Antibiotic duration in native and periprosthetic joint infections

a systematic review and meta-analysis of randomized controlled trials

From UCLouvain, Brussels, Belgium

Correspondence should be sent to F. M. Bombah freddy.bombah@uclouvain.be

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F. M. Bombah,[1,2,3] R. Buzisa Mbuku,[1,2] C. Dongmo Mayopa,[1,2] G. Fodjeu,[1,4] L. Fonkoue,[2,5,6] T. Van den Wyngaert,[1,2] H. Poilvache,[1,2] T. Schubert,[1,2] C. Detrembleur,[1,2] J-C. Yombi,[1,7] O. Cornu[1,2]

[1]Department of Orthopaedics and Traumatology, Cliniques universitaires Saint-Luc UCL, Brussels, Belgium
[2]Neuro Musculo Skeletal Lab, Institute of Experimental and Clinical Research (IREC), UCLouvain, Belgium
[3]Department of Surgery and Specialty, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon
[4]Morphology Lab, Institute of Experimental and Clinical Research (IREC), UCLouvain, Belgium
[5]Department of Orthopaedics and Trauma, Yaoundé General Hospital, Yaounde, Cameroon
[6]Department of Surgery and Specialties, University of Yaounde, Yaounde, Cameroon
[7]Department of Infectious diseases, Cliniques Universitaires Saint-Luc UCL, Brussels, Belgium

Aims

The optimal duration of antibiotic therapy in joint infection remains controversial, particularly as native joint septic arthritis and periprosthetic joint infection (PJI) differ substantially in pathophysiology, surgical management, and prognosis. While short antibiotic courses have been advocated for native joints after adequate drainage, prolonged therapy is often recommended for PJIs due to biofilm-related infection. This systematic review and meta-analysis of randomized controlled trials (RCTs) aimed to compare short- with long-course antibiotic strategies in both native and prosthetic joint infections.

Methods

Following PRISMA guidelines, a systematic search was performed across PubMed, Embase, Web of Science, and the Cochrane Library. Only RCTs were included. Studies were assessed for inclusion using predefined population, intervention, comparison, outcomes, and study (PICOS) criteria. Meta-analyses were conducted using MedCalc, and treatment failures were analyzed using odds ratios (ORs) with 95% CIs.

Results

A total of 12 RCTs involving 1,414 patients (native 577; periprosthetic 837) were included, with six eligible for meta-analysis. For PJIs, long-course therapy (≥ 12 weeks) significantly reduced treatment failure compared with short courses (OR 2.04, 95% CI 1.18 to 3.54; p = 0.011), while complication and mortality rates were similar. In contrast, for native joints, short-course therapy (≤ four weeks) achieved comparable infection control with prolonged regimens (OR 1.347; p = 0.565) when combined with adequate surgical drainage, particularly in paediatric populations. Surgical strategy (e.g. debridement, antibiotics, and implant retention vs one- or two-stage exchange) influenced outcomes more than antibiotic duration alone.

Conclusion

Optimal antibiotic duration should be individualized based on joint type and surgical approach. Short courses are effective for native septic arthritis with proper drainage, whereas PJIs generally require extended therapy due to biofilm-related complexity. We propose the

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Age-Joint-Immunity-Surgery-Sensitivity (AJISS) score as a decision-making tool to guide treatment duration, warranting prospective validation.

Take home message

- This study clarifies the differential impact of antibiotic duration according to joint type (native or prosthetic) and surgical strategy, providing robust evidence to optimize the management of joint infections.
- The introduction of the Age-Joint-Immunity-Surgery-Sensitivity score offers a decision-making model based on key clinical parameters, with the potential to standardize practice and improve therapeutic stratification.

Introduction

Antibiotic therapy is central to managing septic arthritis,[1] eliminating infection locally and systemically. Depending on the context, it may be empirical or targeted based on the pathogen.[1-3] Although the approach differs considerably depending on whether the infection involves a native joint (septic arthritis (SA)) or a periprosthetic joint infection (PJI),[4] the use of an short- compared with long-course antibiotic therapy remains a subject of debate in both SA and PJI.[3,4] Antibiotic treatment is frequently paired with surgical intervention to decompress the joint and remove debris potentially affecting prognosis.[1] In native joints, surgical strategies include simple joint lavage (irrigation), with or without synovectomy, performed via arthrotomy[1,3,5] or arthroscopy.[1,3,5] In PJIs, options include debridement, antibiotics, and implant retention (DAIR) and one- or two-stage prosthetic arthroplasties.[3] This wide therapeutic arsenal has led some authors to propose adapting antibiotic therapy to joint type and surgical approach used. Definitions of short therapy vary depending on joint type: in native joints, short therapy is typically defined as < four weeks;[3,5,6] in prosthetic joints, there is no consensus on short-treatment duration, which varies between six and 12 weeks.[7,8] Despite the central role of antibiotics in septic arthritis treatment, evidence regarding the optimal strategy remains limited. Most existing literature focuses on surgical techniques or observational outcomes, with few comparing antibiotic regimens. This lack of standardized guidance is particularly significant given the increasing prevalence of PJIs and the rise of antimicrobial resistance. Therefore, the aim of this study is to conduct a systematic review and meta-analysis of randomized controlled trials (RCTs) to assess the effectiveness of various antibiotic strategies in the treatment of septic arthritis, including both native and prosthetic joints. By focusing on high-level evidence, this review seeks to clarify the roles of short- compared with long-term duration, and the impact of adjunctive corticosteroid use.

Methods

Search strategy and information source

This study was registered with the Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD420250635375. The literature search was conducted following PRISMA guidelines. A systematic search was performed in PubMed, Embase, Web of Science, and the Cochrane Library to identify eligible studies. The search used medical subject heaings (MeSH) terms and relevant keywords, including 'septic arthritis', 'short-term antibiotic therapy', 'long-term antibiotic therapy', and 'randomized controlled trial'. Ethical approval and informed consent were not required for this study, as it is a systematic review and meta-analysis of published data.

Inclusion and exclusion criteria

Eligible studies compared different surgical interventions and/or antibiotic regimens, and reported clinical outcomes such as infection eradication, complications, or treatment failure. Meta-analysis articles meeting the following patient, intervention, comparator, outcome, studies (PICOS) criteria were selected: 1) population: patients with septic arthritis; 2) intervention: short course of antibiotics; 3) comparator: long course of antibiotics; 4) outcome: at least one of the following outcomes indicating treatment failure was reported: uncontrolled infection, death, or complication; 5) study design: only RCTs were included. We excluded studies performed in animals or published in a language other than English and French. In cases of multiple publications from the same dataset, only the most recent study was included (Figure 1).

Data extraction

Two authors (CDM, FG) independently reviewed the titles and abstracts of the studies and initially identified and assessed the full texts of these studies against the inclusion criteria. Disagreements were resolved by a third reviewer. The following data were extracted for each included study: author's name, year of publication, country, study design, sample size, sex, age, prosthetic joint, native joint, long- and short-course antibiotic treatment, and surgical procedure. Each RCT was evaluated using the Cochrane Risk of Bias Tool, considering the following domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other potential sources of bias (Figure 2).

Statistical analysis

Analyses were performed using MedCalc (Belgium). All p-values < 0.05 were considered statistically significant. For I^2 values less than 50%, the p-value used was based on the fixed-effect model. For I^2 values greater than 50%, the p-value used was based on the random-effect model. Treatment failures were expressed as dichotomous data in the form of odds ratios (ORs) with 95% CIs. The results are presented as forest plots, illustrating the effect estimates for each individual study as well as for all studies combined.

Results

Search output

The database search identified 605 publications after duplicates were removed. Following a rigorous selection process, 554 studies were excluded, including those that did not meet the inclusion criteria. A total of 51 full-text articles

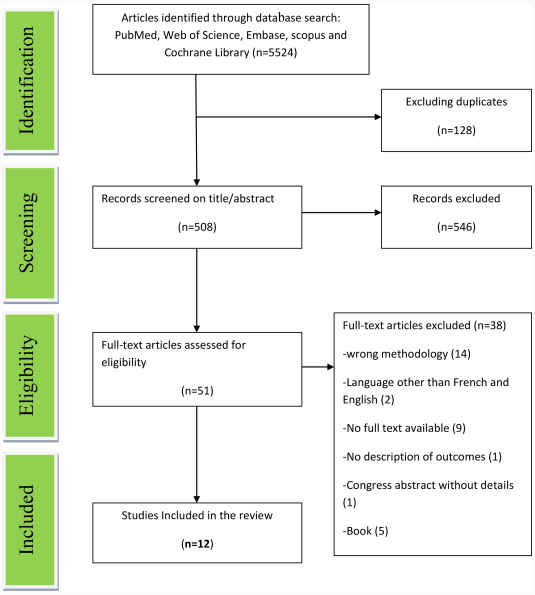


Fig. 1
PRISMA flow diagram, showing the assessment of eligibility for inclusion in the review.

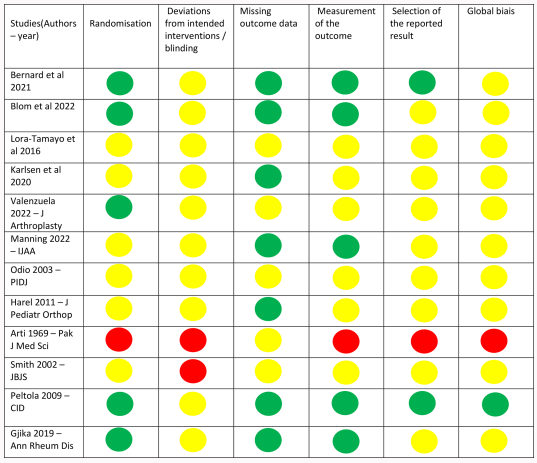


Fig. 2
Risk of bias assessment using the Cochrane Risk of Bias 2 tool.

were screened for potential eligibility, and 39 were excluded due to lack of relevant comparison or full text. In all, 12 RCTs were retained, of which six were selected for the meta-analysis comparing short with long antibiotic therapy.

Characteristics of included studies

Overall, 12 RCTs[9-20] were included in the review: six on prosthetic[9-14] and six on native[15-20] joints. Studies were conducted on 1,414 patients (Table I) (837 patients with septic arthritis on the prosthetic joint and 577 on native joint). The overall mean age was 41.1 years (SD 31.7) (66.4 years (SD 7.45) for adult studies and 5.8 years (SD 2.88) for paediatric studies), and the majority of whom were adult males. The knee was most often affected, followed by hip and shoulder. The different classes of antibiotics used included beta-lactams,[14,15,19] macrolides,[14,20] tetracyclines,[20] fluoroquinolones,[9,11,20] glycopeptides,[14,20] and sulfonamides.[15,20] The authors identified six potential causes of morbidity in medical past history,[9,11,12,14,18,20] diabetes[11,12,14,20] being the most common. Correlation Pearson analysis revealed a strong positive relationship between comorbidity burden and adverse outcomes, particularly in PJIs. Diabetes showed the highest association with treatment failure ($r \approx 0.99$), while immunosuppression strongly correlated with mortality ($r \approx 0.97$). Chronic renal disease and cancer also demonstrated significant links to complications and death. In contrast, native septic arthritis (SA) cases had minimal comorbidity impact and very low mortality, indicating that comorbidities are a major prognostic factor primarily in PJIs.

Therapeutic strategy

The antibiotic treatment strategies reported in the included studies varied according to treatment duration, the use of adjunctive corticosteroids, and the causative pathogen. Antibiotic therapy was classified as either short- or long-term (based on duration), with or without corticosteroids, empirical or targeted. The definitions of short- and long-course antibiotic therapy differed depending on whether the infection involved a native or prosthetic joint. For native joints, therapy was considered short if administered for less than four weeks and long if extended beyond that (≥ four weeks), while for prosthetic joints, short-course therapy was defined as less than 12 weeks, and long-course therapy as six weeks or more.

All of the authors identified nine[9,11,14-20] studies investigating short-course antibiotic therapy and nine[9-1418-20] studies evaluating long-course therapy. Regarding PJIs (Table II), six studies employed long-course antibiotic therapy (12 weeks or more), of which three were comparative studies assessing long compared with short antibiotic regimens (< 12 weeks). For native septic arthritis (Table II), six studies used short-course antibiotic therapy (three weeks or less), of which three were comparative studies evaluating short compared with long antibiotic regimens (four weeks or more). Corticosteroids were administered as an adjunct in paediatric cases,[15-17] and empirical antibiotic therapy was followed by pathogen-targeted treatment. Comparisons between treatment strategies were made across the included studies: long- compared with short-course antibiotic therapy on the prosthetic[9,11,14] and native[18-20] joint.

Outcomes

Differences in treatment failure rates were analyzed, and where appropriate, the findings were further supported by meta-analyses to identify the most effective treatment strategies. The analysis of failure proportions revealed a statistically significant difference in favour of paediatric patients compared with adults for both short-course ($p = 0.023$) and long-course ($p = 0.001$) antibiotic therapy. However, no significant difference was observed with the addition of corticosteroid therapy to antibiotics ($p = 0.108$). A statistically significant difference was observed for single-stage prosthetic arthroplasties compared with two-stage procedures when long-term antibiotic therapy was used ($p = 0.021$). Additionally, short-course antibiotic therapy showed a statistically significant advantage for irrigation over arthrotomy ($p = 0.007$), and for one-stage prosthetic ($p < 0.001$) arthroplasty over debridement and implant retention. Table III summarizes the comparative treatment failure rates across studies.

Table I. General overview of the included articles.

Authors	Country	N	Sex ratio (M/F)	Age, yrs	Medical past	Joint	Na or Pr	Biology	Microbiology	Antibiotic therapy		
										International nonproprietary name	Short	Long
Bernard et al, 2021	England	410	2.08	68.94	Obesity	H: 255 K: 149	Pr	CRP; blood culture	*Staphylococcus aureus*; CoNS; Streptococcus species; Gram-negative organisms	IV: Methicillin/ cephalosporin Oral: Rifapicin/ fluoroquinolone	393	389
Blom et al, 2022	UK, Sweden	140	1.41	71	N/A	H: 140	Pr	N/A	Monomicrobial culture; negative culture; polymicrobial culture	N/A	0	140
Tamayo et al, 2016	Spain	63	0.90	72	Diabetis; chronic heart disease; chronic liver disease; chronic renal disease; cancer	H: 20 K: 24	Pr	N/A	Polymicrobial infection; *Staphylococcus aureus*; CoNS	Rifampicin Levofloxacin	30	33
Espeland et al, 2020	Norway	48	2	68.5	Diabetis; immunosuppressor treatment; smoking	H: 31 K: 9	Pr	CRP; ESR	MSSA; MRSE; *Staphylococcus lugdunensis*; *Staphylococcus capitis*	Rifampicin Cloxacilin	0	48
Valenzuela et al, 2021	USA	116	1	67.1	N/A	H: 44 K: 88	Pr	N/A	N/A		N/A	116
Manning et al, 2023	Australia	60	1.73	67	Diabetes mellitus; chronic renal impairment; cancer; cirrhosis; rheumatoid arthritis; congestive cardiac failure; ischaemic heart disease, present; cerebrovascular disease	N/A	Pr	CRP	Methicillin-susceptible *Staphylococcus aureus*; Group B Streptococcus; group C/G Streptococcus; *Staphylococcus lugdunensis*; other CoNS	Flucloxacilin/ cefazolin ampicillin/penicillin Vancomycin Teicoplanin Ceftriaxone pipericelin	21	29
Odio et al, 2003	Costa Rica	123	1.04	5.68	N/A	H: 47 K: 40 S: 4 E: 24 A: 5	Na	CRP; joint fluid (WBC, LDH, Gram+ stained smear)	*Staphylococcus aureus*, *Haemophilus influenza*, *Staphylococcus pneumoniae*, *Staphylococcus pyogene*	Ampicillin Oxacillin Trimethoprim – Sulfamethoxazole	100	0
Harel et al, 2011	Israël	49	N/A	1	N/A	N/A	Na	N/A	N/A	Cefuroxim	49	0
Hamidreza arti et al, 2014	Iran	60	2.75	8.06	N/A	N/A	Na	N/A	N/A		60	0
Smith et al, 2002	Maliwi	61	2.81	8	HIV; drepano-cytosis	S: 61	Na	N/A	*Salmonella typhimurium*; *Salmonella enteridis*; *Staphylococcus aureus*; type-B haemophilus; group-A streptococcus; *Streptococcus pneumoniae*; klebsiella		21	N/A
Heikki Peltola et al, 2009	Finland	130	1.36	6.2	N/A	H: 48 K: 32 S: 6	Na	CRP; ESR; WBC	*Staphylococcus aureus*; *Haemophilus influenzae* type b; *Streptococcus pyogenes*; *Streptococcus pneumoniae*	Clindamycin Amoxicillin Cephalosporin	31	30

(*Continued*)

(*Continued*)

Authors	Country	N	Sex ratio (M/F)	Age, yrs	Medical past	Joint	Na or Pr	Biology	Microbiology	Antibiotic therapy		
										International nonproprietary name	Short	Long
						E: 8						
						A: 30						
						W/O: 2						
										Ceftriaxon		
						H: 1				Vancomycin		
						K: 14				Co-amoxicilline		
						S: 7				Quinolone		
						E: 1				Cotrimoxazole		
Ergys Gjika et al, 2019	Switzerland	154	1.61	50	Diabetis; cirrhosis; cancer; steroid medication	A: 3 W/O: 98	Na	CRP; bacteraemia	*Staphylococcus aureus*; *Staphylococcus aureus* infection; streptococci; Gram negative(s)	Clindamycine Doxycicline	63	67

A, ankle; CoNS, coagulase-negative staphylococcus; E, elbow; H, hip; IV, intravenous; K, knee; LDH, lactate dehydrogenase; MRSA, methicillin-resistant *Staphylococcus aureus*; MRSE, methicillin-resistant *Staphylococcus epidermisis*; MSSA, methicillin-sensitive *Staphylococcus aureus*; Na, native ; N/A, not available; Pr, prosthetic ; S, shoulder; WBC, white blood cell; W/O, wrist and others.

Table II. General overview of the treatments used in the included articles.

Authors	Country	N	Na or Pr	Short antibiotic therapy		Long antibiotic therapy		Surgical technique						Length of hospital stay (days)		Uncontrolled infection		Complications		Death	
				n	Duration, weeks	n	Duration, weeks	Arthrocenthesis	Arthrotomy	Arthroscopy	DAIR	One-stage	Two-stage	Short	Long	Short	Long	Short	Long	Short	Long
Bernard et al, 2021	England	410	Pr	190	6	188	12				151	146	91		14	32	15	46	35	10	10
Blom et al, 2022	UK, Sweden	140	Pr	N/A		140	> 12				N/A	65	75		17 to 24	N/A	34	N/A	70	N/A	7
Tamayo et al, 2016	Spain	63	Pr	30	8	33	> 12				63	N/A	N/A		N/A	2	1	8	14	2	1
Espeland et al, 2020	Norway	48	Pr	N/A		48	> 12				48	N/A	N/A		N/A	N/A	13	N/A	N/A	N/A	N/A
Valenzuela et al, 2021	USA	116	Pr	N/A		116	> 12				N/A	58	58		2 to 8	N/A	8	N/A	19	N/A	6
Manning et al, 2023	Australia	60	Pr	31	< 12	29	18				60	N/A	N/A		N/A	9	7	5	8	2	1
Odio et al, 2003	Costa Rica	123	Na	100	2	N/A		100							7	18		N/A	N/A	0	N/A
Harel et al, 2011	Israël	49	Na	49	3	N/A		49							9 to 12	0	N/A	2	N/A	0	N/A
Arti et al, 2014	Iran	60	Na	60	3	N/A		60							9 to 12	0		N/A		0	N/A
Smith et al, 2002	Maliwi	61	Na	31	3	30	6	31	30						N/A	0	0	0	0	0	0
Peltola et al, 2009	Finland	130	Na	63	1 (10 days)	67	4 (30 days)	114	15	1						5	3	5	4	0	0
Gjika et al, 2019	Switzerland	154	Na	77	2	77	4 (30 days)	154						4	6	4	4	27	33	0	0

DAIR, debridement, antibiotics, and implant retention; N/A, not available; Na, native ; Pr, prosthetic .

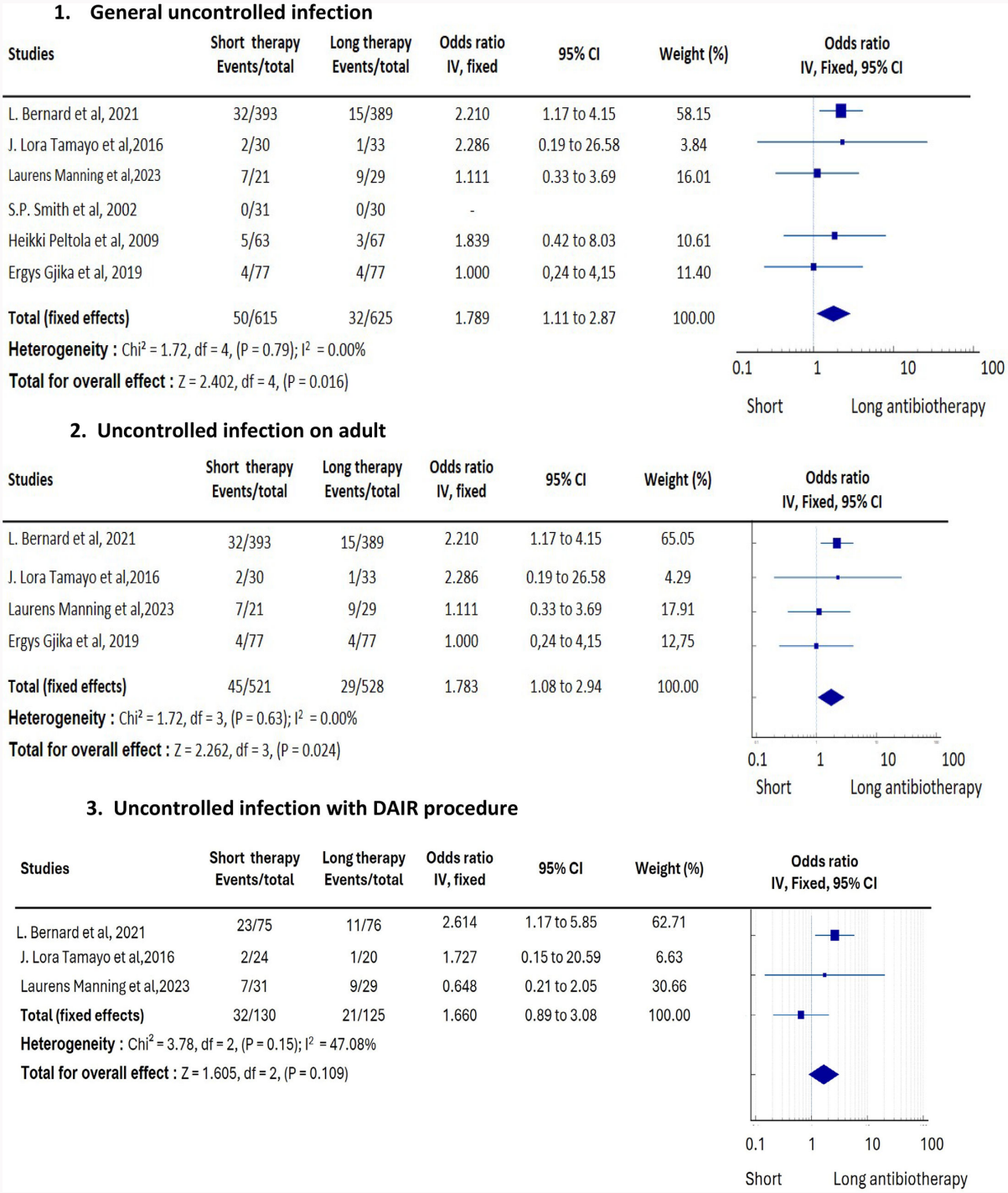


Fig. 3
Meta-analysis of short compared with long antibiotic treatments success of septic arthritis: 1) General uncontrolled infection: fewer with long course. 2) Uncontrolled infection in adults: fewer with long course. 3) Uncontrolled infection with debridement, antibiotics, and implant retention (DAIR) procedure: equivalent. df, degrees of freedom; IV, inverse variance.

The results of the meta-analysis, expressed as odds ratios, indicate a significant advantage for long-course antibiotic therapy compared with short-course therapy (OR 1.789, 95% CI 1.113 to 2.876; p = 0.016). This effect was particularly evident in adults (OR 1.783, 95% CI 1.080 to 2.944; p = 0.024), with low heterogeneity observed across studies (I^2 < 0.001). This effect was not evident in DAIR procedure (OR 1.660, 95% CI 0.89 to 3.08; p = 0.109) (Figure 3).

For prosthetic septic arthritis (Figure 4), prolonged antibiotic therapy was associated with a significantly lower rate of therapeutic failure compared with short-course treatment (OR 2.04, 95% CI 1.18 to 3.54; p = 0.011). Complication rates were similar between the two strategies (OR 1.05, 95% CI 0.69 to 1.59; p = 0.817), while mortality was reduced with longer antibiotic treatments (OR 1.17, 95% CI 0.53 to 2.58; p = 0.697).

Table III. Summary of the comparative surgical treatment failure rates in long- and short-term antibiotherapy.

Variable	Irrigation vs arthrotomy	Irrigation vs arthroscopy	Arthrotomy vs arthroscopy	DAIR vs one stage	DAIR vs two stage	One vs two stage
Long-term antibiotherapy						
Difference	5,440	8,840	14,280	4	4.9	9
95% CI	-7,695 to 42,651	-17,306 to 14,783	-14,131 to 51,307	-1.7 to 11.6	3.63 to 12.38	3.14 to 15.36
p-value	0.626	0.305	0.211	0.179	0.241	0.021
In favour	N/A	N/A	N/A	N/A	N/A	One stage
Short-term antibiotherapy						
Difference	9,600	N/A	N/A	21	12	9
95% CI	1,898 to 22,123	N/A	N/A	10,845 to 30,559	-4 to 24.1	-1,461 to 23,292
p-value	0.007	N/A	N/A	0.001	0.129	0.095
In favour	Irrigation	N/A	N/A	One stage	N/A	N/A

DAIR, debridement, antibiotics, and implant retention; N/A, not available.

Conversely, for native joint septic arthritis (Figure 5), no significant difference was observed in therapeutic failure between short and prolonged antibiotic treatments (OR 1.347, 95% CI 0.49 to 3.72; p = 0.565). However, longer courses were linked to a higher incidence of complications without providing additional efficacy benefits (OR 0.811, 95% CI 0.45 to 1.46; p = 0.565).

Discussion

The management of septic arthritis requires a multidisciplinary approach,[21,22] combining appropriate antimicrobial therapy with surgical intervention.[23-26] This systematic review aimed to identify the most effective antibiotic strategies, in terms of treatment duration and adjunctive corticosteroid use, based on randomized controlled trials.

Our meta-analysis revealed a modest but statistically significant advantage in favour of long-course antibiotic therapy over short-course regimens, particularly in adults (OR 1.783, 95% CI 1.080 to 2.944; p = 0.024). These results suggest that longer durations may provide more robust infection control in this population, especially for PJIs, where biofilm-forming organisms such as *Staphylococcus epidermidis* are common.[9,11,12] Empirical antibiotic therapy (against *Staphylococcus aureus,*[4,9,11,12,14,15,18–20,27,28] streptococci,[4,14,19,20,27,28] and enterobacteria[4,17,27,28]), typically initiated after joint fluid and blood cultures are obtained, remains essential.[1,5,21-25] Once the pathogen and its susceptibility profile are known, targeted therapy should follow to optimize efficacy and reduce antimicrobial resistance risks.[8,10–15,18,19]

Native septic arthritis

Early and intensive antibiotic therapy is essential to limit joint damage and preserve cartilage in the long term.[29] Short antibiotic therapy (< four weeks) appears effective for native joint infections when combined with adequate surgical drainage and early intervention.[1-35,6,18-20] Repeated arthrocentesis or arthroscopy are viable options in early-stage infections,[1–3,5] with the latter allowing direct visualization and thorough lavage.[23,25,30,31] In our review, short-course therapy combined with irrigation showed better outcomes than when paired with arthrotomy (p = 0.0075), particularly in paediatric populations, where infection control rates were significantly higher (p = 0.0232 and p = 0.0007 for short and long courses, respectively). Our meta-analysis found no significant difference in treatment failure between short and long courses (OR 1.347, 95% CI 0.49 to 3.72; p = 0.565). However, prolonged therapy was associated with a higher incidence of complications without additional benefit in infection control. Mortality differences were negligible across regimens.

Adjunctive corticosteroid therapy remains a controversial topic. Its use is mostly restricted to paediatric populations.[15-17,32] Several trials suggest that corticosteroids may reduce inflammation,[22,32] pain, hospital stay, CRP normalization, and long-term sequelae,[15–17,22,32] without compromising infection control.[32,33] However, in adults, data are scarce, and potential immunosuppressive effects warrant caution.[23] Our analysis did not show a statistically significant difference with corticosteroid use (p = 0.108).

PJI

PJIs present unique challenges due to biofilm formation and the complexity of surgical management.[4,8,9] The clinical course of PJI is often categorized as acute (early or subacute), typically occurring within three months of implantation, and chronic (late), which develops beyond this period. This distinction is critical because it influences both surgical strategy and antibiotic duration.[4]

For acute PJIs, particularly those managed with implant retention (DAIR), shorter antibiotic courses have been explored. However, evidence remains mixed: our review found no clear benefit of extended therapy in DAIR cases,[9,11,14] aligning with recent literature suggesting that shorter regimens may be acceptable under strict criteria such as early diagnosis, stable implant, and susceptible organisms.[7,34-37]

Table IV. Personalized Age-Joint-Immunity-Surgery-Sensitivity decision guide score to estimate the duration of antibiotic therapy in septic arthritis.

Criteria	Points
A – Age	
Elderly (aged > 75 years)	+ 2
Adult (aged 15 to 75 years)	+ 1
Child (aged < 15 years)	0
J – Type of joint	
Prosthetic joint	+ 1
Native joint	0
I – Immune status	
Immunosuppressed (e.g. HIV < 200 CD4, chemotherapy, corticosteroids > 10 mg/day)	+ 2
Controlled immunocompromised (e.g. HIV > 200 CD4, controlled diabetes)	+ 1
Immunocompetent	0
S – Surgical option (0 to 3)	
Prosthesis retained (DAIR or simple washout) with the involvement of mature biofilm (ex: chronic septic arthritis)	+ 3
Prosthesis removed (one- or two-stage exchange) with the involvement of mature biofilm (ex: chronic septic arthritis)	+ 2
Incomplete decontamination without the involvement of mature biofilm (ex: native joint with incomplete debridement or DAIR in early PJI)	+ 1
Native joint with complete debridement	0
S – Sensibility of antibiotic (0 to 2)	
Multiresistant strain (R): find intravenous active antibiotics	+ 2
Sensible with high-dose requirement (SDD/I)	+1
Sensible (S)	0
Score interpretation	
Total score	**Recommended antibiotic duration**
0 to 2	3 to 4 weeks
3 to 5	6 to 8 weeks
6 to 9	≥ 12 weeks

DAIR, debridement, antibiotics, and implant retention; PJI, periprosthetic joint infection.

Conversely, chronic PJIs, often associated with mature biofilms and delayed presentation, require more aggressive management. Extended antibiotic therapy (≥ 12 weeks) remains the most widely adopted strategy[7,9-14] and demonstrated a significant reduction in treatment failure compared with short courses (OR 2.04, 95% CI 1.18 to 3.54; p = 0.011). Complication rates were similar between regimens (OR 1.05; p = 0.817), while mortality showed a non-significant trend favouring prolonged therapy (OR 1.17; p = 0.697). Surgical approach strongly influenced outcomes: single-stage exchange under long-course coverage outperformed two-stage procedures (p = 0.021), whereas DAIR showed no clear benefit from extended antibiotic duration.

These findings underscore the importance of tailoring antibiotic duration to infection timing and surgical strategy. Acute PJIs may allow for shorter courses when combined with effective debridement and implant retention, while chronic infections generally require prolonged therapy and often prosthesis exchange.

Clinical implications

These findings underscore the need for individualized treatment strategies rather than a uniform approach. We propose a practical decision-making tool (Age-Joint-Immunity-Surgery-Sensitivity (AJISS) guide) incorporating age,[5,9–20,38,39] immune stats,[11,12,14,20,21] type of surgery, joint involved,[5,9-20] and microbiological profile[40] to tailor antibiotic duration. The AJISS score is based on a strong predictive rationale for estimating the optimal duration of antibiotic therapy in septic arthritis (Table IV). Data from the meta-analysis demonstrate an almost linear inverse correlation (Figure 6) between the score and the probability of success (r ≈ –0.96), confirming that each additional point increases the risk of failure and justifies prolonged treatment. The statistical power of the model is acceptable (≈ 80%) and its discriminative ability satisfactory (area under the curve (AUC) ≈ 0.78), with thresholds (0 to 2, 3 to 5, 6 to 9) clearly separating recommended durations (three to four, six to eight, and ≥ 12 weeks), although, consistent with observed trends (global OR 1.789; p = 0.016).

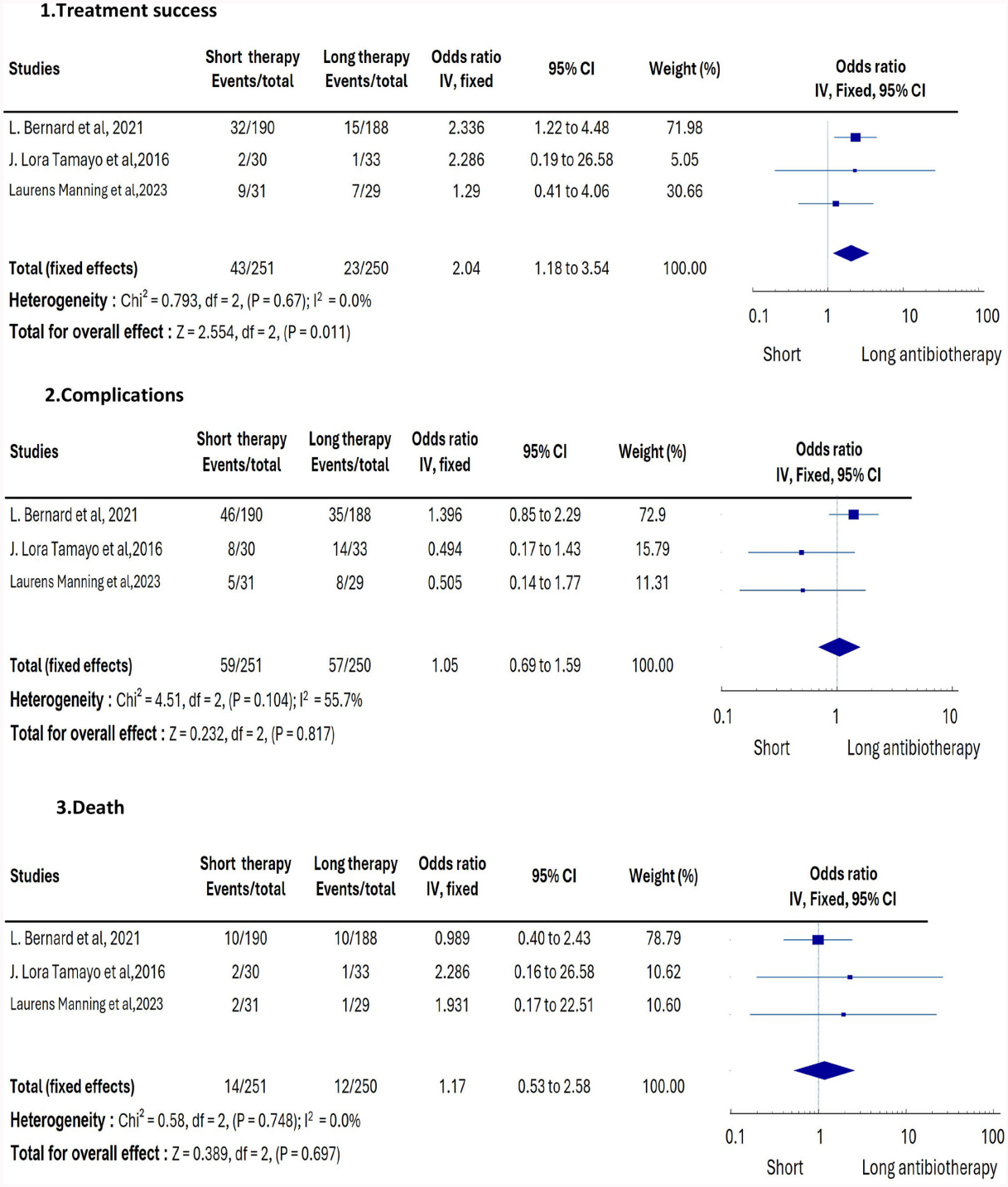


Fig. 4
Meta-analysis of short compared with long antibiotic treatments of prosthetic septic arthritis. 1) Treatment success: fewer therapeutic failures with long-course antibiotic therapy compared with short-course therapy. 2) Complications: equivalent complication rates. 3) Death: fewer deaths associated with long-course antibiotic therapy. df, degrees of freedom; IV, inverse variance.

This tool should be validated in multicentre cohorts, integrating biological markers (e.g. CRP), imaging (e.g. persistent abscess, osteolysis), and drug toxicity considerations.[41] It offers a rational, adaptable framework to optimize treatment length in both native and prosthetic septic arthritis.

First, the number of high-quality RCTs available for inclusion was small, which reduces the statistical power and generalizability of the findings. Second, there was considerable heterogeneity across studies in defining 'short' compared with 'long' antibiotic courses, surgical strategies, and outcome measures, making direct comparisons challenging. Third, sub-group analyses were limited by incomplete reporting of patient-level data, such as comorbidities, microbiological profiles, and immune status, which are critical determinants of treatment success. Fourth, most included trials were conducted in high-resource settings, potentially limiting applicability to low-resource environments where diagnostic and surgical options differ. Further multicentre studies are needed to refine

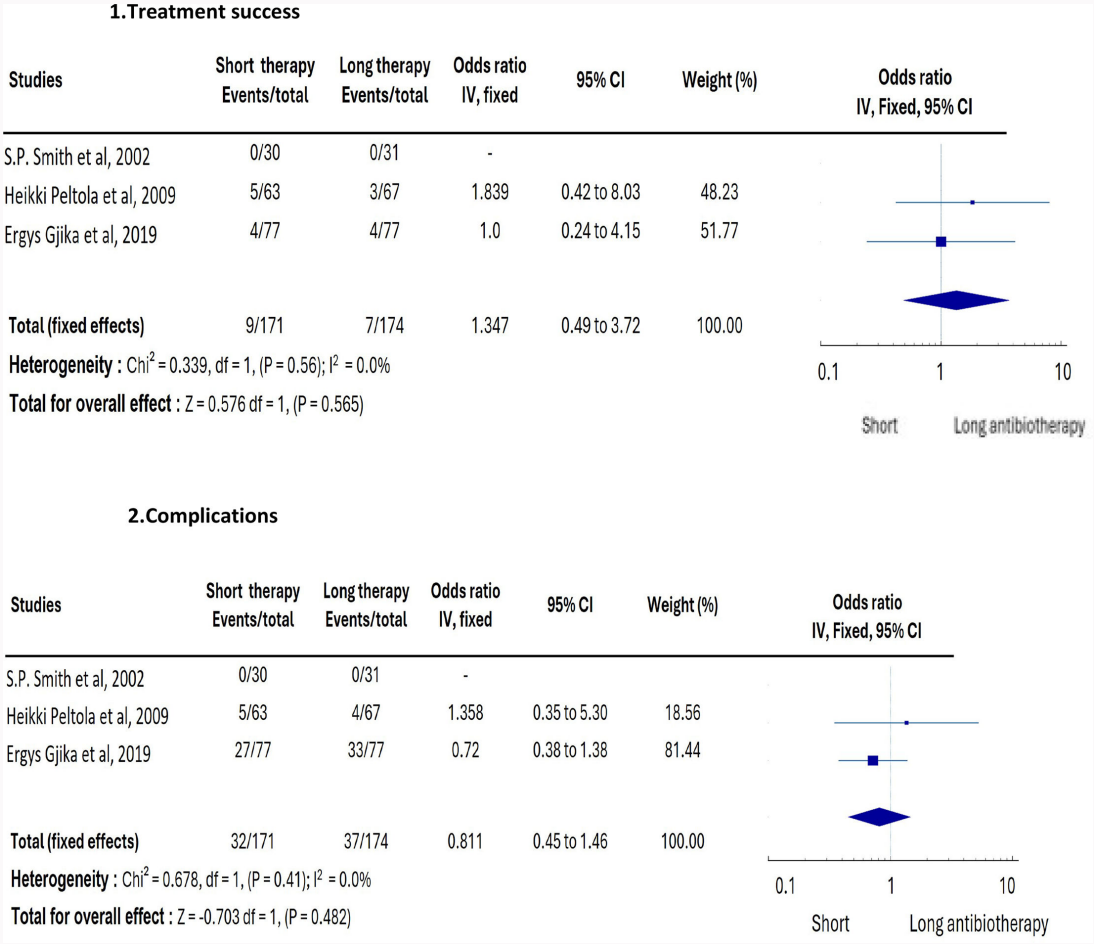


Fig. 5
Meta-analysis of short compared with long antibiotic treatments of native septic arthritis. 1) Treatment success: equivalent therapeutic failures between long-course antibiotic therapy compared with short-course therapy. 2) Complications: more complications with long-course antibiotic therapy compared with short-course therapy. df, degrees of freedom; IV, intravenous.



Fig. 6
Relationship between Age-Joint-Immunity-Surgery-Sensitivity (AJISS) score and predicted probability of therapeutic success.

duration thresholds. Despite these constraints, our findings support a more individualized, evidence-based approach to antibiotic duration.

In conclusion, this meta-analysis of RCTs reveals two distinct patterns in antibiotic management for septic arthritis. For native joints, short-course antibiotic therapy appears effective when combined with adequate surgical drainage, particularly in paediatric populations. In contrast, prosthetic joint infections demonstrate a clear benefit from prolonged antibiotic regimens, reflecting the complexity of biofilm-related infections and the need for sustained antimicrobial coverage. These findings underscore that treatment duration should not follow a one-size-fits-all approach but rather be tailored to joint type, surgical strategy, and patient characteristics, paving the way for individualized decision-making tools such as the AJISS score.

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Author information

F. M. Bombah, MD, PhD Student, Orthopaedic and Trauma Surgeon, Department of Orthopaedics and Traumatology, Cliniques universitaires Saint-Luc UCL, Brussels, Belgium; Neuro Musculo Skeletal Lab, Institute of Experimental and Clinical Research (IREC), UCLouvain, Belgium;
Department of Surgery and Specialty, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon.

R. Buzisa Mbuku, Phd, Orthopaedic and Trauma Resident
C. Dongmo Mayopa, Phd Student, Orthopaedic and Trauma Surgeon
T. Van den Wyngaert, MD, Orthopaedic and Trauma Surgeon
H. Poilvache, MD, PhD, Orthopaedic and Trauma Surgeon
T. Schubert, MD,PhD, Orthopaedic and Trauma Surgeon
C. Detrembleur, PhD, Orthopaedic and Trauma Resident
O. Cornu, MD,PhD, Orthopaedic and Trauma Resident
Department of Orthopaedics and Traumatology, Cliniques universitaires Saint-Luc UCL, Brussels, Belgium; Neuro Musculo Skeletal Lab, Institute of Experimental and Clinical Research (IREC), UCLouvain, Belgium.

G. Fodjeu, Phd Student, Orthopaedic and Trauma Surgeon, Department of Orthopaedics and Traumatology, Cliniques universitaires Saint-Luc UCL, Brussels, Belgium; Morphology Lab, Institute of Experimental and Clinical Research (IREC), UCLouvain, Belgium.

L. Fonkoue, MD, PhD, Orthopaedic and Trauma Surgeon, Neuro Musculo Skeletal Lab, Institute of Experimental and Clinical Research (IREC), UCLouvain, Belgium; Department of Orthopaedics and Trauma, Yaoundé General Hospital, Yaounde, Cameroon; Department of Surgery and Specialties, University of Yaounde, Yaounde, Cameroon.

J-C. Yombi, MD,PhD, Specialty in Internal Medicine and Infectious Diseases, Department of Orthopaedics and Traumatology, Cliniques universitaires Saint-Luc UCL, Brussels, Belgium; Department of Infectious diseases, Cliniques Universitaires Saint-Luc UCL, Brussels, Belgium.

Author contributions

F. M. Bombah: Conceptualization, Data curation, Investigation, Methodology, Project administration, Visualization, Writing – original draft.
R. Buzisa Mbuku: Data curation, Formal analysis.
C. Dongmo Mayopa: Data curation, Formal analysis.
G. Fodjeu: Data curation, Formal analysis.
L. Fonkoue: Supervision, Writing – review & editing.
T. Van den Wyngaert: Data curation, Formal analysis, Writing – review & editing.
H. Poilvache: Writing – review & editing.
T. Schubert: Supervision, Writing – review & editing.
C. Detrembleur: Conceptualization, Data curation, Investigation, Methodology.
J-C. Yombi: Supervision, Writing – review & editing.
O. Cornu: Conceptualization, Methodology, Supervision, Writing – review & editing.

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