg circumference
- Be sensitive to patient's needs, comfort, and wound condition
- fter first application, patients must be followed-up after 24 hours. A contact number should be given to the patient
- Arterial insufficiency (ABPI < 0.8) is a contraindication for compression
- Use compression with caution in patients with diabetes, and those with connective tissue disease, ie. rheumatoid

Short-Stretch (or Inelastic) Bandaging

Short-stretch (inelastic) bandages have been shown to be as cost-effective and efficient as other compression systems in healing venous ulcers. As they do not contract around a limb, they do not exert pressure during inactivity (resting pressure), but their stability creates a high resistance to stretch when pressure is applied through internal muscle contraction and joint movement (working pressure). The rigidity of the bandage acts to reflect this force back into the leg rather than expand the bandage.

SHORT-STRETCH BANDAGE TECHNIQUE

- Bony prominent parts (tibia crest, malleoli, Achilles tendon) must be protected to avoid excess contact pressure.
- When applying the bandage, the leg and foot need to be at right angles, ie. ankle joint to tibia ("toes to nose").
- The bandage must be applied at full stretch with a 50% overlap.
- Start the bandage at the base of the toes and finish below the knee. Spiral technique is recommended.
- Secure the bandage with tape at the base of the toes, the heel and below the knee.
- Two bandages may be applied when the ankle circumference is greater than 25 cm. Start the second bandage at the ankle and apply in the opposite direction to the first.
- At the beginning of treatment, oedema is reduced and, as a result, the leg circumference becomes smaller. Therefore, during the first week(s) the bandage needs to be re-applied more frequently, ie. 2–3 times weekly.
- After the leg circumference stabilises, the bandage may be left in situ for up to one week at a time.

REQUIREMENTS FOR COMPRESSION BANDAGES

To maximise concordance with treatment, a compression bandage must fulfil several key requirements, namely:

- The bandage must be comfortable for the patient so that normal activities can be performed.
- The bandage needs to fit the shape of the leg and stay in place.
- It must encircle the leg evenly and provide adequate graduated compression.
- It must not constrict the foot at any point.

People with venous hypertension will need to wear compression for the rest of their lives. Therefore, in addition to the above criteria, bandages should be cost-effective, washable, reusable, and environmentally friendly.

Compression Hosiery

Compression stockings and hosiery are used to control oedema, manage varicose veins, and for the prevention and treatment of venous disorders. The aim of compression hosiery is to provide graduated compression with the highest pressure at the ankle and the lowest at the knee.

It is recommended that all Leg Club Members attending Leg Club who have venous ulcers that have achieved or almost achieved full closure or have leg oedema, should be educated about the importance of wearing compression hosiery for life. Following holistic assessment and a Doppler ultrasound, if the ABPI reading is appropriate, the Leg Club Member will be provided with compression hosiery to suit their individual requirements and will be measured and fitted with compression hosiery. Studies have demonstrated that compression hosiery reduces venous ulcer recurrence rates.

The requirement may be a hosiery kit, a lower class hosiery or even 2 or 3 layers of simple liners to ensure compliance with application. Compression hosiery is graded into 4 classes (Table 1), and standardised by measurement of the compression at the ankle in mmHg. It is available as below knee, thigh-length stockings, or panty hose (tights).

Do not confuse UK testing standards with Continental ones. Both give compression as mmHg at the ankle, but they use different testing methods and are not numerically equivalent. There are a number of technical standards through where compression hosiery can be characterised by the compression they apply; for example, British Standard BS:6612; 1985 or German Standard RAL-GZ 387; 1987.

Each of these standards sets out different test methods to be used to provide repeatable measures of the compression applied by compression hosiery. 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. For example, class II compression hosiery is stated to apply between 18–24 mmHg at the ankle (BS 6612; 1985) but, if the product has been classified under the draft European standard, will apply 23–32 mmHg. Therefore, the practitioner needs to know both the class of compression and the standard under which the classification has been made, to understand fully the amount of compression likely to be applied by any compression hosiery product.

TABLE 1: CLASS AND INDICATION FOR COMPRESSION HOSIERY

Class	Ankle pressure (UK)	Ankle pressure (Europe)	Type of support	Indication
Class I	14–17 mmHg pressure at ankle	18–24 mmHg pressure at ankle	Light, mild support	Indicated for superficial or early varices during pregnancy
Class II	18–24 mmHg pressure at ankle	23–32 mmHg at ankle	Medium, moderate support	Varices of medium severity Ulcer treatment and prevention/recurrence Mild oedema and varices during pregnancy
Class III	25–35 mmHg pressure at ankle	34–46 mmHg at ankle	Strong support	Gross varices Post-thrombotic venous insufficiency Ulcer treatment and prevention of recurrence Gross oedema
Class IV		49 mmHG+ at ankle	Very strong support	Some instances of lymphoedema

Advancing Technology

There are currently new and advancing ways in which leg ulcers can be managed and although the mainstay of leg ulcer management has been dressing and bandaging, there is increasing evidence that surgical intervention can cure a certain proportion of these leg ulcers.

One example of this comes from research published and performed by Professor Whiteley and his team, who have shown that patients who are able to walk and who have venous leg ulcers (approximately 85%, the commonest form of leg ulcers), can be cured permanently if they have local anaesthetic endovenous surgery.

In addition, some of the patients who have blocked deep veins and who have been told that they are incurable can now be treated and cured using the latest technology, such as venous stents.

Of course, not everybody can be cured surgically and many patients need the expert ulcer care provided by dressing, bandaging, physiotherapy, nutrition and exercise as well as some of the new techniques, to try and improve the healing of the ulcer itself.

For more information on The Whiteley Clinic, please visit www.thewhiteleyclinic.co.uk

Arterial Ulcer Management

The 'Doppler' is the only accurate tool the nurse has to determine whether or not to apply compression to the limb.

The most important factor in arterial ulcer management is to save the limb. Urgent referral to the vascular surgeon is indicated if ABPI is 0.5 or less. All patients should be referred if ABPI is < 0.8 (refer to local provider service guidelines).

Surgery or other prescribed treatment may improve the arterial blood supply and so promote ulcer healing.

Arterial ulcers are far more difficult to heal, and are often extremely painful with associated ischaemic pain. Adequate analgesia should, therefore, be prescribed. It may be necessary for the Leg Club Member to have analgesia prior to dressing change. This analgesia will generally be prescribed for neuropathic pain. Neuropathic pain is not reduced by Paracetamol or morphine and Pregabalin or Gabapentin may be considered by the GP.

Cleansing and choice of wound product is the same as for venous ulceration (but be aware of probable increase in pain in arterial ulceration). Debridement should be done with extreme care. In cases of diabetic foot ulcers or ischaemic toes, debridement should not be considered. Always choose a wound product/ emollient that is least likely to cause allergic reaction. Avoid the use of surgical adhesive tape to secure dressings as the surrounding skin is often friable, sensitive and at risk of further ulceration.

Skin and Ulcer Management

CLEANSING

At Leg Clubs, staff recognise that prevention and treatment of common skin ailments by the care team is an essential component of the fundamental care of the individual. Everyone who attends the Leg Club is provided with good skin management, hygiene and preventive measures, as this can greatly improve the clinical condition and quality of life of those experiencing skin- related problems.

RATIONALE

A clean wound is a healthy wound and a granulating wound is a healing wound. The aim and rationale is to achieve both. Cleansing should be kept simple. It should prevent the build up of exudate, slough and toxic components (Figure 6), and dead skin but should not damage granulation or epithelialial tissue. By removal of dry loose tissue, it should allow new epithelium to grow, and aim to prevent scabs acting as pressure points beneath bandaging.

PROCESS FOR CLEANSING

The patient's leg should be soaked in a clean bucket (lined with a plastic liner) of warm tap water, if practical, at each treatment. If easy, remove dry loose skin/scabs,

PROCESS FOR REMOVAL OF SKIN TISSUE

An emollient or soap substitute may be added if the skin is very dry, but this should be a product, such as Diprobath®, that contains no potential skin sensitisers. Lanolin is a common skin sensitiser in patients with leg ulceration and gravitational eczema. Debridement of the ulcer and dry skin can be accomplished through use of a debridement pad. NICE recommend Debrisoft for this purpose. Once the wound is clean and healthy, do not disturb the wound bed by attempting debridement. The skin surrounding the wound may still require debridement even when the wound is healthy.

Figure 6

NB. Cleansing should never involve scrubbing the wound with gauze or cotton wool balls, as this will damage granulating and epithelialising tissue. It is preferable to leave particles of dressing in the wound, rather than try to remove them. Remaining particles of dressings will be removed at the next application and will damage the wound less than scrubbing.

EMOLLIENTS

To assist removal of dead skin cells, emollients may be added to water or applied to dry skin as creams/ ointment surrounding the ulcer.

Lanolin is by far the most common skin sensitiser in patients with leg ulceration and gravitational eczema. Emollient products containing lanolin should be avoided.

NB. Cleansing should never involve scrubbing the wound with gauze or cotton wool balls, as this will damage granulating and epithelialising tissue. It is preferable to leave particles of dressing in the wound, rather than try to remove them. Remaining particles of dressings will be removed at the next application and will damage the wound less than scrubbing.

Eczema around the Ulcer

Incompetence of the deep and perforating veins causes backflow of blood into the superficial veins. The superficial vein pressure (normal pressure 30 mmHg) rises to 90 mmHg and above.
This causes venous hypertension and venous eczema. The capillaries become engorged and dilated, eventually failing and leaking fluid into the interstitial spaces, causing oedema (Figure 7).

The oedema causes a 'waterlogging' effect and contains proteolytic enzymes that act as irritants and, together with the presence of bacteria, cause irritable venous eczema. The other common cause of eczema around the ulcer is allergic contact dermatitis in reaction to medicaments (Figure 8).

Figure 7 Haemosiderin and venous eczema

TREATMENT OF VENOUS ECZEMA

The irritable effect of eczema can be greatly reduced by addressing the underlying causes:

- the deep and perforating vein incompetence
- the rise in superficial vein pressure
- the oedema.

These can be addressed by applying graduated sustained compression, and by the use of a low-allergen topical regime. This means avoiding preparations containing lanolin, topical antiseptics (especially chlorhexidine and cetrimide), and antibiotics (neomycin, soframycin and framycetin), and parabens, which is a stabiliser in most of the paste bandages.

TREATMENT OF WEEPING ECZEMA

Eczema varies in severity. In mild forms, the skin is dry, hot and itchy. In more severe forms, the skin can become broken, raw and bleeding. Wet eczema presents with a red rash, which will develop blisters that eventually burst and weep. Itching is severe. Erosion of the skin is often apparent and blisters are followed by yellow scabs and crust formations.

Secondary infections are more common with this pattern. Scratching or tissue breakdown can provide an entry point for bacteria and subsequent infection. Staphylococcus aureus is the most common bacterial source of infection, causing the eczema to deteriorate, making treatment more difficult. Infected eczema presents as inflamed (red) and is usually 'weepy' with a yellowish crust. Yellow pus-filled spots (pustules) may also be present, and small red spots around the body hairs (folliculitis). Bacterial infection of eczema should be treated with specific antiseptics or antibiotics in cases where pustules are present under the skin, or when the skin is cracked, broken or weeping. Combination creams containing both a topical steroid and antibiotic help to combat inflammation and infection.

Following consultation with a GP or dermatologist, the use of potassium permanganate , eg. granules or Permitabs® (Centrapharm), may be recommended. Use as instructed by the GP or dermatologist.

After soaking, gently dry off and apply a moderately potent topical corticosteroid cream (Betnovate-RD®

[GSK], or as directed in the local PCT formulary) to the eczema, but never to the ulcer itself.

After a few days, the ulcer and the surrounding eczema will become drier. The potassium permanganate soaks should be discontinued and the Betnovate-RD cream should be changed to Betnovate-RD ointment. Once again, this should be applied only to the eczematous skin and not to the ulcer itself. At first, it should be applied daily and then less frequently as improvement occurs.

Even diluted 1 in 4, betamethasone can thin the skin and so should not be used continuously for more than 3–4 weeks. By then, the eczema should be minimal and the switch can be made to a weaker steroid, such as hydrocortisone ointment or clobetasone (Eumovate® ointment [GSK]) to the area around the ulcer. If eczema persists, a referral should be made to the dermatology department for patch testing.

It is easy to avoid the common allergens already listed. The exception is parabens, which is a stabiliser in most paste bandages because it is bland and soothing and does not dry out as much as the others. Parabens allergy probably affects less than 5% of patients with leg ulcers and so it is reasonable to use it. However, if the eczema persists, stop using it and refer to the GP or dermatology clinic for patch testing.

When applying a paste bandage, it is important to prevent it from drying out. As the wet bandage dries, there may be some shrinkage and constriction. To avoid constriction, the bandage should be applied with a pleat, or folded back on itself, to allow the material to 'give' if shrinkage occurs.

Few studies have been completed on zinc paste bandages, but these have been used for many years with great success. Icthopaste, a coal tar bandage, can be considered in cases of eczema and dermatitis.

Figure 8 Weeping eczema/contact dermatitis

Dressing Selection – Local Provider Service Formulary

Application of any wound dressing is pointless, unless all factors that may delay wound healing have been assessed and the problems addressed.

The success of any dressing results from careful selection based on the needs of the individual patient. The patient's problem is rarely the wound itself, but will probably be:

- the smell
- the pain
- the exudate.

All of these problems can be addressed with clever selection of appropriate dressings.

Before the dressing selection process can begin, it is first necessary to identify the purpose or principal aim of the proposed treatment. Dressings can be used to aid debridement, remove exudate, control bleeding and protect the wound. The selected dressing should provide the optimum wound healing environment by absorbing exudate and preventing maceration of the surrounding skin tissue. It should provide an optimum environment for the promotion of new blood capillary formation (angiogenesis), granulation and epithelialisation, and act as a barrier to prevent bacterial infection. The practitioner should provide a dressing that is easy to apply, comfortable and aesthetic for the patient, and cause the minimum disturbance on removal. There is no magic, aesthetically acceptable dressing that will heal all wounds, so it is not appropriate to simply apply the same dressing to all wound types.

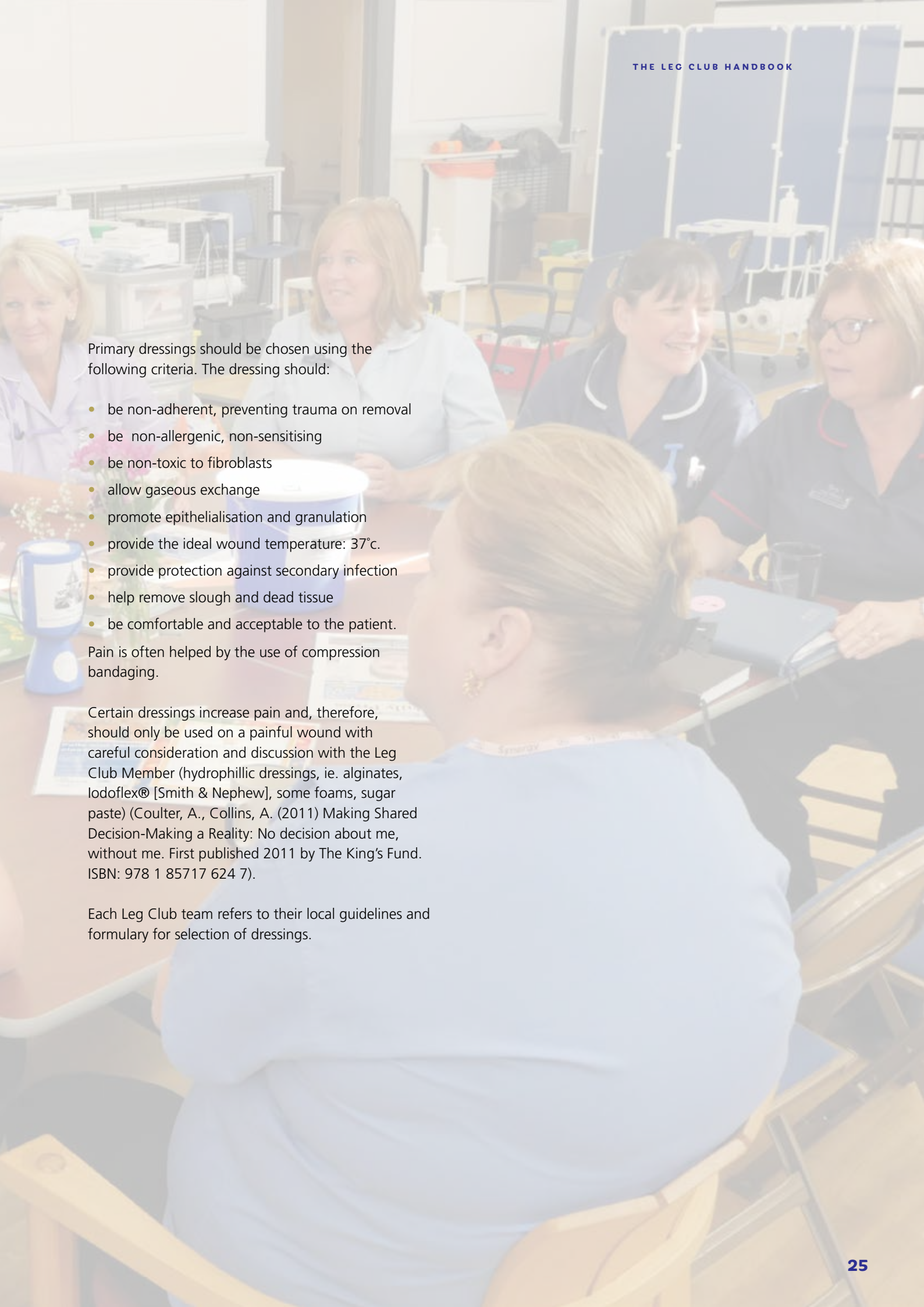
Many sophisticated dressings are available to the wound management practitioner, made from a wide range of materials, including polyurethane, salts of alginic acid and other gelable polysaccharides, such as starch and carboxymethylcellulose.

These materials may be used alone or in combination to form products as diverse as films, foams, fibrous products, beads, hydrogels, or adhesive gel-forming wafers more commonly called hydrocolloid dressings. Depending upon their structure and composition, such dressings may variously be used to absorb exudate, combat odour and infection, relieve pain, promote autolytic debridement (wound cleansing), or provide and maintain a moist environment at the wound surface to facilitate the production of granulation tissue and the process of epithelialisation.

Provider service wound dressing guidelines and formularies consist of an agreed, regularly revised, limited list of dressings (and associated products) and specific prescribing advice, which are used locally by a practice, directorate, trust or health authority. The aim of local provider service guidelines is to promote rational prescribing by encouraging the safe, effective, appropriate and economic use of the dressing's therapy. The formulary is designed to ease the decision-making process, by evaluating evidence-based practice and local preferences to recommend and guide nurses towards effective clinical practice and cost efficiency. Familiarity with prescribing from a restricted list of products, promotes rational prescribing and ensures that the right patient receives the right dressing at the right time, in the right amount, and in the right setting. However, the practitioner must be aware that wound healing is a dynamic process and the performance requirements of a dressing can change as the wound progresses towards healing.

The practitioner should bear in mind that patients can become sensitised to elements of their treatment, eg. latex and adhesives, at any time.

The dressing technique should always be clean, aimed at preventing cross-infection: strict asepsis is unnecessary (Royal College of Nursing [RCN], 1998). The single most important element of infection control is good hand hygiene.



Primary dressings should be chosen using the following criteria. The dressing should:

- be non-adherent, preventing trauma on removal
- be non-allergenic, non-sensitising
- be non-toxic to fibroblasts
- allow gaseous exchange
- promote epithelialisation and granulation
- provide the ideal wound temperature: 37˚c.
- provide protection against secondary infection
- help remove slough and dead tissue
- be comfortable and acceptable to the patient.

Pain is often helped by the use of compression bandaging.

Certain dressings increase pain and, therefore, should only be used on a painful wound with careful consideration and discussion with the Leg Club Member (hydrophillic dressings, ie. alginates, Iodoflex® [Smith & Nephew], some foams, sugar paste) (Coulter, A., Collins, A. (2011) Making Shared Decision-Making a Reality: No decision about me, without me. First published 2011 by The King's Fund. ISBN: 978 1 85717 624 7).

Each Leg Club team refers to their local guidelines and formulary for selection of dressings.

The Non-Healing Ulcer

MALIGNANCY

The development of squamous cell carcinoma in an established venous ulcer (known as Marjolin's ulcer) is rare. However, practitioners with the responsibility of caring for patients with chronic, long-standing ulceration, that is failing to heal with appropriate conventional treatment, should be alerted to the possibility of malignant change.

Factors that practitioners should be aware of:

- Non-healing with appropriate treatment.
- Increase in pain (not associated with clinical infection).
- Foul odour and increase in discharge.
- Bleeding from the ulcer.
- Change in appearance, ie. overgrowth of tissue at the base edge of the ulcer, change and irregularity of shape.
- Squamous or basal cell carcinoma may also present as a primary ulcer, and mimic venous ulceration.
- Early detection of cancers that are localised may only require excision. Larger lesions, presenting as ulceration, may result in wider excision and skin grafting.
- In chronic ulcers that are failing to heal, early biopsy of tissue is recommended to exclude malignancy.

ARTERIAL ULCER

The arterial ulcer is particularly difficult to heal due to the poor blood supply. Referral to the vascular team would ensure that the best treatment for arterial insufficiency is commenced. Then there is a potential to heal the ulcer.

CLINICAL INFECTION

There is a distinct difference between a colonized wound that can be treated with dressings and a clinical infection where dressings would make little difference. A clinical infection should always be referred to the GP for treatment. A colonized wound should always be treated with an antibacterial such as honey, iodine cadexomer, silver or PHMB. New dressings to the market that help control bacteria are activated charcoal and engineered honey.

VASCULITIS

It is impossible to know how many wounds are associated with vasculitis without a biopsy of every wound. However, it is associated with exceptional pain and delay in healing. If vasculitis is suspected, then advice of a dermatologist should be sought who may prescribe steroid therapy for a short time.

Dressing Selection According to Wound Colour

Before any kind of wound dressing is applied, the wound should be appropriately prepared to enhance both its self-healing ability and the effectiveness of the dressing. To achieve optimal healing, wounds must not be infected, they should contain as much vascularised wound bed as possible, and be free of exudate. A simple wound classification system (as shown below), forms a useful starting point in the selection process. Within this classification, wounds are divided into four basic types according to their appearance, but it will be immediately obvious that these groups could be further sub-divided to take account of wound aetiology or depth.

BLACK WOUND

This is a necrotic wound covered with devitalised epidermis. Dead tissue rapidly loses moisture and becomes dehydrated, it shrinks and progressively darkens until it eventually becomes olive green, or black, hard and dry to the touch. The dressing chosen will need to hydrate the dead tissue to allow the body to remove (or loosen) it by autolysis or sharp debridement. Select a dressing that assists with autolysis under an occlusive dressing. Care should be taken not to moisten dead tissue in toes that are black (refer to vascular team) or on heels of arterial disease or the patient at the very end of life.

YELLOW WOUND

A yellow wound contains slough. Slough is a form of necrosis consisting of dead tissues that are usually creamy-yellow or greenish-yellow and this is often progressing from a black wound as slough can be a form of necrosis consisting of rehydrated necrotic tissue and contains fibrous tissue, dead bacteria and dead white cells.

Wet slough will contain a colony of bacteria and should be removed with use of a debridement pad and dressings. Therefore, the dressing should either be an interactive dressing such as a gel, honey, iodine cadexomer, silver fibre dressing, in order to reduce the slough and bacteria.

A firm fibrous yellow covering will not necessarily interfere with wound healing and good granulation can often be seen beneath this cover.

RED WOUND

This can be an example of granulation tissue with a deep pink base, and red bumps or granules formed by the growth of new capillaries. Granulating wounds vary considerably in size, shape, and the amount of exudate that they produce. As a result, no one dressing will be suitable for use in all situations. The presence of healthy granulation tissue can be quantified in terms of percentage, and an increase in the amount of granulation tissue in the wound bed points towards healing. In chronic wounds there may also be variable amounts of healthy and unhealthy granulation tissue (beefy-red in appearance). When there is critical colonisation, the tissue presents as friable bleeding tissue.

GREEN WOUND

This is often mistakenly seen as an example of an infected wound. The green discharge indicates the presence of Pseudomonas aeruginosa – an excellent bacterial coloniser – but the wound is unlikely to be infected. Silver sulfadiazine cream or silver dressings will help to reduce the colonisation.

In order to remove the Pseudomonas, doctors used to recommend acetic acid 1% in water and cream. Pseudomonas does not survive in an acidic environment and acetic acid is certainly acidic. It is now being reconsidered for use due to the resistance of Pseudomonas to most antibiotics. However, it is extremely painful in most cases and may never become common in use.

The early recognition of the signs and symptoms of infection, such as; pain, erythema, increase in the level of exudate, and malodour is important in the management of varicose eczema and leg ulcers. Infection is likely if the ulcer becomes more painful and/or the surrounding skin becomes red, hot or swollen (cellulitis), and the patient feels unwell. Distinguishing the difference between bacterial presence and pathological contamination is important; the presence of the cardinal signs of sepsis — fever, erythema, swelling, pain, and leucocytosis — are usually obvious, and a diagnosis of an infected ulcer is readily made. Obtain a swab for culture and sensitivity, and treat with an appropriate oral antibiotic.

It is important to acknowledge that all chronic wounds intrinsically contain bacteria and healing can still occur in their presence; it is not the presence of bacteria but factors such as their type, virulence, and host characteristics/co-morbidities and ability to fight off infection that determine the organism's influence on chronic wound healing. Nonetheless, preventing infection minimises pain and leads to an improvement in the healing rates and quality of life.

Poor Concordance with Treatment

Leg Club Members are more likely to comply with treatment if they have some control over the situation and are partners with the clinicians in the decision-making process. This includes informed decisions on bandage type, whether multi-layered, long-stretch, short-stretch or compression hosiery. If the Leg Club Member genuinely understands, through education and encouragement, the significance of the wound and its treatment, this will lead to increased concordance. Non-concordance is a negative statement that reflects on the care offered to a patient who might possibly be labelled as 'difficult'. There is a danger that the nurse might play a 'parent' role, making the treatment decisions in isolation from the patient, leaving the patient with an essentially passive role in the practitioner–patient relationship, without ownership or responsibility for his own treatment. Such non-concordance prevents the implementation of an effective wound management programme, and patients are left feeling helpless and hopeless, prompting them to abandon nursing care and to treat the ulcers themselves.

It is the conviction and guiding principle of the Leg Club model that relaxing the Leg Club Member through consistent care and with a friendly and confident approach of the nurse and volunteer, the physiological response of related stress can be reduced or eliminated, which will lead to improved healing. Therefore, it is firmly believed by all who are involved within the Leg Club model, that true partnership between professional and the person with an active or healed leg ulcer is the defining element of successful Leg Clubs, and that this model would be interesting to explore in other areas of wound and health care.

Dressing Types

PRIMARY DRESSINGS

Primary dressings are the dressings that come into contact with the wound surface. The dressing material is not usually absorbent enough to hold exudate. However, certain superabsorbent dressings are specifically designed to manage large amounts of exudate.

SECONDARY DRESSINGS

Secondary dressings are used to cover and secure the primary dressing and are indicated specifically for absorption and protection. Selection should, therefore, consider the nature of the primary dressing, the amount of exudate produced by the wound, and the site of the wound.

Dressings fall broadly into three main categories in terms of their ability to prevent pain and trauma. The value of these definitions is somewhat limited though, as adherence of a dressing to a wound can be influenced by many different factors. The categories are:

- **Adherent:** those which most practitioners would consider to be likely to adhere to any type of drying wound. For example, simple dressing pads or cotton gauze.
- **Low-adherent:** products with a wound-contact surface that is designed specifically to reduce adherence, for example, some absorbent wound dressings, silicone dressings and other products that are designed specifically for this purpose.
- **Non-adherent:** those that maintain a moist gel layer over the wound, for example, hydrocolloids, hydrogels, and alginates. Provided that they are not allowed to dry out, these would not be expected to adhere. The performance of some of these materials will be largely determined by the choice of a secondary dressing where this is required.

It is important to recognise that this simple classification only relates to the interaction that takes place between the dressing and the wound itself, it takes no account of possible trauma caused to the surrounding skin; by removal of adhesive products such as hydrocolloids, adhesive films and self-adhesive foams. It is proposed that a new term, 'atraumatic dressings', be adopted to take account of these factors and more accurately define products which, on removal, do not cause trauma either to newly-formed tissue or to the peri-wound skin.

A general rule of thumb is to keep a dry wound, wet, and a wet wound, dry. Therefore, a dry necrotic wound would require hydration, eg. using a hydrogel with a film as secondary dressing, to provide an environment conducive to autolysis. A wet wound producing quantities of exudate needs an absorbent dressing to reduce wetness and prevent maceration.

If a dressing has adhered to a wound on removal, that dressing type should never be used again on that patient.

IDEAL DRESSINGS
— refer to local provider service formulary

ADVANCED DRESSINGS

The history of wound management is largely based on the development of absorbent dressing materials. The main progress in clinical practice being achieved during war time. Only recently, in the past twenty years, has there been any concerted research into the physiology of wound healing and into the development of modern dressing materials and wound treatments. The new generation of commercially-available 'biological' treatments includes epidermal and dermal replacements, and a variety of growth factors and biological molecules. The tissue replacements are largely allografts (eg. Integra and TransCyte), although there are some autograft preparations available (eg. Myskin™, CellTran UK). The biological molecules include growth factors such as PDGF and GM-CSF, and dermal components such as hyaluronan (Hyalofill®, ConvaTec) and amelogenin (Xelma™, Mölnlycke).

These products have, in most cases, still to be proven for clinical efficacy and cost-effectiveness before they can be justified in everyday community wound management.

Useful Websites and Recommended Reading

www.legclub.org

www.worldwidewounds.com/1997/july/Thomas-Guide/Dress-Select.html

www.worldwidewounds.com/2005/march/Moffatt/Four-Layer-Bandage-System-Part2.html

www.worldwidewounds.com/2003/january/Thomas/Atraumatic-Dressings.html

www.emedicine.com/derm/topic826.htm

www.ewma.org/ Position Documents

www.worldwidewounds.com

www.wounds-uk.com

Bale S, Gray D (2006) *A Pocket Guide to Clinical Decision-making in Wound Management*. Wounds UK, Aberdeen

Charles H, Lindsay E (2004) *Principles of Leg Ulcer Management and Prevention*. Wound Care Society Educational Booklet Volume1, No 4. Wound Care Society

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