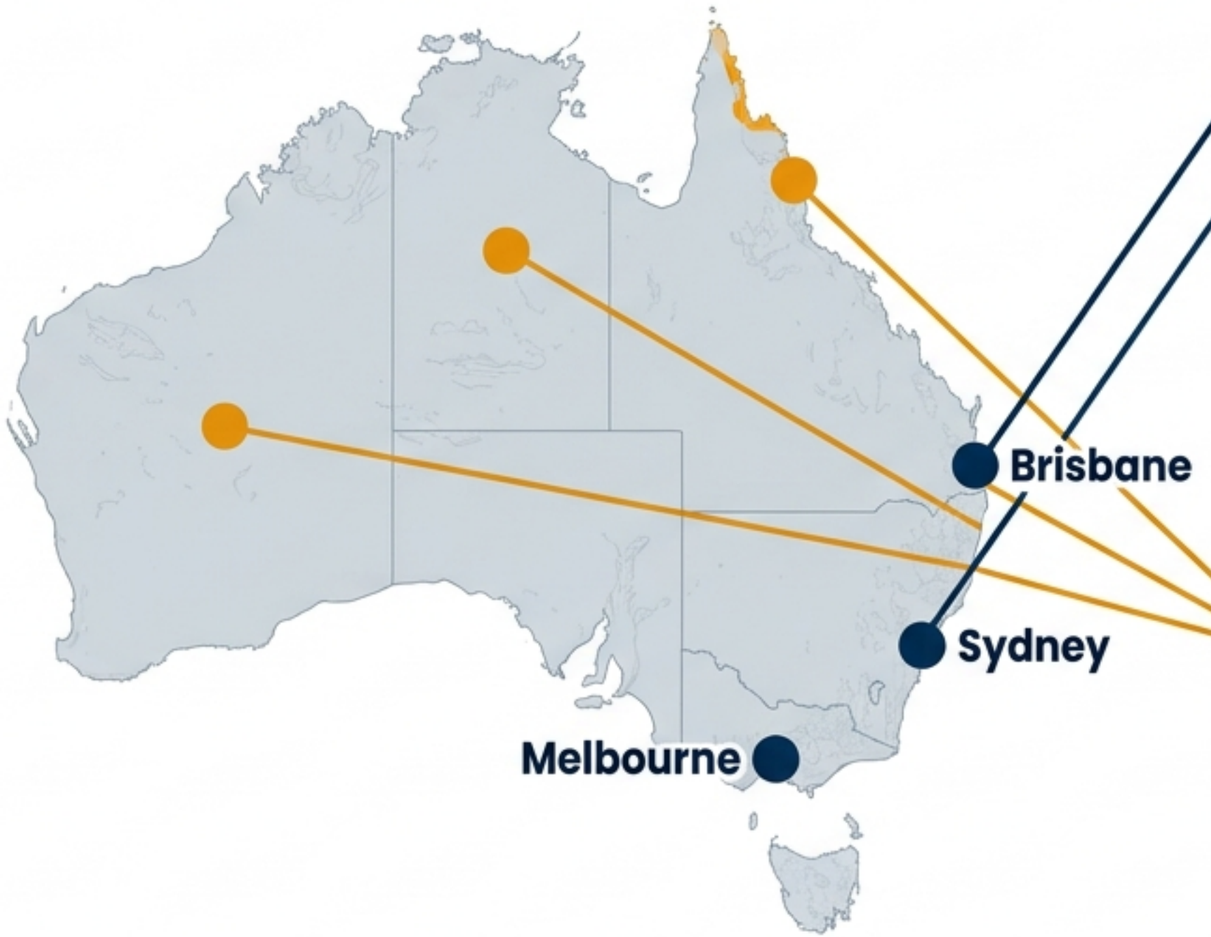
INFECTIVE ENDOCARDITIS

The Clinical Playbook: Diagnosis, Intervention, and Systemic Control

In-hospital Mortality: **15–30%**	5-Year Mortality: **~40%**	Core Principle: **Multidisciplinary Synchronization.**

The Australian Context

Incidence: 3–7 per 100,000 population per year



Urban & Coastal Zones

Healthcare-associated IE increasing via indwelling devices.

Ageing populations with degenerative valvular disease (median age >60).

PWID driving right-sided, *S. aureus* infections.

Prosthetic valves account for **10–30%** of cases.

Remote & Regional Zones

ATSI populations experience IE at rates **5–10x higher.**

Driven by immense Rheumatic Heart Disease (RHD) burden.

High prevalence of Community-Associated MRSA (CA-MRSA).

The Diagnostic Equation: Modified Duke Criteria

Definite IE

2 Major OR 1 Major + 3 Minor OR 5 Minor

Possible IE

1 Major + 1 Minor OR 3 Minor

Major Criteria

1. **1. Blood Cultures**

   Typical organism from ≥2 separate cultures, **OR** persistently positive cultures (>12h apart or majority of ≥4).

2. **2. Endocardial Involvement**

   Echo findings (oscillating mass, abscess, prosthetic dehiscence) **OR** new valvular regurgitation.

Minor Criteria

- Predisposing heart condition or IVDU
- Fever ≥38°C
- Vascular phenomena (major emboli, Janeway lesions, mycotic aneurysm)
- Immunological phenomena (Osler nodes, Roth spots, glomerulonephritis)
- Microbiological evidence not meeting major criteria

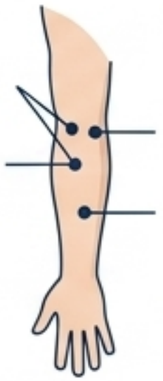
The Golden Hours: Blood Culture Protocol

1. Step 1: 3 Sets

Collect 3 distinct sets (1 aerobic + 1 anaerobic per set = 6 bottles total)

2. Step 2: 3 Sites

Draw from 3 separate venepuncture sites (e.g., both antecubital fossae + one peripheral)



3. Step 3: Volume

20–30 mL per set for adults

4. Step 4: Timing

Obtain all sets within 1–2 hours. Do not wait for fever spikes (bacteraemia is continuous)

DO NOT DELAY ANTIBIOTICS in haemodynamically unstable or septic patients to obtain cultures. Draw immediately, then commence empiric therapy.

Imaging Pathway: Modality Comparison

Transthoracic Echo (TTE)

Sensitivity: 50–60% overall (~90% for native vegetations >5 mm)

Role:
First-line for **ALL** suspected IE

Limitations:
Poor for prosthetic valves, <5mm vegetations, abscesses, or large body habitus

Transoesophageal Echo (TEE)

Sensitivity: 90–95% overall

Role: Mandatory if TTE is negative/inconclusive with high suspicion, suspected prosthetic valve IE, complications, or *S. aureus* bacteraemia

Limitations: Semi-invasive, requires sedation/GA

Beyond Echo: Advanced Imaging

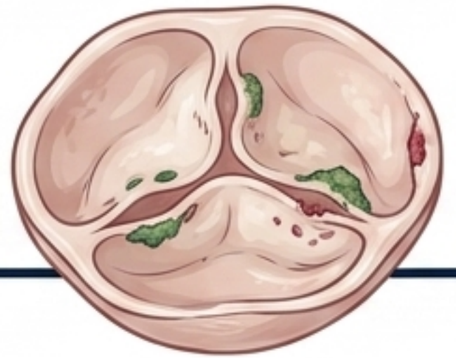
18F-FDG PET/CT:
Excellent for diagnostic ambiguity in prosthetic valve IE

CT Brain/MRI:
Routine for all *S. aureus* IE to detect silent embolic events or mycotic aneurysms

Cardiac CT:
Adjunct for perivalvular anatomy and abscess visualization

Diverging Landscapes: Valve Pathology

Native Valve IE



Primary Drivers:
Degenerative disease, RHD, PWID.

Common Flora:
S. aureus, Viridans streptococci, *Enterococcus*.

Base Empiric Regimen:
Flucloxacillin + Gentamicin.

Surgical Threshold:
Lower likelihood of requiring surgery unless complications arise.

Prosthetic Valve IE

Primary Drivers:
Perioperative contamination (early <12 mo) or transient bacteraemia (late >12 mo).

Common Flora:
Coagulase-negative staphylococci (CoNS), *S. aureus*.

Base Empiric Regimen:
Vancomycin + Gentamicin + Rifampicin (for biofilm penetration).

Surgical Threshold:
Highly likely to require surgery. Early PVE has poor outcomes with antibiotics alone.

The Pathogen Lineup

S. aureus (30–40%)

The apex predator. Highly aggressive, high embolic risk. Common in healthcare, PWID, and CA–MRSA in ATSI communities.

Viridans Group Streptococci (15–25%)

Subacute presentation. Usually penicillin-susceptible oral flora (dental source).

S. gallolyticus (5–10%)

Red Flag: Strong association with colonic neoplasia. Colonoscopy is mandatory.

Enterococcus spp. (5–10%)

GU source, elderly patients. Requires combination synergy therapy.

HACEK Group (2–5%)

Fastidious oral organisms. Require extended incubation. First-line: Ceftriaxone.

Culture-Negative IE (5–15%)

Most commonly prior antibiotic washout. Screen for *Coxiella burnetii* (Q fever - endemic in Australia) or *Bartonella*.

The Premium Clinical Playbook

Empirical Antibiotic Dashboard

Note: Prolonged IV administration required (PICC line). Adjust for renal function.

Clinical Scenario	Empirical Regimen
Native Valve (Community Acquired)	Flucloxacillin 2g IV q4h + Gentamicin 1 mg/kg IV q8h.
Native Valve (Suspected MRSA / Penicillin Anaphylaxis)	Vancomycin 15–20 mg/kg IV q8-12h (AUC-guided) ± Gentamicin.
Prosthetic Valve (Any Timing)	Vancomycin 15–20 mg/kg IV + Gentamicin 1 mg/kg IV + Rifampicin 300–450 mg PO/IV q12h. (Rifampicin for biofilm penetration).
Suspected Enterococcal IE	Ampicillin 2g IV q4h + Gentamicin 1 mg/kg IV q8h.
Injecting Drug Use (Right-Sided)	Flucloxacillin 2g IV q4h ± Gentamicin.

Directed Therapy Matrix (Bug-to-Drug)

S. aureus (MSSA)	Flucloxacillin 2g IV q4h (4–6 weeks). Prosthetic: ≥6 weeks + Rifampicin.
S. aureus (MRSA)	Vancomycin (AUC-guided) OR Daptomycin 8-10 mg/kg IV daily (6 weeks).
Viridans strep (Pen MIC ≤0.12)	Benzylpenicillin 1.8–2.4g IV q4h (4 weeks). Prosthetic: 6 weeks.
E. faecalis	Ampicillin 2g IV q4h + Gentamicin 1 mg/kg IV q8h OR Ampicillin + Ceftriaxone (4–6 weeks).
CoNS (Prosthetic)	Vancomycin + Rifampicin + Gentamicin (≥6 weeks).
Coxiella burnetii (Q Fever)	Doxycycline 100mg BD + Hydroxychloroquine 200mg TDS (≥18 months, sometimes lifelong).

Outpatient Parenteral Antibiotic Therapy (OPAT/HITH) is highly recommended for the tail-end of IV therapy in stable patients with a PICC line.

The Premium Clinical Playbook

Surgical Urgency Spectrum

40-50% of IE cases require surgery during index admission. Do not delay surgery to finish antibiotics if indications are met.

Emergency (24–48h) | HEART FAILURE

Acute severe regurgitation (aortic/mitral) causing pulmonary oedema or cardiogenic shock. Proceed even if haemodynamically unstable.

Urgent (Days) | UNCONTROLLED INFECTION

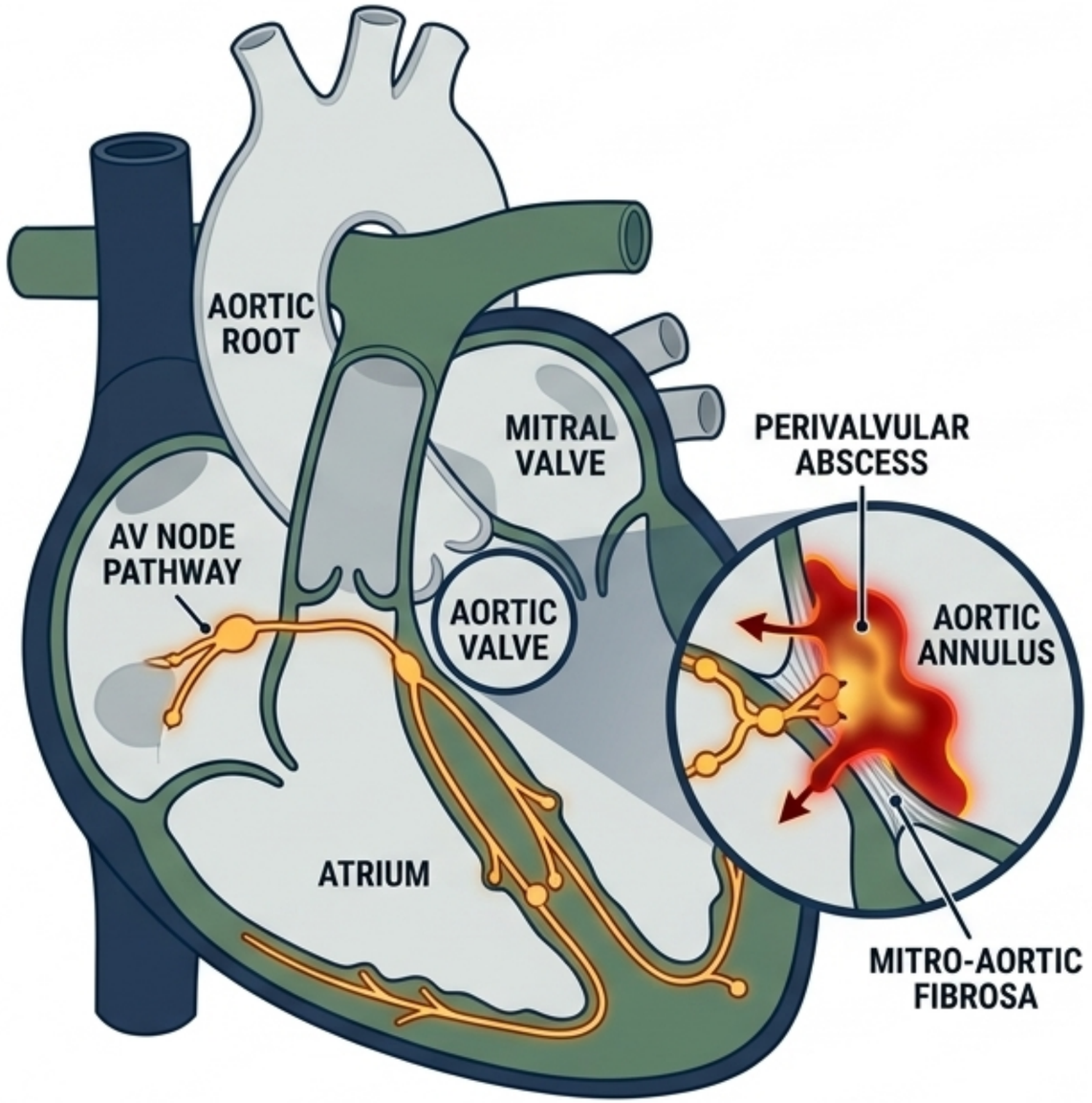
Perivalvular abscess, fistula, persistently positive cultures (>7 days), or fungal IE (almost always requires excision).

Semi-Urgent (1–2 weeks) |EMBOLIC PREVENTION

Vegetation >10mm with prior embolic event, or vegetation >15mm with high mobility (especially anterior mitral leaflet).

Contraindication Note: Severe irreversible neurological deficit from stroke.

The Abscess Anatomy Zoom



Mechanism

Perivalvular abscesses occur in 10-40% of native and up to 60% of prosthetic valve IE. The infection burrows into the aortic annulus, directly destroying the adjacent atrioventricular (AV) node.

NEW HEART BLOCK = ABSCESS

If a patient with IE develops new first-degree AV block, bundle branch block, or complete heart block, it must be treated as an abscess extending into the conduction system until proven otherwise.

Action

Mandates urgent TEE and immediate cardiothoracic surgical review. Antibiotics alone will fail.

The Embolic Vector Map

Right-Sided IE (Tricuspid)

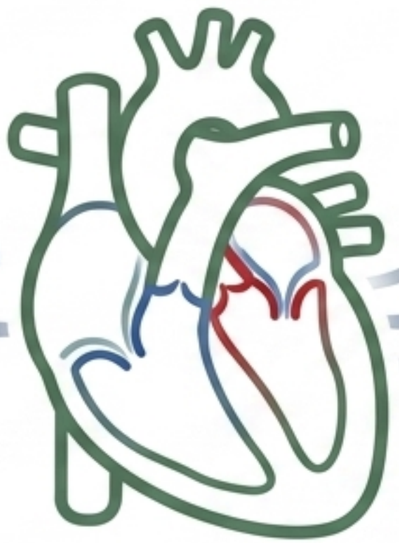
Vector: Lungs.

Result: Septic pulmonary emboli.

Presents as pleuritic pain, haemoptysis.

CT shows peripheral cavitating nodules.

Right-Sided Flow



Left-Sided IE (Mitral/Aortic)

Vector 1: Brain (15-25%)

Ischaemic stroke (often clinically silent in *S. aureus*).

Haemorrhagic stroke.

Mycotic aneurysms.

Vector 2: Spleen (10-40%)

Splenic infarction/abscess. LUQ pain. May require splenectomy.

Vector 3: Kidneys (10-30%)

Renal infarction. Rising creatinine, haematuria.

Vector 4: Spine (3-15%)

Spondylodiscitis. Back pain. MRI spine required.

Special Populations Dashboard

Pregnancy

Penicillins and **cephalosporins** are safe.

Avoid **Doxycycline** and Fluoroquinolones.

Cardiac surgery carries high **fetal mortality** (20-30%) due to bypass hypoperfusion.

Elderly

Presentations are often **atypical** (delirium, falls, functional decline). Validate frailty.

Careful renal dosing required for Gentamicin/Vancomycin (use measured creatinine clearance).

Renal Impairment

Haemodialysis carries a 50x increased risk of IE. **Vancomycin** requires strict AUC dosing and TDM.

Monitor urinalysis for immune-complex glomerulonephritis.

Hepatic Impairment

Flucloxacillin and **Rifampicin** are hepatotoxic. Monitor LFTs fortnightly.

Plan perioperative correction of coagulopathy for surgical candidates.

ATSI Health Action Plan

The Burden

Age-standardised incidence is 5-10x higher in Aboriginal and Torres Strait Islander Australians, driven by catastrophic Rheumatic Heart Disease (RHD) rates.

Microbiology Shift

High prevalence of Community-Associated MRSA.

Empiric therapy must include Vancomycin or Daptomycin in these remote settings.

Remote Logistics

4-6 weeks of IV antibiotics is highly disruptive. Utilize

OPAT/HITH, Royal Flying Doctor Service (RFDS) transport, and telemedicine to minimize community disconnection.

Primary Prevention

Ensure enrolment in RHD Registers (regular benzathine penicillin G prophylaxis).

Integrate oral health into primary care.

Ensure culturally safe care.

Premium Clinical Playbook

PWID & Harm Reduction Protocol

Clinical Profile

- Predominantly right-sided (tricuspid) IE.
- *S. aureus* is the overwhelming culprit.
- High recurrence rate (up to 40%).

Note: Isolated right-sided MSSA IE without complications may qualify for a shorter 2-week IV antibiotic course.

Intervention Mandates

1. **Needle & Syringe Programmes (NSP):**
   Ensure access to sterile equipment.
2. **Opioid Substitution Therapy (OST):**
   Methadone/Buprenorphine dramatically reduces injecting frequency and recurrence.
3. **Technique Counselling:**
   Explicitly counsel against injecting into high-risk sites (neck, groin veins).
4. **Vigilance:**
   PWID with a persistent febrile illness require a **zero-threshold approach for echocardiography and blood cultures.**

Premium Clinical Playbook

Dental Prophylaxis Protocol

Rule of Thumb: Prophylaxis is reserved ONLY for patients at highest risk of adverse outcomes from IE, not just those at risk of acquiring it.

Who Gets Prophylaxis? (The High-Risk Cohort)

- ✓ Prosthetic heart valves or prosthetic repair material.
- ✓ History of previous Infective Endocarditis.
- ✓ Congenital Heart Disease (cyanotic, completely repaired <6 months, or repaired with residual defects).

Pearl: Rheumatic Heart Disease alone does NOT require dental prophylaxis under current Australian guidelines.

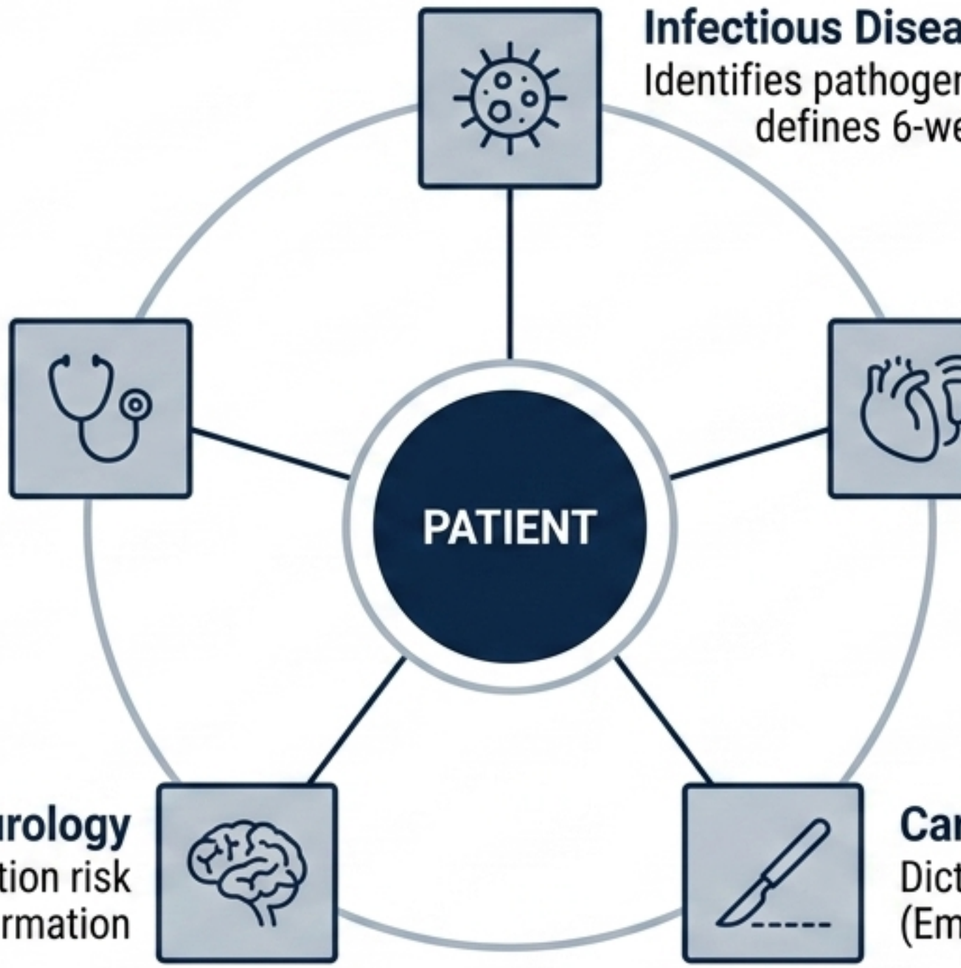
The Regimen

First-line:
Amoxicillin 2g PO
(Single dose, 30-60 mins pre-procedure)

Penicillin Allergy:
Clindamycin 600mg PO
OR
Cefalexin 2g PO

The Endocarditis Team Hub

Core Insight: Optimal survival is impossible without simultaneous, multi-disciplinary synchronization



Infectious Diseases
Identifies pathogen, guides AUC dosing, defines 6-week OPAT runway

Primary Care & ATSI Health
Manages RHD register, delivers harm reduction, oversees dental prophylaxis

Cardiology & Imaging
Executes TEE, maps perivalvular extension, monitors haemodynamics

Neurology
Weighs bypass heparinization risk against stroke transformation

Cardiothoracic Surgery
Dictates precise surgical window (Emergency vs Semi-Urgent), excises abscess