bone & joint infections

general points about osteomyelitis

General:
- Infection in bone may arise from haematogenous spread, direct inoculation following trauma or surgery, or spread from a contiguous structure such as a joint.
- In children and young adults, haematogenous osteomyelitis usually affects the long bones; in adults it is more likely to involve the axial skeleton.
- Staphylococcus aureus accounts for more than 80% of disease, although enteric Gram-negative organisms are an important cause of vertebral osteomyelitis in adults.
- Chronic infections are more difficult to treat and often require prolonged therapy.
- Sequestra, dead bone or foreign material require surgical removal in chronic infection, or in acute infection which fails to resolve.

Investigation:
- It is important to obtain suitable specimens for culture.
- In chronic infections, sinus cultures may be misleading.
- If cultures are negative and alternative pathology such as malignancy and tuberculosis are ruled out, treat as S. aureus infection.

osteomyelitis empirical therapy

- For empirical therapy of osteomyelitis, use:
flucloxacillin 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly.
- For patients hypersensitive to penicillin (excluding immediate hypersensitivity), use:
cephalothin 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly
OR cephazolin 2 g (child: 50 mg/kg up to 2 g) IV, 8-hourly.
- If Gram-negative infection is suspected, or for children under 5 years not immunised against Haemophilus influenzae type b (Hib), use:
cefotaxime 2 g (child: 50 mg/kg up to 2 g) IV, 8-hourly
OR the combination of
ceftriaxone 2 g (child: 50 mg/kg up to 2 g) IV, daily
PLUS flucloxacillin 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly.
- For patients with immediate penicillin hypersensitivity, use initially:
vancomycin 25 mg/kg up to 1 g (child <12 years: 30 mg/kg up to 1 g) IV, 12-hourly
- Adjust therapy according to culture and susceptibility results.

osteomyelitis directed therapy

Methicillin-susceptible Staphylococcus aureus (MSSA)
- To treat osteomyelitis due to MSSA, use:
flucloxacillin 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly
then flucloxacillin 1 g (child: 25 mg/kg up to 1 g) orally, 6-hourly
- For patients hypersensitive to penicillin (excluding immediate hypersensitivity), use:
cephalothin 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly
then cephalexin 1 g (child: 25 mg/kg up to 1 g) orally, 6-hourly
OR
cephazolin 2 g (child: 50 mg/kg up to 2 g) IV, 8-hourly
then cephalexin 1 g (child: 25 mg/kg up to 1 g) orally, 6-hourly
- For patients with immediate penicillin hypersensitivity and MSSA with proven macrolide (and hence lincosamide) susceptibility, use:
clindamycin 450 mg (child: 10 mg/kg up to 450 mg) IV, 8-hourly
then clindamycin 450 mg (child: 10 mg/kg up to 450 mg) orally, 8-hourly
OR
lincomycin 600 mg (child: 15 mg/kg up to 600 mg) IV, 8-hourly
then clindamycin 450 mg (child: 10 mg/kg up to 450 mg) orally, 8-hourly
- For patients with immediate penicillin hypersensitivity and MSSA which is not susceptible to macrolides (and hence lincosamides), use initially:
vancomycin 25 mg/kg up to 1 g (child <12 years: 30 mg/kg up to 1 g) IV, 12-hourly
- Base oral therapy following vancomycin on proven susceptibility; suitable oral options may be trimethoprim+sulfamethoxazole (dose as for MRSA) or doxycycline 100 mg (child >8 years: 2.5 mg/kg up to 100 mg) orally, 12-hourly.

Methicillin-resistant Staphylococcus aureus (MRSA)
- To treat osteomyelitis due to MRSA, use initially:
vancomycin 25 mg/kg up to 1 g (child <12 years: 30 mg/kg up to 1 g) IV,
FOLLOWED BY (if the organism is proven susceptible)
rifampicin 300 mg (child: 7.5 mg/kg up to 300 mg) orally, 12-hourly
PLUS
fusidate sodium tablets 500 mg (child: 12 mg/kg up to 500 mg) orally, 12-hourly
- If the MRSA is non-multiresistant, for alternative oral continuation therapy, according to susceptibilities, use:
clindamycin 450 mg (child: 10 mg/kg up to 450 mg) orally, 8-hourly
OR trimethoprim+sulfamethoxazole 320+1600 mg (child: 8+40 mg/kg up to 320+1600 mg) orally, 12-hourly.
- For multiresistant MRSA, alternative oral therapies include linezolid and pristinamycin

duration of therapy for osteomyelitis

Age group (infection type)	Duration of antibiotic therapy (modified by clinical response)	
	Intravenous (minimum)	Total duration (completed with oral antibiotics)
neonates (acute)	4 weeks	4 weeks (all IV)
children (acute)	3 days	minimum 4 weeks
adults (acute)	4 weeks [NB1]	minimum 6 weeks
children (chronic)	may not be necessary	many months
adults (chronic)	2 weeks	many months

viral arthritis

- A number of viruses can cause joint inflammation.
- Oligoarthritis or polyarticular disease is more common than monoarticular arthritis.
- Acute rheumatic fever must be excluded.
- Viruses implicated include hepatitis B and C, rubella (and its vaccine), parvovirus B19 and a number of alphaviruses.
- In Australia, Ross River virus and Barmah Forest virus are the most common. Although asymptomatic infection and seroconversion with these viruses is common, acute polyarticular synovitis is not infrequent and may cause severe pain and disability.
- Almost all infections are self-limiting, with joint pain usually resolving within 3 to 6 months. As there are no effective antiviral drugs, symptomatic treatment with anti-inflammatory drugs and analgesics is the mainstay of therapy.

septic bursitis

- Septic bursitis is usually caused by Staphylococcus aureus and often follows local trauma. The usual sites are the prepatellar and olecranon bursae.
- Confirm with aspiration and culture.
- Sometimes the underlying joint is also involved.
- Treat with an antistaphylococcal antibiotic for 2 to 3 weeks, as for treatment of Septic arthritis due to S. aureus.
- The infected bursa should be aspirated repeatedly if clinically indicated and may need formal drainage.

duration of therapy for septic arthritis

Age group	Duration of antibiotic therapy (modified by clinical response)	
	Intravenous (minimum)	Total duration (completed with oral antibiotics)
neonates	4 weeks	4 weeks (all IV)
children	3 days	3 weeks
adults	2 weeks	4-6 weeks

empirical treatment of septic arthritis

- Empirical therapy is similar to that of osteomyelitis but should be directed wherever possible by the result of Gram stain of a joint aspirate.
- Adjust therapy according to the culture and susceptibility results.
- For directed therapy of septic arthritis due to organisms other than Staphylococcus aureus, seek advice from an infectious diseases physician or clinical microbiologist.
- Gonococcal arthritis should be treated with cefotaxime or ceftriaxone (as for disseminated gonococcal sepsis) until susceptibility tests are known. Treatment should continue for a total of 7 days. Joint washouts are usually unnecessary.

general points about septic arthritis

- Septic arthritis generally presents either spontaneously or following penetrating trauma as a monoarticular arthritis.
- The pathogens involved are generally similar to those that cause acute osteomyelitis.
- Diagnostic specimens including a joint aspirate and blood cultures should be taken prior to the commencement of therapy whenever possible. This allows alternative diagnoses such as acute crystal arthropathies to be firmly ruled in or out.
- It is urgent to drain pus from the infected joint to avoid permanent joint damage and to allow antibiotics to work effectively. The standard method of drainage is arthroscopic washout, or arthrotomy for deeper joints. Repeated simple needle aspiration has been suggested as a less invasive alternative; however, there is insufficient evidence to recommend this.

management of infected prostheses

- Infections involving orthopaedic and prosthetic material are most frequently due to staphylococci [coagulase-negative staphylococci (eg Staphylococcus epidermidis) and Staphylococcus aureus.]
- These infections are difficult to cure with antibiotics alone and may require extensive debridement and/or removal of the infected prosthesis.
- Note that negative bacterial cultures of joint aspirates or intraoperative joint swabs will not exclude the presence of infection, particularly if the patient is on antibiotics.
- Examination of multiple (at least 5) intraoperative joint tissue biopsies in the absence of antibiotic treatment is recommended when detection of infection with optimal sensitivity is required.

- Early infection (presenting within 4 weeks after surgery) is usually due to S. aureus and can often be successfully treated with extensive debridement, prosthesis retention and 4 to 6 weeks of appropriate intravenous antibiotics. Cure rates of 60% to 80% have been reported in this group when the organism isolated is fully susceptible to the antibiotics used.
- Prosthetic joint infection due to genuine new acute haematogenous seeding can also be treated this way provided surgery is performed within 72 hours of symptom onset

- For chronic infections, cure is rare if the prosthetic material is not removed. In these patients, removal of the prosthesis with a 2-stage joint replacement (delayed-exchange arthroplasty) and 6 weeks of intravenous antibiotics has the best reported success rates (80% to 90%). One-stage replacement (direct-exchange arthroplasty) may be preferred in some frail patients, but the success rate is lower (70% to 80%).