Post-DAIR Antibiotic Duration · Orthopaedic Implant Surgery

FAST & FRUGAL TREE · GIGERENZER FRAMEWORK · 3-CUE MAXIMUM

FFT · GIGERENZER FRAMEWORK

PJI · DAIR · Implant Retention

Walsh / OrthoScenius · 2026

DECISION TREE — THREE CUES, FOUR EXITS

CUE 1 · HIGHEST VALIDITY

MRSA, MRSE, or high-virulence organism confirmed?

(S. aureus, highly resistant Gram-negatives, fungal, polymicrobial)

Validity anchor: Non-MRSA = major success criterion (80.98% success vs 57.11% overall) — Qu 2019 N=1,266 · S. aureus failure: major risk factor — ICM DAIR 2025 N=1,989 patients

▲ YES

EXIT 1 · EXTENDED + RIFAMPIN COMBINATION

12 weeks IV + 6–12 months oral

Rifampin combination mandatory for S. aureus / biofilm-forming organisms

MRSA and S. aureus require rifampin combination (biofilm penetration) + extended duration. Failure rate without rifampin in S. aureus DAIR approaches 50–70%. Engage ID from day 0.

ICM DAIR 2025: S. aureus + prolonged symptoms = major failure risk factors · Qu 2019: MRSA fails major criteria · Siqueira 2015: S. aureus suppression HR 0.63 (p=0.047)

▼ NO

CUE 2 · TIMING VALIDITY

Symptom duration ≥3 weeks before debridement?

Validity anchor: Symptoms <3 weeks = major success criterion; combi with non-MRSA organism → 80.98% DAIR success — Qu 2019 · ICM DA 2025: acute onset (<6 wks post-op or <7 days symptoms) required for optimal candidacy

▲ YES (chronic)

EXIT 2 · EXTENDED STANDARD COURSE

12 weeks systemic + consider chronic oral suppression

Reassess DAIR candidacy — may need revision

Delayed presentation implies established biofilm. DAIR success rates drop significantly. If proceeding with DAIR: 12-week systemic antibiotics per ICM 2025 protocol + reassess for revision at 6 weeks if markers not normalising.

ICM DAIR 2025: 12-week systemic antibiotic protocol · Qu 2019: symptoms ≥3 weeks → fails major criteria → lower success · Siqueira 2015: chronic suppression 5-yr survival 68.5% vs 41.1%

▼ NO (acute)

CUE 3 · HOST / SEROLOGICAL VALIDITY

Immunocompromised OR elevated ESR:CRP ratio (≥1.31)?

Or: prior multiple revisions / multiple failed DAIRs / rheumatoid arthritis

Validity anchor: ESR:CRP ratio ≥1.31 → AUC 0 for reinfection in chronic PJI (75% sensitivity, 8 specificity) — Maier 2020 N=179 · RA comorbidity = minor failure criterion — Qu 2019

▲ YES

EXIT 3 · STANDARD + SUPPRESSION

12 weeks systemic + 6 months oral suppression

Organism-specific oral agent; ID-directed

Immunocompromised hosts or elevated serological risk markers warrant chronic oral suppression post-standard IV course. Optimise immunosuppression during and after treatment.

Siqueira 2015: suppression 68.5% vs 41.1% 5-yr survival (HR 0.63) · Maier 2020: ECR ≥1.31 → 84% specificity for reinfection in chronic PJI

▼ NO

EXIT 4 · STANDARD PROTOCOL

6 weeks IV oral step-down

OVIVA-equivalent oral step-down after clinical response

Acute presentation, non-virulent organism, immunocomp normal serolo trajectory. Sta IV course with oral step-dow once CRP tren down + patie tolerating oral

ICM DAIR 2025: PJI success ~61. with standard protocol · OVIVA 2019: oral non-inferior to IV for bone/joint infec (non-inferiority

CUE VALIDITY RANKING — QUANTIFIED EFFECT SIZES

RANK	CUE	EFFECT SIZE	SOURCE · N
1	CUE 1 Non-MRSA organism (DAIR success major criterion)	80.98% success (non-MRSA + <3 wks) vs 57.11% overall	Qu 2019 Pooled N=1,266
1a	CUE 1 S. aureus: chronic oral suppression benefit	HR 0.63 (p=0.047) 57.4% vs 40.1% 5-yr survival	Siqueira 2015 N=368 PSM cohort
1b	CUE 1 S. aureus: major failure risk factor for DAIR	Major failure predictor (61.1% acute hematogenous success)	ICM DAIR 2025 N=1,989 (45 studies)
2	CUE 2 Symptom duration <3 weeks (major criterion)	Both criteria met → 80.98% success Either absent → drops to ~57%	Qu 2019 N=1,266 pooled
2a	CUE 2 Acute onset <6 weeks post-op or <7 days symptoms	Optimal DAIR candidacy (ICM consensus threshold)	ICM DAIR 2025 Consensus statement
3	CUE 3 ESR:CRP ratio ≥1.31 (chronic PJI reinfection)	AUC 0.80; sensitivity 75% specificity 84%	Maier 2020 N=179 retrospective
3a	CUE 3 Overall suppression benefit (all organisms)	HR 0.63 (p=0.008) 68.5% vs 41.1% 5-yr survival	Siqueira 2015 N=368 PSM

ERROR COST ASYMMETRY · THRESHOLD RATIONALE

MISS — UNDER-TREAT (FALSE NEGATIVE)

Persistent PJI → implant failure → revision surgery or arthrodesis · Re-infection after DAIR: 20–43% without optimal antibiotics · Potential sepsis, amputation, death in high-risk hosts.

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FALSE ALARM — OVER-TREAT (FALSE POSITIVE)

Extended oral course where short would suffice → GI side effects (diarrhoea, Clostridioides difficile ~1–3%) · Drug interactions · Cost. Recoverable with agent switch or cessation.

Asymmetry Rule: DAIR treatment failure leads to implant loss and a more complex revision — catastrophic and costly. An extended antibiotic course in a low-risk patient adds GI risk (~1–3% C. difficile) and cost, but is manageable and reversible. Therefore **Cues 1 and 2 set low thresholds** — accept GI side effects to eliminate treatment failure in high-risk cases. Cue 3 is more symmetric: ESR:CRP ratio adds specificity for chronic reinfection risk, preventing blanket suppression in all acute patients (which would

ALWAYS: Infectious Disease consultation for every PJI · ≥5 intraoperative cultures before antibiotics · Modular component exchange at DAIR · Monitor ESR/CRP to confirm serological response · Repeat aspiration if markers not normalising at 6 weeks · Register with institutional PJI outcome database

reverse asymmetry toward excess drug burden). **The OVIVA principle applies at Exit 4**: once tolerating oral and clinically responding, IV continuation adds no benefit but adds IV-line risk and hospitalisation cost — asymmetry favours oral step-down.

THRESHOLD CHOICES · JUSTIFICATION

- **Exit 1 (virulent organism, 12 wks IV + 6–12 mo oral):** S. aureus and MRSA have high biofilm-formation capacity — antibiotic penetration requires rifampin combination for at least 6 weeks IV. Prolonged oral suppression mirrors the 68.5% vs 41.1% survival benefit from Siqueira 2015, particularly for S. aureus.
- **Exit 2 (delayed presentation, 12 wks + consider suppression):** Symptoms ≥3 weeks imply established mature biofilm. DAIR success drops from 80.98% to baseline (~57%). ICM 2025 mandates 12-week systemic antibiotic protocol when DAIR is pursued in less-ideal candidates.
- **Exit 3 (host risk / elevated ECR, 12 wks + 6 mo suppression):** ESR:CRP ≥1.31 has 84% specificity for reinfection — a positive test should trigger suppression planning. Immunocompromised hosts cannot independently clear residual organisms; suppression bridges until immune reconstitution where possible.
- **Exit 4 (ideal DAIR candidate, 6 wks IV → oral):** OVIVA 2019 (RCT) demonstrated oral non-inferiority to IV for bone/joint infection once clinical response confirmed. Acute, non-virulent, immunocompetent patients have the highest probability of success with standard protocol + early oral step-down.

Sources (Vault-grounded): Qu et al. 2019 (DAIR Pooled Analysis N=1,266) · Siqueira et al. 2015 (Chronic Oral Suppression N=368) · Maier et al. 2020 (ESR:CRP Ratio N=179) · ICM DAIR 2025 Consensus (N=1,989, 45 studies) · OVIVA Trial 2019 (Oral vs IV non-inferiority RCT)