

# MANAGEMENT OF CHRONIC OEDEMA IN THE COMMUNITY

Chronic oedema of the lower limb: causes, presentation and management priorities



Managing 'wet legs' in patients with chronic oedema



Arterial assessment in patients with chronic oedema of the lower limb



Chronic oedema and The importance of skin care

How to use multilayer inelastic bandaging and compression garments

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## EDITORIAL

# THE MANAGEMENT OF PATIENTS WITH CHRONIC OEDEMA IN THE COMMUNITY

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Chronic oedema of the lower limb is a prevalent condition which is frequently encountered and managed in the community. As the older adult population increases it is reasonable to expect a parallel increase in co-morbidities, many of which are risk factors for chronic oedema and reduced mobility.

Consequently it is important that any clinician caring for patients in the community has the ability to identify chronic oedema, understand its differing causes and presentations and initiate early interventions to both avoid complications and improve outcomes and quality of life for the patient. The identification and management of any underlying medical conditions which may be contributing to the condition is paramount. If the problem is complicated it should be identified as a multidisciplinary issue, so that

both the patient and the community practitioner can receive the assistance required to manage the situation.

Failure to identify chronic oedema or failure to refer the patient to an appropriate specialist leaves the patient open to the development of complications and the clinician open to allegations of poor care.

The management of chronic oedema involves several strands of care and requires a nurse with skills in interpreting assessment and tailoring a package of leg care to suit the patient as an individual. A skin care regimen should be developed to maintain barrier function and vascular assessment is vital to exclude the presence of arterial disease. Once this is ascertained, the clinician can proceed with the use of an individualised application of compression, whether bandaging or hosiery. Should the patient's limbs

become wet, then wound management skills in selecting appropriate absorbent dressings for use under compression become important. This supplement provides relevant and practical information on all these aspects of care to guide those clinicians who are actively responsible for the management of patients with chronic oedema in the community.

Finally, it should always be remembered that the patient and their family/carers also have a vital role to play in the management of chronic oedema, since if the appropriate efforts are not made to elevate the limb, wear compression hosiery or exercise (where possible) then all the clinician's efforts may be in vain. Consequently the engagement of the patient by the clinician in a concordant relationship of trust and mutual respect and understanding becomes vital to the successful management of chronic oedema.

# CHRONIC OEDEMA OF THE LOWER LIMB: CAUSES, PRESENTATION AND MANAGEMENT PRIORITIES

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Chronic oedema is an umbrella term for swelling which has been present for at least three months in the limbs and/or mid-line structures such as the trunk, head and neck or genitalia (Moffatt et al, 2003). From a practical, clinical point of view it is a useful term, as it covers oedema of a wide range of aetiologies. It is important to try to understand the cause of an individual patient's chronic oedema in order to be able to determine the best management.

The aetiology of chronic oedema may be quite complex in some patients and there may be a number of factors contributing to the condition. Common causes

are listed in *Table 1*. Oedema may also occur due to a number of more 'systemic' problems such as heart failure, hepatic cirrhosis and hypothyroidism. It may be caused by drugs, such as the calcium channel antagonists amlodipine and felodipine, non-steroidal anti-inflammatory drugs and steroids (Keeley, 2008).

This article will describe the symptoms and signs associated with some of the more common patterns of oedema likely to be encountered in the community, but will also give examples of rarer problems.

## DEPENDENCY OEDEMA

### Cause

This is usually associated with long-standing immobility which may be due to neurological problems such as multiple sclerosis, respiratory problems such as chronic obstructive pulmonary disease or musculoskeletal problems such as rheumatoid arthritis.

It arises because of failure of the calf muscle pump which normally enhances venous and lymphatic drainage in the legs.

### Presentation

It typically presents as soft oedema beginning in the feet and working up the legs. It is usually bilateral (*Figure 1*), but may be unilateral, such as in patients with a hemiparesis. In the latter, arm

swelling can also occur. People affected by dependency oedema typically spend much of the day sitting and may even sleep in a sitting position at night.

The oedema is usually very soft and easily pits when it first presents, but can become firmer over time. Distortion of limb shape can develop (*Figure 2*) and skin breakdown can occur together with ulceration.

### Management priorities and solutions

Ideally, early management of this problem is advisable before significant limb distortion occurs. Where possible, exercises and elevation of the limbs while sitting should be encouraged.

Compression stockings are usually very helpful but there can be difficulties in putting them on and taking them off as many patients

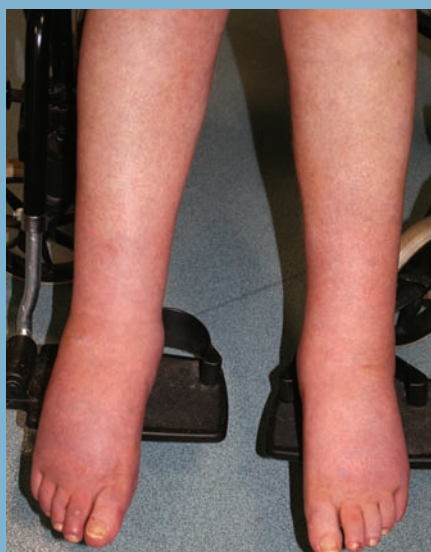


Figure 1. Mild dependency oedema in a patient with multiple sclerosis.

**Table 1**

### Common causes of chronic oedema

- 'Dependency' oedema: associated with immobility
- Oedema due to heart failure
- Venous oedema: e.g. resulting from venous disease such as post-thrombotic syndrome or severe varicose veins
- Oedema associated with obesity
- Lymphoedema: primary and secondary
- Oedema related to advanced cancer

with this type of oedema will not be able to do this themselves and will require help.

Particular care is needed in patients with neurological problems and numbness in the limb as compression garments can cause tissue injury which the patient may not be able to feel (*Figure 3*).

If early intervention is not introduced, patients with dependency oedema can go on to develop chronic 'leaky or wet legs' where profuse leakage of lymph from breaks in the skin requires longer-term bandaging. Wet legs are discussed in detail on pgs.20–23 of this supplement.

## OEDEMA DUE TO HEART FAILURE

### Cause

Heart failure is commonly due to ischaemic heart disease but could have other causes such as pulmonary heart disease, valvular disease and cardiomyopathy.

### Presentation

Patients may develop peripheral oedema as a result of acute heart failure following on from a myocardial infarction, but many patients have chronic heart failure which leads to persistently swollen legs. With reduced mobility, presentation will be similar to dependency oedema. Evidence for a cardiac cause of the oedema should be sought, such as angina,

or a known history of ischaemic heart disease and known heart valve disease. Patients may also report breathlessness on exertion and have clinical signs of heart failure such as a raised jugular venous pressure, bilateral basal crackles on auscultation of the chest and a triple rhythm on auscultation of the heart. Oedema will typically be present in both legs, although it may not be symmetrical. The oedema may also be quite extensive and extend to the sacral region.

### Management priorities and solutions

Heart failure is usually managed medically with drugs such as diuretics, ACE inhibitors and digoxin. Nevertheless, some patients with chronic heart failure and immobility may benefit from light compression treatment of their legs. However, compression treatment may exacerbate acute heart failure so a medical assessment is required to determine whether this is being controlled and whether compression is advisable. Even if compression is indicated, a modified reduced pressure regimen is usually applied, often commencing with only one leg to minimise fluid movement (Lymphoedema Framework, 2006).

Patients with ischaemic heart disease may also have peripheral vascular disease so it is particularly

important to assess peripheral arterial circulation in this group of patients before applying compression.

If peripheral vascular disease is detected, it is recommended that the patient is assessed by a vascular surgeon. Full compression may then be possible once the vascular disease is treated. However, if the peripheral vascular disease cannot be improved, then either reduced compression therapy or none at all may be indicated.

When monitoring patients with chronic leg oedema of any cause, the development of heart failure should be considered if the patient's oedema becomes worse (*Figure 4*). Should this develop, appropriate medical treatment of the heart failure is required and removal of compression garments or a reduction in the strength of compression on the legs is advisable.

## VENOUS DISEASE AND OEDEMA

### Cause

Chronic venous hypertension, e.g. due to post-thrombotic syndrome or severe varicose veins, can result in chronic oedema.

### Presentation

As well as the oedema there will usually be signs of chronic venous disease with venous dilation, e.g. submalleolar



Figure 2. Dependency oedema in a patient with paraplegia.



Figure 3. Tissue damage from a compression garment in a patient with peripheral neuropathy.



Figure 4. Chronic leg oedema in a patient who developed heart failure which exacerbated the oedema.



Figure 5. Lipodermatosclerosis in the right leg of a patient with post-thrombotic syndrome.



Figure 6. Chronic lipodermatosclerosis and venous ulceration.



Figure 7. Oedematous 'apron'.

venous flare, telangiectasia, varicose veins; skin changes such as pigmentation, particularly in the gaiter area; venous eczema and lipodermatosclerosis (Figure 5).

Patients with chronic venous disease may go on to develop ulceration. In severe cases the limb may look like an inverted champagne bottle and may well display ulceration (Figure 6).

### Management priorities and solutions

Most vascular surgical departments have local guidelines for referral of patients for consideration of varicose vein surgery and these should be followed.

Using compression garments in the earlier stages of venous disease is often very effective in easing the discomfort associated with the swelling. This approach, together with appropriate skin care using moisturisers and topical steroid creams for varicose eczema where necessary, should reduce the chance of developing ulceration. Established ulcers are usually managed with either an inelastic cohesive bandage system, short-stretch bandaging or a four-layer elastic compression

bandage, followed by a compression garment once the ulcers are healed.

### OBSESITY AND OEDEMA

#### Cause

Patients with severe problems with obesity quite commonly develop chronic oedema which may have the clinical features of lymphoedema, but other patients have appearances more typical of venous disease (Figure 6). If a person becomes sufficiently immobile due to their obesity and associated complications such as arthritis, they may develop dependency-type oedema.

#### Presentation

Oedema typically develops in the lower parts of the legs, but may extend to include the whole leg. Some patients with severe obesity have an abdominal 'apron' of fat, and lymphoedema may develop here (Figure 7). The typical appearances of chronic lymphoedema may develop in the skin of the leg (Figure 8).

Lymphoedema of the legs in obese patients can sometimes be confused with a separate condition called lipoedema (Figure 9). This is an

uncommon lipodystrophy in which there is an increased deposition of fat in the lower part of the body from the hips down to the ankles. Patients often describe having had 'fat legs' since their teenage years. It occurs exclusively in women and typically presents with a non-pitting swelling which does not usually affect the feet. However, if the condition has been present for some time, superadded oedema can develop, particularly in the feet and ankles (lipolymphoedema).

### Management priorities and solutions

Management of the oedema in this group of patients can pose significant challenges. There can often be practical difficulties in applying compression bandages and garments. The oedema often adds to the immobility which the patient is already experiencing and this in turn can lead to a further exacerbation of the swelling. With reduced mobility, patients are unable to exercise and, therefore, they tend to put on more weight. The development of lymphoedema in the abdominal apron is particularly difficult to manage as it is not an easy area to treat with compression therapy.



Figure 8. Lymphotoedematous skin changes with papillomatosis in the legs.



Figure 9. Patient with lipoedema.



Figure 10. Infant with Milroy's Disease.

Clinical experience suggests that if obese patients are able to lose weight it can have a significant impact on reducing their oedema, which in turn may help them become more mobile and enable them to lose more weight. Management in this group of patients should therefore be focused upon weight loss as well as managing the oedema with the usual compression techniques. Some patients will require referral for bariatric surgery.

Patients with lipolymphoedema can benefit from compression treatments, but with pure lipoedema this approach is not particularly helpful, as compression does not reduce the fat component.

## LYMPHOEDEMA

### Causes — primary

Primary lymphoedema occurs because of an abnormality in the development of the lymphatic system, leading to poor drainage of lymph. There are many types of primary lymphoedema, some of which are inherited. Although relatively little is known about the different types of primary lymphoedema, there do seem to be a variety of abnormalities that can occur to cause the problem,

such as distal hypoplasia in Milroy's Disease and valvular problems in the lymphatics in lymphoedema-distichiasis.

### Causes — secondary

Secondary lymphoedema is due to lymphatic damage by some extrinsic process such as surgery, radiotherapy, infection such as cellulitis, trauma and lymphadenopathy due to cancer.

### Presentation

The pattern of presentation will depend upon the type of lymphoedema. Some rare primary lymphoedemas, such as Milroy's disease, may present at birth (Figure 10).

Primary lymphoedema is usually diagnosed on the basis of age of onset, family history and the lack of an identifiable cause of damage to the lymphatic system. With secondary lymphoedema there should be a clear cause of lymphatic damage (Figure 11).

Initially, when lymphoedema presents the swelling is usually soft and easy to 'pit'. As time goes by, the subcutaneous tissues become firmer due to fibrosis and the deposition



Figure 11. Lymphoedema of the leg associated with pelvic and inguinal lymphadenopathy due to melanoma with acute cellulitis of the right thigh.

of adipose tissue so the pitting is less obvious. Stemmer's sign for lymphoedema is usually positive at this stage. This is defined as the inability to pick up a fold of skin at the base of the second toe (see p17). Skin changes such as hyperkeratosis, lymphangiectasia and papillomatosis

can occur as the condition progresses (Figure 12). These changes and care of the skin are detailed on pgs.13–19.

### Management priorities and solutions

Early treatment with compression bandages or garments, skin care, exercises and massage (manual lymphatic drainage [MLD] or self-administered massage [SLD]) where indicated is advisable. There is evidence that treating lymphoedema reduces the incidence of cellulitis which is the most significant complication (Ko et al, 1998). Cellulitis in lymphoedema typically presents as a flu-like illness which usually precedes the development of increased swelling in the limb with redness, pain and warmth in the affected area (Figure 11). Prompt treatment with antibiotics is required.

Once severe skin changes have developed and the subcutaneous tissues become more fibrosed and firmer, conventional compression treatment is less effective. Therefore, the early identification of lymphoedema and the introduction of treatment to control the problem is advisable.

### CHRONIC OEDEMA OF MULTIPLE AETIOLOGY

#### Cause

For many patients there is no one single cause of their oedema. For example, a patient may have had surgery such as a hip or knee replacement, a deep vein thrombosis in the same leg, become immobile as a result of arthritis, have varicose veins and be on medication which may exacerbate oedema.

#### Presentation

The multiple factors which contribute to the development of the oedema are usually evident from the patient's medical history, but it is not normally possible to define how much each factor contributes to the problem. Skin appearances can be very variable and are often a mixture of those described above (Figure 13).

### Management priorities and solutions

The main priorities of treatment — as with other types of chronic oedema — are to reduce the oedema, improve the skin condition, reduce the incidence of cellulitis and generally improve the patient's quality of life. However, in this scenario it is important to consider other 'reversible' elements such as medication that may be exacerbating the problem and whether there is a possibility of heart failure.

In patients with advanced pelvic cancer, the leg oedema may have complex causes: metastatic lymphadenopathy, the aftermath of previous treatment, extrinsic venous compression or thrombosis, hypoalbuminaemia and reduced mobility. In these situations the oedema can become really quite extensive involving the genitalia and trunk and, as a result, is often difficult to treat. This seems to be particularly the case where hypoalbuminaemia is a part of the aetiology. Although compression treatment can form part of the management, the focus is often on relieving symptoms rather than aiming to control the swelling fully. Thus, supportive bandaging, particularly to control leakage of fluid (lymphorrhoea), may be appropriate. In recent times there has been interest in the needle drainage of severe oedema in patients with advanced cancer nearing the end of their lives, although this has not been established as a routine procedure (Clein and Pugachev, 2004). For some patients the use of steroids and diuretics may play a part in controlling the swelling.

### CONCLUSION

Chronic oedema covers a wide variety of different aetiologies and, indeed, in any one individual patient there may be more than one cause of the oedema. Careful clinical assessment is helpful in unravelling these causes and in determining the most appropriate management for the patient.



Figure 12. Lymphoedema of the leg showing severe papillomatosis.



Figure 13. Leg oedema in a patient with mixed aetiology swelling.

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# ARTERIAL ASSESSMENT IN PATIENTS WITH CHRONIC OEDEMA OF THE LOWER LIMB

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When treating patients with chronic oedema one of the key elements of management is the application of compression using either multilayer inelastic bandaging or hosiery, and this is discussed in detail on pgs. 24–31. National guidelines recommend that vascular assessment should be carried out as part of an holistic assessment to exclude occult arterial disease before commencing compression therapy for patients with leg ulceration (CREST, 1998; RCN, 1998; SIGN, 1998), but there is no such guidance for patients with chronic oedema.

However, it is important that if the patient's history and physical examination indicates the presence of arterial disease, vascular assessment should be carried out. With the prevalence of arterial disease increasing with age, it is likely to be present in a large number of patients (Burns et al, 2003). Other risk factors are listed in *Table 1*.

## WHY IS VASCULAR ASSESSMENT IMPORTANT?

Necrosis caused by compression was reported as a possible complication in patients with occult arterial disease by Callam et al (1987). In this study 154 surgeons were asked to complete a questionnaire concerning the number of cases of ulcers or necrosis they had seen in the past five years that were

specifically induced or aggravated by compression bandages, compression stockings or anti-embolic stockings. All of the surgeons replied and 32% had seen at least one case of pressure damage while 32% had seen more than one case. In all, seven cases needed reconstruction and 12 limbs were amputated.

Although this study provides a useful reminder of the hazards of compression, it used a retrospective methodology and relied heavily on the memories of the surgeons. Therefore it may not truly reflect the extent of the problem as other factors could have influenced the results such as the type of bandage used, the method of application and the skills of the healthcare professional performing the bandaging. Indeed it is possible for inexperienced and untrained nurses to produce reverse gradients when bandaging and this can cause damage to the patient as reverse gradients can cause a tourniquet effect at the calf, leading to occlusion of skin blood flow and necrosis. It is unclear how many patients truly develop necrosis as a complication of compression but in order to exclude significant arterial disease or ulceration that is other than venous in origin, a detailed assessment should be carried out before applying compression therapy.

## INVESTIGATIONS

The key investigation for establishing vascular status is the

Doppler ankle brachial pressure index (ABPI). Assessment of pedal pulses in patients with chronic oedema can be difficult due to the volumes of fluid present in the tissue (Doherty et al, 2006). Simple palpation techniques can be carried out but are essentially flawed due to the distortion of the pulse signal through the oedematous tissue. This is also true when attempting to use Doppler in very oedematous limbs (Doherty et al, 2006). Where there is difficulty carrying out an ABPI, the Pulse Oximetry Lanarkshire Oximetry Index (LOI) may be a suitable alternative (Bianchi, 2005).

**Table 1**  
Risk factors associated with arterial disease

### Systemic indicators of arterial disease

- History of ischemic heart disease
- History of stroke
- Transient ischaemic attacks
- History of rest pain
- History of arterial surgery
- History of intermittent claudication

### Changes to the limb

- Pale colourless limb
- Dependent rubor
- Thin, pale, yellow nails/thickened nails as a result of fungal infection
- Limb feels cold to the touch
- Shiny, taut, hairless skin
- Diminished or absent foot pulses
- Delayed capillary refill
- Loss of colour on elevation



Figure 1. Excessive oedema of the lower leg.

It is important to be aware that these vascular investigations should be carried out by a trained practitioner and the results viewed in the context of the patient's overall presentation, medical history and findings. The following section will describe both investigations.

#### EQUIPMENT

If the patient has excessive oedema (Figure 1) an ankle pressure reading may be difficult to perform using standard equipment. It is therefore important to ensure that the correct equipment is available before beginning the procedure.

#### Blood pressure cuff

For both LOI and ABPI, the size and shape of the oedematous limb may mean that a normal-sized blood pressure cuff cannot fit around the circumference of the limb. It is imperative that nurses have access to a larger size cuff which will be more comfortable for the patients and make the overall

assessment process more accurate and easier to carry out.

The cuff sizes suggested below are guidelines for arm circumference but may also be applied to leg circumference.

- Limb circumference 22–26cm: 'small adult cuff' 12x22cm
- Limb circumference 27–34cm: 'adult cuff' 16x30cm
- Limb circumference 35–44cm: 'large adult cuff' 16x36cm
- Limb circumference 45–52cm: 'adult thigh cuff' 16x42cm.

#### Doppler probe

Due to the signal distortion caused by the oedema in this patient group, it may be necessary to use a Doppler probe with a lower frequency than usual — 5MHz rather than 8MHz — to pick up the signal.

#### Ultrasound gel

A generous pea-sized amount of gel should be used. If too little is

used there will not be enough to conduct the sound, too much and it will be difficult to maintain the position of the probe.

#### CALCULATING THE ABPI

ABPI is the index used to assign a numerical value to help objectively assess the level of arterial occlusion present in a patient. This is calculated by assessing the systolic pressure of the brachial pulses and dividing this with the systolic pressure reading for the ankle. Doppler assessment should always be combined with the clinical judgement of the practitioner before any garments or bandages are prescribed.

#### The procedure

The patient should lie flat for 20 minutes before the assessment. The following steps should then be taken:

- 1) Place the correct size of sphygmomanometer cuff around the arm of the patient and apply gel over the site of the brachial pulse. Apply doppler probe to brachial artery (Figure 2).
- 2) Begin inflating the cuff until the signal disappears.
- 3) Deflate the cuff slowly until the signal returns. This figure is the brachial systolic pressure.
- 4) Repeat the procedure for the



Figure 2. Sphygmomanometer cuff around the upper arm with the Doppler probe placed over the brachial pulse.



Figure 3. The sphygmomanometer cuff in position around the ankle

other arm. The highest reading of the two is the one used to calculate the ABPI.

5) Apply the correct size of sphygmomanometer cuff around the ankle (*Figure 3*).

6) Locate the Dorsalis pedis pulse by palpation then apply ultrasound gel and the Doppler probe.

7) Inflate the cuff until the signal disappears.

8) Slowly deflate the cuff until the signal returns and record the reading.

9) Locate the anterior tibial pulse and repeat the procedure. Use the higher of the readings to calculate the ABPI.

10) Repeat for the other leg.

11) To calculate the ankle brachial pressure index for each leg divide the pressure at the ankle by the pressure at the brachial and express as a decimal:

- Normal = ABPI >0.8
- Moderate arterial disease = ABPI 0.5–0.8
- Severe arterial disease = ABPI <0.5

If Doppler ABPI is difficult to assess, this may be due to oedematous tissue interfering with the Doppler signal or in some instances because the patient has



Figure 4. Blood pressure cuff around the upper arm and pulse oximetry probe on any toe.

difficulty lying flat for 20 minutes before the assessment. If either of these problems exist, pulse oximetry LOI may be a more suitable assessment to use.

#### PULSE OXIMETRY LOI

When calculating LOI, the practitioner should explain the procedure to the patient, ensure he/she is lying comfortably in a semi-recumbent position and follow the stages below.

#### Measurement of finger oximetry pressure

An appropriately sized blood pressure cuff should be placed around the upper arm.

The pulse oximetry sensor should be placed on any finger and the baseline pulse oximetry reading recorded (*Figure 4*). The sphygmomanometer cuff should be inflated to 60mmHg, then inflated in 10mmHg increments with approximately 10 seconds between increments. Once the pressure measures 100mmHg, incremental changes can be increased to 20mmHg.



Figure 5. Blood pressure cuff around the ankle and pulse oximetry probe placed on one of the first three toes.



Figure 6. Signal checked with bandages in place with leg horizontal.

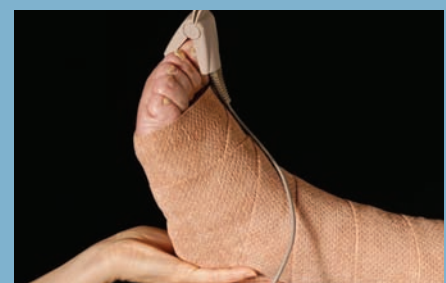


Figure 7. Signal checked with bandages in place with leg elevated.

When the pulse oximetry signal is lost, the pressure should be recorded at the measurement immediately below, e.g. if the signal is lost at 180mmHg, the nurse should record 160mmHg. If 180mmHg is reached before the signal is lost, the cuff should not be inflated further and a maximum pressure of 180mmHg should be recorded. The measurement should be repeated on the other arm and the higher of the two readings used to calculate LOI.

### Measurement of toe oximetry pressure

An appropriately-sized cuff is placed around the ankle immediately above the malleoli. Any fragile skin or ulcer tissue should be protected beforehand. The oximetry sensor should be placed on one of the first three toes (*Figure 5*). The cuff should then be inflated as above and the pressure at which the signal is lost recorded. Again, a measurement of 180mmHg should be recorded if reached without loss of signal.

### Calculating toe/finger oximetry index (ratio):

The LOI for each leg is calculated by dividing toe pressure by finger pressure and expressing it as a decimal, e.g. if the toe reading is 120mmHg and the finger reading 140mmHg, then the LOI toe reading/finger reading which is  $140/120 = 1.17$ . The readings are similar to ABPI readings:

- Normal: LOI=0.8
- Moderate arterial disease LOI=0.5–0.8
- Severe arterial disease: LOI=0.5.

### Stage 3

The nurse should apply an appropriate graduated compression bandage or stocking to the leg and then place the sensor on one of the first three toes. The signal should be checked with the leg horizontal (*Figure 6*), then elevated for approximately 30 seconds (*Figure 7*).

The test is carried out with patients in a semi-recumbent position, rather than supine as recommended for Doppler ABPI. The author's clinical experience indicates that many elderly patients with co-morbidities affecting their cardiovascular or respiratory systems find lying flat particularly uncomfortable.

### THE LIMITATIONS OF LOI VASCULAR ASSESSMENT

The limitations described here apply to a very small percentage of patients but should be considered when carrying out the vascular assessment by pulse oximetry.

The signal may be difficult to detect if the patient has grossly dystrophic toenails or extreme cyanosis, or where there is peripheral vasoconstriction such as with Raynaud's disease. Additionally, LOI will not detect localised arterial disease where there is adequate collateral circulation. If it is necessary to assess blood flow to individual arteries, Doppler should be used.

### OTHER CONSIDERATIONS

#### Pain

Pain can be an indicator of, among other conditions, the presence of venous or arterial disease. Carrying out a vascular assessment to assist in diagnosis is therefore important. It will be necessary to explain the importance of the assessment to the patient and to explain that it will be carried out in a timely fashion. If the patient decides not to proceed, further investigations may be required and a referral to a medical practitioner may be necessary.

#### Unable to detect blood flow

If you are unable to detect pulses or blood flow to the foot, consider the patient's history, look for other signs of ischaemia and a referral to a medical practitioner may be necessary.

### CONCLUSION

Compression therapy is contraindicated in patients with significant arterial disease. Vascular assessment, along with a detailed holistic assessment is recommended before commencing compression therapy in patients with leg ulceration. Although there is no specific guidance on vascular assessment in patients with chronic oedema, many may be at risk of arterial disease and vascular assessment should be considered.

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# CHRONIC OEDEMA AND THE IMPORTANCE OF SKIN CARE

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Patients with chronic oedema can present with a variety of complex intervention and management issues. Skin care and the recognition of potential risks to skin integrity sits high on this list and is recognised in the *Best Practice for The Management of Lymphoedema International Consensus* (Lymphoedema Framework, 2006). For example, it is well documented that the skin of a lymphovenous limb will be compromised and prone to a selection of skin problems which will compound the risk of infection and potential further lymphatic damage (Lymphoedema Framework, 2006). It is therefore important that healthcare professionals who care for people with chronic oedema should have a competent level of dermatological knowledge as well as access to expert dermatology advice when necessary.

Patients with chronic oedema predominantly of the lower limb, are referred to dermatology mainly for skin care management or treatment of secondary skin disease or infection with cellulitis being the most prolific and dominant reason for hospital admission (Carroll and Roser, 1992; Mortimer, 1995; Dupuy et al, 1999). Chronic oedema services should be putting forward skin care as a mandatory requirement and prominent feature of patient management for this condition. Although there is little supporting research evidence to back up this statement it should be seen as a move to best practice (Harris et al, 2001).

A team approach between patient/carer and practitioner should dominate the ethos of this particular element of chronic oedema management as there is much that patients and their carers can be taught in terms of self-help and observation (Lymphoedema Framework, 2006). The aim of this article is to demonstrate and educate the practitioner on the importance of protecting the skin barrier and encouraging a long-term skin care routine together with patient education. It will also list the potential dermatological conditions which may present in patients with chronic oedema. These conditions may increase the risk of infection and potentially cause further damage to the lymphatic system.

## THE IMPORTANCE OF THE SKIN AS A BARRIER

The skin is an important homeostatic regulator and is required to provide a barrier to the external environment while acting as a protector to the internal environment (Ersser et al, 2007). Individuals with an impaired lymphatic system are at high risk of contracting infection via the skin. Any trauma to the affected limb, minor or major, will become a portal for bacteria to penetrate the dormant, protein-rich lymph fluid which provides a welcoming environment for colonisation by opportunistic bacteria.

When caring for the skin, practitioners need to complete a

thorough skin assessment (*Table 1*) and address good hygiene, emollient therapy, effective control of tinea pedis, venous eczema, folliculitis, maceration, ulceration and any other conditions which could present (Mortimer, 1995; Dupuy et al, 1999; Roujeau et al, 2004; Swartz, 2004; Bjornsdottir et al, 2005).

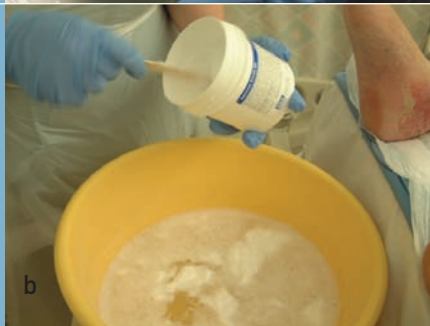
## USE OF EMOLLIENT THERAPY

Emollient therapy is documented as having a role to play in skin barrier function. There is no strong evidence as to which is the best product to use (Rawlings et al, 2004). However, emollients' mode of action is well documented and is identified as either 'occlusive' or 'active' (Fendler, 2000; Flynn et al, 2001; Rawlings and Harding, 2004; Ersser et al, 2007). Emollient therapy can be listed as having the following benefits:

- Occlusive — trapping water in the stratum corneum
- Active — moving water from the dermis to the epidermis
- Exfoliative
- Anti-inflammatory
- Antimitotic
- Antipruritic
- Accelerates regeneration of skin barrier.

## SKIN CARE FOR PATIENTS WITH CHRONIC OEDEMA

Teaching patients the importance of protecting their skin against bacteria is paramount in any care plan for patients with chronic



Figures 1a and b. Use of soap substitutes. Preparing to wash with a soap substitute. Encourage decanting from tubs to reduce contamination or recommend the use of pump dispensers. Mix with water while also applying liberally to the skin.

Figure 1c. Use a disposable cloth to wash the limb using good amounts of soap substitute. This will encourage loosening of dead hyperkeratotic skin. Other daily topical treatments include emollients, fungal creams/topical corticosteroids.

Figure 1d. Ensure interdigital areas are gently yet thoroughly cleaned, ensure good drying of this area afterwards so as not to encourage moist warm area for potential tinea pedis.

**Table 1**

Skin assessment [Adapted from The Lymphoedema Framework, 2006]

- **Quality of life [psychological]:** How is the person coping with the way their skin looks, smells and feels?
- **Hydration of skin:** Dryness is associated with hyperkeratosis — a build up of dead skin (Figures 4a and b). Topical emollients and gentle manual removal is recommended. Determine: what topical and washing regimen is being implemented? What topical treatments are being used? For example, soap substitutes, emollients, fungal creams, or topical corticosteroids. How often is the skin thoroughly washed and moisturised? What resources are in place to carry out this intervention?
- **Are there any known skin sensitivities** to topical treatment or bandages?
- **Observe for signs of cellulitis/erysipelas** (Figure 5) The presence of cellulitis/erysipelas is commonly associated with chronic oedema, particularly of the lower limb. The term cellulitis and erysipelas are often used to depict different levels of infection, with cellulitis affecting subcutaneous tissues and erysipelas the superficial dermal tissues. The two conditions often co-exist. Common pathogens are Streptococci A or G and Staphylococcus aureus (Kilburn et al, 2003). Classic signs are increase temperature of the skin, pain, tenderness, oedema, blisters, and tracking of erythema (redness) up the limb
- **Colour/circulation of the skin:** Is there redness, pallor, cyanosis? Is the skin warm or cold?
- **Pigmentation/lipodermatosclerosis:** Is there brown hemosiderin staining consistent with venous insufficiency of the lower leg? Thickening/induration of the subcutaneous tissues is commonly seen and associated with venous eczema
- **Fungal infections:** (Figures 6a and b: tinea pedis and onychomycosis) Inspect between the toes, and soles of feet, looking for signs of maceration, fungal infections (tinea pedis), fungal toenails (Onychomycosis), ingrowing toenails, dry skin, non-healing lesions, and ulcers
- **Fragility:** Is the skin vulnerable? For example, check for any breaks to the skin, cuts, and trauma. Observe for new or known existing rashes; venous, contact, gravitational, and discoid eczema; lichen simplex chronicus, lichen planus and psoriasis (Figure 7); thinning of skin (atrophy); scarring; blistering; itching; dry, dead skin build up; hyperkeratosis; maceration, and swelling. Examine for decreased sensation (neuropathy), venous/arterial ulcers, potential skin cancer lesions, and leakage of lymph fluid from skin (lymphorrhoea). Check pressure areas, such as the heels
- **Observe for any skin changes directly associated with chronic oedema**
  - **Papillomatosis** (Elephantiasis nostra verrucosa- ENV): Raised papule lesions of the skin, development of verrucous, cobblestone, hyperkeratotic plaques, often covered with a loose adherent crust, sometimes weepy and/or foul smelling, commonly seen on shins (Figure 8)
  - **Lymphangiectasia:** blister-like lesions; dilation of blood vessels
  - **Lymphorrhoea:** the weeping or oozing of clear or straw coloured fluid from the skin
  - **Deepened skin folds** (Figure 9)
  - **Orange peel skin (peau d'orange)**
  - **Kaposi-Stemmer sign** (Figure 10) Skin on dorsum of second toe cannot be pinched as a fold by the fingers

oedema and areas that they should be advised on can be listed as follows:

- Encourage daily skin inspection (if not impeded by bandaging) — observe for cracks, cuts, dry skin, non-healing areas, rashes, and signs of infection such as increased temperature and tenderness
- Encourage particular attention to areas with reduced sensation or where there is natural occlusion caused by skin folds

or interdigitally

- Daily cleansing of skin with appropriate topical treatment. Advise patients to use a soap substitute to encourage avoidance of detergent perfumed products such as soap and shower gels which will do little to hydrate the skin (Figure 1a–d). There are many available soap substitutes (Table 2) and where possible the patient should participate in the decision of which to use. Stress

**Table 2**  
Common soap substitutes

- Aqueous cream 500mg
- Epaderm/Hydromol ointment 500g
- Epaderm cream 500mg
- Dermol 500 lotion/cream 500 mg (antibacterial)
- Cetraben cream 500mg
- Zerobase 500mg
- Diprobase cream 500mg
- Oilatum cream 500g

**Table 3**  
Possible adverse effects of soap substitutes/  
emollients

- Stinging
- Discomfort
- Irritation
- Allergic reaction such as contact dermatitis
- Patient does not like
- Folliculitis

the importance of effective washing and drying of skin, especially interdigitally and in between skin folds.

Choosing the right emollient/soap substitute is not always straightforward and little education is given to the practitioner/prescriber, particularly concerning methods of application (Figure 2). All of the topical treatments in Table 2

can be used as soap substitutes and most can also double as emollients. Although adverse effects of soap substitutes and emollients are uncommon, practitioners should familiarise themselves with problems that can occur (Table 3) (Marks, 1997). *The British National Formulary* lists the common preservatives which may in some cases cause sensitivity. These sensitisations can be proven if suspected by referral to a dermatologist for patch testing (Figure 3). There is some evidence to recommend aqueous cream — perhaps the most frequently issued emollient — to be used as a soap substitute and not as a leave-on emollient due to its high water and preservative content. When used as a leave-on emollient, stinging and discomfort has been reported in some patients (Cork et al, 2003).

Practitioners should ensure that the use of emollients and soap substitutes are demonstrated to the patient/carer and that repeat prescriptions are readily obtainable to encourage concordance. Soap substitutes should be water soluble and warning should be given to the patient that bathing/showering areas can become slippery when using these products and that caution should be

taken. Encouragement to use disposable cloths rather than flannels in the patient's home is preferable to reduce possible contamination with bacteria. Pump dispensers are preferable as they are easy to use and they also reduce the risk of bacterial contamination. If petroleum products such as liquid paraffin/soft paraffin are used, advice should be given to avoid naked flames as they can be easily ignited when soaked into bandages and clothing (British Medical Association and Royal Pharmaceutical Society of Great Britain, 2007).

- Advise regular checking of fingernails/toenails for any signs of infection, cracks, fungus or hangnails. Encourage filing of nails rather than cutting to avoid accidental trauma. The patient should see a podiatrist or chiropodist if nail care is difficult for them to do themselves. Good fitting shoes for the lower limb in patients with chronic oedema are also essential. The use of antifungal foot powders may be advisable particularly if tinea pedis (athlete's foot) has been an issue.
- Teach patients/carers to recognise signs of infection, which include redness, heat, tenderness, blistering, malaise, raised temperature, or feeling



Figure 2. Application of emollient. Downward application is advised to avoid blocking of hair follicles to reduce the incidence of associated folliculitis (Figure 15)(Ersser et al, 2007).

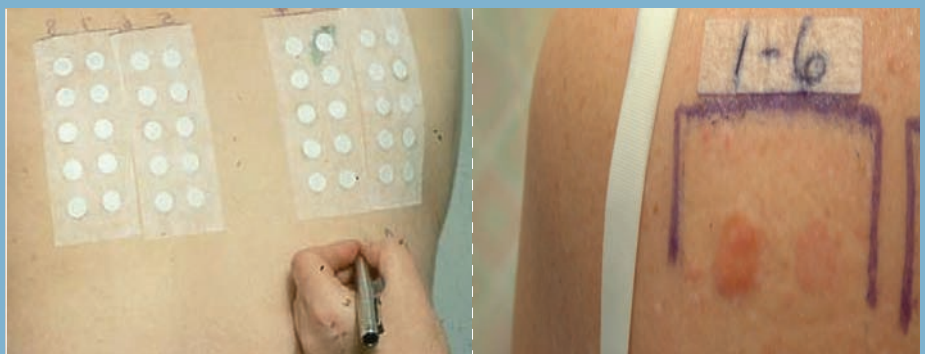


Figure 3. Patch testing showing positive reaction



Figure 4a. Dry skin with associated hyperkeratosis.



Figure 4b. Gentle manual removal of hyperkeratotic skin.

unwell. Small grazes and/or cuts should be cleaned, covered and observed.

- It is advisable to avoid injections, blood samples or taking blood pressure on an affected limb.
- Patients need to be advised to protect affected limbs from sun burn and to wear appropriate sun protection and protective clothing.
- Advise protection of limbs for daily activities such as gardening, e.g. by the wearing of gloves and trousers to minimise risk of accidental trauma.

#### SKIN ASSESSMENT

Skin assessment is a crucial part of chronic oedema management and should cover the key areas listed in *Table 1*.

The epidermis can be directly affected by chronic oedema. This is particularly demonstrated in lower limbs where verrucous, cobblestone plaques, known as elephantiasis nostra verrucosa (ENV) can occur. Plaques of ENV can be covered with crusting and can become weepy, producing excessive exudate which can in turn make the epidermis soft, soggy and macerated and prone to ulceration and infection. The build up of hyperkeratosis and papillomatosis, especially in skin folds, produces odour from the microbes harboured in these areas (*Figure 4a*). Salicylic acid ointment can be used to assist removal of scale together with daily washing and moisturising (*Figure 4b*).

Poorly controlled weeping of lymph from the skin surface (lymphorrhoea) will quickly saturate dressings, clothes and footwear causing further risk of infection through contamination and maceration of skin (Mortimer, 1995) and patients with ‘wet’ or ‘leaky legs’ are often referred to dermatology resulting in a complete reassessment of the patient’s management. The management of wet legs is discussed on pgs. 20–23 of this document.

Quality of life and psychological aspects should be included in any chronic oedema assessment, in particular with reference to the skin. Chronic oedema and associated problems of leakage of lymph fluid, malodorous wounds and skin disease and infections can cause considerable distress especially if the patient has not been able to access a comprehensive lymphoedema service (Dealey, 1999).

#### RECOGNISING AND TREATING COMMON SKIN DISEASES ASSOCIATED WITH CHRONIC OEDEMA

##### Tinea

Lymphoedematous limbs are susceptible to fungal infections (Moffat et al, 2006). Common



Figure 5. Common presentation of cellulitis.



Figure 6a. Tinea pedis (athlete’s foot).



Figure 6b. Tinea pedis with associated onychomycosis (fungal toenails).



Figure 7. Stasis eczema, lipodermatosclerosis.





Figure 8. Papillomatosis.



Figure 11a. Dermapak for skin scrapings.



Figure 12. Venous stasis eczema-associated ulceration.



Figure 9. Deepened skin folds.



Figure 11b. Tinea spread to dorsum—note peripheral scaling—common diagnostic sign.



Figure 10. Kaposi-Stemmer positive sign.



Figure 11c. Taking nail clippings for mycology.

sites are skin folds, the interdigital area and sometimes associated with coexisting fungal nails (tinea unguium). Interdigitally it can be moist with a white powdery scale and irritation. Maceration can be seen and the area will be at high risk for subsequent cellulitic infections. Skin scrapings can be taken to confirm mycology if diagnosis is uncertain or when topical treatments have failed

and oral medication is being considered (Clinical Knowledge Summary, 2006) (*Figures 6a and b; 11a and c*).

Treatment for fungal skin infections is recommended with one of the following topical treatments:

- Imidazoles (2–4 weeks)
- Terbenafine (1 week — adults only)
- Undecenoates (2–4 weeks

— adults only).

It is advised to continue treatment for 1–2 weeks once the skin is healed. Oral treatment should be considered if fungal infection is extensive or topical treatment has failed. Refer to the British National Formulary for prescription guidelines or Clinical Knowledge Summary (2006). Fungal nails will require systemic treatment for best results and the duration



Figure 13. Lymphangiosarcoma.



Figure 14. Use of paste bandaging.



Figure 15. Folliculitis.

of treatment will depend on the response. Topical treatments such as Loceryl can be used, but treatment needs to be for a period of 6–12 months (Doherty, 2001).

#### **Venous stasis eczema (varicose eczema)**

This common inflammatory condition usually affects the lower limbs and is often seen to coexist with varicose veins. Clinical signs include inflamed, red, eczematous skin; itching; scaling; pigmentation (haemosiderin deposit); hardened, tight red/brown skin/tissues (lipodermatosclerosis which is vulnerable to ulceration) and atrophy blanching. Weeping is seen if secondary infection is a factor (*Figures 12a and b*). Practitioners should monitor areas of non-healing ulceration as there is an association of repeated episodes of chronic ulceration and healing stimulating proliferation of keratinocytes which may contribute to neoplastic transformation. Referral to the most appropriate specialist is required if the ulcer is not responsive or there is

a drop in ABPI. The condition lymphangiosarcoma (Stewart-Treves syndrome) although rare should not be overlooked (*Figure 13*). This presents as a red/purple macular area of discoloration/bruising, progressing to ulceration, crusting, and ultimately extensive necrosis as it spreads widely. Urgent referral to an oncologist would be required (Lymphoedema Framework, 2006).

Treatment of venous stasis eczema usually consists of topical corticosteroids and emollient therapy. Assessment for potency should not only cover local policy but also logistics of application particularly when bandages/stockings are being used for compression. There is limited evidence to the efficacy of compression stockings in venous stasis eczema (Partsch, 2003; Barron et al, 2007; Duffill, 2008). Efficacy of topical corticosteroids is helped by correct diagnosis, an understanding of mode of action and potential side effects. It can sometimes be more effective to use a potent steroid for a

short amount of time rather than a milder potency for a longer period of time (Davis, 2001). A potent corticosteroid would be acceptable for a period of seven days then reducing to a milder potency. In the real world this may not be possible depending on the patient's mobility and comorbidities and age. It needs a common-sense approach as a poor response will follow if topical corticosteroids are not applied frequently enough or they are at too low potency. Good use of emollients and the use of paste bandages to aid occlusion and encourage skin barrier repair are relevant therapies (*Figure 14*). Refer to a dermatologist if the condition is not responding to treatment or if contact dermatitis or a differential diagnosis is considered (Smith, 2006; Barron et al, 2007; Middleton 2007).

#### **Folliculitis**

Folliculitis is caused by inflammation of the hair follicles causing a rash with pustules (*Figure 15*). It can occur on any surface of the body that has

hair follicles. The pathogen is usually *Staphylococcus aureus*. Swabs can be taken if exudate is present, in particular if resistant to treatment. Treatments follow the route of reducing *S. aureus* colonisation using an antiseptic wash/lotion containing chlorhexidine and benzalkonium (e.g. Hibiscrub or Dermol 500). Heavy duty petroleum-based topical therapies can introduce or encourage folliculitis (Buxton, 1998). A light non-greasy emollient is recommended to reduce the risk of further blockage of hair follicles. Referral to a dermatologist is suggested if there is no response to the treatment after one month.

## CONCLUSION

Emollient therapy and topical regimens require involvement of the patient in terms of choice and education, especially if they are going to participate in their own care. A patient's choice of emollient products is important, particularly for their comfort and subsequent concordance. Correct diagnosis of secondary dermatological disorders and appropriate referral is essential. Incorrect use of topical corticosteroids could lead to unwanted side-effects and disguise the original presentation which may impede diagnosis. Appropriate use of topical corticosteroids in terms of potency and duration combined with realistic management plans are an important treatment for some inflammatory dermatoses (Davis, 2001).

This brief overview of skincare for patients with lymphoedema touches areas which require more in-depth explanation and understanding. Used as a starting point, it can direct the practitioner to possible areas in their practice where deficits can be recognised and addressed as part of their professional development.

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# MANAGING 'WET LEGS' IN PATIENTS WITH CHRONIC OEDEMA

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The growth of the elderly population has many consequences for health care. Increasing age is likely to lead to the onset of chronic disease or at least decreasing mobility and independence. The caseload of a community nurse is concentrated on individuals who are unable to attend a clinic setting and is consequently made up of many elderly patients with poor mobility and long-term conditions, which can result in the development of chronic oedema. Consequently, the syndrome of 'wet legs' is very familiar to clinicians working in the community.

Wet legs and leaky legs are terms used to describe lymphorrhea, a condition in which lymph escapes from breaks in the skin of patients with oedematous limbs. Lymph appears as beads of fluid which then trickle from the affected area, putting the patient at risk of skin damage and an increased risk of complications resulting from infection.

## EPIDEMIOLOGY OF CHRONIC OEDEMA

Before attempting to manage the problem of a patient with 'wet legs' it is important to establish the underlying cause and whether any comorbidities are likely to affect management. These factors are discussed in more detail on pgs.4–8. Most people over the age of 80 years are likely to have a degree of cardiac failure and also have declining mobility. If, in addition, they have suffered a cerebral vascular accident (CVA) or have motor neurone disease (MND), it is likely that they will spend many hours a day sitting with their leg dependant, and this can eventually lead to chronic oedema (*Table 1*). This is defined as swelling which has been present for more than three months and is unrelieved by elevation or diuretic drugs (Moffatt et al, 2003). It is important to note that GPs may have prescribed diuretics for the patient's oedema, as this can lead to dehydration in older people.

Blankfield et al (1998) investigated causes of bilateral chronic oedema in

45 patients in a primary care setting in the USA. The original causes were thought to be 71% venous insufficiency and 18% cardiac failure. However, following investigation it was discovered that the actual causes were; 33% cardiac failure, 42% pulmonary hypertension and 22% venous insufficiency. This underlines the necessity for thorough clinical examination and investigation of patients.

A study of chronic oedema in south-west London revealed that the condition is more common than previously thought, with a prevalence of 1.33 per 1000 population, which is similar to that of venous leg ulcers.

**Table 1**

**Causes of chronic oedema, immobility/reduced mobility post-orthopaedic surgery**

- Immobility/reduced mobility post-orthopaedic surgery
- Neuromuscular disease
- Cardiac failure
- Post-coronary artery bypass graft surgery, harvesting of a vein from lower limb
- Venous hypertension
- Arterial disease and the positive effect of gravity, drawing blood down to provide oxygen to tissues affords pain relief
- Rheumatoid arthritis of lower limb leading to immobility
- Hypoproteinaemia secondary to malnutrition
- Renal disease



Figure 1. Chronic oedema has caused wet legs in this immobile patient. The florid appearance is due to venous hypertension.

The prevalence of chronic oedema also increases with age, being 5.4/1000 in those aged over 65 years and 10.3/1000 in those aged over 85 years (Moffatt et al, 2003).

In more recent years, obesity has become more prevalent. When this occurs in an individual who may already have poor mobility, there is a greater impact, both on the individual's mobility and, due to raised intra-abdominal pressure, on the venous system, which may lead to chronic oedema.

### PHYSIOLOGY OF CHRONIC OEDEMA

Oedema develops when the rate of capillary filtration exceeds that of lymphatic drainage for a substantial period of time, i.e. there is more excess fluid produced by the tissues than can be transported away. This occurs over a number of weeks or months and therefore can be insidious in its development.

Capillary filtration, or the movement of fluid out from the capillary vessels is a passive process. The fluid passes into the interstitial fluid between and within tissues and most interstitial fluid is then returned to the circulation via the lymphatics with little being reabsorbed by the capillaries (Topham and Mortimer, 2002). Oedema develops due to either a rise in capillary filtration or a reduction in lymph drainage. Capillary filtration is influenced by inflammation, congestive cardiac failure and venous hypertension. Any of these factors may predispose people who are immobile or have limited mobility to the development of oedema. In these patients, intervention is required to maintain skin integrity to prevent the limb deteriorating into a wet leg (*Figure 1*).

### UNDERSTANDING WET LEGS

Lymph drainage from the oedematous limb can occur as a result of any open break in the skin; an opening, no matter how small, can cause fluid to weep or

drain. Insect bites, cuts, abrasions and cracks in skin from dryness or wounds of any type can all result in wet legs. Good skin care is therefore of paramount importance in patients with chronic oedema in order to reduce the risk of breaches in the skin's integrity and to maintain good hygiene to reduce the risk of infection. Skin care is discussed in more detail on pgs.13–19.

Lymph is a protein-rich fluid and its presence on the limb can lead to a number of complications. The composition of lymph provides a source of nutrients for bacteria and openings in the skin provide an entry point for micro-organisms, which can result in complications such as cellulitis, lymphangitis and erysipelas. Furthermore, the fluid can result in maceration of the skin if not managed appropriately.

### IMPACT OF MOISTURE ON SKIN INTEGRITY

Maceration is the term commonly used to describe the effect that excessive moisture has upon the skin. Thomas (2008) suggested that moisture-related skin changes would be more appropriate since it would include other types of superficial skin damage such as intertrigo and excoriation. *Figure 2* illustrates the damage which excessive moisture can cause.

### MANAGEMENT OF 'WET LEG' SYNDROME

There are several aspects of care to be considered and included to a lesser or greater degree depending on the individual patient. It is important to remember that the presence of fluid on the limb can feel cold, wet and uncomfortable. The leaking fluid can also saturate footwear, clothes, bedding and furniture necessitating several changes a day. These factors can greatly reduce the patient's quality of life and may lead to embarrassment and social isolation if not adequately managed.



Figure 2. Skin excoriation due to moisture. This 93-year-old patient is virtually immobile and sits for many hours with his legs dependant. He has excoriation of his feet due to moisture.

### The nurse/patient relationship

It is vital that a concordant relationship exists between the community nurse and the patient. This involves an exchange of information from the patient regarding their priorities for managing their problem (Mandel, 2006). The practitioner has a responsibility to explain to the patient, using terminology which they can comprehend, why their limbs have become oedematous and leaky and how they need to participate in their own care to remedy the situation. Failure to do so is likely to result in a scenario where the nurse is continually dressing wet limbs and the patient's quality of life gradually deteriorates.

### Use of wound dressings

The use of absorbent dressings, which incorporate either absorbent fibres or a foam, which will remove moisture from the wound/skin and distribute the fluid away from the wound contact layer by spreading laterally and upwards through the dressing. Many dressings also contain gel-forming agents which 'lock' the fluid away (Thomas, 2008).



Figure 3. An older woman who is immobile secondary to dementia. Inappropriate bandaging has exacerbated the problem.



Figure 4. The patient has cardiac failure and sits for long periods with his legs dependant, resulting in chronic oedema. Note the oedematous toes.



Figure 7. 85-year-old woman who had previous bilateral knee replacement surgery and was able to transfer to bed/chair only. Bilateral chronic oedema, worse in left leg. This patient stated that her legs were always slimmer in the early morning after a night in bed.

However the fluid-handling capability of any dressing has its limits, and, while it may seem logical to add more bulk to the dressing to increase its fluid-handling capability, this may have a detrimental effect upon the wound. As the surface pressure increases, the dressing loses its conformability and patient comfort is decreased. All dressings have their fluid-handling limit and once a dressing is saturated it should be renewed. To do otherwise risks maceration of the skin and the development of malodour.

It is vital that absorbent dressings are employed and their frequency of change is closely monitored. Any dressing which has increased wear

time due to high absorbency and retention of fluid, is beneficial to both the community nurse and patient since it represents cost-effectiveness in both time-saving and reduced numbers of dressings used (Beldon, 2008). Since the dressing is likely to be used under compression bandaging, it is important that it does not interrupt graduation of compression by being too bulky. The use of non-adherent, atraumatic dressings will avoid further damage to the skin. *Table 2* shows a list of dressings that are suitable for use under compression bandaging.

#### Multi-layer lymphoedema bandaging

Multilayer lymphoedema bandaging (MLLB) using short-stretch bandages, can be applied by a competent practitioner following thorough assessment, if it is considered appropriate for the patient. If the chronic oedema is due to severe cardiac failure, MLLB may not be indicated as the volume of fluid may cause cardio-pulmonary embarrassment. However, good practice in retention bandaging is important, as an inappropriately applied bandage may cause new problems (*Figure 3*).



Figure 5. Plantar flexion.



Figure 6. Dorsiflexion.

**Table 2**

Absorbent wound dressings to use under compression bandaging

- Foams: Allevyn®, Biatain®, Mepilex®
- Alginates: Algisite®, Sorbsan Plus®, Comfeel Seasorb®
- Protease modulating matrix dressing: Aquacel®, Flivasorb®, Sorbion Sana®

MLLB may be extremely useful in reducing chronic oedema and is often an acceptable treatment for elderly patients as it supports the tissues without squeezing them (Lindsay et al, 2003). The oedematous limb may be misshapen and the toes are often oedematous (*Figure 4*), so the patient may require both toe and limb bandaging. Particular attention should be paid to any skin folds at the ankle, and a wool padding bandage should be applied to both to ensure graduation of pressure and to protect any folds of skin by filling any indentations. Foam dressings may be used to protect vulnerable spots such as the Achilles tendon (Williams, 2003). Oedema may resolve quickly, especially if the patient fully participates in the plan of care which, in turn, will help to resolve leaking. Practitioners must be prepared to reapply bandages regularly and to modify the bandaging as needed and as the limbs change in size and shape. For this reason compression should be applied by a practitioner who is knowledgeable and competent in MLLB. Guidance for MLLB is provided on p24–31.

Once the leakage has stopped and skin condition improved, the usual compression regimen can be reintroduced.

## EXERCISE AND ELEVATION

Ankle joint movement is a vital biomechanical element of the functioning calf muscle pump (Davies et al, 2008). A reduction in the range of movement of the ankle joint leads to reduced calf muscle pump efficiency and consequently venous pressure may elevate (Kugler et al, 2001). Studies have demonstrated that exercise improves venous haemodynamics and increases calf muscle strength (Hartmann and Cheeseborough, 1994; Yang et al, 1999; Kan et al, 2001; Padberg et al, 2004). Patients should be encouraged to do simple exercises such as dorsiflexion and plantarflexion (*Figures 5 and 6*) to improve the calf muscle pump's efficiency.

The foot pump should also be considered. If the patient is able to bear weight (even if only to transfer from bed to chair), during such action, blood which has collected within the plantar plexus is emptied into the venous system and transported away. Thus, even relatively immobile patients may benefit from exercise, even if they are only standing for a few moments (White et al, 1996). Patients often comment that their legs are less oedematous in the morning after a night in bed (*Figure 7*). Practitioners should use this opportunity to explain the positive effect that gravity can have on the elevated limb, and patients should be encouraged to support the limb and elevate it at rest.

## CONCLUSION

The management of patients with chronic lower limb oedema and lymphorrhoea requires the attention of a knowledgeable and competent practitioner to both assess the patient and their limbs, and to integrate multi-factorial aspects of care.

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# HOW TO USE MULTILAYER INELASTIC BANDAGING AND COMPRESSION GARMENTS

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For a person with chronic oedema, which is either due to dependency, lymphovenous disease or mild uncomplicated lymphoedema of the lower limb and provided it is, by definition, mild to moderate and not a complex condition, then management and maintenance may take place in the community.

A full holistic assessment of the patient should be carried out, including vascular status, in accordance with local guidelines to establish a clear diagnosis and to determine suitability for compression. Once suitability is confirmed, treatment will revolve around:

- Skin care to maintain skin integrity in order to minimise the risk of infection (Lymphoedema Framework, 2006)
- Exercise/mobility to improve muscular strength, cardiovascular function, psychological wellbeing and functional capacity (Lymphoedema Framework, 2006)
- Compression therapy with multilayer, inelastic (short-stretch) bandages
- Compression hosiery.

The first two points are discussed elsewhere in this supplement, so this article will now focus upon the use of multilayer inelastic bandages and compression hosiery in the management of chronic oedema.

## COMPRESSION THERAPY

### Multilayer inelastic bandaging

Multilayer inelastic bandaging can be

used as part of the intensive stage of oedema therapy, to bring about volume reduction in the limb. In some patients, it may also be used in the long-term if the use of hosiery is contraindicated or for palliation.

Multilayer inelastic bandaging is indicated for the treatment of patients with:

- Ankle brachial pressure index (ABPI)  $>0.8$  or  $<1.2$
- Fragile, damaged or ulcerated skin
- Distorted limb shape
- Areas of tissue thickening/fibrosis
- Pronounced skin folds
- Presence of lymphorrhea
- Limbs which are too large to fit compression garments.

The positive effects of multilayer inelastic bandaging on limbs with chronic oedema include:

- Reduction in capillary filtration
- Movement of fluid into non-compressed parts of the body
- Increased lymphatic reabsorption and stimulation of lymphatic transport
- Improved venous pump function in patients with venous and lymphatic dysfunction (Foldi et al, 2005)
- Breakdown of fibrosclerotic tissue
- Improvement in skin conditions, such as hyperkeratosis and papillomatosis
- Support of overstretched inelastic tissue
- Elimination of lymphorrhea.

However, the use of this bandaging system should be used with caution in patients with:

- Acute cellulitis
- Uncontrolled cardiac failure
- Acute deep vein thrombosis
- Untreated trunk or genital oedema
- Latex allergies/sensitivities
- Arterial insufficiency; ABPI  $<0.8$  or  $>1.2$  (unless after specialist referral and under supervision)
- Diabetes and rheumatoid arthritis (unless after specialist referral and under supervision)
- Severe peripheral neuropathy, where there is a need for specialist supervision.

## HOW INELASTIC BANDAGING WORKS

As part of holistic assessment, the whole of the oedematous limb should be inspected and the extent of the swelling, limb shape and skin condition should be noted. These factors help to determine if below-knee or full-leg bandaging should be used. Generally in chronic oedema, bandages are applied to the whole limb as this prevents displacement of oedema above and below the bandaged areas.

However, if a shorter system is required and appropriate, bandaging should reach above the knee to prevent oedema accumulation in this area.

For patients with chronic oedema, short-stretch bandages such as Actico® are used to deliver compression in the majority of cases. This is because they have a low amount of extensibility and thus the ability to provide a semi-rigid casing around the limb. This results in a



greater variation between working and resting pressures, which enhances the function of the veins and the lymphatics (Partsch, 2003).

### Working pressure

Short-stretch bandaging has a very high resistance to stretch when pressure is applied to it through internal muscle contraction and joint movement, as occurs during exercise or movement of the limb. This force is referred to as 'working pressure'. The bandaging creates a soft, 'cast-like' environment which fully resists these forces and leads to a temporary increase in pressure inside the limb. This aids venous return and enhances the function of the lymphatics.

### Resting pressure

When the limb is resting, short-stretch bandages support the tissues without 'squeezing the leg'. This is called 'resting pressure'. The lower resting pressure exerted by short-stretch bandages makes them more comfortable for the patient to wear, encouraging concordance (Williams, 2002).

In patients with chronic oedema when short-stretch multilayer compression bandages are applied to the limb they compress the vein and help to close any damaged valves, stopping the backflow of blood and helping to improve lymphatic drainage (Figure 1).

### Calculating sub-bandage pressure

Compression bandaging is a

cornerstone of chronic oedema treatment. Its efficacy depends on correct application and the pressure exerted on the tissue covered by the bandage (the sub-bandage pressure). Laplace's law (Figure 2) is commonly used to predict the amount of sub-bandage pressure that a compression bandage will deliver. The law demonstrates that sub-bandage pressure will rise with increasing bandage tension, amount of bandage overlap and number of bandage layers, and will decrease with increasing limb circumference and bandage width.

In reality, the situation is more complex, because the oedematous leg is not truly cylindrical. The Laplace equation must therefore be interpreted with care.

### THE MULTILAYER INELASTIC BANDAGING SYSTEM

It should be noted that this component of chronic oedema management should not be delivered in isolation but in combination with skin care and exercise/movement (Doherty, 2006). The multilayer inelastic bandaging system usually consists of the following components (all products listed are available from Activa Healthcare):

- Skin care
- Toe bandaging: should be carried out using a 4cm conforming bandage if required, such as Moll elast<sup>®</sup>
- A layer of tubular retention bandage, such as ActiFast<sup>®</sup>
- Padding, such as FlexiBan<sup>®</sup> or

Cellona<sup>®</sup>

- Short-stretch bandages e.g. Actico<sup>®</sup> or in patients with known skin sensitivity, a 100% cotton bandage, e.g. Rosidal K<sup>®</sup>.

### A GUIDE TO APPLICATION

Before bandaging begins, the patient should be comfortable, and the limb needs to be adequately supported. The limb should be washed if possible, and a liberal amount of emollient applied. An appropriate wound dressing should be selected and applied if needed, in accordance with local guidelines.

#### Step 1

Toe bandaging may be necessary to prevent dependency oedema, or if swelling is present. Dorsal and toe oedema often occurs when using an elastic bandage system as the bandages are not strong enough to contain the swelling.

The toes can be bandaged using a 4cm or 5cm conforming bandage. Padding can be used to protect painful joints, e.g. bunions. The bandage should be anchored around the foot, then taken across the dorsum of the foot to the large toe. The toes should be evenly bandaged using several layers. The bandage should then be taken back across the dorsum and under the sole of the foot, and these steps repeated to ensure adequate coverage of each toe (Figure 3).

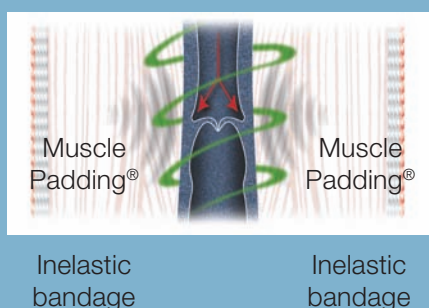


Figure 1. Effects of multilayer inelastic bandaging on venous return.

$$P = \frac{T \times N}{C \times W} \times 4630$$

P = Sub bandage pressure (mmHg)  
T = Bandage tension  
N = Number of layers  
C = Limb circumference (cm)  
W = Bandage width (cm)

Figure 2. Laplace's law.



Figure 3. Toe bandaging.

## Step 2

A layer of tubular retention bandage, e.g. ActiFast® is applied along the entire length of the limb; this will protect the skin, help with the penetration of emollients, absorb sweat, and hold any wound dressings in place. An extra 6cm of ActiFast® can be provided at each end of the limb and folded over to secure the padding layer and to prevent fraying (*Figure 4*).



Figure 4.

### Tip 1.

To make and use an ActiFast® pillow, take the correct width and length of ActiFast® to cover/fit the area to be protected, then pleat and fold a length of FlexiBan® padding and place inside the ActiFast®. This can be very useful when padding or infilling areas and can, if required, be re-used (*Figure 4*).

### Tip 2.

To confirm that application of padding has resulted in a graduated shape, place the hands around the limb, bringing the thumbs together at the front of the leg. Move the hands up the limb at regular increments, checking that the distance between the thumbs increases gradually.

## Step 3

With the foot in a dorsi-flex position if possible, the limb should be reshaped and protected using appropriate padding, e.g. FlexiBan®. This is used to protect the skin and tissue by reducing the risk of pressure damage to vulnerable pressure areas, such as the tibial crest, dorsum of foot, Achilles tendon and the popliteal fossa. Padding is also used to infill skin folds/hollows and to equalise pressure over the entire limb (*Tip 1*; *Figure 5*).



Figure 5.

#### Step 4

At this stage, the shape of the entire limb should be assessed. Padding should then be applied along the length of the leg with the aim of achieving an even conical shape. The unique shape of each limb needs to be considered, and padded accordingly to establish a graduated profile (*Tip 2*), decreasing from distal to proximal. This will help to enhance limb volume reduction and reshaping. It must be remembered that although many of the limbs to be treated are large to begin with, they must be padded fully to ensure an appropriate, graduated shape if a positive outcome is desired (*Figure 6*).



Figure 6.

#### Step 5

Before application of the first layer of inelastic bandaging, check that the foot is correctly positioned 'toe to nose' to maximise ankle movement post-bandaging. Apply a short stretch bandage such as Actico® 8cm. Make two turns at the base of the toes with tension ensuring a little padding is visible (cohesive bandages such as Actico® should not come in direct contact with skin to prevent exposure to potential allergens and skin damage). If a patient has a long foot, an extra turn can be applied to the mid-line.

Continue to bandage the foot using a figure-of-eight technique at the ankle to cover the heel. This technique results in fewer creases when moving. As the bandage reaches the ankle, apply at full-stretch in a simple spiral with 50% overlap to just above the malleolus (*Figure 7*). Full-stretch is achieved by pulling the bandage as firmly as possible and keeping the roll as close to the skin as possible during application. By following these simple measures, correct compression will be applied.



Figure 7.

### Step 6

At this point, cut off any excess 8cm bandage, and switch to a 10cm width. The bandages should be joined with a small overlap (*Figure 8*) and bandaging continued up the limb using a simple spiral technique with 50% overlap at an even, full stretch.



Figure 8.



Figure 9.

### Step 7

When bandaging the knee area, the patient can be sitting or standing but the knee needs to have slight flexion (*Figure 9*). Continue to bandage over the knee with the 10cm bandage, changing to 12cm above the knee. Continue using a simple spiral technique, with 50% overlap at full stretch, stopping just below the top of padding (*Figure 10*).



Figure 10

## Step 8

Apply a second layer of inelastic bandage if necessary. In patients requiring support and palliation, such as those with advanced cancer, one layer may be adequate. Two layers allow for greater reduction; additional layers can be applied by an experienced practitioner. Start at the foot again, using the same sequence of bandage sizes and technique, but take the bandages in the opposite direction to create a semi-rigid casing around the length of the leg (*Figure 11*). Any excess bandages can be cut off as before. Ensure all layers have bonded by applying gentle pressure and check that they are secure. The cohesive properties of Actico® aids self-bandaging in patients who are competent to do so.



Figure 11.

## REAPPLICATION OF BANDAGES

Frequency of reapplication will be determined by the severity of the oedema, condition of the skin and rate of oedema reduction, which is greatest in the first few weeks of treatment. A decrease in limb volume can lead to bandages becoming a little loose. They may need to be checked more frequently and changed more often in the initial weeks to ensure that sub-bandage pressure keeps pace with changes in the size of the limb. If the patient has a wound, the need to dress this may also influence the frequency of rebandaging, as may issues with continence (Lymphoedema Framework, 2006).

Actico® only has 1% elastane in the material, which will help the bandage not to shorten around the limb after application and it will not exert an ever increasing pressure during inactivity, making it comfortable to wear (*Table 1*).

On bandage removal, puffy areas may be seen where oedema has formed. This indicates insufficient pressure in these areas, either as a result of too few layers of bandage or not enough bandage tension. Also observe for oedema of the toes if not bandaged, and for the presence of any oedema proximal to where bandaging ends. Red or broken areas indicate that excessive pressure has been applied at that point and these require protection from pressure damage (Doherty, 2006).

The principles of short-stretch bandaging are summarised in *Table 2*.

## HOSIERY

Once multilayer inelastic bandaging has been used to reduce limb swelling, compression hosiery can be used to maintain the reduction. Chronic oedema tends to be a life-long condition and successful

**Table 1**  
Practitioner's comment from a clinical audit of Actico® inelastic cohesive bandage

- Patient had no cramp as experienced with previous cotton short-stretch bandages
- Patient found it fairly easy to mobilise and exercise with the Actico® bandage. It is lighter and less bulky than other bandages
- Bandage did not slip between treatments
- Very useful for lymphovenous disease – bandages hold better so patient has to attend the clinic less
- Patient found them lighter and more comfortable than previous short-stretch bandages
- Lighter for a patient with palliative needs  
Williams (2005)

**Table 2**  
Bandaging principles

Apply bandages at full extension, except for wrapping toes

The entire limb should be protected using under padding

Always apply additional padding to the popliteal fossa (the area on the back side of the leg at the knee joint)

Bandage joints when they are in a functional position to prevent creases during movement

It may be advisable to bandage joints using figure-of-eight turns, as fewer creases develop during movement

Caution should be taken if sensory or vascular deficit is present (e.g. diabetes mellitus, paralysis, bronchial asthma or hypertension)



Figure 12. Thigh-length grip top European class 2 hosiery on an oedematous limb.



Figure 15. Pull the stocking up the leg in stages - do not force it.



Figure 16. Thigh length stockings should be pulled up to the middle section of the thigh.



Figure 17. Below knee stockings should be pulled up to the bend at the back of the knee.



Figure 13. Slip your hand down the inside of the stocking. Gently grasp the heel area and pull the stocking inside out. This will leave the toe region still tucked in. Fold back the edge about an inch/2-3 cms so that the toes can easily be slipped into the front of the stocking. Unfold the inch while getting the toes and heel into the right position.



Figure 14. Gently pull the rest of the stocking over the foot, heel and ankle.



Figure 18. Ensure that the toes are not restricted.

**Table 3**  
Comparison of compression levels

	Actilymph European standard hosiery	Activa British standard hosiery
Class 1	18–21mmHg	14–17mmHg
Class 2	23–32mmHg	18–24mmHg
Class 3	34–46mmHg	25–35mmHg

control of this requires continual skin and preventive care through the use of compression hosiery. Limb shape plays an important role when selecting a compression garment (International Consensus, 2006). While some patients may require made-to-measure hosiery due to shape distortion, the majority of patients with minimal or no limb distortion are able to fit into stock sizes and can use a circular knit stocking.

Hosiery should only be prescribed following full assessment and consideration of factors such as the severity of the oedema, the patient's comfort, preference, lifestyle, psychosocial status, current disease and ability to apply and remove garments. Measurement should only take place when swelling and pitting oedema has been minimised. Accurate measurement is important to achieve a correct fit for both ready to wear and custom made garments and should be carried out according to the manufacturer's instructions.

Once the new garment is received, the practitioner should check that it fits properly and fully covers the area needing treatment. At the first fitting, the patient/carer should be taught how to apply the garment (Figures 13–18), remove and care for it, with the practitioner ensuring

that the patient/carer can do this without difficulty. At follow up, the practitioner should check that the patient is concordant with treatment and that the swelling is not occurring proximally or distally to the dressing (Lymphoedema Framework, 2006).

### THE ACTILYMPH RANGE OF COMPRESSION GARMENTS

The ActiLymph® European compression garments have been specially designed for the management of chronic oedema but have some differences to British Standard hosiery including:

- The level of compression for each class (Table 3)
- The differences in styles available
- The difference in sizes available
- The function and construction of the material.

The majority of chronic oedema patients will benefit from the use of thigh-length stockings, and those in the Actilymph® range have a comfortable beaded silicon top band which alleviates the need for the patient to wear a suspender belt (Figure 12). For those requiring below-knee garments, these are available in two lengths:

- Petite for less than 38cm
- Standard length for limbs greater than 38cm.

It is important to have a stocking that will sit on the surface of the skin and not enter into skin folds or creases while having the ability to contain and give long-term maintenance to the limb. Therefore, one needs to consider the construction of the fabric and stiffness index of the garment.

The Actilymph® hosiery range provides additional levels of stiffness and compression, yet remain comfortable to wear and easy to apply. Some patient groups such as the elderly or infirm will benefit from using the ActiGlide® hosiery applicator. Both

Actilymph® and ActiGlide® are available on FP10/GP10 and are nurse prescribable.

### CONCLUSIONS

Multilayer inelastic bandaging is a mainstay of chronic oedema management that is used for intensive therapy or the long-term management or palliation of some patients. However, it must be used as part of an holistic approach to management, which should also include skin care and exercise. It should only be used following thorough assessment and once an accurate diagnosis has been made, since its use is contraindicated in some patient groups. The use of short-stretch bandages such as Actico® is beneficial due to the high working and low resting pressures exerted, which makes this type of system particularly comfortable for the patient. Once the limb volume has reduced, the majority of patients can be maintained using hosiery, such as the ActiLymph compression stocking.

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