## Purpose

The Diabetes Foot Unit (DFU) aims to provide a multi-disciplinary, evidence based assessment, treatment and management of patients with diabetes related pathology. The unit aims to reduce wound and amputation rates, hospital admissions, reduce length of stay, and ensure cost effective and appropriate use of hospital investigations and resources for this patient group.

This document outlines the working structure of the DFU. This includes referral pathways into the unit, patient care practices including assessment, investigation and management principles, and guidelines to access physiotherapy and orthotics services.

## Target Audience

For Members of the Diabetes Foot Unit including:

- Diabetes and Endocrinology Team (Adam Roberts and Michael McNamara)
- Vascular Surgery Team (Damian Holdaway and Mayur Krishnaswamy)
- Infectious Diseases Team (Eugene Athan and James Pollard)
- Podiatrists (Chris Klein and Nicki Spooner)
- Orthotists (Ben McMurtrie and Chris Doaks)
- Plastic Surgery (Need nominations)
- Orthopaedic Team (Need nominations)
- Physiotherapy Department at University Hospital Geelong

## Definition

N/A

## Procedure

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### Entry Pathways and Referral Guidelines for patients into the DFU (Acute Foot Lesion)

Entry criteria for patients into the DFU:

Diabetes related foot problems with an acute lesion, including (but not limited to):

Foot ulceration (below the malleolus)

- Doctor or podiatrist concern
- No improvement in ulcer within 2 weeks under GP management
- Poor glycaemic control

Charcot foot (altered structural integrity of the foot)

Progressive signs of infection despite appropriate antibiotic therapy

Osteomyelitis (includes ulcerations where bone has been probed)

**Referrals accepted from:**
Emergency department
Primary Care Physicians
Inpatient hospital units
Podiatrists – Community Health Centres and Private Practitioners
Specialists

**Urgent Referrals to be made via Telephone Contact to DFU:**
M-F 8-5pm: Endocrinology Registrar via Switchboard (4215 0000) - pager 962 or 472.
After Hours: Endocrinology Registrar or Endocrinologist on Call (via Switchboard).

**Non-Urgent Referrals**
Can be made via Fax to the DFU (Acute Foot Lesion Clinic) on 4215 1383. Every endeavour will be made to see the patient within 1 week.

Telephone Referrals from LMO, other clinician, inpatient hospital units including all referrals for inpatient AND outpatient review:

- ➔ Inpatient care deemed necessary → Registrar / Endocrinologist will organise direct admission (avoiding Emergency Department). Patient will be admitted under the DFU bed card.
- ➔ Outpatient care appropriate → Referring Clinician will be directed to fax referral to DRC on 4215 1383 and Diabetes Referral Centre Staff will notify patient of initial appointment in Diabetic Foot Unit (Acute Care) Clinic on a Tuesday afternoon. This will usually be within 1 week. The patient will see a podiatrist and endocrinologist +/- ID registrar +/- vascular surgeon.

Referral from Emergency Dept:
If a patient presents to the Emergency Department with an acute diabetes related foot lesion, the emergency department triage nurse can contact the Endocrinology Registrar directly to assess the patient. Over the weekend, offloading in the ED can be implemented with the application of a backslab or CAM boot if available.

**Criteria for Referral to DFU Acute Care Clinic:**
Known diagnosis of Diabetes Mellitus (Type I or II) with or without peripheral neuropathy
Acute or chronic ulcer below the level of the malleoli
Failure of antibiotic therapy of 2 weeks or more
Charcot neuroarthropathy (confirmed or suspected)

**Criteria where referral by telephone is recommended for urgent admission:**
Sepsis relating to a diabetic foot wound (fever, rigors, malaise)
Rapidly spreading cellulitis
Exposed bone
Wet gangrenous wounds requiring immediate surgical review

NB: **Post-operative infections** should be referred back to the surgical team under which the procedure was performed. **Acutely ischaemic limbs, gangrene or/and necrotizing fasciitis** should be referred immediately to the oncall Vascular team member.

***The Patient will require a written referral from their GP to the Outpatient DFU prior to initial outpatient consultation***

**Patient Care Assessment and Management Principles:**

Assessment:

1. Accurate assessment of the factors contributing to the presentation of the ulceration/lesion including neuropathy, infection, arterial and/or venous disease, glycaemic control, smoking status, pressure, ill-fitting footwear, foot deformity, previous amputations, chronic renal failure, and relevant medical and social factors.
2. Assessment of lesion / ulceration:
   - Document size, site, and characteristics of ulcer.
   - Probe to assess depth
   - Obtain suitable deep wound specimen for microscopy, culture and sensitivities.
3. Assess and document the severity or existence of peripheral arterial disease, sensory deficits and foot deformity.
4. Review previous examination results for vascular imaging, imaging of site (XR, MRI etc).
5. Assess glycaemic control and vascular risk factors.

Management plan:

Treating Team to develop a treatment plan designed to not only treat the acute lesion, but also to manage the factors that contributed to the lesion with the aim to prevent further acute foot complications.

1. Optimise glycaemic control
2. Order necessary investigations as appropriate: XR, FBE, UEC, CRP, further imaging.
3. Provide treatment of common skin and nail problems as required to ensure foot health.
4. Establish wound management plan which includes RDNS referral to dress ulcers (if required).

   *For RDNS referral, call Home Referral Service: call ext. 57735 (fax: 57795) and complete RDNS referral form.*
5. Provide specialist education and advice for patient and carer. E.g. What is a Charcot foot?
6. Advice on footwear and the provision of orthoses including paperwork for SWEP funding of long term footwear.
7. Gait Aids / OT / Physio and Geelong Orthotic Referrals as required.
8. Refer to other Specialist Medical and Surgical Services (as required).
9. Involve Infectious Diseases Team (where necessary) to review current antibiotic therapy.

Documentation:

1. Documentation of consultation to be sent to LMO after each consultation. These will be scanned in the DMR notes on BOSS and distributed electronically to other treating practitioners including RDNS, GP and any other involved clinicians.
2. Document ulceration via electronic measurement and visual methods (e.g. digital photography).

Step Down Service

Chronic ulcerations or arthropathy in high risk feet which persist despite appropriate risk factor management, wound care and podiatry intervention may require ongoing specialist supervision.

**Criteria for discharge to step down service:**

- Persistent diabetic foot ulcerations (>6 weeks) with requirement for ongoing offloading and/or debridement
- Destructive osteomyelitis has been excluded

The options for step down supervised care include:
Diabetes Referral Centre Outpatient Clinic

Medically supervised podiatry care offered on Thursday mornings only. Waiting times may apply.

Step Down services without medical supervision

Currently provided through Barwon Health Community Centres (Belmont, Newcomb, Corio, and McKellar Centre) and private community podiatry.

Discharge Planning:

Develop a discharge plan which addresses continued surveillance and treatment as determined by risk status of the individual to minimise the risk of recurrence of acute foot lesions / ulceration. This includes:

- Appropriate long-term footwear
- Education on the importance of foot care – the "Do's and Don'ts"
- Set up follow-up through Community Health Centre Podiatrist, Private Podiatrist or DRC Podiatrist.
- Rehabilitation (if required).

**Supply of Gait aids to patients of the Diabetes Foot Unit**

- Patient who are having a total contact cast (TCC) or Charcot restraint orthotic walker (CROW) fitted should be referred to physio prior to the fitting of these devices.
- Patients who arrive at DFU Tuesday outpatient clinic who require immediate fitting of temporary footwear and then require a gait aid should be triaged as being able to wait for 3-5 days for physio review. Patient who are deemed unsafe for immediate discharge will need to be admitted for provision of gait aids and physio assessment to ensure safety.

**Barwon Health Physiotherapy Department**

The Physiotherapy department at UHG does NOT offer an on call service for provision of gait aids. They operate on an appointment system.

Non urgent requests for gait aids may be sent to physiotherapy on the appropriate referral form and the patient can have an appointment booked (usually within 5-7 working days).

Urgent requests for gait aid could be:

1. Sent to physiotherapy on the appropriate referral form and the patient can have an appointment booked (usually within 5-7 working days).
2. Phoned through to the Allied Health Office (ext. 50826) to enquire whether there is a physiotherapist *who may* be able to assess the patient that day. This may require the patient to wait several hours to be seen.
3. In the event that a patient is seen by a physiotherapist and deemed a safety / falls risk when mobilising according to the weight bearing orders issued by the DFU, the physiotherapist may contact the team at DFU to discuss an alternative management plan.
4. Urgent requests may also be directed to EMD who have a supply of crutches.
5. Urgent requests could also be directed to private equipment suppliers who can supply equipment on the spot. This is often the most convenient for the patient, but instructions on how to use aid are often not given.

*Please note: There is a hire and / or purchase fee for all equipment supplied by the Physiotherapy department at UHG. Outpatients who borrow equipment from physiotherapy are required to pay a hire fee after thirty days and purchase or return the equipment after 60 days.*

Equipment is often cheaper for the patient if purchased through a private supplier, rather than through Barwon Health.

Please note:

1. Barwon Health does not endorse any particular supplier and has no responsibility for equipment supplied by these companies.
2. Patients who require bariatric or extra heavy duty equipment should be directed straight to a private supplier (i.e. White Cross Medical Supplies or Geelong Medical Supplies – see below) as physiotherapy does not keep a supply of this equipment.

Prices as at February 2016 for equipment supplied by the Barwon Health Physiotherapy department:

| Aid | 30 days | 30-60 days hire fee | After 60 days – MUST be returned otherwise full replacement cost is charged as below |
|---|---|---|---|
| Wheelchair | NOT AVAILABLE | | |
| Crutches - elbow | Free | $40 | $70 |
| Crutches - axillary | Free | $40 | $52 |
| 4 wheel frame | Free | $40 | $260 |
| Walking stick | Free | $40 | $20 |
| Gutter frame | Free | $40 | $370 |

**Equipment Suppliers / Prices in the Geelong Region**: *(Prices as at Feb 2016)*

| Supplier Name | Address | Phone | Aid | Cost |
|---|---|---|---|---|
| **WhiteCross** | 51 West Fyans st, Newtown | 5222 6666 | **Purchase** | |
| | | | 4 wheel frame (130kg) | $135 |
| | | | 4 wheel frame (150kg) | $175 |
| | | | Maxi Mack Walker (200kg) | $310 |
| | | | Mighty Mack Walker (225kg) | $350 |
| | | | Venus Wheelchair | $325 |
| | | | Gutter Frame | $379 |
| | | | Crutches - Underarm or forearm | $45 |
| | | | **Hire (per week)** | |
| | | | Crutches | $6 |
| | | | 4 wheel frame | $12 |
| | | | Wheelchair | $20 |
| **Geelong Medical Supplies** | 1/11 Hepner Place, Geelong | 5272 1414 | **Purchase** | |
| | | | 4 wheel frame (up to 100kg) | $175-$250 |
| | | | Wheelchair - basic | $375 |
| | | | Crutches – Underarm wooden | $48.10 |
| | | | Crutches – Forearm aluminium | $66.15 |
| | | | **Hire (per week)** | |
| | | | Crutches | $5-6 |
| | | | 4 wheel frame | $12 |
| | | | Wheelchair | $14-$16 |
| **Scooters Australia** | 52 Charles Street, Newcomb | 1300 622 633 | **Purchase** | |
| | | | 4 wheel frame (up to 125kg) | $149 |
| | | | 4 wheel frame (up to 200kg) | $380 |
| | | | Wheelchair - basic | ~$475 |
| | | | **Hire (per week)** | |
| | | | 4 wheel frame (up to 125kg) | $22 |
| | | | 4 wheel frame (up to 200kg) | $33 |
| | | | Wheelchair - basic | $44 |
| **Geelong Wheelchair Services** | 106 Bailey St, Grovedale | 52440844 | **Purchase** | |
| | | | 4 wheel frame (up to 120kg) | $160 |
| | | | 4 wheel frame (up to 160kg) | $285 |
| | | | Wheelchair - Lightweight | $850-950 |
| | | | Crutches - Forearm | $90 |
| | | | **Hire (per week)** | |
| | | | Crutches | $10 |
| | | | 4 wheel frame | $10 |
| | | | 4 wheel frame (up to ~130kg) | $10 |
| | | | Wheelchair (lightweight) | $20 |
| | | | Wheelchair (up to 140kg) | $20 |

## Evaluation

Regular document revision

## Key Aligned Documents

Diabetes Foot Unit (DFU) – Antibiotic Guidelines, PROMPT: Barwon Health \ Diabetes & Endocrinology \ Diabetes Referral Services

Patient Identification Policy, PROMPT: Barwon Health \ Clinical Practice \ Clinical Practice

Standard & Transmission-based Precautions, PROMPT: Barwon Health \ Infectious Diseases \ Infection Prevention Services

## Key Legislation, Acts & Standards

National safety and quality health service standards (2012, September). Retrieved July15, 2015 from http://www.safetyandquality.gov.au/wp-content/uploads/2011/09/NSQHS-Standards-Sept-2012.pdf

## References

N/A

## Contributors

| | Name | Position | Service / Program |
|---|---|---|---|
| **Lead Reviewer:** | Chris Jung | Endocrinologist | Diabetes Referral Service |
| **Contributors:** | Adam Roberts | Endocrinologist | Diabetes Referral Service |
| | Peter Schoch | Physiotherapist | Physiotherapy Department |
| | Kimberly Cukier | Endocrinologist | Diabetes Referral Service |
| **Committee/s:** | N/A | | |

| | | |
|---|---|---|
| **Title:** | **Management of Charcot Neuroarthropathy of the Foot** | |
| **Department** | Podiatry | PROCEDURE |
| **Approved by** | Chief Operating Officer , Acute Services | |

Barwon Health

## Purpose

The purpose of the procedure is to ensure best practice management of a patient suspected of having Charcot Neuroarthropathy, ensuring it is timely and efficiently linked with appropriate services.

## Target Audience

Barwon Health Clinical Staff and Students.

## Definition

Charcot's Neuroarthropathy (CN) is a pathological and progressive condition/process, which results in marked bony destruction, resorption and fusion. CN of the foot occurs when there is peripheral neuropathy and can result in severe foot deformity, morbidity, non- healing and infected ulcers of the foot requiring lower limb amputation and increased risk of mortality.

CN occurs most commonly in the presence of established diabetic neuropathy. It is also associated with other causes of neuropathy such as Leprosy, toxic exposure (e.g. alcohol), Vitamin B12 deficiency (e. g. Pernicious Anaemia), Syringomyelia, Poliomyelitis, Rheumatoid Arthritis, Multiple Sclerosis, congenital conditions and traumatic injury. It is more likely unilateral.

Typical acute presentation of CN has several or all of the following: erythema, heat, swelling, retained pulses, pain/tenderness and joint deformity. Deformity may or may not be present depending on the duration and the stage of bone and joint degeneration. The severity of pain can often be less than the clinical signs and symptoms would suggest due to the underlying neuropathy and hence the absence of pain does not exclude a diagnosis of CN.The mid-tarsal joint is usually most affected, leading to a medial arch prone to collapse and bony prominences forming on the plantar surface of the foot.

CN, once diagnosed is managed with a multi-disciplinary team approach. The purpose of this procedure is to direct the management of CN according to current evidence based practice.

**Note: There is a critical distinction required from infection, which may be difficult. The presence of a wound or other evidence of a portal of entry favours infection.**

Differential diagnosis:
Infection (cellulitis, deep tissue infection, osteomyelitis)
Traumatic fracture/injury
Deep Vein Thrombosis
Gout and pseudo gout
Inflammatory arthritis
Insect bite

## Procedure

### Stages of Development of a Charcot Foot

### STAGE 0: Inflammatory

| Events | Treatment |
|---|---|
| Localised warmth swelling, and redness minimal<br>No radiographic abnormalities; MRI – non-displaced fractures + increased marrow oedema.<br><br>In this Stage Charcot is commonly misdiagnosed as, cellulitis, deep vein thrombosis or gout.<br><br>Pain may or may not be present. Deformity is not usually evident but may be difficult to evaluate due to oedema. | - Patient to be non-weight bearing until diagnosis can be confirmed/denied due to the risk of the bones in the foot dislocating or subluxing.<br>- Tubigrip to be applied in two layers to reduce swelling and pain.<br>- Suspected CN contact DFU.<br>- When diagnosis is confirmed Total Contact Cast (TCC) is indicated for treatment |

**STAGE 1: Developmental**

| Events | Treatment |
|---|---|
| Joints in the foot and surrounding bones are destroyed as the joint becomes unstable<br>Foot experiences:<br>• Swelling (increased blood flow)<br>• Erythema (redness)<br>• +/- pain (may be referred pain)<br>• Warmth (>2° hotter than the other side)<br><br>The foot may appear infected due to these appearance characteristics and since no trauma may have occurred. There is a danger of incorrect diagnosis, including cellulitis, DVT, osteomyelitis, gout, traumatic # or injury.<br><br>Radiographic presence of bony debris, fragmentation of subchondral bone, periarticular fracture, subluxation, and/or dislocation. | Total Contact Cast<br>The purpose of the TCC is to:<br>- Redistribute the load away from the affected area.<br>- Reduce oedema.<br>- Reduce the movement of the foot.<br>- Support the contours of the foot to prevent excessive deformity.<br>The TCC:<br>- is changed weekly/fortnightly to maintain intimate fit and control, and to allow inspection of the leg.<br>- TCC therapy can last for up to 6 months.<br><br>It requires:<br>- Adequate blood supply and regular monitoring<br>- Patient compliance<br>- Adequate balance/mobility<br><br>Temperature monitoring to assess level of inflammation is also indicated at cast changes. |

**STAGE 2: Coalescence**

| Events | Treatment |
|---|---|
| The destructive phase slows down and the body's healing processes start. The swelling and heat in the limb are reduced and have a more similar presentation to the other limb.<br><br>Radiographic presence of resorption of fine debris new bone formation, coalescence of fragments, fusion of joints (ankylosis), and/or sclerosis of bone ends. | Charcot Restraint Orthotic Walker (CROW)<br>- Similar concept to TCC<br>- Removable for better hygiene and easier access to skin<br>- Has a rocker sole on the base for easier walking<br>- Fortnightly monitoring of temperatures at CROW review to monitor levels of inflammation. |

**STAGE 3: Remodelling**

| Events | Treatment |
|---|---|
| The bones and joints have now healed.<br>Residual instability and deformity may occur.<br>• Marked decrease or absence of warmth, swelling, and redness.<br>• Radiographic appearance of remodelled and new bone formation, decreased sclerosis. | - Custom foot orthoses<br>- Extra depth or surgical shoes, depending on extent of residual deformity<br>- Monthly temperature monitoring for any signs of reactivation of Charcot process |

**Diagnostic tests**

**Imaging**

Plain film x-rays, bilateral weight bearing or semi-weight bearing (to ensure consistent bony alignment) should be performed. A foot series consisting of anterior/posterior, lateral and oblique views should be requested. Radiographic imaging is often not diagnostic during Stage 0.

Magnetic resonance imaging (MRI) is frequently used to establish the diagnosis and is the modality of choice for differentiating between Charcot and acute osteomyelitis. MRI is also the modality of choice to diagnose the Stage 0 Charcot foot and managing the outcomes needs to follow the appropriate pathway.

There is minimal evidence for the use of nuclear medicine, positron emission tomography (PET) or computed tomography (CT) in the diagnosis or assessment of Charcot.

**Pathology**

There are currently no blood tests available to confirm the presence of Charcot. The main objective of pathology testing in the acute stages is to rule out differential diagnoses, particularly infection in the early stages. A full blood examination, erythrocyte sedimentation rate and C-reactive protein should initially be performed to rule out infection.

Additional tests focusing on vitamin D, calcium and bone turnover markers may be required after specialist consultation, especially before considering treatment with bisphosphonates. Tests monitoring renal and liver function and glucose control may also be indicated.

**Immediate treatment**

- Patient to be non-weight bearing until diagnosis can be confirmed/denied due to the risk of developing significant foot deformity with the bones in the foot fracturing, dislocating or subluxing.
- Tubigrip to be applied in two layers to reduce swelling and pain.
- Referral to Diabetes Foot Unit (DFU) via 42150000- pager 962 or 472.
- Consultation with Endocrinology for medical review of diabetes, and for assessment, diagnosis and treatment of diabetic foot disease, and additional medical referrals e.g. ID, vascular surgery.
- Referral to Podiatrist and Orthotist for further assessment and treatment.

**Monitoring**

Monitoring the CN foot is vital in establishing the current stage (acute/chronic) of the condition in which will direct most appropriate management.

**Temperature measurement**

Infrared Dermal Thermometry should be used at each appointment to compare temperatures of the affected and contralateral foot.

**Radiographic**

Full foot series plain x-rays should be ordered at initial baseline, and repeated every eight weeks until the CN stage is confirmed as Stage 2, then four weeks after this to confirm Stage 3. X-rays should also be done in circumstances where there is suspicion of reactivation of acute stage or if further obvious trauma has occurred to the foot.

**Bilateral CN**

Where there is bilateral CN (which is rare but may occur), bilateral TCCs are the ideal treatment however, are rarely appropriate due to poor mobility with bilateral casting. If bilateral TCCs are inappropriate, a TCC should be applied to the more critical limb and a RCW applied to the contralateral foot. Non-weight bearing in a wheelchair or hospital admission should also be considered.

**Multidisciplinary team (Diabetes Foot Unit)**

**Medical Specialists:**

**Endocrinologist**
Assessment and diagnosis
Optimise control and management of medical conditions as a priority.
Patient education of process/risks/complications/management
Develop treatment plan
Monitor treatment and progress
Referral to other specialists as required

**Orthopaedic Surgeon**
Complex case assessment and reconstructive surgery

**Vascular Surgeon**
Vascular assessment and management.

**Podiatrist treatment**
Liaison with medical specialists
Contribute to treatment plan
Monitoring of temperature changes of foot
Monitoring of volume fluctuations in lower leg
Review of sound limb/primary foot care
Assess and treat wounds if present

**Diabetes Educator** – Management of Diabetes where not meeting diabetes management targets.

**Orthotist treatment**
Review of current foot orthoses and footwear
Liaison with medical specialists
Charcot Restraint Orthotic Walker after resolution of acute symptoms
Long term foot orthoses and footwear advice, liaise with footwear manufacturers

**Plaster technician**
Total Contact Casting (TCC)
Weekly to fortnightly review for change of cast

**Other referrals**
**Physiotherapy** – Falls risk assessment, gait aids and rehabilitation
**Occupational Therapy** – home assessments

## Evaluation

Monitoring of RISKMAN reporting for adverse outcomes.

## Key Aligned Documents

Clinical Handover Policy, PROMPT: Barwon Health \ Organisational Services \ Safety and Quality

Patient Identification Policy, PROMPT: Barwon Health \ Clinical Practice \ Clinical Practice

Standard & Transmission-based Precautions, PROMPT: Barwon Health \ Infectious Diseases \ Infection Prevention Services

## Key Legislation, Acts & Standards

Charter of Human Rights and Responsibilities Act 2006 (VIC). Version No. 013. Version incorporating amendments as at 1 July 2014 Retrieved June 4, 2015 from http://www.austlii.edu.au/au/legis/vic/consol_act/cohrara2006433/

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## Contributors

| | Name | Position | Service / Program |
|---|---|---|---|
| **Lead Reviewer:** | Chris Klein | Senior Clinical Podiatrist | Medical Services |
| **Contributors:** | Lisa Edwards | Senior Clinical Podiatrist | Medical Services |
| | Chris Jung | Endocrinologist | Medical Services |
| | Adam Roberts | Endocrinologist | Medical Services |
| | David North | Vascular surgeon | Medial Services |
| | Prof. Richard Page | Director of Orthopaedic Surgery | Medical Services |

| | Name | Position | Service / Program |
|---|---|---|---|
| | Ass. Prof. Mark Kotowicz | Department of Endocrinology and Diabetes. | Medical Services |
| | Carol Mioduchowski | Manager Podiatry | Barwon Health |
| | Heather Heart | NUM- Diabetes Referral Centre | Diabetes Referral Centre |
| **Committee/s:** | N/A | | |

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## Purpose

The following information is a summary of the recommended initial antibiotic therapy for diabetic foot infections. The guideline will not be applicable for all individuals, in all situations and at all times. The clinical experience of the health provider, the expectations and desires of the patient and the availability of supportive services and medical technology will all influence the treatment plan.
These guidelines are intended to guide initial treatment of diabetes foot infection, until expert opinion from the Infectious Diseases Team is obtained.

## Target Audience

Members of the Diabetes Foot Unit – in particular the Endocrinology Consultant, Endocrinology Registrar and Resident, Vascular Surgical Consultant, Vascular Surgical Registrar and Resident.

## Definitions

Localised infections:
No signs of systemic toxicity and
<2cm of surrounding erythema and
No deep abscess, osteomyelitis or gangrene.

Severe infections:
Characterised by one or several of the following:

- systemic toxicity or septic shock (e.g. fever, chills, rigors, hypotension, tachycardia, malaise, anorexia, hyperglycaemia)
- bacteremia

- extensive cellulitis (extending beyond 2cm from wound), deep abscess, osteomyelitis or/and septic arthritis, marked necrosis or/and gangrene
- especially in a limb that is ischaemic

## Guideline

### 1. CELLULITIS ONLY (No ulceration)

**Localised Infections:**

Treat for approximately one week, but use clinical response as a guide.

- Flucloxacillin 500mg orally, QID (reduce dose in severe renal impairment)

For patients with penicillin allergy, not severe or anaphylactic in nature:
- Cefalexin 500mg orally, QID

For patients with severe or anaphylactic penicillin allergy:
- Clindamycin 450mg orally, TDS

**Severe Infections:**

Intravenous antibiotics until systemic and local improvement, then convert to oral therapy as per "Cellulitis only: Localised Infections". Antibiotic duration should continue for a total of two weeks in total (oral and intravenous) but clinical response should be used as a guide.

- Flucloxacillin 2g IV, QID (reduce dose in severe renal impairment)

For patients with penicillin allergy, not severe or anaphylactic in nature,
- Cefazolin 2g IV, TDS (reduce dose in severe renal impairment)

For patients with severe or anaphylactic penicillin allergy,
- Clindamycin 600mg IV, TDS or Vancomycin (Please refer to Vancomycin Drug Protocol)

**Myositis/Myonecrosis (Gas Gangrene):**

The basis of treatment is **surgical debridement** of necrotic tissue and antibiotic therapy. **Urgent referral to the plastic surgery and infectious disease units are essential.** Broad spectrum empirical treatment should be initiated until organism identification and sensitivities have returned. **Antibiotic therapy may need to be changed** depending on organism identification and sensitivities.

- Meropenem 1g IV, TDS (dose adjust for renal impairment)
  *AND*
- Vancomycin (Please refer to Vancomycin Drug Protocol)
  *AND*
- Clindamycin 600mg IV, TDS

## 2. INFECTED ULCER – SUPERFICIAL (not involving tendon, joint, or bone)

**Localised Infections:**

- Treat empirically for approximately one week, but clinical response should be used as a guide.
- Acute infection in patients who have not recently received antibiotics is usually caused by Staphylococcus aureus and streptococci
- Chronic infections are often polymicrobial, involving Gram-positive and Gram-negative aerobic and anaerobic bacteria
- If there is no clinical improvement after 5 days of empiric antibiotic treatment, therapy should be modified to cover the organism's susceptibility profiles as identified from ulcer swabs.

- Amoxicillin/clavulanate 875/125mg orally, BD

**OR THE COMBINATION OF**

- Cefalexin 500mg orally, QID
  *AND*
- Metronidazole 400mg orally, BD

For patients with severe or anaphylactic penicillin allergy:

- Ciprofloxacin 500mg orally, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 450mg orally, TDS

*Methicillin-resistant Staph.aureus:*

- Vancomycin (Please refer to Vancomycin Drug Protocol)

**Severe infections:**

- Commence intravenous antibiotics until the patient has systemically improved and the local signs of infection are resolving. At this time convert to oral therapy, as per "Infected ulcer – Superficial: Localised Infection".
- If there is no clinical improvement after 5 days of empiric antibiotic treatment, therapy should be modified to cover organism's susceptibility profiles as identified from ulcer swabs.
- Antibiotic duration should continue for a total of two weeks (oral and intravenous) but clinical response should be used as a guide.

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)

For patients with severe or anaphylactic penicillin allergy:

- Ciprofloxacin 400mg IV, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 900mg IV, TDS (Slow infusion required)

*Methicillin- resistant Staph.aureus:*

- Vancomycin (Please refer to Vancomycin Drug Protocol)

## 3. INFECTED ULCER – DOWN TO TENDON / JOINT CAPSULE

**Localised Infection:**

Treat empirically until antibiotics can be tailored to susceptibility results of cultured organisms. Duration of treatment will depend on clinical response.

- Amoxicillin/clavulanate 875/125mg orally, BD

For patients with severe or anaphylactic penicillin allergy:

- Ciprofloxacin 500mg orally, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 450mg orally, TDS

**Note:** If a sensitive *Staph. aureus* has been cultured, consider using:
- Flucloxacillin 500mg orally, QID (reduce dose in severe renal impairment)
  *AND*
- Ciprofloxacin 500mg orally, BD (reduce dose in renal impairment)

*Pseudomonas:*
If *Pseudomonas* is isolated from a deep wound swab, treat for approximately **2 weeks**. The exact treatment duration will need to be guided by clinical response.

- Ciprofloxacin 500mg orally, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 450mg orally, TDS

*Methicillin-resistant Staph.aureus:*
Treat for approximately 2 weeks with combination therapy but treatment duration will need to be guided by clinical response.

- Rifampicin 300mg orally, BD
  *AND*
- Fusidate sodium 500mg orally, TDS
  *AND*
- Amoxicillin/clavulanate 875/125mg orally, BD

**INFECTED ULCER – DOWN TO TENDON / JOINT CAPSULE (CONTINUED):**

**Severe Infections:**

Treat empirically until antibiotics can be tailored to susceptibility results of cultured organisms. Commence therapy with intravenous antibiotics until the patient has systemically improved and the local signs of infection are resolving. Convert to oral therapy as per "Infected ulcer – Down to tendon/joint capsule: Localised Infections". Duration of treatment will depend on clinical response. Referral should be made to the Infectious Diseases Team.

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)

For patients with severe or anaphylactic penicillin allergy:

- Ciprofloxacin 400mg IV, BD

*AND*

- Clindamycin 900mg IV, TDS (Slow infusion required)

*Pseudomonas:*

Individuals with *Pseudomonas* infection should remain on intravenous antibiotics until there is systemic improvement and the local signs of infection are resolving. Convert to oral therapy as per "Infected ulcer – Down to tendon/joint capsule: Localised Infections (Pseudomonas)".

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)

*AND EITHER*

- Gentamicin IV, daily as per Aminoglycoside Dosing and Monitoring Protocol

**OR**

- Ciprofloxacin 500mg orally BD (reduce dose in renal impairment)

*Methicillin-resistant Staph.aureus:*

Individuals with *MRSA* infection should remain on intravenous antibiotics until there is systemic improvement and the local signs of infection are resolving. Convert to oral therapy as per "Infected ulcer – Down to tendon/joint capsule: Localised Infections (Methicillin-resistant Staph.aureus)"

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)

*AND*

- Vancomycin (Please refer to Vancomycin Drug Protocol)

## 4. OSTEOMYELITIS

**Associated ulceration and localized cellulitis:**

Treatment with empiric antibiotics should be delayed until bone / deep swabs have been sent for microbiological evaluation. If limited surgical intervention has been undertaken, 6 weeks of antibiotic therapy is recommended. Alternatively, if surgical resection / enucleation of infected bone has occurred, antibiotic therapy should be ceased 2-5 days after infected bone is entirely removed. Consider referral to the Infectious Diseases Team.

- Amoxicillin/clavulanate 875/125mg orally, BD

For patients with severe or anaphylactic penicillin allergy:

- Ciprofloxacin 500mg orally, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 450mg orally, TDS

**Note:** If a sensitive *Staph. aureus* has been cultured, consider using:

- Flucloxacillin 500mg orally, QID
  *AND*
- Ciprofloxacin 500mg orally, BD

*Pseudomonas:*
Initially manage with a week of intravenous combination therapy. The duration of the course should be completed with combination oral antibiotics.

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)
  *AND EITHER*
- Gentamicin IV, daily as per Aminoglycoside Dosing and Monitoring Protocol

**OR**

- Ciprofloxacin 750mg orally BD (reduce dose in renal impairment)

FOLLOWED BY:

- Ciprofloxacin 750mg orally, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 450mg orally, TDS

*Methicillin-resistant Staph.aureus:*
Initially manage with two weeks of intravenous combination therapy. The duration of the course should be completed with combination oral antibiotics.

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)
  *AND*
- Vancomycin (Please refer to Vancomycin Drug Protocol)

FOLLOWED BY

- Rifampicin 300mg orally, BD
  *AND*
- Fusidate sodium 500mg orally, TDS

**OSTEOMYELITIS (CONTINUED):**

**Severe Infections:**

Treatment with empiric intravenous antibiotics should be commenced without delay. Intravenous antibiotics can be converted to oral therapy, as per "Osteomyelitis – Associated Superficial ulceration and localized cellulitis" once the patient has systemically improved and any local signs of infection are resolving. If limited surgical intervention has been undertaken, 6 weeks of antibiotic therapy is recommended. All patients should be referred to the Infectious Diseases Team. Alternatively, if surgical resection / enucleation of infected bone has occurred, antibiotic therapy should be ceased 2-5 days after infected bone is entirely removed

Initial empiric therapy:

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)

For patients with severe or anaphylactic penicillin allergy:

- Ciprofloxacin 400mg IV, BD (reduce dose in renal impairment)
  *AND*
- Clindamycin 900mg IV, TDS (Slow infusion required)

*Pseudomonas:*
Once Pseudomonas species confirmed, consider rationalizing intravenous antibiotic therapy. Treat with intravenous antibiotics for a total of 1 week

- Ceftazidime 2g IV, TDS

FOLLOWED BY:

- Ciprofloxacin 750mg orally, BD (reduce dose in renal impairment)

*Methicillin-resistant Staph.aureus (needs advice from ID team):*
Initially manage with two weeks of intravenous combination therapy. The duration of the course should be completed with combination oral antibiotics.

- Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)
  *AND*

Vancomycin (Please refer to Vancomycin Drug Protocol)

FOLLOWED BY

- Rifampicin 300mg orally, BD
  *AND*
- Fusidate sodium 500mg orally, TDS
  (As approved by the Infectious Disease team)

**Summary Table**

| SUMMARY TABLE | LOCALISED INFECTIONS | SEVERE INFECTIONS |
|---|---|---|
| **CELLULITIS**<br>Treat for approx 1-2 weeks | Flucloxacillin 500mg oral QID<br>*OR*<br>Cefalexin 500mg oral QID | Flucloxacillin 2g IV QID (reduce dose in renal impairment)<br>*OR*<br>Cefazolin 2g IV TDS |
| **INFECTED-ULCER SUPERFICIAL**<br>Treat for approx 1-2 weeks | Amoxicillin/Clavulanic Acid 875/125mg oral BD | Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment) |
| **INFECTED ULCER – DOWN TO TENDON / JOINT CAPSULE**<br>Treat for approx 2 weeks, or until clinically indicated | Amoxicillin/Clavulanic Acid 875/125mg oral BD | Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment) |
| | Pseudomonas:<br>Ciprofloxacin 500mg orally, BD (reduce dose in renal impairment)<br>*AND*<br>Clindamycin 450mg orally, TDS | Pseudomonas:<br>Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)<br>*AND EITHER*<br>Gentamicin IV, daily as per Aminoglycoside Dosing and Monitoring Protocol<br>*OR*<br>Ciprofloxacin 500mg orally BD |
| | MRSA:<br>Rifampicin 300mg orally, BD<br>*AND*<br>Fusidate sodium 500mg orally, TDS<br>*AND*<br>Amoxicillin/Clavulanic Acid 875/125mg oral BD | MRSA:<br>Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)<br>*AND*<br>Vancomycin (Please refer to Vancomycin Drug Protocol) |
| **MYOSITIS / MYONECROSIS (GAS GANGRENE)**<br>**Urgent referral** to surgical unit for debridement and infectious diseases unit | Meropenem 1g IV, TDS (dose adjust for renal impairment)<br>*AND*<br>Vancomycin (Please refer to Vancomycin Drug Protocol)<br>*AND*<br>Clindamycin 600mg IV, TDS | |

| SUMMARY TABLE | ASSOCIATED ULCERATION AND LOCALIZED CELLULITIS | SEVERE INFECTIONS |
|---|---|---|
| **OSTEOMYELITIS**<br>Treat for a total of 6 weeks if non-surgical management. Refer to ID. | Amoxicillin/Clavulanic Acid 875/125mg oral BD | Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment) |
| | Pseudomonas:<br>1 week IV initially, then complete course with oral AB:<br>Piperacillin/Tazobactam 4.5g IV, TDS (reduce dose in renal impairment)<br>*AND EITHER*<br>Gentamicin IV, daily as per Aminoglycoside Dosing and Monitoring Protocol<br>*OR*<br>Ciprofloxacin 750mg orally BD (reduce dose in renal impairment)<br>*FOLLOWED BY:*<br>Ciprofloxacin 750mg oral BD (reduce dose in renal impairment)<br>*AND*<br>Clindamycin 450mg oral TDS | Pseudomonas:<br>Once Pseudomonas is confirmed, consider rationalizing IV antibiotic therapy. Treat with IV antibiotic therapy for 1 week:<br>Ceftazidime 2g IV, TDS<br>*FOLLOWED BY:*<br>Ciprofloxacin 750mg oral BD (reduce dose in renal impairment) |
| | MRSA<br>2 weeks IV initially, then complete course with oral AB:<br>Piperacillin/Tazobactam 4.5g IV, TDS<br>*AND*<br>Vancomycin (Please refer to Vancomycin Drug Protocol)<br>*FOLLOWED BY*<br>Rifampicin 300mg oral BD<br>*AND*<br>Fusidate sodium 500mg oral TDS | |

## Evaluation

Regular document revision and review of relevant 'RiskMan' Reports

## Key Aligned Documents

Adult Aminoglycoside Dosing and Monitoring, PROMPT: Barwon Health \ Pharmacy \ Drug Protocols
Adult Vancomycin Dosing and Administration, PROMPT: Barwon Health \ Pharmacy \ Drug Protocols
Hand Hygiene, PROMPT: Barwon Health \ Infectious Diseases \ Infection Prevention Services
Patient/Client/Resident Identification Policy, PROMPT: Barwon Health \ Clinical Practice \ Clinical Practice
Penicillin Allergy Traffic Light Poster, PROMPT: Barwon Health \ Pharmacy \ Pharmacy
Restricted Antimicrobial Prescribing Procedure, PROMPT: Barwon Health \ Pharmacy \ Pharmacy
Standard & Transmission-based Precautions, PROMPT: Barwon Health \ Infectious Diseases \ Infection Prevention Services

## Key Legislation, Acts & Standards

National safety and quality health service standards (2011, September). Retrieved June 22, 2012 from http://www.safetyandquality.gov.au/wp-content/uploads/2011/01/NSQHS-Standards-Sept2011.pdf

NSQHSS: **3.11.1, 4.9.1, 4.9.2**

## References

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Rossi, S. (Ed.). (2015). *Australian medicines handbook.* Adelaide: Australian Medicines Handbook Pty Ltd.

The Royal Melbourne Hospital, Department of Diabetes and Endocrinology (n.d.). *Evidence Based Guidelines for the Inpatient management of Acute Diabetes related Foot Complications*, Melbourne: Clinical Epidemiology & Health Service Evaluation Unit.

Wraight, P., & May, K. (n.d.). *Is there any evidence of an ulcer*, Diabetic Foot Unit, Melbourne: Royal Melbourne Hospital.

## Key Words

Cefazolin is also known as cephazolin
Amoxicillin is also known as amoxycillin
Cefalexin is also known as cephalexin

## Contributors

| | Name | Position | Service / Program |
|---|---|---|---|
| **Lead Reviewer:** | Chris Jung | Endocrinologist | Diabetes Referral Centre |
| **Contributors:** | Eugene Athan | ID Physician | Infectious Disease Unit |
| | James Pollard | ID Physician | Infectious Disease Unit |
| | Adam Roberts | Endocrinologist | Diabetic Foot Unit |
| | Kimberly Cukier | Endocrinologist | Diabetes Referral Centre |
| | Alicia Neels | AMS Pharmacist | Pharmacy |
| **Committee/s:** | N/A | | |