Diabetic Foot Infections:
Institutional Treatment Guidance

These guidelines should not replace clinical judgment. Therapeutic decisions should be based on clinical data including patient history, comorbidities, antimicrobial susceptibility patterns, and cost. The Infectious Diseases consult services are available for complex patient consultations and should be strongly considered in all patients with severe infections or osteomyelitis.

The antimicrobial stewardship program evaluated Diabetic Foot Infections over 6 months (N=111). Multiple opportunities for improvement in care were noted. Deep cultures were obtained in only 54% of cases undergoing operative debridement. When culture data was evaluated, the microbial etiology was primarily gram positive cocci (*S. aureus* and Beta-hemolytic Streptococci). MRSA and Pseudomonas were rare, found in only 8% and 4% of cases respectively. Only 59% of treatment regimens were considered compliant with national guidelines. Superficial wound swabs were obtained in 23% of cases, which is considered inappropriate and not recommended.

Microbial Epidemiology of DFI N=49 cases*		
	n	Percent
MSSA	23	47%
***B*-Hemolytic Streptococci**	19	39%
Proteus sp.	7	14%
Coag-Neg Staph	6	12%
MRSA	4	8%
Enterococcus sp.	4	8%
Enterobacter sp.	3	6%
E. coli	3	6%
Klebsiella sp.	3	6%
Pseudomonas aeruginosa	2	4%

* Of 111 cases, only 49 had culture

Management Guidelines:

Wound Cultures:

Do:

- Obtain a culture if antibiotics are to be used, and before they are started, if possible
- Only obtain deep tissue cultures or biopsies after cleaning and debriding the wound

Do Not:

- Culture a wound that appears uninfected
- Swab the wound to obtain a culture
- Culture without first cleaning and debriding a wound

Imaging:

- A x-ray is recommended in all new diabetic foot ulcers to evaluate for deformity, boney destruction, soft tissue gas, and/or foreign bodies
- When more specific imaging is needed to evaluate for either soft tissue abscess or osteomyelitis an MRI is preferred

Osteomyelitis Evaluation:

- Consider osteomyelitis in any infected, deep, or large foot ulcer, particularly those that are chronic and over bony prominences
- Plain films along with the probe to bone test are reasonable first steps in evaluating for osteomyelitis
- Patients where the diagnosis remains unclear should undergo MRI
- Patients with findings suggestive of osteomyelitis should undergo debridement with bone culture <u>before antibiotics are started if possible</u>
    - Consult orthopedics or vascular surgery for potential surgical intervention
    - If debridement is not an option an IR guided bone biopsy should be obtained to determine the microbial etiology
- Consult infectious diseases for evaluation and management of long-term antibiotics

Other Ancillary Studies and Consults to Consider:

- Obtain Ankle Brachial Index (ABI) if history of peripheral vascular disease, poor pulses and/or poor healing
- Obtain Wound Care Consult on all foot wounds
- Control of diabetes is very important to wound healing. Consult Diabetic Education and consider consulting DEM service

Treatment Guidance

<u>Define Infection Severity:</u>

Mild: At least 2 of the following are present at the site of the ulcer/wound: Swelling or induration, erythema, tenderness or pain, warmth, purulent drainage

- Ulcers who do not have at least 2 signs of infection should **<u>not</u>** be cultured or have antibiotics prescribed

Moderate: Local infection with or involvement of deeper structures (abscess, osteomyelitis, septic arthritis) or more extensive erythema (>2 cm spread or associated lymphangitis) without systemic signs of inflammation

Severe: As above with systemic signs of infection (fever, tachycardia, leukocytosis, hypotension, sepsis syndrome, necrotizing infection, etc.) Generally life- or limb-threatening.

Recommended Antibiotic Regimens Based on Severity:

Chronic ulcer without signs of infection: Do not culture wound and do not treat with antibiotics

Mild infection: Use oral agents treating gram-positive cocci only (Beta-hemolytic streptococci and MSSA). Consider addition of MRSA active agent if history of MRSA infection/colonization.

- Cephalexin 1000mg PO TID OR Amoxicillin-clavulanate 875/125 mg PO q12h
- If MRSA concern (see above) add: Doxycycline 100 mg PO q12h or TMP/SMX DS 1 tab PO q12h
- Severe PCN Allergy: Clindamycin 300 mg PO q8h

Moderate infection: May use oral or parenteral agents depending on care location and severity of infection. Treat for pathogens as above plus aerobic gram-negatives. Consider addition of MRSA active agent if history of MRSA infection/colonization.

Oral Options:

- Amoxacillin-clavulanate 875/125 mg PO q12h
- If MRSA concern (see above) add: Doxycycline 100 mg PO q12h or TMP/SMX DS 1 tab PO q12h
- Severe PCN allergy: Levofloxacin 750 mg PO daily PLUS Doxycycline 100 mg PO q12h

IV Options:

- Ceftriaxone 2g IV daily PLUS Metronidazole 500mg IV q8h **OR**
- Ampicillin/sulbactam 3g q6h **OR**
- Ertapenem 1g daily
- If MRSA concern (see above) add: Vancomycin 15 mg/kg IV Q12h
- Severe PCN Allergy: Levofloxacin 750 mg IV daily PLUS Clindamycin 900 mg IV q8h

Severe Infection: Increased frequency of polymicrobial infection. Treat gram-positive cocci including MRSA, aerobic gram-negative rods, and anaerobes. Do not include Pseudomonas coverage unless risk factors (water exposure, previous isolation of Pseudomonas). **Consult a surgery team in all severe infections.**

- Vancomycin 15 mg/kg IV q12h PLUS Ceftriaxone 2g IV daily PLUS Metronidazole 500mg IV q8h (PREFERRED) **OR**
- Vancomycin 15 mg/kg IV q12h PLUS Ertapenem 1g daily **OR**
- Vancomycin 15 mg/kg IV q12h PLUS Piperacillin/tazobactam 4.5g IV q8h infused over 4 hours **OR**
- Severe PCN Allergy: Vancomycin 15 mg/kg IV q12h PLUS Aztreonam 2g IV q8h PLUS Metronidazole 500mg IV q8h
- Water exposure: Treat for Pseduomonas replacing ceftriaxone with cefepime until cultures return or using piperacillin/tazobactam regimen (increased nephrotoxicity with vancomcyin)

Duration and Route of Therapy for DFI: The duration of therapy and route of administration will vary based on patient factors, severity of infection, presence of bone involvement, extent of surgical debridement, and pathogens isolated. The table below is a general guideline; base all decisions on duration and route on individual case data.

Site of Infection and Severity	Route	Duration
Soft Tissue only: Mild	Oral	1-2 weeks
Soft Tissue only: Moderate	Oral or IV with change to PO with improvement	1-3 weeks
Soft Tissue only: Severe	IV then change to PO with improvement*	2-4 weeks
Bone or Joint: complete resection of infected tissue (i.e. amputation)	IV or PO	2-5 days post resection
Bone or Joint: residual soft tissue infection but complete bone resection	IV then change to PO with improvement*	1-3 weeks
Bone and Joint: resected but residual bone infection	IV with possible change to PO*	4-6 weeks
Bone and Joint: no surgery or residual dead bone	IV with possible change to PO 4-6 weeks*	≥3 months

* Early switch to highly bioavailable oral agents (FQ, TMP-SMX, linezolid, metronidazole, etc.) safe and effective in most patients

Created: July 2017
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