

ABSTRACT

Introduction:

Foot osteomyelitis is a serious complication in patients with diabetes. At the University of Louisville, these patients are managed by a multidisciplinary team composed of Infectious Diseases, Podiatry, Vascular Surgery, Pharmacy, and Microbiology. Clinical outcomes of patients with foot osteomyelitis should be evaluated 12 months after discontinuation of antibiotic therapy. Due to this long follow-up period, data on clinical outcomes of patients with foot osteomyelitis is sparse.

Objective:

The objective of this study was to define the etiology, antibiotic management, and clinical outcomes of patients with foot osteomyelitis treated at the University of Louisville.

Methods:

This was a secondary data analysis of the Bone and Joint Infection Organization (BAJIO) database. Foot osteomyelitis was defined as a positive imaging of the foot plus a positive culture from the affected bone. Clinical success was considered in patients with no clinical or microbiological evidence of infection at 12 month follow-up.

Results:

A total of 158 patients with foot osteomyelitis were evaluated. The most common etiology was *Staphylococcus aureus* in 28% of patients, with 50% of those being MRSA. Cefazolin and vancomycin were used for MSSA and MRSA, respectively. Twelve-month follow-up was available in 27 patients, with 21 (78%) experiencing clinical success and 6 (22%) clinical failure.

Conclusions:

This study indicates that, with a multidisciplinary approach, 80% of patients with foot osteomyelitis can reach clinical success at 12 months. A primary weakness of this study is the minimal number of patients that could be followed for a full 12 months after antibiotic therapy.

INTRODUCTION

Diabetic foot infections (DFI), which are infections of the soft tissue or bones below the malleoli, are a common clinical problem. Most infections occur in a site of skin trauma or ulceration. The estimated lifetime risk of a person with diabetes mellitus developing a foot ulcer is 15% to 25%, with an annual incidence of 3% to 10%.¹ In 2001, diabetes-related foot ulcers and amputations were estimated to cost U.S. health care payers 11 billion dollars.² Major predisposing factors are peripheral neuropathy, peripheral arterial disease, and impaired immunity. More than one-half of non-traumatic lower extremity amputations are related to diabetic foot infections, and 85% of all lower extremity amputations in patients with diabetes are preceded by an ulcer.^{3,4}

The most common pathogens in diabetic foot infection are aerobic gram-positive cocci, mainly *Staphylococcus* species. Methicillin-resistant staphylococcus aureus (MRSA) is present in 10% to 32% of diabetic foot infections and is associated with a higher rate of treatment failure.⁵ Nevertheless, it is common to see a polymicrobial infection in DFI including anaerobes and gram negative bacteria.

The success to arrest the infection may vary depending of the presence of multiple factors such as comorbidities, adherence to therapy, complications, the etiology and the extension of the infection as well as complications such as bacteremia. In many instances the treatment is not only managed by one specialist, but as a multidisciplinary approach including Infectious Diseases, Podiatry, Vascular Surgery, Pharmacy and Microbiology. Data describing the patient's characteristics and outcomes after 12 month of treatment for DFI is scant. The primary objective of this study was to evaluate the outcomes of patients with DFI at the University of Louisville Hospital. The secondary objective was to evaluate the patient's characteristics, the most common antibiotics used, and the microbial etiology.

METHODS

Study Design and study population

This was a retrospective, observational study of patients with foot osteomyelitis followed by the multi-disciplinary Bone and Joint Infection Program at the University of Louisville Hospital, Kentucky. A secondary data analysis from the Bone and Joint Infection Organization (BAJIO) database was done in order to obtain data regarding patient's characteristics, antibiotics used, and outcomes.

Study definitions

- I. Osteomyelitis: defined as a positive imaging of the foot plus a positive culture from the affected bone.
- II. Study outcomes: Clinical outcomes were evaluated 12 months after the end of induction antibiotic therapy.

Outcomes were classified as:

- *Infection arrested* if no clinical or laboratory evidence of infection after the antibiotics were discontinued;
- *Infection arrested with suppressive therapy* if no clinical or laboratory evidence of infection but the antibiotics were continued due to presence of hardware;
- *Failure during suppressive therapy* if clinical or laboratory evidence of infection within 12 month after while being on suppressive therapy;
- *Failure not on antimicrobial therapy* if the patient showed clinical or laboratory evidence of infection or relapse within 12 month after the end of antibiotic therapy.

RESULTS

- A total of 158 adult patients were evaluated.
- Patient's characteristics are shown in Table 1.
- The etiology of DFI is shown in Figure 1.
- The antibiotic regimens are shown in Figure 2.
- Clinical outcomes at the end of treatment and at 12 month later are shown in Table 2.

Table 1 Patient characteristics

label	value
BMI, Median(IQR)	27 (8)
Age at Diagnosis, Median(IQR)	54.5 (13)
Sex, n(%)	24 (15.2)
Acute Renal Disease, n(%)	27 (17.1)
Acute Alcoholism/AlcoholicWithdrawal, n(%)	17 (10.8)
Rheumatoid Arthritis, n(%)	3 (1.9)
Bedridden, n(%)	6 (3.8)
Active Cancer (currently receiving therapy), n(%)	1 (0.6)
History of Cancer, n(%)	6 (3.8)
Chronic Kidney Disease, n(%)	50 (31.6)
Chronic Neurologic Disease, n(%)	3 (1.9)
Cirrhosis, n(%)	8 (5.1)
Congestive Heart Failure, n(%)	30 (19)
Coronary Artery Disease, n(%)	45 (28.5)
Dementia/CVA, n(%)	14 (8.9)
Dialysis, n(%)	7 (4.4)
Known Hepatitis Disease, n(%)	20 (12.7)
Known HIV disease, n(%)	5 (3.2)
Current Viral Load (VL) < 1000 copies?, n(%)	2 (1.3)
Hyperlipidemia, n(%)	91 (57.6)
Hypertension, n(%)	129 (81.6)
Chronic immuno suppressant medication, other, n(%)	3 (1.9)
IV Drug Use (past), n(%)	16 (10.1)
IV Drug Use (present), n(%)	5 (3.2)
Neuropathy, n(%)	111 (70.3)
Osteoarthritis, n(%)	12 (7.6)
Prior Hospitalization < 30 Days, n(%)	43 (27.2)
Prior Hospitalization < 90 Days, n(%)	40 (25.3)
PVD (longstanding), n(%)	82 (51.9)
Chronic systemic steroid use, n(%)	4 (2.5)
Tobacco Use (past), n(%)	105 (66.5)
Tobacco Use (present), n(%)	83 (52.5)

RESULTS

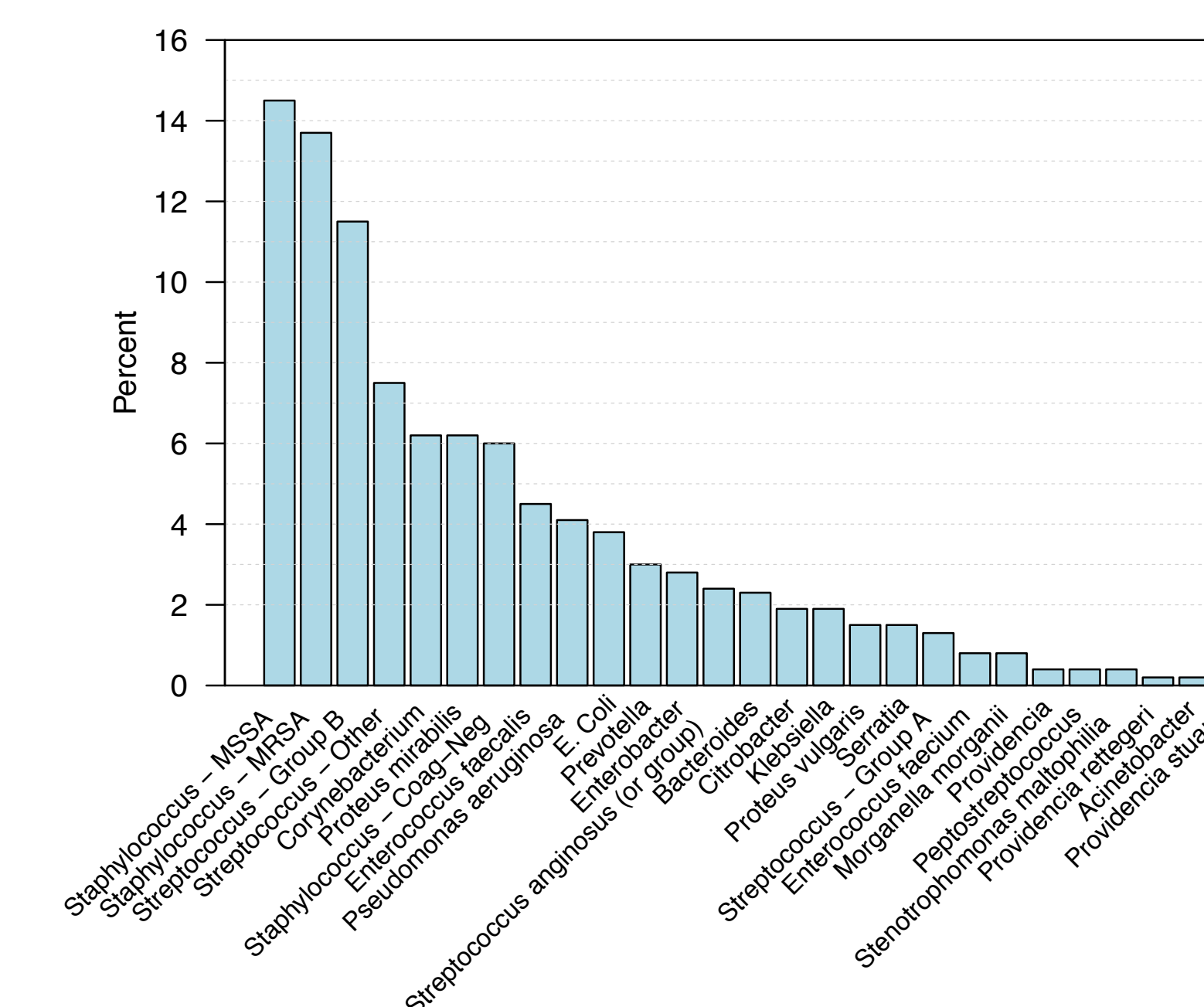


Figure 1 Etiology of DFI

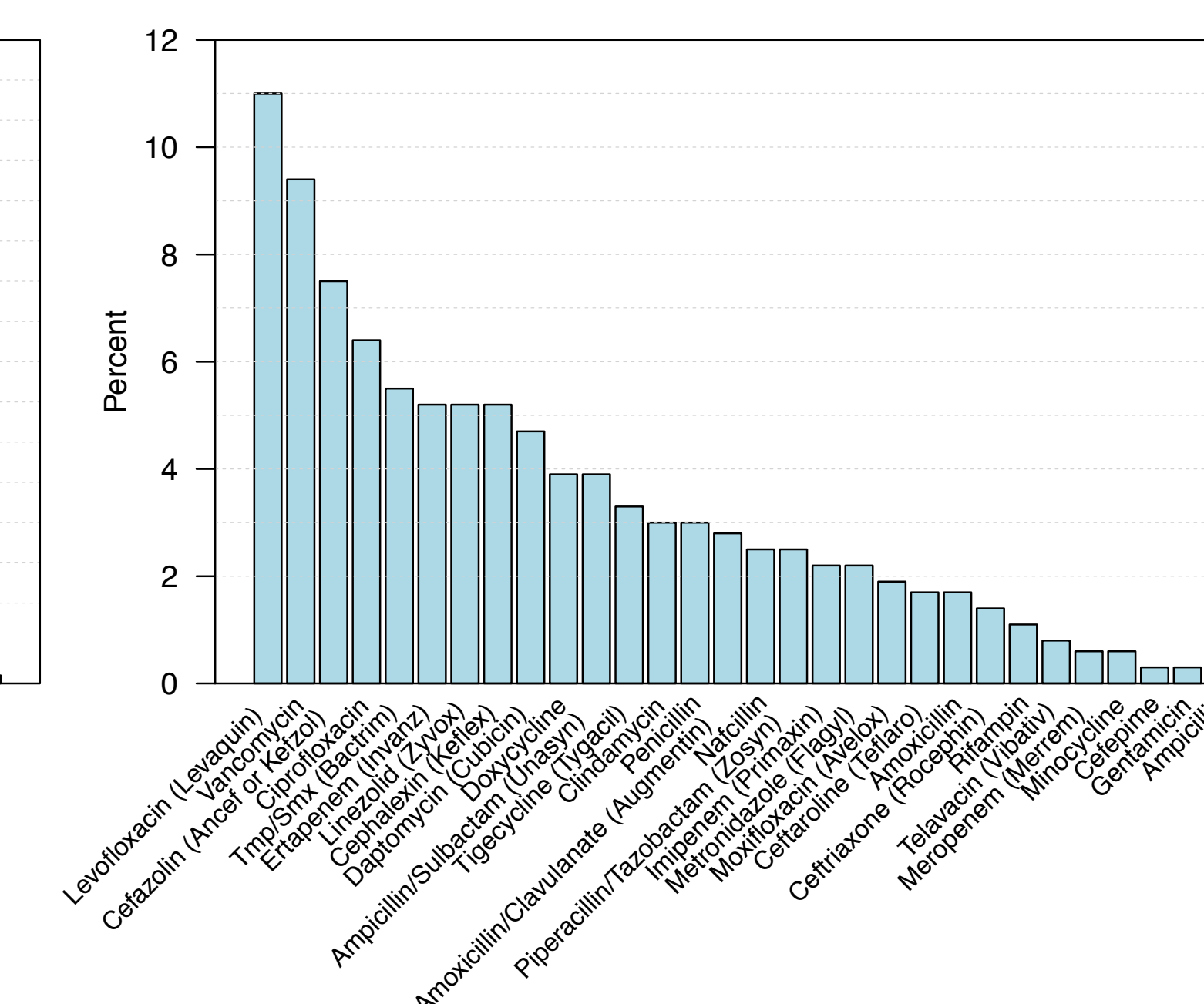


Figure 2 Antibiotics

Table 2 Clinical outcomes at end of treatment

Variable	Value
Infection arrested	20, (24.4)
Infection arrested + suppressive therapy	1, (1.2)
Failure during suppressive therapy	0, (0)
Failure, not on antimicrobial therapy	6, (7.3)
Clinically Unevaluable: New episode of chronic infection	38, (46.3)
Died	10, (12.2)
Unknown, Lost to Follow-up	7, (8.5)

CONCLUSIONS

- This study indicates that, with a multidisciplinary approach, 80% of patients with foot osteomyelitis can reach clinical success at 12 months.
- Vancomycin and Levofloxacin were the most common antibiotics used empirically, covering the most common isolated bacteria for foot osteomyelitis including *Staphylococcus aureus* (MSSA, MRSA) and aerobic gram negative rods such as *Pseudomonas aeruginosa*.
- A primary weakness of this study is the minimal number of patients that could be followed for a full 12 months after antibiotic therapy.
- Further studies are needed to better understand clinical outcomes of patients with foot osteomyelitis

REFERENCES

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