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The Leeds Teaching Hospitals



YOR-SPINE: A retrospective cohort study describing the epidemiology, management and clinical outcomes in spinal infections at Leeds Teaching Hospitals NHS Trust, UK between 2022-25

L.Brodie¹, B.Staniforth¹, T.Adeyemi², V.Borse², N.Adsul², K.Woods¹ – ¹Dept of Infection, ²Dept of Spinal Surgery - *Leeds Teaching Hospitals NHS Trust - Leeds (UK)*

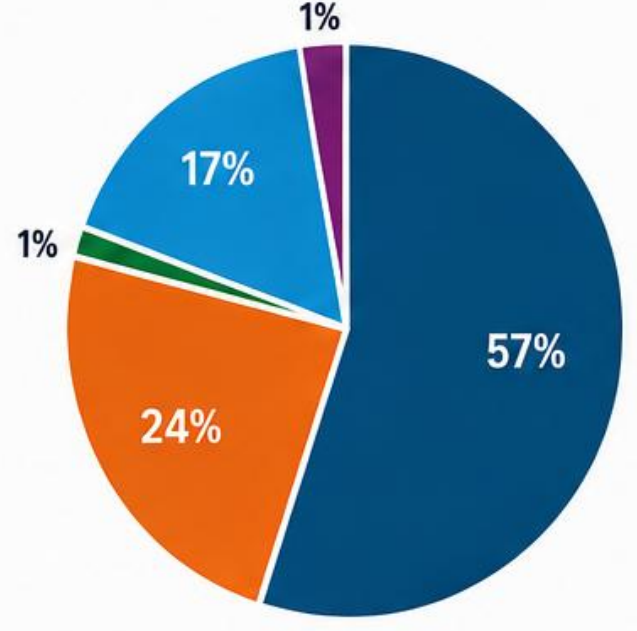
Background:

Pyogenic spinal infections are increasing in prevalence and are associated with significant morbidity and mortality and often require complex prolonged treatment (1,2,3). This is a retrospective cohort study of 213 patients managed for native and implant-associated spinal infection between January 2022 and December 2025 at Leeds Teaching Hospitals NHS Trust.

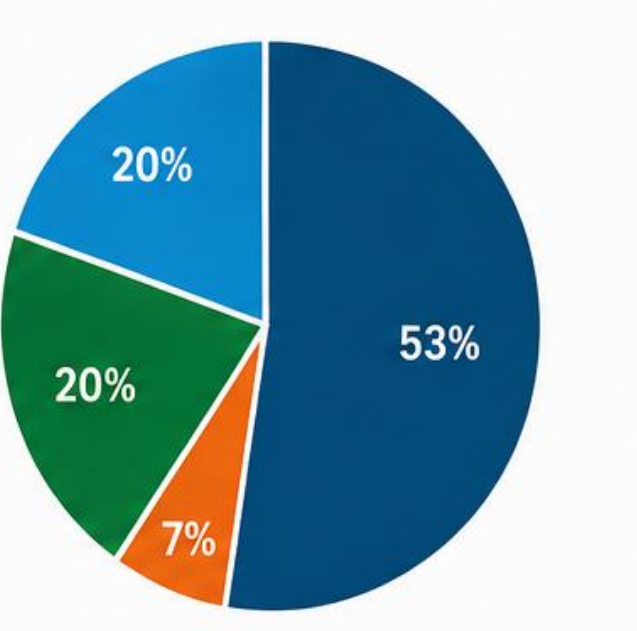
Objectives:

- Describe the cohort of spinal infections, including native and implant-associated
- Describe the microbiological aetiology of infections including proportion of culture-confirmed versus culture-negative cases
- Describe antimicrobial therapy, including choice, duration and oral switch
- Describe clinical outcomes of native and implant-associated spinal infection cases, including how antimicrobial treatment choices and surgical management affect patient outcomes

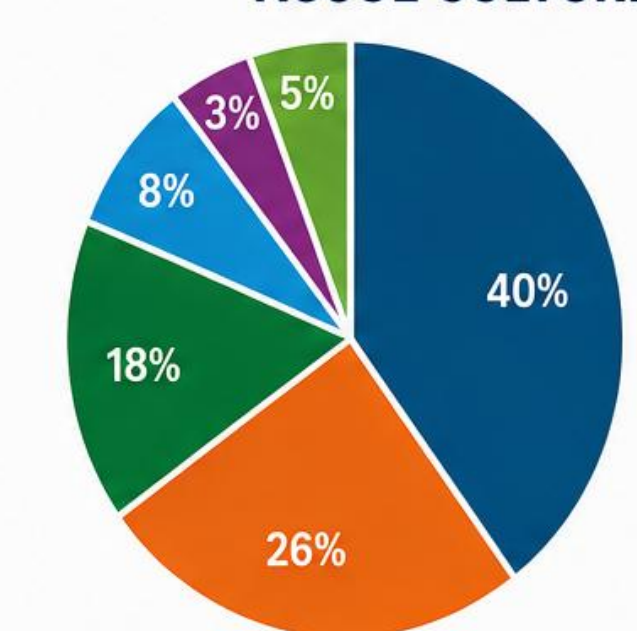
Figure 2: Microbiological aetiology in native and implant-associated infections

BLOOD CULTURES – NATIVE

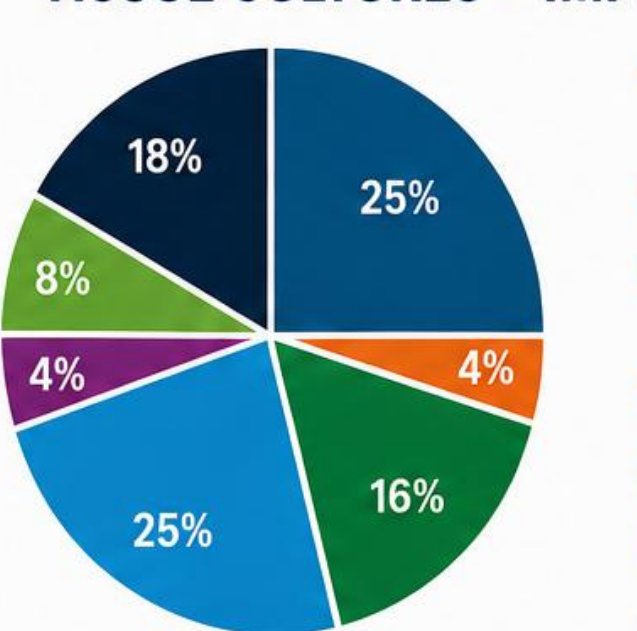
- Staphylococcus aureus (MSSA/MRSA)
- Streptococcus spp
- Coagulase negative Staphylococcus spp
- Enterobacterales spp
- Pseudomonas spp

BLOOD CULTURES – IMPLANT-ASSOCIATED

- Staphylococcus aureus (MSSA/MRSA)
- Streptococcus spp
- Coagulase negative Staphylococcus spp
- Enterobacterales spp

TISSUE CULTURES – NATIVE

- Staphylococcus aureus (MSSA/MRSA)
- Streptococcus spp
- Coagulase negative Staphylococcus spp
- Enterobacterales spp
- Cutibacterium spp
- Other

TISSUE CULTURES – IMPLANT-ASSOCIATED

- Staphylococcus aureus (MSSA/MRSA)
- Streptococcus spp
- Coagulase negative Staphylococcus spp
- Enterobacterales spp
- Pseudomonas spp
- Corynebacterium spp
- Cutibacterium spp

Methods:

Eligible patients were identified from spinal infection MDT lists.

INCLUSION CRITERIA:

- All adult patients (over 18-years) with spinal infection managed at LTHT during study period (January 2022-December 2025)

EXCLUSION CRITERIA:

- Children under 18-years of age
- Infection caused by mycobacterial species, Brucella species and fungi

Data was collected using electronic health records and laboratory systems and recorded on an excel data collection form and stored on an NHS secure drive. Statistical analysis was performed using excel and GraphPad Prism.

Results:

- 213 patients were included in the analysis (table 1); 159 native infections, and 54 implant-associated infections (33 defined as early onset <6 weeks, and 21 late onset >6 weeks).
- Native infections were more likely to present systemically unwell compared to implant-associated, with SIRS criteria present in 49.7% compared to 25.9% in implants (p=0.002), and 11.9% of native infections presented with a QSOFA score of ≥2 compared to 1.9% in implant-associated (p=0.028).
- Empirical and targeted antimicrobial choice including choice of oral switch and durations are outlined in table 2 and figure 1.
- Microbiological diagnosis was established in 84% of native cases and 87% of implant-associated infections with causative organisms in figure 2. Polymicrobial infection was more frequent in implant-associated compared to native infections, 25.9% versus 0.6% (p<0.001). Infection with AMR-organisms was more frequent in native infections compared to implants (8.8% versus 5.6%) but this was not statistically significant (p=0.57).
- Adverse events associated with antimicrobials (including line infections, line related thrombosis, diarrhoea/CDI and blood abnormalities) were encountered in 28.3% of native and 24.1% in implant-associated (p=0.547)
- Surgical management occurred in 32.1% of native, compared to 83.3% of implant-associated. 30/45 patients underwent DAIR, and 15/45 underwent removal of implant.
- Overall relapse rate was similar at 11.3% (native) and 11.1% (implants). Lower albumin levels at presentation was noted for patients who relapsed (25.33g/L versus 30.4g/L although the difference did not meet statistical significance (p=0.051). Relapse occurred in 4/30 patients managed with DAIR (13.3%) compared with 1/15 following implant removal (6.7%) (p=0.65). There was no significant difference in relapse in those receiving exclusive IV therapy (13.3%) versus patients with IVOS (10.4%) (p=0.664).

Table 1: Patient demographics and characteristics at presentation. Values are median (IQR) unless otherwise stated

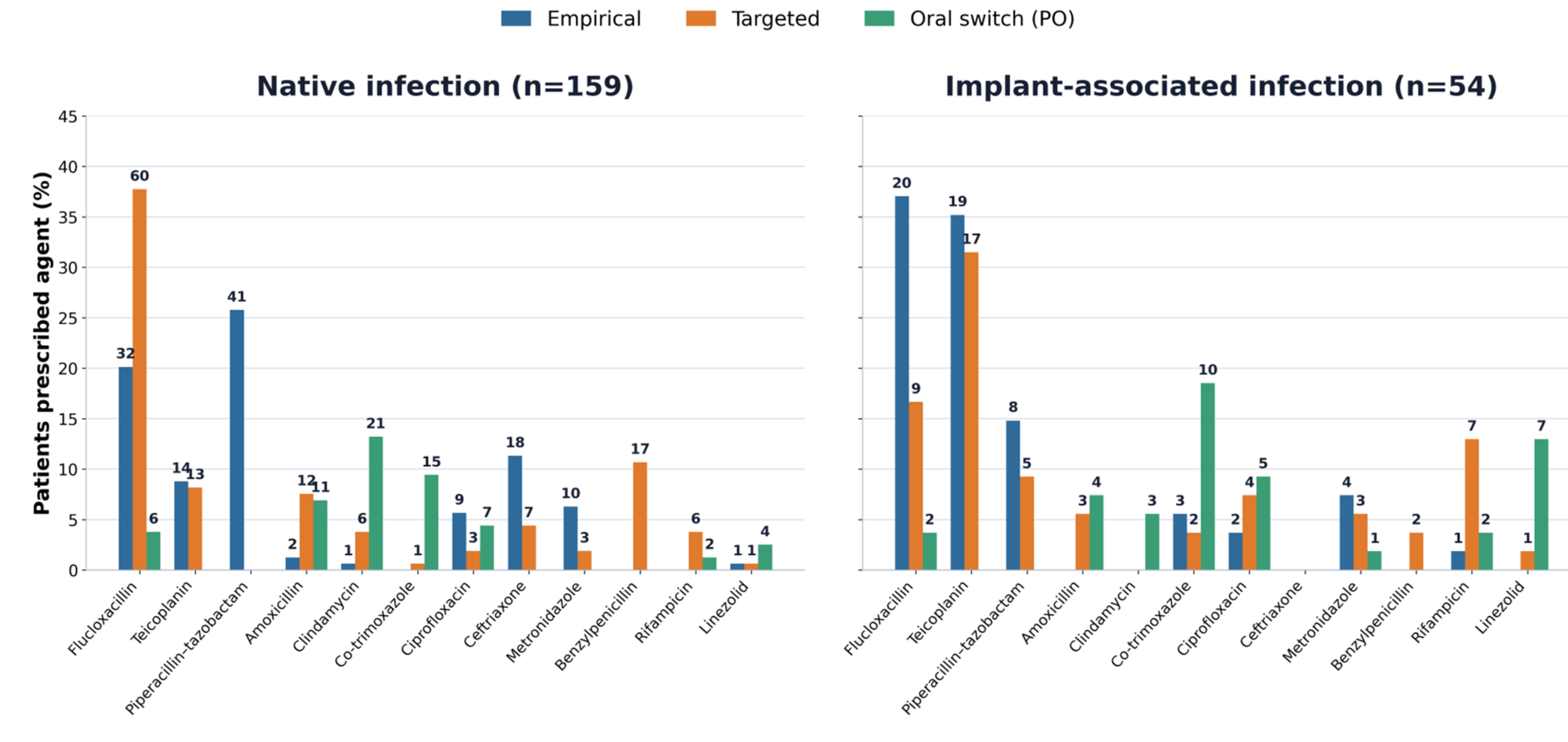
	Native (n=159)	Implant-associated (n=54)	Statistical analysis
Median age (range)	64 years (24-98)	64 years (21-88)	
Sex distribution n (%)	Female 56 (35%) Male 103 (65%)	Female 22 (41%) Male 32 (59%)	
Rockwood clinical frailty score (1-9)	3 (2-4)	3 (3-5)	
Rockwood clinical frailty score ≥5 n (%)	29 (18.2%)	15 (27.8%)	p=0.172
qSOFA score ≥2 n (%)	19 (11.9%)	1 (1.9%)	p=0.028
SIRS criteria at presentation n (%)	79 (49.7%)	14 (25.9%)	p=0.002
Body mass index	27.85 (24.0-31.9)	29.0 (24.0-33.0)	
White cell count at presentation (x10 ⁹ /L)	11.1 (8.5-15.2)	9.6 (6.0-12.2)	p<0.001
Serum albumin at presentation (g/L)	27.8 (24.0-31.9)	29.0 (24.0-33.0)	p<0.001
C-reactive protein at presentation (mg/L)	129.0 (56.5-223.5)	60.0 (23.3-131.5)	p<0.001
Peak C-reactive protein (mg/L)	198.5 (98.0-283.0)	109.0 (71.5-203)	p<0.001

Table 2: Summary of infection management

	Native (n=159)	Implants (n=54)
Microbiological diagnoses established	133 (84%)	47 (87%)
Patients receiving exclusive IV antibiotics (%)	82 (52%)	18 (33%)
Patients receiving exclusive oral antibiotics (%)	4 (3%)	1 (2%)
Patients who had IV to PO switch/IVOS (%)	73 (46%)	36 (67%)
Median total duration of antibiotics in days (IQR)	44 (42-53)	61 (43-89)
Duration of IVs before IVOS in days (IQR)	28 (15-37)	35 (18-46)
Patients receiving OPAT/COPAT (%)	81 (51%)	29 (54%)
Number of patients with adverse events related to antimicrobials (%)	45 (28%)	13 (24%)
Number of cases managed with surgical intervention (%)	51 (32%)	45 (83%)
Post-operative complications (%)	4 (8%)	12 (27%)

Figure 1: Summary of empirical, targeted and oral switch antimicrobial prescribing practice

Antibiotic prescribing by treatment stage

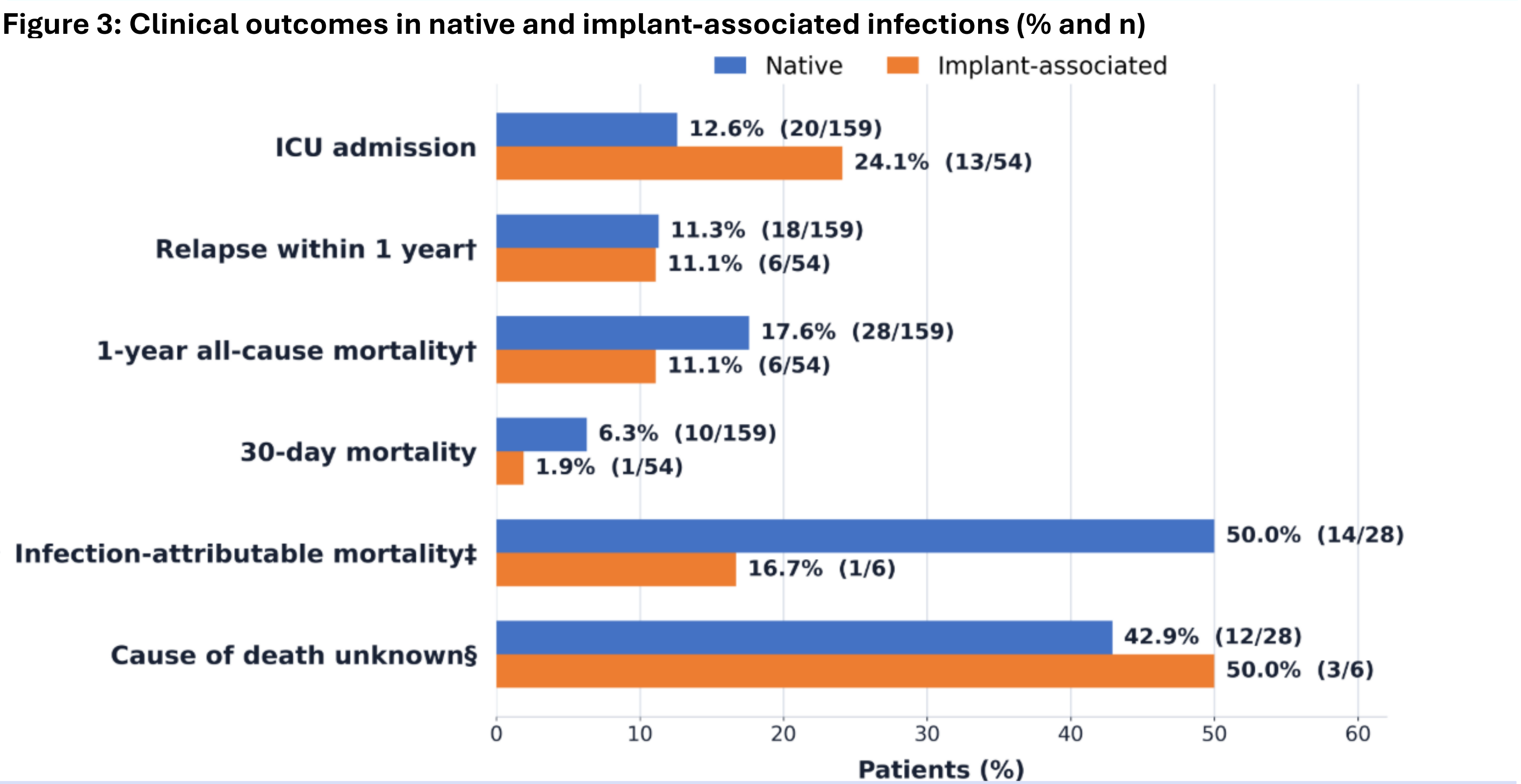


Legend: ■ Empirical ■ Targeted ■ Oral switch (PO)

Native infection (n=159)

Implant-associated infection (n=54)

Antibiotics: Fluorocillin, Teicoplanin, Piperacillin-tazobactam, Amoxicillin, Clindamycin, Co-trimoxazole, Ciprofloxacin, Ceftriaxone, Metronidazole, Benzylpenicillin, Rifampicin, Linezolid.

Figure 3: Clinical outcomes in native and implant-associated infections (% and n)

Legend: ■ Native ■ Implant-associated

Outcomes: ICU admission, Relapse within 1 year, 1-year all-cause mortality, 30-day mortality, Infection-attributable mortality, Cause of death unknown.

Bars show percentage of each infection group; labels show patient counts. Combination regimens contribute to more than one agent. Twelve most frequently prescribed agents shown. Rifampicin and metronidazole in the oral-switch series were administered orally. Teicoplanin and aztreonam were excluded from oral-switch counts because they have no oral formulation.

Conclusion:

The management of spinal infections is complex and associated with significant treatment burden, morbidity and mortality. Native infections presented with greater systemic inflammatory responses. Whereas implant-associated infections were more frequently polymicrobial. Our data supports that 6-week courses of antimicrobials are sufficient for native infections and oral switch is not associated with poorer outcomes although further analysis is ongoing. Next steps include quality improvement interventions focusing on antimicrobial stewardship and optimal tissue sampling, and further data analysis to gain a greater understanding of risk of relapse and mortality in native and implant-associated infections.

References:

1. Tsantes AG, Papadopoulos DV, Vrioni G, et al. Spinal Infections: An Update. *Microorganisms*. 2020;8(4):476. Published 2020 Mar 27. doi:10.3390/microorganisms8040476
2. Skaf GS, Domloj NT, Fehlings MG, et al. Pyogenic spondylodiscitis: an overview. *J Infect Public Health*. 2010;3(1):5-16. doi:10.1016/j.jiph.2010.01.001
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