Improving Diabetes Care and Outcomes

Lower Limb Ulcers in Diabetes

A Practical Guide to Diagnosis and Management

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A practical guide to lower limb ulcer management

Lower limb ulcers are responsible for more hospital admissions of patients with diabetes than any other single cause. Many of these admissions are prolonged. Effective management of lower limb ulcers in patients with diabetes can prevent many of the complications associated with ulcers, and also may result in fewer and shorter hospital admissions for treatment of ulcers.

Patients with diabetes can develop ulcers secondary to —

- **venous insufficiency**, which is common in all patients, whether they have diabetes or not
- **peripheral neuropathy**, through foot deformity (motor neuropathy), lack of sensation (sensory neuropathy) and dry skin and subsequent fissuring (autonomic neuropathy)
- **ischaemia**, because of their propensity to large vessel atherosclerosis.

Patients with diabetes are also prone to develop infection in lower limb ulcers if their diabetes is poorly controlled.

These guidelines have been prepared as an aid to clinical decision-making and to assist the practitioner in the management of patients with diabetes and lower limb ulcers. Adherence to them does not guarantee a successful outcome in every case, but they do encompass known effective processes of care. The ultimate judgement concerning a particular patient or treatment depends on the exercise
of clinical discretion.

How to use this document

This document contains a **core section** which is designed to be read by all health professionals involved in the care of patients with diabetes and lower limb ulceration.

There are **three supplements** in which further information is supplied to specific health professional groups (general practitioners, podiatrists, nurses) in aspects of ulcer care relevant to them.

Prevention of lower limb ulcers should be the primary goal of those involved in the care of patients with diabetes, and a section on Patient Education has been included in this document.

Managing the ulcer

There are a few simple principles which can be applied to the treatment of all ulcers.

Identify and treat the cause

Successful management of ulcers is dependent on identifying and treating the underlying pathology responsible for the ulcer.

Devise a plan of management

This should include a deadline for improvement in the ulcer.

Assess for infection

Treat infection promptly if it is suspected (see page 12).
In general, other local treatment such as compression therapy or debridement should be deferred until any infection is controlled.

Use an ulcer record chart

It is important to monitor the progress of ulcer treatment (see the inside back cover for a chart to use).

Apply local treatment

- Clean the ulcer.
- Debride where appropriate.
- Apply appropriate dressings.

Identifying the ulcer

Lower limb ulcers in patients with diabetes can be divided into three clinical types: venous, neuropathic and ischaemic.

In most cases, the type of ulcer can be quickly identified by assessing three parameters:

- the **position** of the ulcer
- the **surrounds** of the ulcer
- the **character** of the ulcer.

Infection

Infection may be associated with any ulcer.

Local signs of infection such as swelling, erythema and heat may be absent.

A high index of suspicion of infection is needed for any ulcer in a patient with diabetes, especially if it is painful.

Venous ulcers

The most common (>80%) lower limb ulcer in all patients, whether they have diabetes or not

Position

Lower calf

Surrounds

Venous eczema

Pigmentation

Possible ankle oedema

Character

Usually painless

Exudative

Irregular hyperaemic edges

Important consideration

Ischaemia may complicate a venous or neuropathic ulcer. The appearance may still conform to the venous or neuropathic picture in such cases.

Identifying the ulcer

Neuropathic ulcers

Much more common in people with diabetes than in those without diabetes

Position

Plantar aspect of foot

Pressure points

Surrounds

Callus/hyperkeratosis

Patchy loss of sensation

Absent ankle reflexes

Character

Painless

Exudative

Hyperaemic or inactive edges

Ischaemic ulcers

Uncommon in any patient, but delayed treatment may result in limb loss

Position

Foot borders

Apex of toes

Dorsum of foot

Surrounds

Pale shiny skin

Poor capillary return

Dry skin/fissures

Absent pulses

Character

Painful

Non-exudative

Inactive edges

Two indications that ischaemia may be present are:
- pain in an ulcer that should be painless
- the absence of palpable peripheral pulses.

Treating the cause

While most lower limb ulcers begin as superficial wounds after local trauma, their failure to heal is due to underlying pathological processes. These must be corrected for healing to occur.

Venous ulcers

Cause

Chronic venous hypertension due to venous valvular reflux

Treatment

Graduated compression bandaging

Leg elevation

Possible removal of varicose veins (after ulcer has healed)

Treating the cause

Neuropathic ulcers

Cause

Abnormal pressure due to biomechanical factors (altered shape of foot) and lack of early warning pain mechanism

Treatment

Pressure redistribution by aggressive callus debridement / orthoses / modified footwear / casts

Ischaemic ulcers

Cause

Decreased arterial perfusion due to occlusive macrovascular arterial disease

Treatment

Revascularization by interventional (surgical / percutaneous) techniques

Surgical debridement (in theatre)

AVOID compression or elevation

Applying local treatment

Dressings are only an adjunct to treatment, and are not a substitute for treating the pathological process underlying the ulcer formation.

Dressings have the potential to facilitate wound healing, but inappropriate application of dressings can also retard the healing of an ulcer.

It is best to become familiar with a small group of dressings for ulcers, with perhaps one type of dressing from each treatment group (see table).

There is no substitute for **frequent inspection** of the ulcer under the dressing to assess progress.

Venous ulcers

Character

Exudative

Sloughy

Shallow

Usually painless

Dressing

Absorptive dressings

Alginates or foam types

Additional treatment

Graduated compression bandaging

Leg elevation

Possible removal of varicose veins (after ulcer has healed)

Neuropathic ulcers

Character

Exudative

Sloughy

Deep

Painless

Dressing

Absorptive and protective dressings

Foam type preferred

Additional treatment

Pressure redistribution by aggressive callus debridement / orthoses / modified footwear / casts

Ischaemic ulcers

Character

Non-exudative

Necrotic eschar

Painful

Dressing

Dressing for loosening necrotic material

Hydrophilic gels

Additional treatment

Revascularization by interventional (surgical / percutaneous) techniques

Surgical debridement (in theatre)

AVOID compression or elevation

Assessing for infection

There is no definite way to determine whether an ulcer is infected or not — **clinical suspicion** is the most important criterion. In patients with diabetes, an important sign of infection can be **elevated blood sugar levels** and difficulty in controlling blood sugar levels with medication.

Local infection should be suspected if:

- there is an increase in pain from the ulcer
- there is heat, swelling or erythema in the area surrounding the ulcer
- there is an increase in **discharge** from the ulcer
- there is an **odour** arising from the ulcer
- the ulcer appears to be increasing in **size or depth**
- there are tender inguinal **lymph nodes**

Constitutional symptoms and signs of infection (fever, rigors, malaise, and elevated white cell count) are **often lacking** in patients with diabetes and with infected lower limb ulcers.

Infection signs
Elevated blood sugar levels
Blood sugar levels difficult to control
Painful ulcer
Heat, swelling, erythema
Increased discharge from ulcer
Odour from ulcer
Increased size or depth of ulcer
Tender inguinal lymph nodes

Non-healing ulcers

Ulcer healing requires both adequate perfusion for granulation and good quality surrounding skin for epithelialisation.

Many of the factors responsible for poor healing can be corrected.

Since the time-course of ulcer resolution is measured in weeks or months, it is helpful to have a record of the progress of the ulcer. Size can be measured two-dimensionally by tracing the contour of the ulcer on transparent paper.

Persistance or expansion of an ulcer after all the potentially correctible factors have been addressed is an indication for referral to a specialist clinic for further evaluation.

Factors which may retard healing

Local
Infection
Oedema
Poor condition of surrounding skin (eg. eczema, maceration)
Ischaemia
Foreign body in ulcer base (eg. calcification of venous ulcer base)
Inadequate debridement of necrotic wound debris
Inadequate primary treatment (eg. compression bandaging, callus debridement, re-distribution of pressure)
Allergy to dressing materials
Inappropriate dressings
General
Poorly controlled diabetes (persistent hyperglycaemia)
Anaemia (if severe)
Poor compliance with treatment

Patient education:

Foot care advice for people with diabetes

It is the responsibility of all health professionals to give patients information which can help to prevent lower limb ulcers.

Check every day

Look very carefully at your feet every day. If you can't see well, ask someone else who can.

This ensures you can have any small foot injuries treated promptly. With prompt treatment they are more likely to heal quickly and you are more likely to avoid amputations.

Have your doctor check

Ask your doctor to look at your feet on every visit.

Always wear shoes

Never go barefoot because you may not feel a stone or sharp object, or realise the road or sand is too hot.

Avoid heat

Because you may not feel a burn —

- never warm your feet in front of a heater
- avoid hot water bottles
- take care with hot liquids and hot sand on the beach
- use sunscreen on bare legs and feet
- avoid hot water in baths, showers and spas. Test the temperature with your forearm first.

Treat injuries immediately

First Aid for a small injury (eg. scratch, blister, or red rubbed area):

- wash the foot with tap water either from a nozzle or in a bowl
- gently pat the foot dry with a clean towel
- cover the injury with a non-stick dressing
- fix the dressing in place with tape (from chemist)
- avoid using plastic dressing strips or dressings with a strong adhesive
- clean the wound by washing and change the dressing every day.

Go immediately to your doctor, podiatrist or hospital emergency department if you are not able to treat the injury yourself.

If there is redness, swelling or leaking fluid, remember that this could mean infection — go to your doctor, podiatrist or hospital

A Foot First Aid Kit with first aid and routine foot care materials is available from Diabetes Australia.

emergency department.

Treat any common foot problems

Small injuries — use first aid.

Dry skin — ask the chemist for a moisturising cream. Rub it well into the feet at least once a day.

Wet, raw, peeling skin between toes — treat with first aid as for an injury, but seek medical advice if it persists, as tinea may be present.

Moist white skin between toes— after drying well, dip a cotton applicator into methylated spirits and wipe all the area between the toes.

If there is no improvement within a week, ask your doctor or podiatrist to advise you on which other medicine you can use, as tinea may be present.

Wear appropriate socks or stock-

Choose mixtures of cotton or wool with some polyester.

Choose padded socks if possible, but ensure that shoes are big enough to take them.

Avoid —

- tight elastic
- darns or bulky seams
- socks and stockings which are too loose or too tight.

Choose the right shoes

Choose shoes with —

- a shoe upper of soft materials
- no seams or stitches over toe joints
- secure fastenings such as laces, straps, velcro or zips
- cushioning synthetic soles.

Have shoes fitted carefully with —

- no tight spots
- the widest heel base possible
- a firm heel cup
- plenty of room for toes to stretch.

Take your insoles, orthoses, or padded socks with you when buying shoes.

Have a fitting done each time you buy shoes, as sizes can vary between brands.

Have shoe fittings done late in the day when your feet are at their largest.

Wear new shoes for one hour at first, while sitting down. Then check feet for signs of pressure such as redness. Total wearing time should add up to 20 hours inside the house before wearing the shoes outside.

Resources

The management of lower limb ulcers requires a multidisciplinary team approach. Ulcer treatment is often **protracted** and **frequent assessment is mandatory** to detect any complications at an early stage. Timely assistance from the resource areas outlined below can be of considerable benefit in the assessment and treatment of lower limb ulceration.

Community Nursing

Many elderly patients with lower limb ulcers are unable to apply dressings or bandages to their ulcers unaided. They may also find it difficult to visit surgeries or medical centres/clinics on a frequent basis.

Community Nurses provide an invaluable service in:

- advising on appropriate ulcer dressings
- ensuring that ulcer dressings and bandages are correctly applied;
- assessing progress or deterioration in the ulcer by frequent inspection and measurement of the ulcer;
- alerting the general practitioner to any developing problems.

Podiatry

Podiatrists have a vital role to play in the prevention and management of foot ulcers. Services that qualified podiatrists can supply include:

- **assessment** of abnormal pressure areas which are the precursors of ulcer formation, especially in patients with peripheral neuropathy;
- **advice** regarding footwear which may prevent ulcer development;
- **construction** of orthoses to re-distribute pressure away from potential or actual ulcer areas;
- **debridement** of callus at pressure areas to prevent ulcers and of callus surrounding ulcers to promote healing;
- involvement in **total contact cast** fitting and **monitoring** of ulcer progress.

Where to refer for advice and help with ongoing management

- Public hospital clinics:
  - — high risk foot clinics (Endocrinology Depts in some tertiary referral institutions)
  - — diabetes complications clinics (Endocrinology Depts)
  - — ulcer clinics (General Surg. or Vascular Surg./Med. Depts)
- Podiatrists with a special interest in diabetes care (information from Diabetes Australia)
- Diabetes Centres & Diabetes Educators
- Community Nursing Organizations (members with wound management experience)
- Specialists with an interest in diabetic foot problems (physicians or surgeons)

Specialised vascular investigation and assessment

Since the consequences of failure to recognise ischaemia as a cause or contributor to lower limb ulceration can result in limb loss, objective assessment of perfusion is desirable in cases where there is reasonable doubt about the adequacy of peripheral circulation.

The cornerstone of objective peripheral arterial assessment is the **Doppler pressure measurement**. This simple and inexpensive screening test is routinely provided by **Vascular Laboratories** and by some radiological facilities. If the ratio of the ankle (posterior tibial/dorsalis pedis artery) systolic pressure to the arm (brachial artery) systolic pressure is < 0.75, then significant ischaemia is present.

More complex investigations of the peripheral vasculature include **duplex ultrasound** assessment and **angiography**. Such investigations are used as a prelude to surgery or angioplasty and are best reserved for this indication rather than as screening tests.

Specialists in vascular disease (**vascular surgeons or vascular physicians**) can offer a comprehensive assessment and treatment service for lower limb ulcers in which a vascular component is suspected. **Vascular clinics** are available in many public teaching hospitals, and many hospitals also provide a leg ulcer clinic.

Consider referral if...

- the ulcer is persistently painful
- the ulcer is infected and does not respond promptly (24—48 hours) to treatment
- diabetes control is poor
- the ulcer is thought to be of ischaemic origin
- the ulcer is deteriorating despite treatment
- there is a question about the aetiology of the ulcer
- more specialised treatment is warranted (such as regular debridement or total contact casting)

General Practice Supplement

If the cause of an ulcer is not apparent after clinical assessment, investigations may be required to establish the aetiology and to plan effective treatment.

Specific management strategies appropriate to the major ulcer types are detailed here. These comments are accompanied by treatment flow charts for ulcer management.

The investigation of unusual ulcers is considered in a separate section on page 27.

Venous ulcers

Investigation

Uncomplicated venous ulcers do not usually require any further investigations. Detailed assessment of the distribution of varicose veins or investigation of the deep venous system is not necessary unless vein surgery is being planned. Under these circumstances, the surgeon involved will usually organise the appropriate tests.

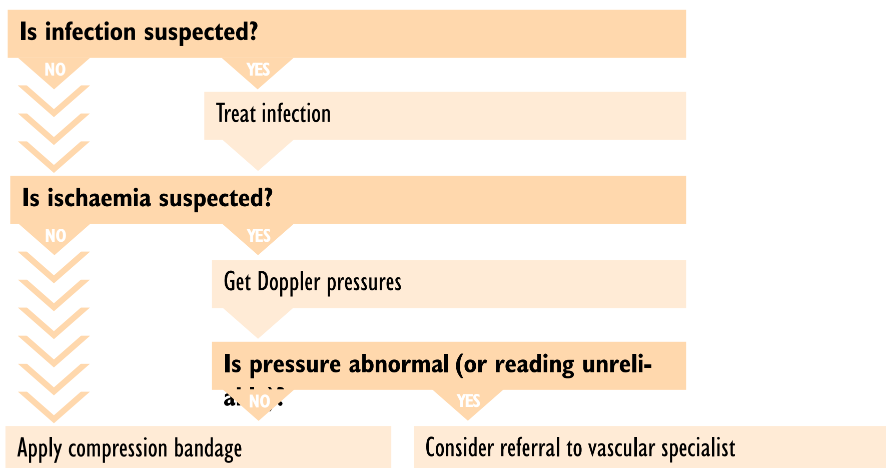
Assess perfusion

The clinical assessment of any ulcer should include

- assessment for elevation pallor and
- **palpation of peripheral pulses**.

Should these be impalpable, then the ulcer should be suspected of having a significant ischaemic component, and this should be confirmed by **Doppler pressure studies.** If these reveal significant ischaemia, then this must be considered the more important contributor to the aetiology of the ulcer and the ulcer should be treated as a primarily ischaemic one (see page 22).

Treatment flowchart for venous ulcers



Management

Compression bandages

Contra-indications — compression treatment is contra-indicated by leg ischaemia or ulcer infection. If either condition is suspected, compression treatment should be withheld.

Compression bandages are either a combination of elastic and cotton, or just elastic, and are usually applied to produce a pressure of **15-35 mmHg**. They are placed over the dressings, and wound in a spiral fashion from the foot to just below knee level.

There are some types of bandages which incorporate a topical healing agent such as zinc and there are several bandage systems which incorporate several layers, both elastic and non-elastic.

Many bandages are designed to remain in place for several days at a time. Most compression bandages come with instructions, though patients may require the assistance of a carer or community nurse to apply bandages correctly. Patients should be instructed to remove any bandages immediately if they are causing pain.

Elevation

The patient's leg should be kept in an **elevated position** when sitting or lying. It may be possible to elevate the foot of the patient's bed to improve venous return at night.

Debridement

Chemical or mechanical debridement to the base of some venous ulcers may be beneficial if there is a thick yellow layer of fibrin. This can be accomplished by using a pair of metal forceps and a scalpel to remove any loose or dead tissue. A half-strength elase (proteolytic enzyme) solution while sometimes effective should be used with caution and never for more than a few days. Other agents such as hydrocolloid pastes can also be used.

Skin grafting

Accelerated healing can sometimes be achieved by means of a **split skin graft**. This technique is useful for ulcers of large surface area which have a healthy granulating base and are not infected.

Varicose vein surgery

Consideration of **varicose vein removal** is usually deferred until after the ulcer has healed.

Neuropathic ulcers

Investigation

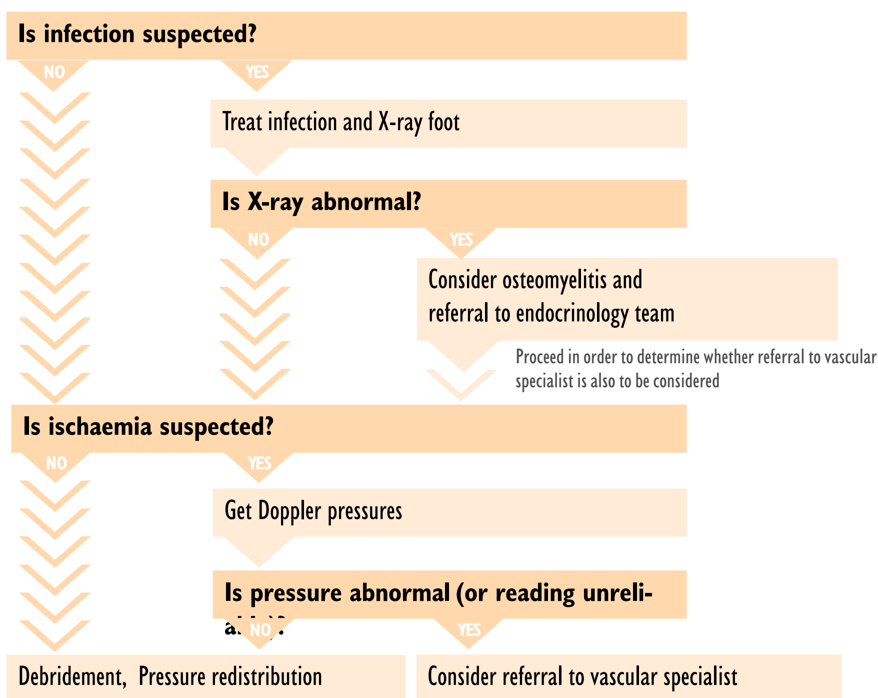
Test diabetic patients for neuropathy

All patients with diabetes should be assessed for peripheral neuropathy. Such testing should include vibration and light touch sensation, and an assessment of lying and standing blood pressure and pulse rate to detect autonomic neuropathy.

A useful standard way of testing light touch is by means of a 5.07 (10g) monofilament. This nylon fibre is placed on the skin and pressure applied until the fibre deforms. A person with normal sensation should be able to feel the fibre at that stage. Several points on each leg should be tested, since neuropathy may be patchy, and it is best to avoid areas of heavy callus. Any failure to detect the pressure of the monofilament is strongly suggestive of peripheral neuropathy.

Information about monofilaments can be obtained from Diabetes Australia.

Treatment flowchart for neuropathic ulcers



Obtain foot X-rays

Foot X-rays should be obtained in all cases of neuropathic ulceration. X-rays are useful in providing a baseline for future X-rays and in identifying: osteomyelitis, bone malalignment, neuropathy, any radio-opaque foreign body, or the presence of gas in the soft tissues which may suggest Clostridial infection. It is important to realise that bone may appear normal on X-ray in the early stages of osteomyelitis.

Assess perfusion

The clinical assessment of any ulcer should include

- assessment for elevation pallor and
- **palpation of peripheral pulses**.

Should these be impalpable, then the ulcer should be suspected of having a significant ischaemic component, and this should be confirmed by **Doppler pressure studies.** If these reveal significant ischaemia, then this must be considered the more important contributor to the aetiology of the ulcer and the ulcer should be treated as a primarily ischaemic one (see page

22).

Management

Debridement

To promote healing, the callus surrounding the ulcer should be debrided to expose healthy tissue and reduce pressure. This task is best performed by a podiatrist on a regular and frequent (often weekly) basis.

Pressure re-distribution

Methods of pressure reduction over ulcerated areas include the use of **orthoses** (insoles), shoe modification,temporary new footwear such as post-operative sandals, and **total contact casting**. Access to a good podiatry service is essential to provide these treatments. When the ulcer is healed, attention must be paid to supplying **appropriate footwear** to prevent re-occurrence of the ulcer.

Ischaemic ulcers

Investigation

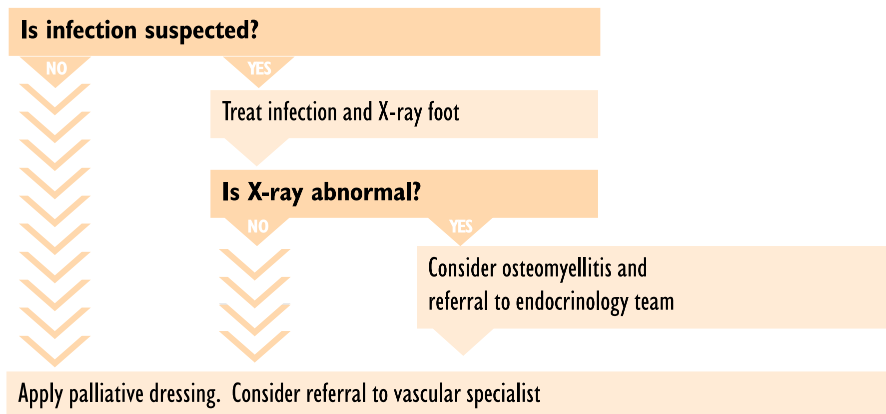
Check for signs and symptoms of arterial insufficiency

If **pain** in a foot without palpable pulses is persistent, this is a sign of severe arterial compromise and is an indication for urgent referral for revascularization of the limb. Often patients complain particularly of pain in the foot during the night, which is relieved temporarily by putting the foot in a dependent position. A prior history of claudication is often lacking, especially in elderly patients.

Quantify perfusion

The extent of arterial insufficiency should be quantitated by **Doppler pressure measurements** (see page 17). A foot ulcer associated with an absolute foot pressure of < 55 mmHg is unlikely to heal without revascularization of the limb; if between 55 and 100 mmHg, then it may heal in time,

Treatment flowchart for ischaemic ulcers



but revascularisation remains an important option.

Note that pressure measurements provide vital information about adequacy of leg perfusion. Imaging techniques such as duplex ultrasound and angiography provide documentation of areas of stenosis or occlusion rather than an overall assessment of perfusion.

Vascular calcification is a problem encountered frequently in patients with diabetes, and this can prevent accurate measurement of pressure by the Doppler method.

If pressure results are reported as " > x mmHg", then such results are unreliable. While toe pressures can be more reliable, referral to a vascular specialist should be made under any circumstances where there is doubt about the perfusion of the leg.

Management

Palliative measures

Elevation of the head of the bed can sometimes be of benefit in increasing foot perfusion during the night. Drugs such as beta-blockers should be avoided.

Reperfusion

There is no drug therapy which has been proven to heal ischaemic ulcers. Consider **early referral** to a vascular specialist or clinic if an ulcer of ischaemic origin is recognised or suspected, as revascularization can result in limb salvage in many cases. Revascularization may take the form of angioplasty (balloon dilatation, stent placement, endarterectomy), or bypass grafting may be required.

Debridement

There is **no place** for debridement of ischaemic ulcers outside the operating theatre.

Infection

Antibiotic therapy for infected ulcers is empiric. Since *Staph. aureus* and *Strep. pyogenes* are often pathogenic organisms in diabetic ulcers, treatment should aim to cover these organisms. Swabs may be unreliable in identifying infection of an ulcer, as it is difficult to distinguish between colonising organisms and pathogenic ones. Antibiotics which are often prescribed include Cephalexin, Augmentin, Clindamycin and Dicloxacillin. Flucloxacillin is also used. Penicillin is effective against *Strep. pyogenes* but should usually be combined with an anti-staphylococcal agent. Anaerobic infection (commonly manifested by a malodourous ulcer) can be treated with metronidazole. It is usually not necessary to cover for gram-negative organisms unless the patient is obviously unwell. Oral antibiotics may be used initially for treatment of local infection in an ulcer, but intraveneous antibiotics should be used if there is not a prompt improvement.

Renal function should be monitored if nephrotoxic antibiotocs are used and dosage adjusted as required.

Topical antibiotics have no place in the treatment of infected lower limb ulcers.

Infections arising in foot ulcers, especially chronic ones, can be associated with underlying **osteomyelitis**. An X-ray is mandatory in chronically infected foot ulcers to assess underlying bone structure. Foreign bodies can also be associated with infection. If osteomyelitis is suspected on X-ray, prompt referral and hospitalization can limit bone loss due to infection and may save the foot from amputation. If osteomyelitis is proven or if the patient is unwell, intravenous antibiotics are recommended initially, followed by several weeks of oral therapy.

Local signs of infection can be masked in ischaemic ulcers because poor perfusion may limit the local white cell inflammatory response. A **high index of suspicion** for infection is called for in such cases. Infected ischaemic ulcers are also very difficult to treat effectively, since antibiotic penetration to the site of infection is limited by poor perfusion. If infection does not resolve promptly (within days) with oral antibiotics, intravenous antibiotics and possibly revascularization of the limb, may be required.

Non-healing ulcers

A plan of action with **clearly defined deadlines** for clinical improvement and **parameters of progress** which can be easily measured can help to identify ulcers which are failing to respond to treatment.

If there has been no improvement after several weeks of treatment, a re-assessment is necessary. Treatment failure is usually due to one or more of a number of causes as set out on page 13. The following paragraphs refer to some important causes.

Infection and/or ischaemia

An empiric course of antibiotics is often the only practical way to determine if infection plays a role in retarding ulcer healing. Response should be prompt (within a week). Ischaemia if suspected should be assessed by Doppler pressure measurements as set out above (page 22).

Inadequate treatment of the underlying pathological process

For venous ulcers, this may be due to insufficient compression bandaging, while for neuropathic ulcers, it could be due to failure to correct abnormal pressure at the site of the ulcer.

Use of inappropriate dressings

Occlusive or non-absorbant dressings on exudative ulcers can trap exudate beneath the dressing, which can lead to maceration of the ulcer edge and prevent healing at this interface. Maceration can be recognised by an unhealthy white appearance to the ulcer edge, which is often soft and soggy. If this is found, a change of dressing to an absorbant type (either foam or alginate) should quickly resolve the

problem.

Insufficient debridement

Lack of debridement can retard healing by allowing buildup of dead skin, callus or necrotic material within or surrounding an ulcer. This prevents healthy new skin or granulation tissue from developing. Mechanical approaches to debridement are the most satisfactory. This is best achieved by use of a scalpel and forceps to gently remove non-viable tissue. Experience is necessary to perform this task satisfactorily. Callus debridement is best done by a podiatrist. It is often required on a weekly basis in neuropathic ulcers.

Debridement should not be attempted if an ischaemic aetiology for the ulcer is suspected.

Dressing allergy

Dressing allergy is uncommon. It can sometimes be recognised by inflammation of the tissue surrounding the ulcer which matches the area of the dressing, but infection must be suspected first if inflammation is seen. Sometimes allergy can be manifested by failure of an ulcer to granulate satisfactorily. Changing the type of dressing should result in

Re-evaluating a non-healing ulcer

Infection ?	Treat with appropriate antibiotics
Ischaemia ?	Refer to vascular specialist
Inappropriate dressing ?	Change dressing
Mis-identification of ulcer cause ?	Re-assess clinical picture

a prompt response — within a week the ulcer should start to improve.

Unusual causes of ulceration

Certain characteristics of an ulcer can suggest an unusual cause. An uncommon cause of ulceration in the lower limb should be considered if an ulcer:

- is in an unusual site (eg. upper calf)
- has failed to respond to management
- exists at multiple sites
- is associated with constitutional symptoms without local signs of infection
- is painful in the presence of normal pulses and in the absence of infection.

Unusual causes of lower limb ulcers include:

- **inflammatory** ulcers (eg. pyoderma gangrenosum)
- **immunologic** ulcers (eg. vasculitis)
- **neoplastic** ulcers.

Investigation of unusual ulcers usually involve a **biopsy** of the ulcer edge. This procedure yields more information than almost any other single test. If there is uncertainty about the nature of an ulcer or if an unusual cause is suspected, referral to a specialist clinic is indicated.

Podiatry Supplement

Assessment

Podiatrists have a unique role in the prevention and treatment of foot complications in diabetes through education and the use of specialised procedures in foot care.

Active foot problem assessment

Document presence of:
Gangrene/ulceration
Soft tissue infection
Corns/callus/haemorrhagic pre-ulcerous callus
Dystrophic toenails
Traumatised areas (blisters, abrasions, erythematous areas)
Dry skin with active or potential fissures
Interdigital maceration / erosions / fissures
Foot deformity - claw toes - hammer toes - hallux valgus – bunions - Charcot foot (neuro-arthropathy).

Risk factor assessment

- Poor foot care
- Poor motivation (denial)
- Poor footwear
- Socio-economic disadvantage
- Physical disability:
  - poor vision
  - advanced age
  - poor mobility/agility
- History of previous foot ulceration or amputation
- Foot deformity or joint dysfunction

Vascular assessment

- Palpate pulses
- Test capillary return
- Perform Buerger's test (elevation pallor, dependent rubor).

Neurological assessment

- Test vibration perception with biothesiometer or tuning fork (128c)
- Test ankle reflexes
- Test light touch sensation with 5.07 (10 g) monofilament.

Biomechanical assessment

- Examine lower limb joints to identify abnormalities in range or axis of motion
- Test lower limb muscle tone
- Examine gait using either a walkway or treadmill (+/- electronic data gathering)
- Devise individual treatment for abnormalities (exercises, physiotherapy, orthotics or footwear modification).

Treatment

Podiatry has much to offer in terms of prevention of all foot ulcers. However, if there is gangrene or suspicion of infection, immediate referral must be organised to the general practitioner, specialist or hospital emergency facility if a doctor cannot be contacted. Regular and frequent attention to callus debridement at the borders of ulcers is an essential part of ulcer treatment providing that ischaemia has been excluded by assessment.

Foot ulceration

Identify cause of ulceration (see pages 6—9)

Liaise closely with medical and nursing staff to ensure that all health care professionals involved with the patient are aware of the presence of the ulcer

Refer all vascular (ischaemic or venous) ulcers to the appropriate specialist service via the patient's general practitioner

Refer all ulcers where cause is not apparent to the patient's GP

Ensure that all patients with neuropathic ulcers are seen on a regular and frequent basis for debridement of callus surrounding ulcer

Arrange biomechanical assessment of such patients

Prescribe orthoses when appropriate

Consider use of total contact casting.

Charcot foot (neuro-arthropathy)

Acute stage:

Organise non-weight bearing (wheelchair, crutches).

Consider total contact casting as soon as possible to prevent bone fracture and subsequent deformity

Patients should be given instructions about general cast care and told to report immediately such symptoms as swelling of toes, discolouration, unusual sensation especially pain, odour, temperature changes or discharge

Cast should be reviewed regularly and changed as required

Chronic stage (established deformity):

Treat any callus or ulceration (see below).

Organise custom made footwear or adapt orthopaedic footwear

Organise orthoses to be worn as shoe inserts.

In conjunction with general practitioner or endocrinologist, consider surgical reconstruction by orthopaedic surgeon after confirmation that limb perfusion is adequate

Haemorrhagic callus

Debride excess hyperkeratotic tissue

Provide deflective paddings and protective coverings

Dress any ulcer under callus appropriately

Consider total contact cast if ulcer fails to heal

Organise biomechanical assessment

Provide orthoses when appropriate

Advise on optimal foot care & footwear

Corns and callus

Debride excess hyperkeratotic tissue

Provide deflective paddings and protective coverings

Organise biomechanical assessment

Provide orthoses or orthodigital devices where appropriate

Encourage appropriate foot care routines

Advise on optimal footwear.

Dystrophic toenails

Cut toenail to normal shape

Reduce bulky nail with nail drill, file or scalpel

Debride callus in sulci

Clear away subungual epidermal/fungal debris

Dress any subungual ulcer or haematoma

Treat any fungal nail infection

Advise on optimal footwear

Introduce and encourage appropriate foot care routines

Organise follow-up podiatry treatment if needed

Interdigital problems

Clean interdigital areas with soap and water and pat dry with a soft light-coloured towel

Inspect the towel for discolouration or epidermal debris

Closely inspect toe creases to identify problems

Maceration

Select either an astringent (such as methylated spirits) and ensure that the patient is able to treat interdigital areas once or twice each day

Enlist the help of an appropriate helper if necessary

Review within one week

Add an anti-fungal topical agent if necessary

Advise on appropriate shoes, socks or hosiery

Review regularly.

Erosions/fissures

Dress with foam-type dressing daily

Review within one week

If healing is delayed consider a topical anti-fungal agent

Dry skin with activeor potential

Debride any excess hyperkeratosis

Treat any active fissure as an ulcer

Ensure that the patient or carer can rub in moisturising cream once or twice daily to reduce dryness and to improve flexibility of skin

Check footwear for roughness in the heel cup. Discourage wearing of footwear which does not have an enclosed heel cup.

Traumatised areas

Eliminate cause of trauma

e.g. inappropriate footwear or walking barefoot

If skin is unbroken, apply protective padding or a removable sponge protector

If skin is broken, treat as an ulcer. Redress daily at first, and monitor for signs of infection

Check at least once weekly until healing is complete

Alert patient and carer to possible signs of infection (see page 12)

Nursing Supplement

First Aid on discovery of an ulcer

1. Wash the area with tap water either from a nozzle or in a bowl
2. Gently pat dry the surrounding skin with a clean towel
3. Cover with a non-stick dressing (from Chemist)
4. Do not use plastic dressing strips or a dressing with a strong adhesive
5. Fix the dressing in place with tape (from Chemist)
6. Clean the area and change the dressing every day
7. If there is no improvement in 24—48 hours, the patient should seek medical advice

If there is pain, redness, heat, swelling, leaking fluid or an unpleasant odour associated with the ulcer, this could mean infection. The patient should go to the local doctor or hospital emergency department.

Patients with neuropathy should check the ulcer daily for the above signs, as they may not feel pain in the foot. If the patient cannot easily see the ulcer because of its position or because of visual impairment, a carer or nurse should inspect the ulcer daily.

Venous ulcer

Encourage exercise such as walking

Elevate the limb when at rest

What dressing should I use?

Choose the dressing according to the amount of exudate and patient comfort (see page 10)

Compression bandaging or stockings should be used only after checking that palpable pulses are present in the limb.

Compression is contra-indicated in the presence of arterial or neuropathic problems.
If in doubt, refer for vascular assessment before using compression therapy

Neuropathic ulcer

Assess neurological and vascular status as could be a combination of neuropathic and ischaemic ulcer. If assessed as a purely neuropathic ulcer, proceed...

Weekly aggressive debridement of the surrounding callus by a podiatrist

Cleaning the ulcer

If the ulcer is on the plantar surface, when showering it is recommended that the patient does not stand with the ulcer uncovered as this causes maceration to the wound area.

It is preferable to clean the ulcer with a hand-held shower while sitting, and then dry the surrounding area with a clean towel. If this is not possible, put a plastic bag over the foot while showering and when finished, remove the dressing and gently clean the ulcer with normal saline or tap water.

Relieve pressure by:

- reducing weight bearing on wound area
- re-assessing footwear
- using dressings that do not apply or increase pressure to the ulcer or surrounding skin

What dressing should I use?

Recommended dressing is a foam dressing

Do not use an occlusive dressing or dressing that sticks to the wound, such as hydrocolloids or films

If using a gel on a weight-bearing sloughy ulcer, use sparingly.

How do I hold the dressing in place?

The preferred method is to picture frame the dressing with tape that "breathes" or stretches

Do not use bandages or peripads as they can add pressure and increase the risk of further ulceration

Arterial ulcer

Requires referral to a vascular specialist for urgent assessment for revascularisation

Associated with severe pain that tends to be worse when the limb is elevated — encourage patient to keep foot down

Do not debride with a scalpel, scissors or any other mechanical means

Encourage exercise such as walking

What dressing should I use?

If the ulcer has a dry eschar then no dressing is required until patient has been seen by the vascular specialist

If the ulcer is moist and deep, use a hydrophilic gel and cover with foam dressing. No bandaging.

After assessment by vascular specialist, a dry ischaemic ulcer should also be dressed in this way

How do I hold the dressing in place?

Picture frame the dressing with tape that "breathes" and stretches

Do not use any constricting bandages or compression stocking

Mixed aetiology ulcer

(ischaemic + neuropathic/venous)

Usually painful

Hazardous to debride — should only be done in operating theatre

What dressing should I use?

Gels and foams are the preferred dressings

Wound Assessment

Patient name:

DOB:

Notes taken by:

Date:

Colour of wound

- ☐ Red
- ☐ Yellow
- ☐ Black

Exudate

- ☐ Nil
- ☐ Light
- ☐ Moderate
- ☐ Heavy

Depth of wound

- ☐ Red skin
- ☐ Superficial
- ☐ Shallow
- ☐ Cavity
- ☐ Sinus

Surrounding skin

- ☐ Normal
- ☐ Inflamed
- ☐ Macerated
- ☐ Callus
- ☐ Other

Sign of infection

- ☐ Red
- ☐ Hot
- ☐ Swollen
- ☐ Smelly

Can you visualise/probe:

- ☐ Tendon
- ☐ Bone

Wound Management

Antibiotics on presentation

☐ Yes ☐ No

Type and dose ______________________

Date commenced ______________________

Needs referral for:

Antibiotics	☐ Yes	☐ No
Vascular assessment	☐ Yes	☐ No
Wound biopsy	☐ Yes	☐ No
X-ray	☐ Yes	☐ No
Bone scan	☐ Yes	☐ No
HbAIC	☐ Yes	☐ No

Referral to other services (specify):

☐ Yes ☐ No

____

Letter to GP requesting referral for patient to see Vascular Specialist:

☐ Yes ☐ No

Date: ______________________

Management plan

Can patient/carer attend dressing? ☐ Yes ☐ No

Community nurse required? ☐ Yes ☐ No

Type of dressing (specify):

☐ Gel ______________________

☐ Foam ______________________

☐ Tape ______________________

Cleaning method: ______________________

Frequency of dressing change: ______________________

Notes:

____

____

____

Ulcer Record Chart

Name	Ulcer Management
DOB	Dressing frequency
Doctor	Type of dressing — as per C.D.E assessment

	Week	0	1	2	3	4
	Date					
Size	Length					
	Depth					
	Tracing or photo ?					
Colour	Red / pink					
	Yellow					
	Black					
Exudate	Light					
	Moderate					
	Heavy					
Signs of infection	Redness					
	Increased exudate					
	Hot					
	Swollen					
	Smelly					
Swab taken						
Podiatry done						
Wound not responding to treatment						
Is referral back to doctor required?						
Changes to:	Ulcer management					
	Dressing frequency					
	Dressing type/taping					

Review at Week 12

Ulcer healed: ☐ Yes ☐ No

If not healed, complete reassessment / case management review

	5	6	7	8	9	10	11	12

Reassessment and case management review

Referred back to doctor to reassess: ☐ Yes ☐ No Wound management reviewed: ☐ Yes ☐ No

Dressing appropriate (as per CDE assessment): ☐ Yes ☐ No Required resources available: ☐ Yes ☐ No

Cause

Chronic venous hypertension due to venous valvular insufficiency

Position

Lower calf

Character

Usually painless
Sloughy
Shallow
Exudative
Irregular hyperaemic edges

Surrounds

Venous eczema
Possible ankle oedema
Pigmentation

Dressing

Absorptive dressings
Alginates or foam types

Treatment

Graduated compression bandaging
Leg elevation

Possible removal of

Cause

Abnormal pressure due to al
early warning pain mechanis

Position

Plantar aspect of foot
Pressure points

Character

Painless
Sloughy
Deep
Exudative
Hyperaemic or inactive edge

Surrounds

Callus/hyperkeratosis
Patchy loss of sensation
Absent ankle reflexes

Dressing

Absorptive and protective dr
Foam type preferred

Treatment

Pressure redistribution by ap
orthotics, /modified footwea

tered shape of foot, and lack of
sm

s

ressings

ggressive callus debridement,
r, casts

Cause

Decreased arterial perfusion
due to occlusive macrovascular
arterial disease

Position

Foot borders
Apex of toes
Dorsum of foot

Character

Painful
Non-exudative
Necrotic eschar
Inactive edges

Surrounds

Pale shiny skin
Poor capillary return
Dry skin/fissures
Absent pulses

Dressing

Dressing for loosening
of necrotic material
Hydrophilic gels

Treatment

Revascularization by interventional (surgical/percutaneous)
techniques. Surgical debridement in theatre