Clinical guidelines for the in-patient management of diabetic foot infections

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Clinical guidelines for the in-patient management of diabetic foot infections

Background
Diabetic foot infections (infected foot ulcers, gangrene and osteomyelitis) are a major cause for admission for patients with diabetes mellitus. If not promptly treated, severe foot infections can lead to septicaemia and death. A multidisciplinary team approach (by podiatrists, physicians, vascular and orthopaedic surgeons, nursing staff and diabetes nurse specialists) is required to reduce morbidity and mortality for affected patients.

Purpose of this clinical guideline
This guideline has been produced to promote consistent care of patients with diabetic foot infections. It outlines the actions necessary for managing these conditions and thereby reduces the risk to patients as much as possible. Whilst based on scientific evidence or professional consensus these guidelines are not intended to replace clinical judgement.

Scope of the guideline
The guideline should be used Trust wide by medical, surgical, podiatric and nursing staff for the management of patients with diabetic foot infections.

Classification of infected foot ulcers

Mild: presence of markers of inflammation, erythema less than 3cm around ulcer, infection limited to skin or subcutaneous tissues, no systemic toxicity.

Moderate: erythema more than 3cm around ulcer, lymphangitis, spread beneath superficial fascia, deep abscess, gangrene or involvement of muscles, tendon or bone, but no systemic toxicity.

Severe: infection as above with systemic toxicity (fever, tachycardia, tachypnoea, leukocytosis, raised CRP).
Guideline recommendation

1. Diabetic foot infections
   1.1. Patients with moderate to severe diabetic foot infections as described above require urgent admission to hospital to prevent rapid deterioration (see appendix 1 & 2).
   1.2. The foot ulcer/affected foot should be exposed and examined. The other unaffected foot should also be inspected.
   1.3. Assessment of circulation may be difficult. Pedal pulses may be hard to feel in swollen feet. Diabetic neuropathy may lead to paradoxical erythema even where ischaemia is present. Doppler examination can be difficult to interpret due to arterial calcification. Duplex examination in the Vascular lab is often necessary. If pedal pulses are not palpable, please refer for urgent vascular surgical assessment (see 2.5).
   1.4. A wound swab (best obtained from the debrided base of the infected ulcer) should be sent off ideally before antibiotics are commenced. Purulent collections should be aspirated or swabbed and sent to laboratory promptly.
   1.5. Routine blood investigations should include FBC, U&E, LFT, CRP, GLU, and Blood Cultures.
   1.6. An x-ray of the affected area or foot (forefoot, mid-foot, hind-foot) should be performed to assess for osteomyelitis, fractures, Charcot foot, etc.
   1.7. All patients must be on prophylactic subcutaneous heparin.
   1.8. Patients may require insulin therapy/infusion to improve their diabetes control.
   1.9. A member of the diabetic foot team should be informed of any patient admitted with a diabetic foot problem (please send a fax to Ext - 5159).

2. Infected diabetic foot ulcers
   2.1. The presence of infection and ischaemia greatly increase the probability of a foot ulcer not healing and thereby deteriorating, leading to gangrene and septicaemia.
   2.2. After obtaining appropriate specimens (as in section 1.4), intravenous antibiotics should be commenced in these patients.
   2.3. You may need to cover gram-negative and anaerobic organism when there is a deep ulcer and/or significant ischaemia, or previous antibiotic usage.
   2.4. If pedal pulses are not palpable and ischaemia is suspected (see 1.3), the On Call surgical team / vascular surgeon (see 2.5) should be informed as soon as possible, as early vascular intervention can improve healing of foot ulcers, prevent deterioration, and also limit the extent of necessary amputation.
   2.5. The presence of osteomyelitis, deep abscess, large areas of slough/necrosis, pre-gangrene and gangrene warrant urgent assessment by the vascular surgeons. Please bleep the on-call surgical SpR, who will contact the vascular surgeons or orthopaedic surgeons as necessary.
   2.6. Antibiotics with good bone penetration should be used for patients with osteomyelitis.
   2.7. The presence of MRSA should prompt the swabbing of other relevant areas, informing the Infection Control Nurse and discussion with the microbiologist.
CAUTION:  You must refer to the intranet for the most recent version of this policy.

2.8. Debridement of neuropathic and neuro-ischaemic foot ulcers will be carried out as necessary by the podiatric team in close collaboration with the vascular surgeons.
2.9. See appendix 2 for antibiotics usage for diabetic foot infections, and remember that the microbiologist is there for urgent advice.

3. **Wound dressing and diabetic foot ulcers**
   3.1. Patients should be kept off their feet for as much as possible to aid healing of their ulcers.
   3.2. The foot team should inspect their shoes for foreign bodies, as shoes are the commonest culprits in the pathogenesis of foot ulceration.
   3.3. Sterile, non-adhesive dressings should be used to cover ulcers to protect them from trauma, absorb exudates, reduce infection and promote healing.
   3.4. Please liaise with podiatrist and the tissue viability nurse.

4. **Osteomyelitis (and the acute Charcot foot)**
   Osteomyelitis is suspected if there is a red, swollen, sometimes painful joint or toe (sausage toe) in the presence of a nearby infected ulcer. The underlying bone is usually exposed. An x-ray may be normal in the early stages, but later may reveal cortical destruction, periostal reaction, reduced bone density or sclerosis.

Charcot foot is suspected if there is a red, swollen, sometimes painful joint (commonest in the mid-foot) in the absence of infection in patients with severe diabetic neuropathy. However, this could co-exist with infection. An x-ray could be normal initially, but later reveal destructive bony changes and the typical disorganised joint.

**All patients with suspected osteomyelitis should have:**

4.1. A specimen from the ulcer or discharge (best done after cleaning/debridment) should be sent for culture and sensitivity.
4.2. Antibiotics as for moderate/severe foot infection to target most likely pathogens (see appendix 2).
4.3. An x-ray of the affected site. Patients may require a magnetic resonance imaging test (MRI) to differentiate osteomyelitis from the acute Charcot foot.
4.4. Review by the vascular surgeons as soon as possible, especially if there is associated ischaemia, pre-gangrene, gangrene or deep abscess. The vascular surgeons will liaise with the orthopaedic surgeons as appropriate.
4.5. The acute Charcot foot is usually treated by casting, stabilisation and non-weight bearing (this could be done on an out-patient basis). Please inform the diabetic foot team.

5. **Discharge from hospital and out-patient follow-up**
   5.1. No patient should be discharged with either moderate or severe infection. Patients with mild infection can be discharged on oral antibiotics (1-2 weeks course for mild foot infections; 8-12 weeks for unresolved osteomyelitis).
5.2. Foot ulcers do not necessarily need to be healed before patients can be discharged from hospital.
5.3. All foot lesions must be inspected on the day of discharge.
5.4. All patients on discharge must be referred to the diabetic foot clinic for out-patient follow-up, using appropriate referral forms (patients need to be seen within two weeks of discharge).

Suggested areas for audit

1. Foot ulcers swabs/sample sent for microbiological examination before antibiotics commenced. (100%)
2. Vascular assessment done for all patients. (100%)
3. Patients referred to the diabetic foot clinic on discharge. (100%)

References


King’s College Hospital (2003) Guidelines for the microbiological management of diabetic foot infections.


Appendix 1
Flow chart showing guidelines for in-patient management of diabetic foot infections

Appendix 2
Flow chart showing guidelines for use of antibiotics for diabetic foot infections
Appendix 1

Guidelines for in-patient management of diabetic foot infections

**Moderate/severely infected diabetic foot ulcers**

- Examine foot lesion
- FBC, U&E, LFT, CRP, GLU, B/C
- Swab/curettage/aspirate ulcer for microbiology
- Vascular assessment
- X-ray of affected foot
- Inform Diabetic Foot Team

**Intravenous antibiotics** to cover gram-positive, gram-negative and anaerobic organism (see appendix 2)

- S.C. Clexane
- Wound dressing
- Improve diabetes control

**Presence of severe ischaemia, large areas of slough/necrosis, deep abscess, osteomyelitis, pre-gangrene, gangrene**

- Contact on-call surgical SpR
- Inform vascular surgeons

**Osteomyelitis suspected, but not confirmed, consider MRI scan**

**Regular change of soiled dressing and wound assessment**

- Change to oral antibiotics after clinical improvement (temp, WBC, CRP)
- Diabetologist and podiatrist to assess weekly for diabetes control and wound debridment

**Infection mild/resolved (see appendix 2 for discharge antibiotics)**

**Discharge on oral antibiotics for follow-up in next Friday Diabetic Foot Clinic**

**Fax discharge letter/referral form (urgent) to: Ext- 5159**
Appendix 2

Diabetic Foot Infections

**Mild**
Superficial infection (erythema <3cm around ulcer)

**Moderate**
A Cellulitis (erythema >3cm around ulcer), lymphangitis
B Deep abscess, tendon/bone involvement, or gangrene

**Severe**
A and/or B + Toxicity
Fever, ↑pulse, ↑WBC, ↑CRP Tachypnoea

IV Tazocin 4.5g tds

Penicillin anaphylaxis:
IV Clindamycin 300mg qds + Oral Ciprofloxacin 500mg bd

Penicillin allergic:
IV Vancomycin (monitor levels/renal function) + IV Metronidazole 500mg tds + Oral Ciprofloxacin 500mg bd

IV Flucloxacillin 1-2g qds
Co-amoxiclav 1.2g tds

Penicillin allergic: IV Clarithromycin 500mg bd

Penicillin anaphylaxis: IV Clindamycin 300mg qds + Oral Ciprofloxacin 500mg bd

Inform Infection Control
MRSA topical therapy
Discuss with microbiologist about adding IV Vancomycin

MRSA
Recent admissions
Patients from nursing home
MRSA tagged on PAS
Microbiological confirmation

Swab other relevant areas

Review microbiology report. Switching to oral antibiotics 24-48 hours after cellulitis and clinical signs of toxicity have resolved

Discharge on oral antibiotics (1-2 weeks course)
Monotherapy: Flucloxacillin 500mg qds or clarithromycin 500mg bd

Osteomyelitis (non-surgical therapy), discharge on
Oral Clindamycin 450mg qds
Or
Flucloxacillin 500mg qds + sodium fusidate 500mg tds

If no improvement after 4-6 weeks (X-ray), switch to ciprofloxacin 750mg bd to cover for Pseudomonas

MRSA Osteomyelitis
Rifampicin 600mg bd + Doxycycline 200mg stat, then 100mg od x 4wks

If abnormal liver function
Sodium Fusidate 500mg tds + Trimethoprim 200mg bd

*Monitor liver and renal function on all antibiotics