Antimicrobial Guidelines for the Empirical Management of Diabetic Foot Infections

University Hospitals of Leicester NHS
NHS Trust

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1. Introduction

This guideline aims to promote the consistent care of patients with diabetic foot infections across UHL.

Diabetic foot infections (infected foot ulcers, gangrene and osteomyelitis) are a major cause for admission to hospital. If not treated appropriately, foot infections can lead to septicaemia, amputation and death. A multidisciplinary team approach reduces morbidity and mortality in affected patients.

The presentation of diabetic foot infections varies and may include, infected foot ulcer, osteomyelitis and/or extensive infected gangrene. Patients with a neuropathic or neuro-ischaemic foot often have little or no pain leading to delayed presentation and diagnosis. Patients may therefore present with an "asymptomatic" limb or life threatening infection, often the only clue being deterioration in glycaemic control.

2. Guideline Standards and Procedures

2.1. Referral to Diabetic Foot Team

Clinicians must follow the Emergency Diabetes Foot Referral Pathway (B25/2017) for all patients admitted to UHL with suspected diabetic foot infection and treated under this guideline.

2.2. Microbiological samples

- For the appropriate management of diabetic foot infection it is important to collect the correct microbiological, and when necessary, histological specimens.
- Samples should be taken prior to initiating antimicrobial therapy. However, treatment should not be delayed in severe infection.
- After debridement, deep tissue or bone specimens should be obtained as these have the best correlation between isolate and causative organism.
- Antibiotic therapy must be reviewed with the results of bone or deep tissue specimens and therapy amended if required.

2.3. Severity of Infection

- **Mild infection**:
  - Presence of 2 or more manifestations of inflammation: purulence, erythema, pain, tenderness, warmth or induration
  - AND any cellulitis or erythema which is 2 cm or less around the ulcer
  - AND infection is limited to the skin or superficial subcutaneous tissues
  - WITHOUT other local complications or systemic illness.
- **Moderate infection**
  - AS FOR MILD INFECTION in a patient who is systemically well and metabolically stable
  - BUT has 1 or more of the following characteristics: cellulitis extending greater than 2 cm, lymphangitic streaking, spread beneath the superficial fascia, deep tissue abscess, and involvement of muscle, tendon, joint or bone.
- **Severe infection**
  - Infection in a patient with systemic toxicity or metabolic instability (e.g. fever, rigors, tachycardia, hypotension, confusion, vomiting, leucocytosis, severe hyperglycaemia)

2.4. Recommended Treatment Summary

<table>
<tr><th>Severity of Infection
See descriptions above</th><th>First line treatment</th><th>Second line treatment
If patient is allergic to penicillin</th><th>Alternative treatment
<u>For use by diabetic foot clinic only</u>
(for resistant infections and drug-intolerance). Otherwise requires discussion with microbiology.</th><th>Duration of therapy</th></tr>
<tr><td>Mild</td><td>Oral flucloxacillin 1 g every 6-hours (QDS)</td><td>Oral doxycycline 200 mg once daily</td><td>Oral clindamycin 300 mg every 6-hours (QDS)</td><td>14 days

Review all microbiology samples when back (usually within 72 hours) and amend regimen if necessary.</td></tr>
<tr><td rowspan="2">Moderate</td><td>Oral flucloxacillin 1 g QDS
&
Oral ciprofloxacin 500 mg BD
&
Oral metronidazole 400 mg TDS</td><td>Oral doxycycline 200 mg OD
&
Oral ciprofloxacin 500 mg BD
&
Oral metronidazole 400 mg TDS</td><td>Oral linezolid 600 mg BD
&
Oral ciprofloxacin 500 mg BD
&
Oral metronidazole 400 mg TDS</td><td rowspan="2">14 days initially

Review in foot clinic at one week to check progress. Review all microbiology samples when back and amend regimen if necessary.

For inpatients and discharges requiring a total duration longer than 14 days, the patient must be discussed with microbiology (or OPAT if for IV therapy at home).</td></tr>
<tr><td colspan="3">If the enteral route is not appropriate discuss options with microbiology</td></tr>
<tr><td>Severe</td><td>IV piperacillin-tazobactam 4.5 g every 8-hours
&
IV teicoplanin* 6 mg/kg body weight every 12 hours (BD) for five doses followed by 6mg/kg body weight OD

Vascular surgery referral if necessary</td><td>IV meropenem 1 g every 8-hours
&
IV teicoplanin* 6 mg/kg body weight every 12 hours (BD) for five doses followed by 6mg/kg body weight OD

Vascular surgery referral if necessary</td><td>Discuss with microbiologist for advice</td><td>7 days initially

On-going review by diabetic foot team, taking microbiology results into consideration.

For inpatients and discharges requiring a total duration longer than 14 days, the patient must be discussed with microbiology (or OPAT if for IV therapy at home).</td></tr>
<tr><td>Osteomyelitis</td><td colspan="4">Will require prolonged durations of antimicrobials
Discuss these cases with microbiology and refer to vascular or orthopaedic surgery where necessary</td></tr>
</table>

If any concerns that there may be potential for osteomyelitis then empirical dosing for teicoplanin will need discussion with a microbiologist.

2.5 Additional Considerations

IV to oral switch

- Where a patient has been prescribed IV antibiotics for the purpose of enabling administration while the patient is unable to take medications orally, the antibiotics should be switch to oral as soon as possible.

Renal/Hepatic Impairment

- Diabetic patients will often have compromised renal function. Dose reductions are required in renal impairment. Refer to the Antimicrobial Website or ward pharmacist for advice.
- Refer to ward pharmacist for advice on treatment in patients with liver impairment.
- For more information on contraindications, cautions, drug interactions and adverse effects refer to the British National Formulary or the Summary of Product Characteristics

2.5. Essential pharmaceutical Advice and Monitoring

Clindamycin

- Diarrhoea: Patients should be advised to stop taking clindamycin immediately if they develop diarrhoea and to seek advice from the diabetic foot team.

Doxycycline

- Photosensitivity: Advise patients to protect the skin from sunlight even on a cloudy day and not to use sunbeds.
- Administration: Should be taken with a full glass of water and remain upright for at least 30 minutes. Avoid polyvalent metal ion medicines (calcium, iron, magnesium) within 2 hours of taking doxycycline.

Linezolid

- Interactions: Seek pharmacist advice if patient is on antidepressant medication.
- Duration: Linezolid should not be used for longer than 4-weeks without specialist input
- Neuropathy: Inform patient about the risk of optic and peripheral neuropathy
- FBCs: Take a full blood count before first dose and at weekly intervals.

Teicoplanin

- Dosing should be calculated using actual body weight, even in the morbidly obese.
- Therapeutic drug levels are required if the total duration of teicoplanin therapy exceeds 7 days – follow assay advice as per MicroGuide.
- Dose adjustment required in renal impairment i.e. CrCl is less than 80ml/min – see MicroGuide for dosing recommendations or speak to a pharmacist for advice.
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Ciprofloxacin

Ciprofloxacin should generally be avoided in patients who have previously had serious side effects with a fluoroquinolone or quinolone antibiotic. Discuss with microbiology or an antimicrobial pharmacist if further advice needed.

- Tendonitis: Patients at higher risk are older people, people with renal insufficiency, people with a transplanted kidney, and those taking corticosteroids. Patients should stop taking ciprofloxacin if they experience any tendon pain or swelling.
- Peripheral neuropathies: Patients should be advised to stop taking ciprofloxacin if they experience any pain, swelling, tingling, burning, weakness or numbness of any joints or limbs.
- Do not prescribe for patients with a history of aortic aneurysm or are at risk for an aortic aneurysm. Patients must seek immediate medical treatment for any symptoms associated with aortic aneurysm (e.g. sudden, severe, and constant pain in the stomach, chest or back).

3. Education and Training

None

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Adherence to the recommended antimicrobial treatment	Annual and ad-hoc antimicrobial prescribing audits	Antimicrobial pharmacists (Corrine Ashton and Rachel Leithead)	Annual – Trust wide audit Ad-Hoc – As part of QI projects and *C. difficile* PII	To TIPAC and CMGs
Samples taken before treatment initiated (where possible)	Annual antimicrobial prescribing audit	Antimicrobial pharmacists (Corrine Ashton and Rachel Leithead)	Annual – Trust wide audit	To TIPAC and CMGs

5. Supporting References

1. Benjamin Lipsky, Antony Berendt et al: Diagnosis and treatment of diabetic foot infections. IDSA guidelines CID 2004: 39 (1st October)
2. Graham Leese, Dilip Nathwani et al: Use of antibiotics in people with diabetic foot disease: a consensus statement. The Diabetic Foot Journal Vol. 12, No. 2 2009
3. Peter Cavanagh et al: Treatment for diabetic foot ulcers. The Lancet Nov 12 2005, Vol. 366, No. 9498, p. 1725-1735
4. Benjamin Lipsky, David G Armstrong et al: Ertapenem versus piperacillin/tazobactam for diabetic foot infection (SIDESTEP): prospective, randomised, controlled, double-blinded multicentre trial. Lancet 2005, Vol. 366, p 1695-1703
5. Fran Game: Management of osteomyelitis of the foot in diabetes mellitus. Nature reviews/Endocrinology, Vol. 6, Jan 2010, p 43-47
6. Mark Kosinski, Benjamin A Lipsky: Current medical management of diabetic foot infections. Expert reviews in Anti-infective therapy 2010: 8 (11) p 1293-1305
7. Matthew E Falagas et al: Linezolid versus Glycopeptide or ß-lactam for treatment of Gram positive bacterial infection: Meta analysis of randomised controlled trials. The Lancet Infectious Diseases, Vol. 8 (1) Jan 2008, p 53-66
8. Benjamin Lipsky Edgar JG Peters:Guidelines of the diagnosis and treatment of foot infection in persons with diabetes IWGDF 2019 update. Diabetes Metabolism RES REV 2020;36 S1e 3280.

6. Key Words

- Diabetic foot ulcer
- Infected diabetic foot ulcer
- Diabetic foot infections

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Details of Changes made during review			
Date	**Issue No.**	**Reviewed By**	**Description of change (if any)**
June 2017	8	D Modha	• Reformatted as per Trust policy for policies • Durations and review clarified • Teicoplanin dosing advice removed as needs microbiologist input and dose will depend on depth of infection.
Feb 2018	8.2	D Modha MF Kong R Hamilton	• Quinolone warnings added in
July 2022	9	D Modha S Hackney R Leithead	• Vancomycin replaced with teicoplanin for severe DFI • Vancomycin monitoring advice removed • Teicoplanin monitoring advice added