Osteomyelitis & Bone Infection Clinical Pathway

A highly structured visual reference guide for the diagnosis, phenotyping, and management of bone and joint infections.

TARGET AUDIENCE

Clinical Pharmacists, Medical Officers, and Surgical Trainees.

Adult & Paediatric

Australian Epidemiology

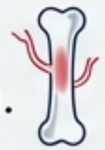
Evidence-based (OVIVA, IDSA aligned)

Staphylococcus aureus drives the majority of infections across four distinct clinical phenotypes

Acute Haematogenous (AHO)

Incidence ~8 per 100,000 in children <5 years.

Male predominance (2:1).



Vertebral Osteomyelitis

Incidence ~2.4 per 100,000.

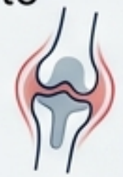
Median age 65 years.

Staphylococci in ~60%.

CA-MRSA Rates: ~15–20% nationally, up to 50–70% in remote Indigenous communities.

Chronic Osteomyelitis

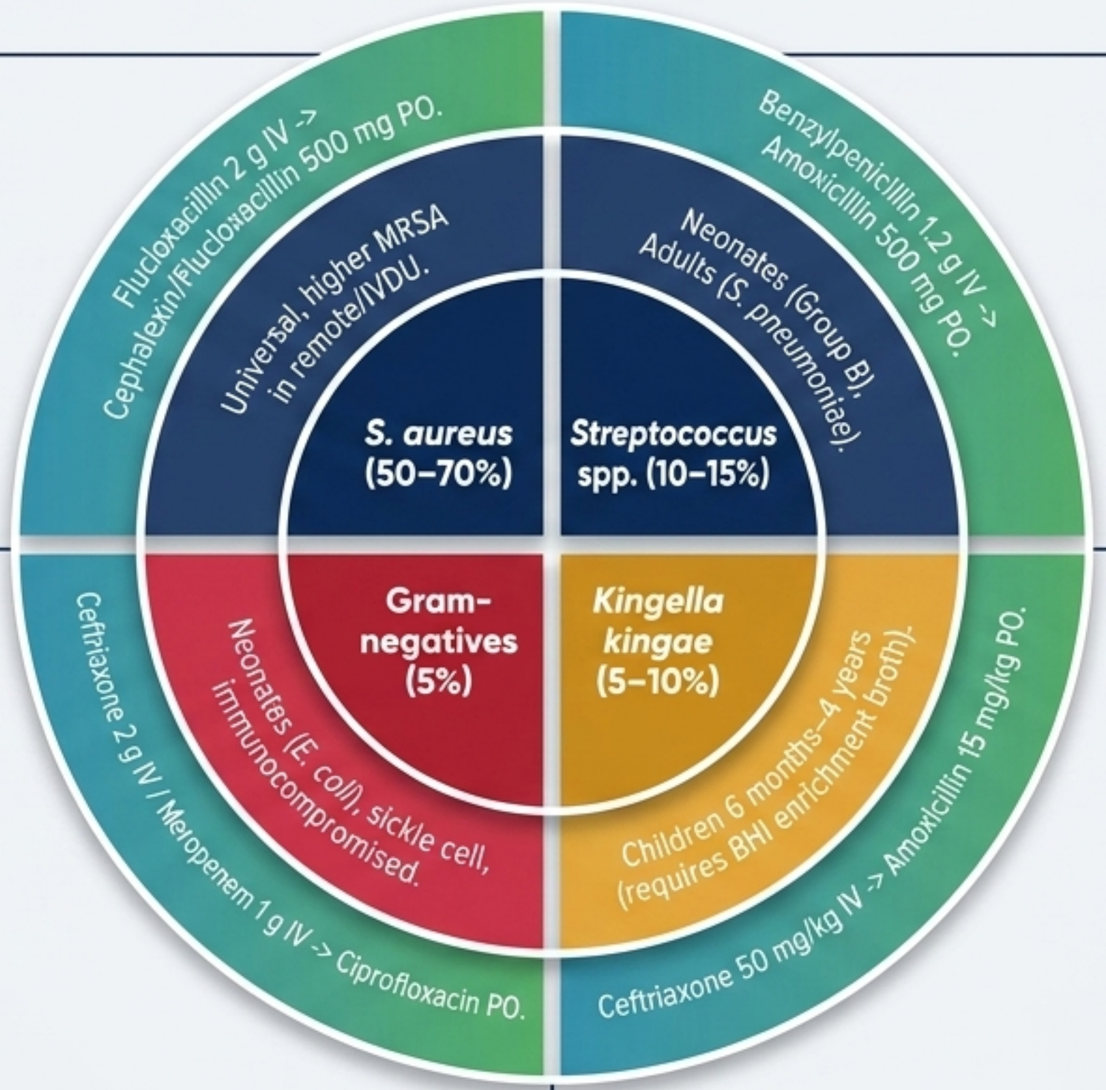
Rising incidence linked to diabetes, peripheral vascular disease, and prosthetic joints.



Diabetic Foot

Affects 10–20% of patients with diabetic foot ulcers during their lifetime.

The microbiological landscape dictates targeted intravenous and oral therapies



Magnetic Resonance Imaging is the gold standard; plain radiographic changes lag by weeks

Symptom Onset (Day 0) → Late Disease (Week 4+)

Plain X-Ray

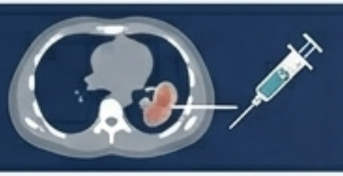
First-line screening. Low sensitivity early (43–75%).
Changes like cortical erosion/periosteal reaction lag by 2–4 weeks.

Bone Scan (Tc-99m)

Sensitivity 73–95%.
Screening role when MRI is unavailable; limited utility in diabetic neuropathy.

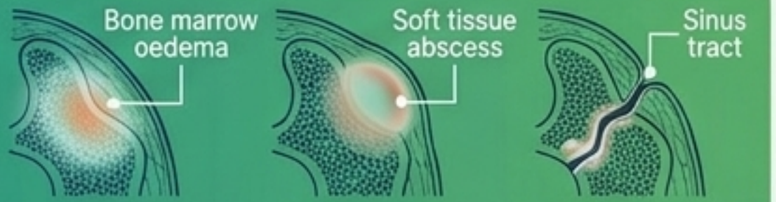
CT Scan

Sensitivity 67–80%. High utility for detecting sequestrum and performing guided biopsies.



MRI with Contrast (Gold Standard) ★

Sensitivity 90–100%. Unmatched for early bone marrow oedema, abscesses, and sinus tracts.



Deep bone biopsy remains the definitive diagnostic gold standard

Success Pathway

1. Timing

Perform ideally before antibiotics. If already on therapy, withhold for 48 hours if clinically safe.

Success Pathway

2. Technique

CT-guided percutaneous for deep/vertebral bone; open biopsy during debridement for chronic/diabetic foot.

Success Pathway

3. Samples

Send for **aerobic, anaerobic, mycobacterial**, **fungal**, and **histopathology**. *(Note: Use BHI broth for paediatric cases to catch Kingella).*

Success Pathway

4. Yield

CT-guided biopsy is diagnostic in ~70%. Repeat if clinical suspicion remains high.

Alert

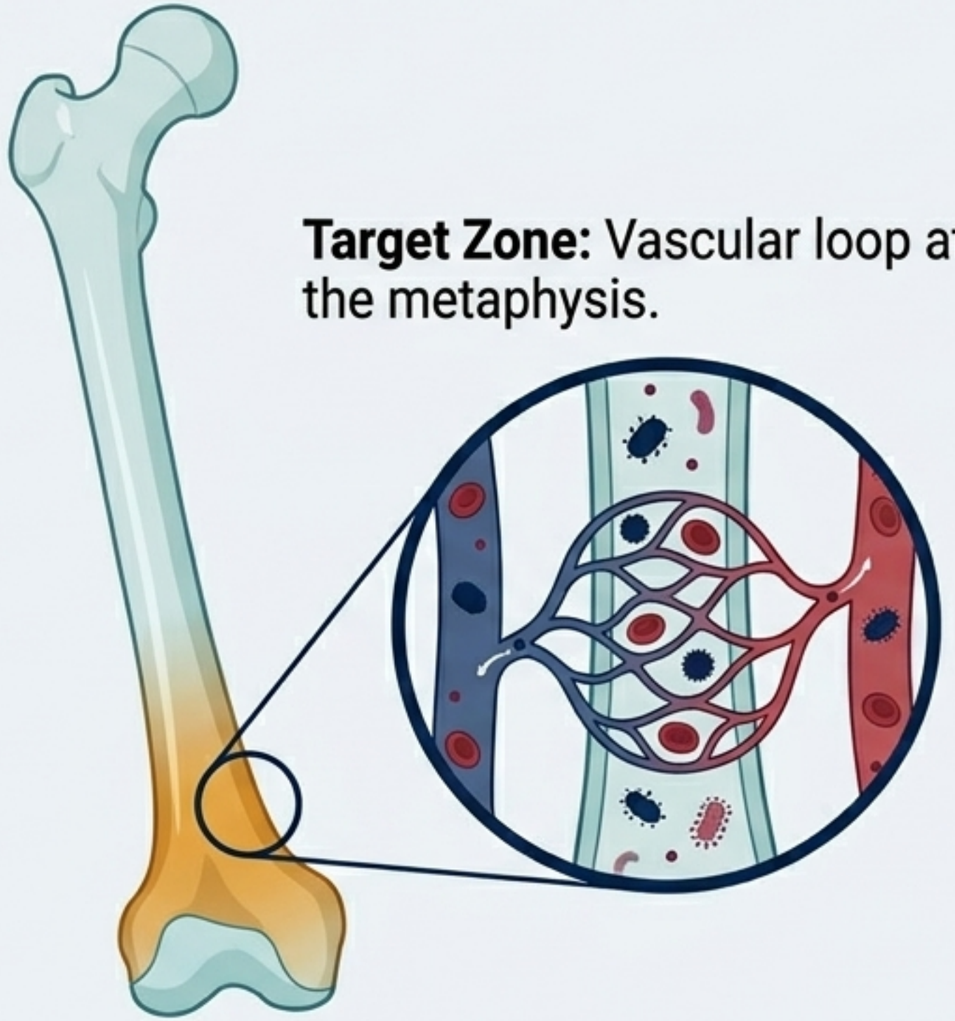
WARNING: Superficial Sampling

Sinus tract cultures correlate poorly with deep-bone cultures. Always obtain **intraoperative bone biopsy** rather than relying on superficial sinus swabs.

The clinical phenotype dictates specific investigations and treatment durations

	Acute Haematogenous (AHO)	Chronic	Vertebral	Diabetic Foot
Typical Patient	Children <5 yrs, males.	Diabetics, PVD, prosthetic joints.	Median age 65, IVDU, prior hospitalisation.	Present in 10-20% of diabetic ulcers.
Key Clinical Clues	Pseudoparalysis, local warmth (erythema absent early).	>6 weeks symptoms, sinus tract formation.	Insidious back pain, fever absent in 30%.	Positive probe-to-bone test (87% specificity).
Pathology Focus	Bacteraemic seeding to metaphysis. *S. aureus* + *Kingella*.	Sequestrum/Involucrum. Often polymicrobial.	Epidural abscess risk. *S. aureus* (50-60%) + *M. tuberculosis* risk.	Contiguous spread. Polymicrobial.
Minimum Duration Base Rule	3–4 weeks.	6 weeks (post-debridement).	6 weeks minimum.	6 weeks (shorter if bone resected).

Acute Haematogenous Osteomyelitis (AHO): Driven by bacteraemic seeding



Target Zone: Vascular loop at the metaphysis.

Clinical Presentation

Look for **pseudoparalysis** in infants. Erythema may be absent early; high clinical suspicion required.

⚠ Surgical Urgency

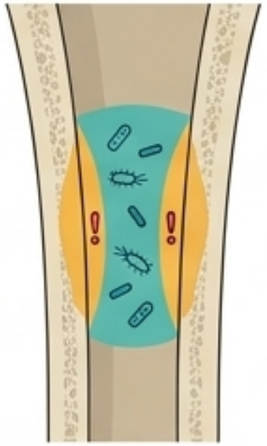
Urgent surgical referral required if:
Subperiosteal/intraosseous abscess on imaging, failure to improve after 48h of antibiotics, or systemic toxicity/sepsis.

Immediate Medical Management

IV antibiotics within 1 hour (post-cultures/CRP). Flucloxacillin 50 mg/kg IV 6-hourly (children) / 2 g IV 4-6 hourly (adults). Add Vancomycin if MRSA risk.

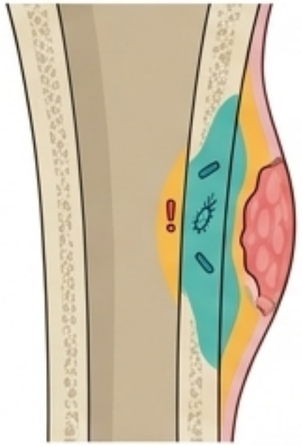
Chronic Osteomyelitis is defined by necrotic bone and the Cierny-Mader Staging system

Stage I: Medullary



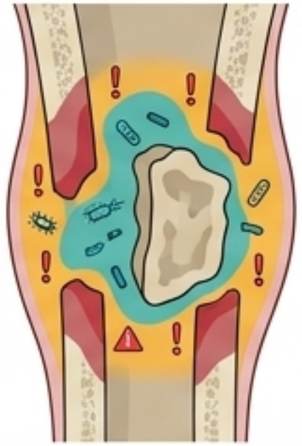
Stage I: Medullary
Infection confined to the inner endosteal surface.

Stage II: Superficial



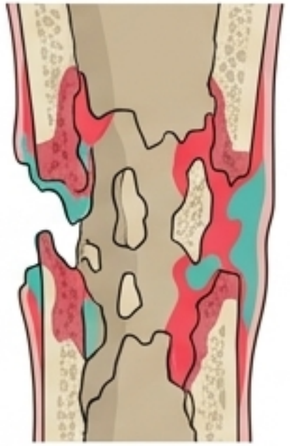
Stage II: Superficial
Infection spreading to the cortical surface with an adjacent soft-tissue defect.

Stage III: Localised



Stage III: Localised
Full-thickness cortical necrosis and a distinct sequestrum (dead bone).

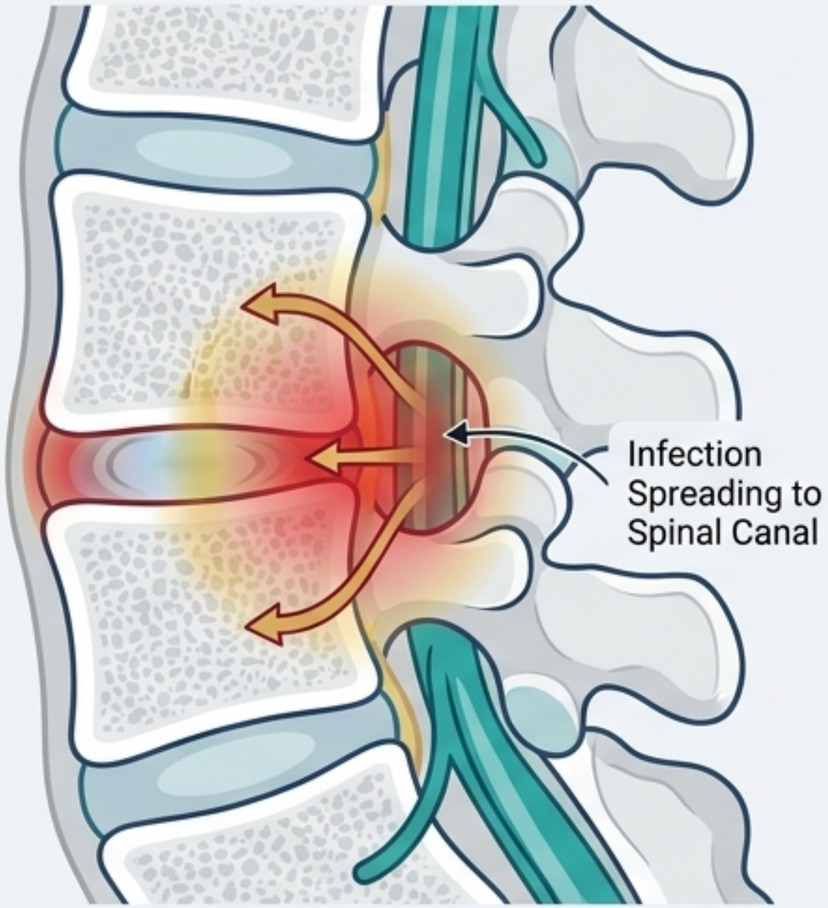
Stage IV: Diffuse



Massive structural loss and mechanical instability; may require surgical reconstruction.

Management Principle: Surgical debridement of necrotic bone and soft tissue is essential — antibiotics alone are insufficient. Withhold pre-op IV antibiotics until deep cultures are obtained.

Vertebral Osteomyelitis presents insidiously and carries a high risk of neurological compromise



Clinical Presentation Profile

Insidious back pain lasting weeks to months. Elevated ESR/CRP in >90%. Blood cultures are positive in ~60%. **Key clue:** Fever is absent in ~30% of cases.

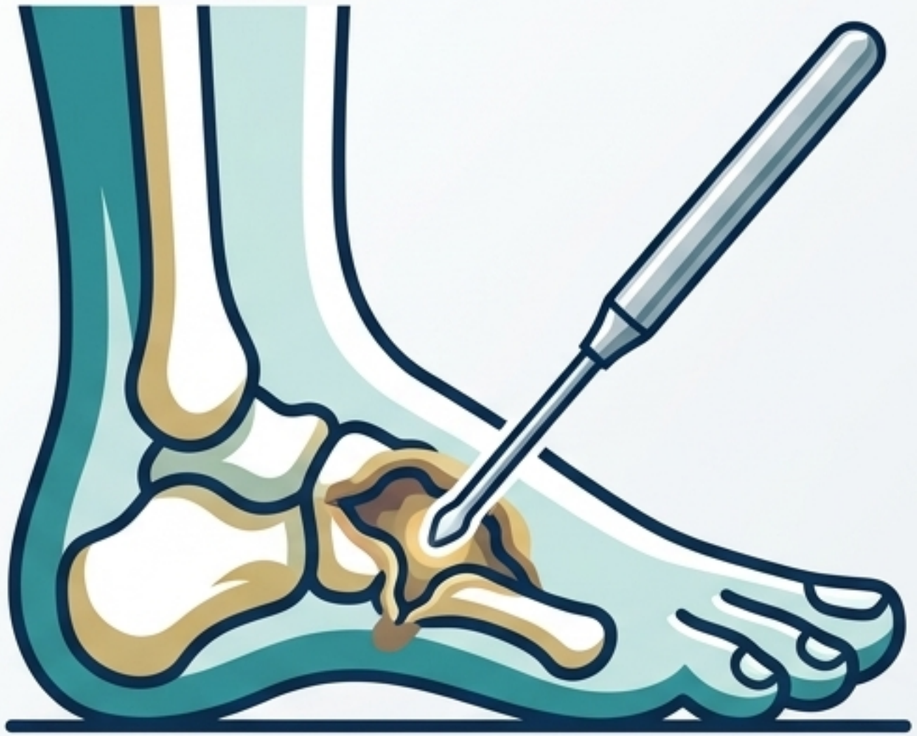
⚠ Critical Complication Risk

EMERGENT MRI indicated if new **neurological deficit** occurs (seen in 10-30% of cases) to rule out **epidural abscess** requiring urgent surgical decompression.

Microbiology & Management

S. aureus (50-60%) dominates. Consider *M. tuberculosis* in endemic or immunocompromised patients. Empiric therapy: Flucloxacillin IV ± Ceftriaxone. Minimum duration: 6 weeks.

Diabetic Foot Osteomyelitis can often avoid amputation through early diagnosis and targeted therapy



Diagnostic Anchor

Probe-to-bone test: 87% sensitivity, 83% specificity.
A positive test in the setting of an ulcer dramatically raises pre-test probability.

The OVIVA Trial Paradigm Shift

Oral-only treatment is supported for cases without systemic sepsis, provided bone biopsy confirms the pathogen and good vascular supply is present.

Antibiotic Regimens

- Trimethoprim/Sulfamethoxazole (SXT): Avoid if eGFR <30.
- Amoxicillin/Clavulanate: Dose adjust for renal impairment.

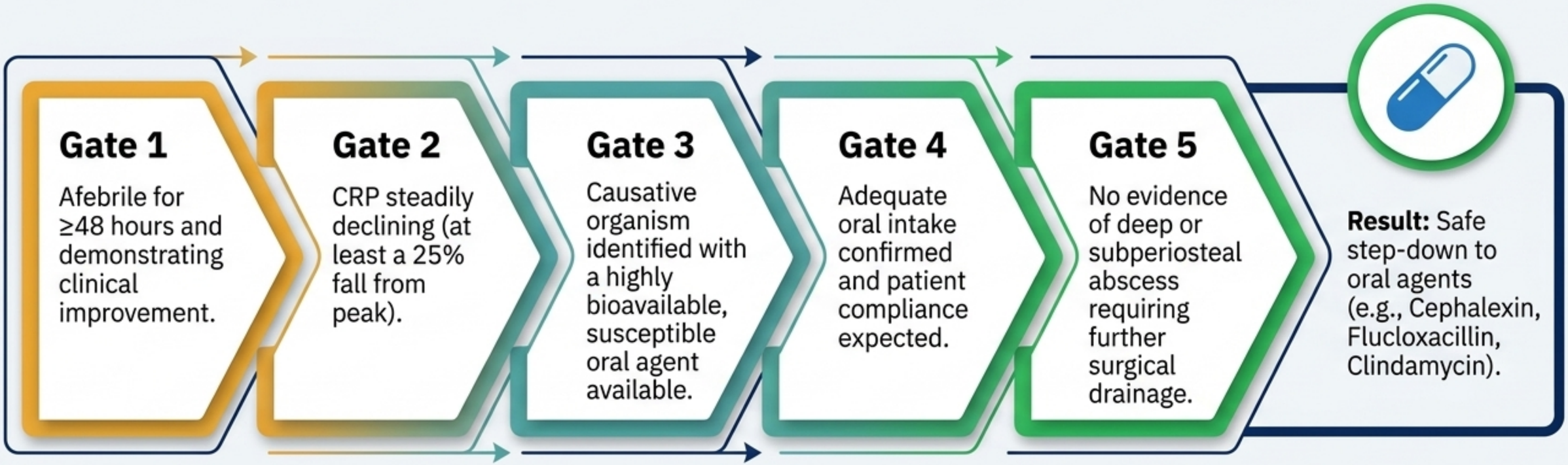
Multidisciplinary Care

Offloading and intensive wound care are critical adjuncts for tissue healing.

Empirical Regimens and Therapy Durations by Clinical Setting

Clinical Setting	Empirical Regimen	Total Duration
AHO (Low MRSA Risk)	Flucloxacillin IV then PO	3–4 weeks total
AHO (High MRSA Risk)	Vancomycin IV -> Clindamycin PO	4–6 weeks total
Chronic Osteomyelitis	Pathogen-directed post-debridement	6 weeks (up to 3–6 months if hardware retained)
Vertebral Osteomyelitis	Flucloxacillin ± Ceftriaxone IV	6 weeks minimum
Diabetic Foot (No Sepsis)	SXT or Amox/Clav PO	6 weeks (shorter if bone resected)

Strict clinical milestones govern the safe transition from intravenous to oral therapy



Adjusting standard therapy protocols for special populations and organ impairment

Paediatric

AHO duration 3-4w (3w if uncomplicated). BHI broth essential for Kingella.

Pregnancy

Safe: Flucloxacillin, Cephalexin, Clindamycin (Cat A).
Avoid: SXT, Tetracyclines.

Renal Impairment

Flucloxacillin: reduce max dose if eGFR <10.
SXT: avoid if eGFR <30.
Vancomycin: extended intervals.

Hepatic Impairment

Flucloxacillin hepatotoxicity risk; use Cefazolin/Cephalexin. SXT/Clindamycin require strict LFT monitoring.

Immunocompromised

Requires broader empiric cover (gram-negatives, fungi, mycobacteria).
Longer durations (6-12 weeks).

Elderly

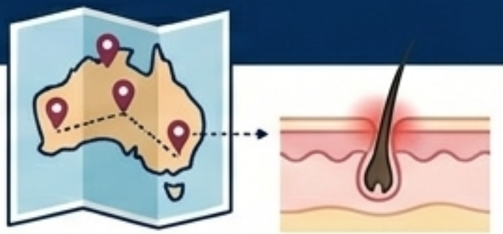
Atypical presentations (confusion, no fever).
High prevalence of vertebral/prosthetic infections.
Beware polypharmacy.

Aboriginal and Torres Strait Islander health: Addressing upstream drivers of severe disease

Root Causes

Upstream drivers

- **Endemic skin infections** (scabies, impetigo) serve as entry portals for *S. aureus*.
- **Remote geography** creates extreme distance to specialized hospital care.
- **Remote skin** bartny healties extreme distance.



Clinical Reality

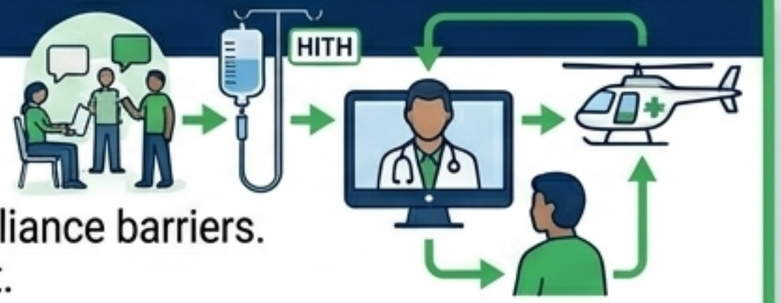
The data

- **2–4x increased** incidence of **osteomyelitis** (especially pediatric AHO).
- **CA-MRSA prevalence** reaches **50–70%** in remote communities (mandating upfront Vancomycin/Clindamycin).
- **Delayed presentation** leads to advanced structural disease.

Systemic Interventions

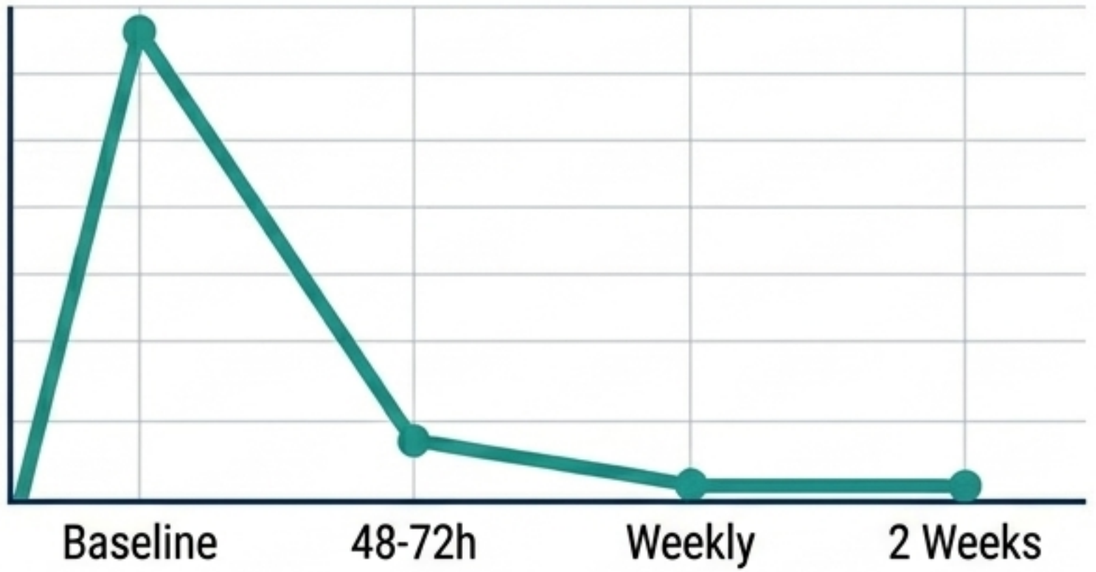
Solutions

- **Community skin infection programs** (e.g., RHDAustralia Healthy Skin Programme).
- **Depot IV antibiotics via Hospital in the Home (HITH)** to bypass prolonged oral compliance barriers.
- **Telehealth ID consults** and **RFDS coordination** for surgical imaging and debridement.



Monitoring response: Track systemic inflammation, not radiographic lag

C-Reactive Protein (CRP)



The primary marker. Check at baseline, 48-72h, and weekly. Should normalise by 2 weeks in acute cases.

Erythrocyte Sedimentation Rate (ESR)

Slower to normalise and may remain elevated for months. Less useful for tracking acute treatment response.

Imaging Rule

Do not routinely repeat imaging. Early inflammatory changes on MRI (like bone marrow oedema) persist persist for months even with successful cure. Only repeat imaging if clinical deterioration occurs.

Pharmacology Target: Vancomycin target trough is strictly 15–20 mg/L to ensure adequate bone penetration.