Care plans for native and prosthetic joint septic arthritis, and acute hematogenous and chronic osteomyelitis

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The current paper presents care plans for the treatment of septic arthritis of native and prosthetic joints, as well as for acute hematogenous and chronic osteomyelitis. A nursing care plan for septic arthritis and osteomyelitis is included, along with pathogen-specific therapy for common pathogens, including Gram-positive and Gram-negative cocci.

Key Words: *Acute hematogenous osteomyelitis; Care plan; Chronic osteomyelitis; Native joint septic arthritis; Prosthetic joint septic arthritis*

Plans de soins pour l'arthrite articulaire septique et l'ostéomyélite hématogène aiguë et chronique touchant des articulations natives et des prothèses

RÉSUMÉ : Le présent article propose des plans de soins pour le traitement de l'arthrite septique touchant les articulations natives ou des prothèses et l'ostéomyélite hématogène aiguë et chronique. Un plan de soins infirmiers pour le traitement de l'arthrite septique et de l'ostéomyélite y est inclus, de même que des suggestions d'antibiothérapie spécifiques à certains agents pathogènes courants dont les cocci Gram positif et Gram négatif.

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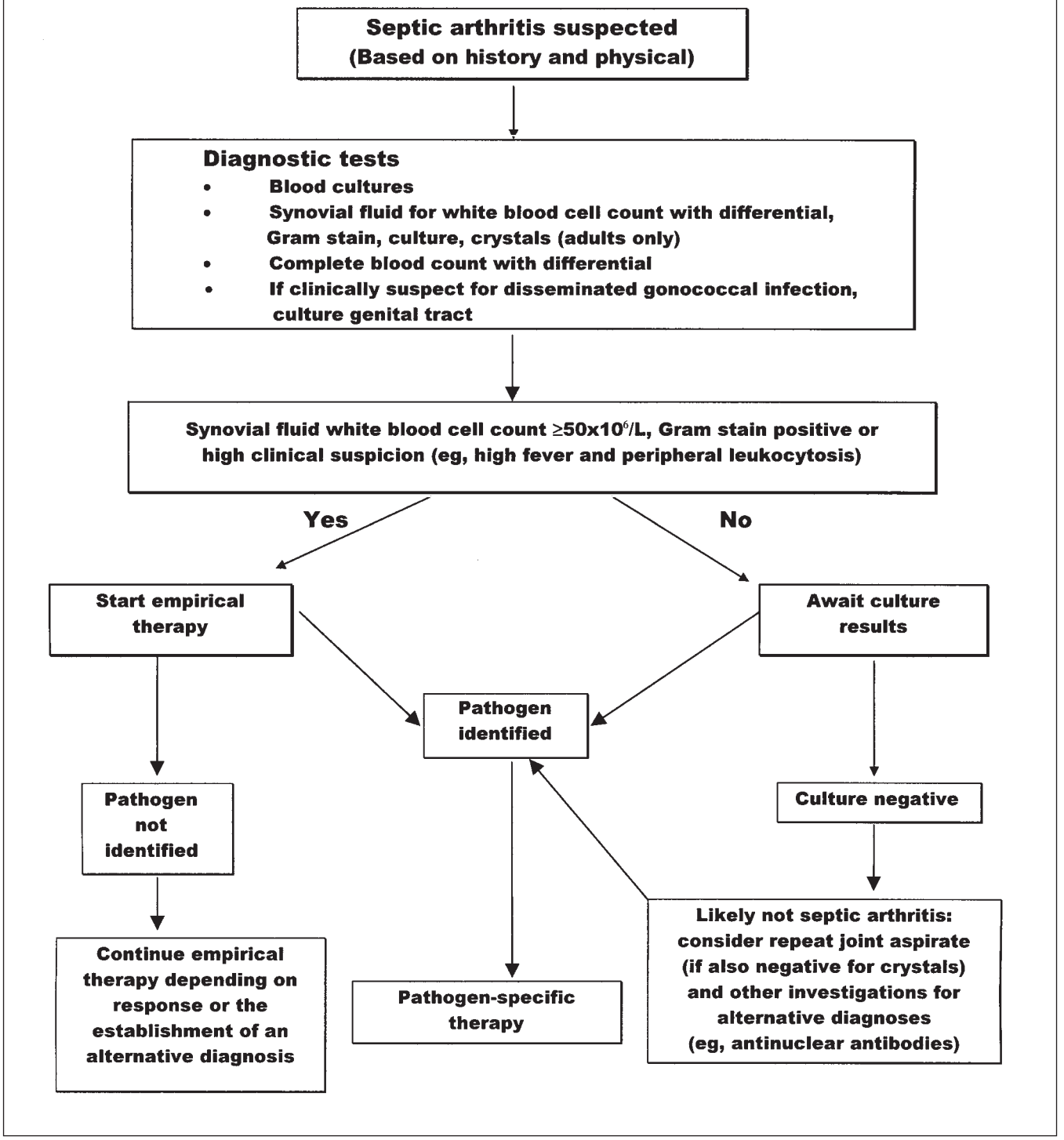

Figure 1) *Care plan for septic arthritis of a native joint*

SEPTIC ARTHRITIS OF A NATIVE JOINT

Septic arthritis of a native joint is the prevalent form of septic arthritis (1). The most common predisposing condition of this infection in adults is rheumatoid arthritis (2), and any monoarticular exacerbation of arthritis in a patient with rheumatoid arthritis must be investigated for infection. The care plan for this septic arthritis of a native joint is outlined in Figure 1. The most common pathogens are methicillin-susceptible *Staphylococcus aureus* followed by streptococci (2); therefore, the usual empirical therapy is cloxacillin

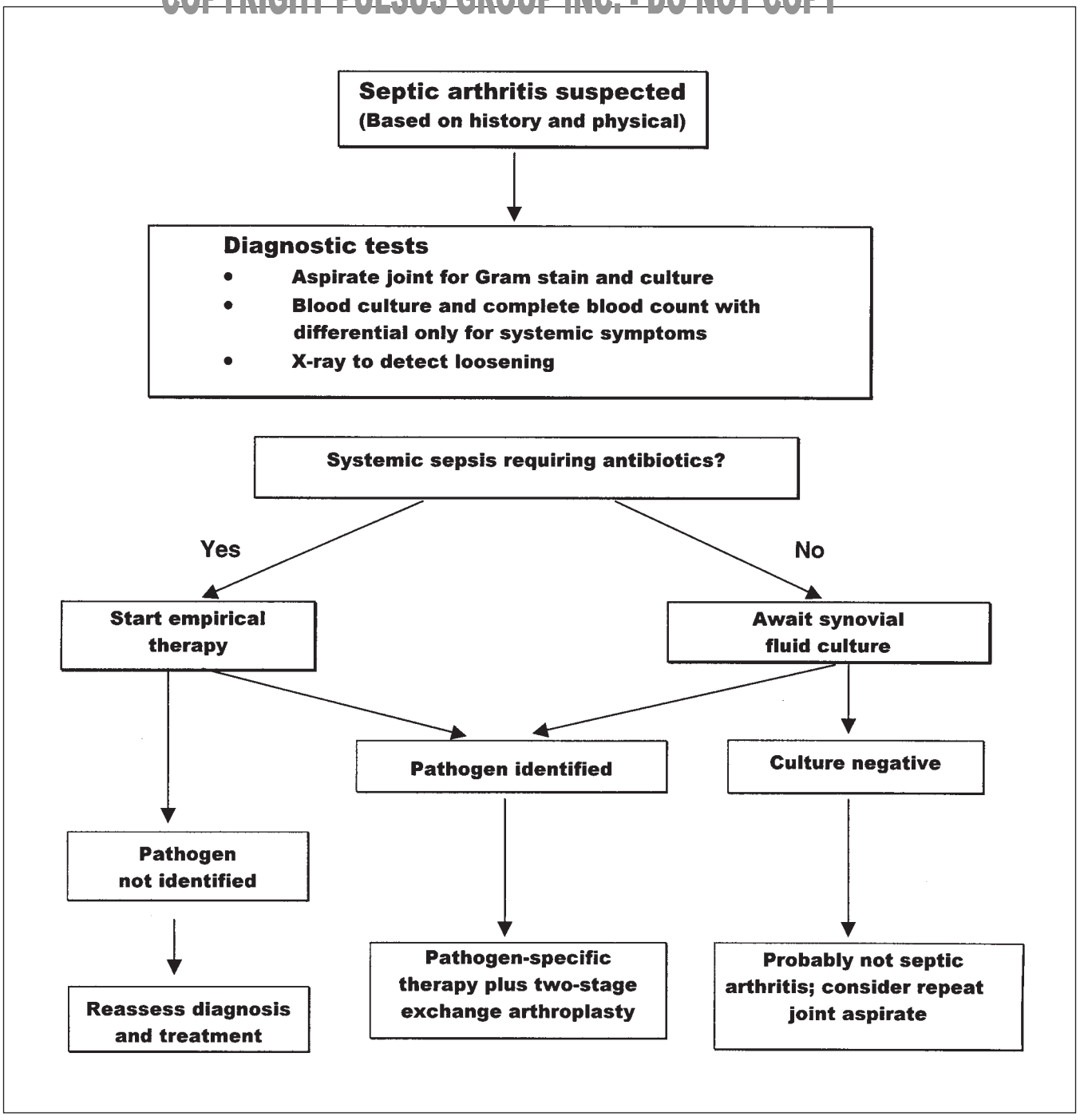

Figure 2) *Care plan for septic arthritis of a prosthetic joint*

or cefazolin. Pending culture results, some clinicians add gentamicin in selected cases to eradicate *Enterobacteriaceae,* such as *Escherichia coli*, *Klebsiella* species and *Enterobacter* species (3). However, de novo Gram-negative rod infections are not common in the immunocompetent host. In penicillin-allergic patients, vancomycin or clindamycin are the agents of choice. The usual duration of therapy is three to four weeks (4). In addition to antibiotics, joint drainage should be performed in all cases. Usually this can be accomplished by aspirations, but sometimes open surgical drainage must be employed if pus is too thick or if the infection involves the hip joint. In children, initial parenteral antibiotic therapy is usually stepped down to oral therapy if there is a known susceptible organism and if the infection is resolving well clinically.

The care pathway (Figure 1) does not apply to gonococcal arthritis, which presents differently and is easy to distinguish clinically from septic arthritis due to other pathogens. Gonococcal arthritis usually requires only three days of intravenous antibiotics (usually ceftriaxone) followed by seven days of oral antibiotics.

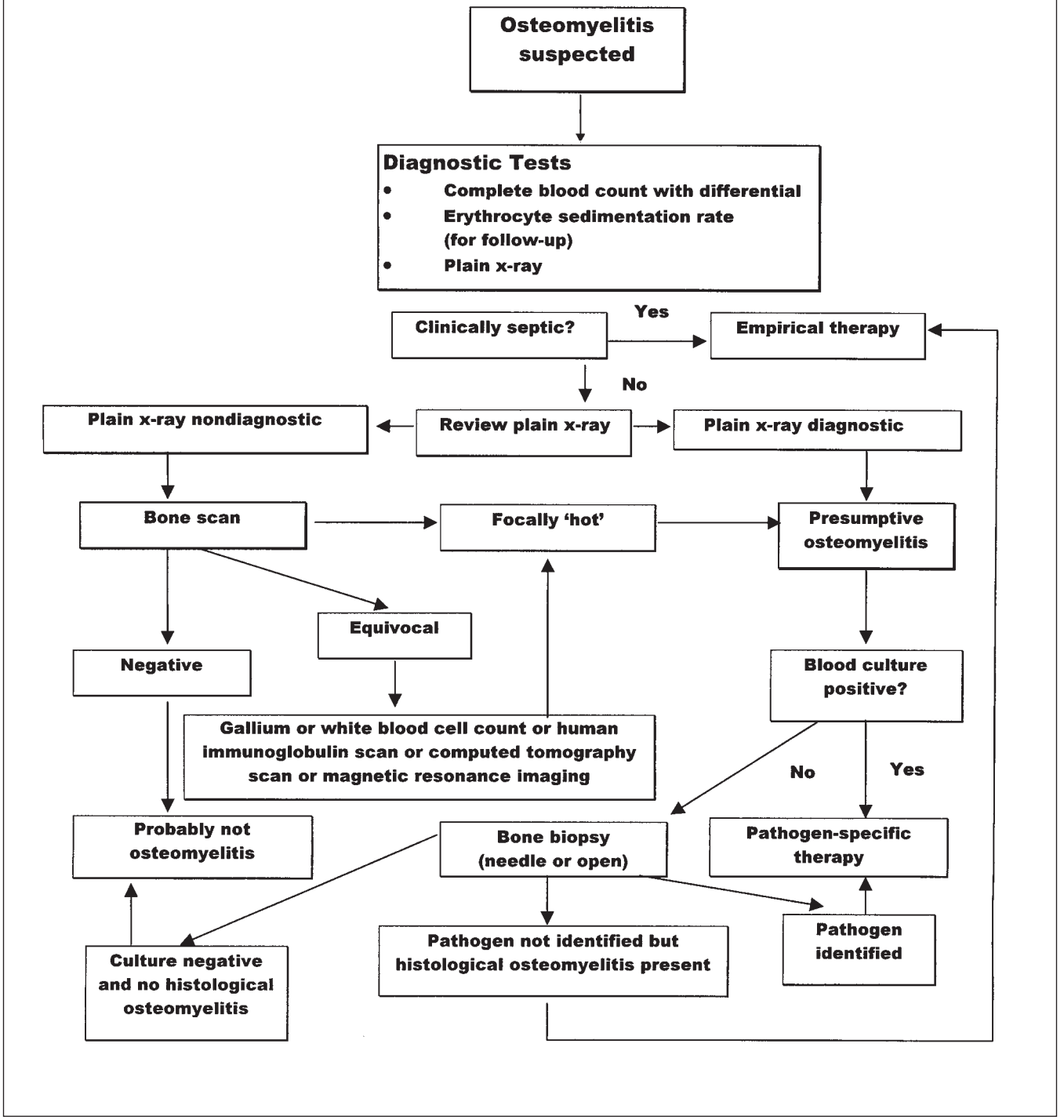

Figure 3) *Care plan for hematogenous osteomyelitis*

SEPTIC ARTHRITIS OF A PROSTHETIC JOINT

The clinical signs and symptoms for the patient with an infected prosthetic joint may be insidious; for example, the patient may have pain as the major complaint, instead of fever or other features of sepsis. Figure 2 depicts the steps to follow when caring for a patient with an infected prosthetic joint. The most important diagnostic procedure is aspiration of the involved joint. Empirical therapy should be avoided if at all possible so that reliable cultures can be taken and susceptibility testing can be performed on any isolates. The most common pathogen is coagulase-negative staphylococcus (5). The minimum duration of therapy is six weeks, which usually

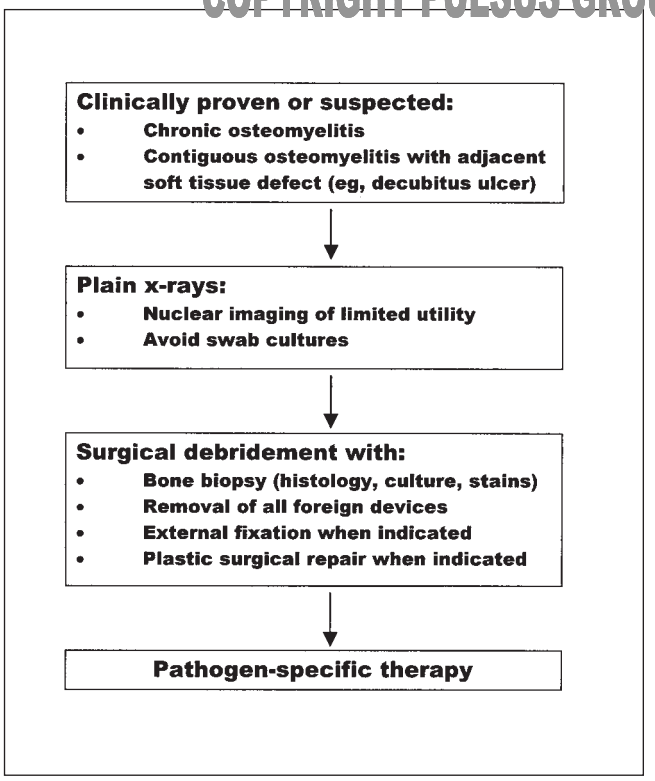

Figure 4) *Care plan for chronic osteomyelitis*

TABLE 1
Septic arthritis or osteomyelitis nursing care plan

Nursing diagnosis	Potential for deterioration or adverse effects	
Nursing goal	No deterioration or adverse effects	
Outcome criteria	Deterioration or adverse effects resulting in a change in treatment	
Nursing interventions	Nursing assessment	Nurse alert
	• Assess joint or wound for colour, swelling, pain, decreased range of motion and drainage • Record vital signs • Assess intravenous device and skin exit site • Ask about skin rash and other adverse events of the medication and confirm presence if mentioned • Assess adherence to regimen: drug, intravenous device maintenance, activities of daily living (especially mobility), laboratory monitoring	• Increased swelling, increased redness, increased pain, decreased range of motion, adverse change in wound drainage • Fever ≥38°C • Redness, swelling or pain at intravenous site; device malfunction • Skin rash; other significant adverse events

includes a short hospital stay and outpatient intravenous antibiotic therapy using a peripherally inserted central catheter. A two-stage exchange arthroplasty is the usual surgical strategy (6). Medical therapy alone almost always fails. If the erythrocyte sedimentation rate and the C-reactive protein levels are high to begin with, further monitoring these parameters may be used as a rough index of response of the infection, because reculturing the joint by reaspiration is not usually conducted until just before the second-stage arthroplasty.

HEMATOGENOUS OSTEOMYELITIS

Hematogenous osteomyelitis may present either in the acute stage, as is usual for small children, or in the chronic stage. The care plan for hematogenous arthritis is presented in Figure 3. For a patient in the acute stage, it is important to remember that plain x-rays do not exclude the diagnosis of osteomyelitis. A technetium-labelled bone scan is much more sensitive in the early stages. The best microbiological diagnostic test for children is blood culture, and *S aureus* is by far the most common isolate (7,8). Cloxacillin, therefore, is the usual agent of choice, but cefazolin can also be used. In children with staphylococcal or streptococcal osteomyelitis, oral step-down therapy is usually preferred once the acute stage of the infection is under control (9). The usual duration of therapy for children is four weeks, while the usual duration of intravenous therapy for adults is six weeks with a peripherally inserted central catheter. In adults with infection caused by Gram-negative rods, an oral fluoroquinolone such as ciprofloxacin, 500 to 750 mg bid, is usually preferred.

CHRONIC OSTEOMYELITIS

The care plan for chronic osteomyelitis can be found in Figure 4. In chronic osteomyelitis, blood culture is usually negative; empirical therapy should be avoided. The most important diagnostic test is a bone biopsy with histology, and aerobic and anaerobic culture. Normal x-rays usually show changes, but a normal x-ray does not rule out osteomyelitis. If a draining sinus is present, surface swab cultures should be avoided because they may pick up colonizing bacteria and lead to treatment with unnecessary antibiotics. Sinus tract swabs that grow *S aureus* often predict that the pathogen is in bone, but sinus tract swabs that grow Gram-negative rods do not (10). Although orthopedic hardware should be removed whenever possible, in the case of a patient with infection of a fracture with internal fixation, the aim of therapy is only to suppress the infection to a low level that will allow bone union to occur. Once this is achieved and the patient can bear weight, the hardware can be removed, any sequestrum can be debrided, and a second course of antibiotics can be started to eradicate the infection. The minimum duration of therapy is six weeks, usually completed in an outpatient intravenous antibiotic program with a peripherally inserted central catheter. In the case of susceptible Gram-negative osteomyelitis, the full course of treatment may be accomplished with an oral fluoroquinolone, such as ciprofloxacin, 500 to 750 mg bid, if adherence to the oral regimen can be assured. The sedimentation rate and C-reactive protein levels may be useful surrogate markers of the progress of the infection.

TABLE 2
Pathogen-specific therapy: Antibiotics of choice for common Gram-positive cocci

	Antibiotic treatment*	
Organism	**Adult dose**	**Paediatric dose**
Staphylococcus aureus, methicillin susceptible	Cloxacillin 2 g (every 6 h) or Cefazolin 2 g (every 8 h)	Cloxacillin 50 mg/kg (every 6 h)† or Cefazolin 30 mg/kg (every 8 h)†
For cephalosporin allergy	Vancomycin 1 g (every 12 h) or Clindamycin 600 mg (every 8 h)	Vancomycin 15 mg/kg (every 8 to 12 h) or Clindamycin 10 to 13 mg/kg (every 8 h) †
S aureus, methicillin resistant	Vancomycin 1 g (every 12 h)	Vancomycin 15 mg/kg (every 8 to 12 h)
Streptococcus species	Penicillin G 3 to 4 MU (every 12 h) or Cefazolin 2 g (every 8 h)	Penicillin 50,000 U/kg (every 6 h)† or Cefazolin 30 to 50 mg/kg† (every 8 h)
For cephalosporin allergy	Vancomycin 1 g (every 12 h) or Clindamycin 600 mg (every 8 h)	Vancomycin 15 mg/kg (every 12 h) or Clindamycin 10 to 13 mg/kg (every 8 h)†
For once daily therapy	Ceftriazone 2 g (every 24 h)	Ceftriazone 50 mg/kg (every 24 h)
Enterococcus species	Ampicillin 2 g (every 6 h)‡ plus Bentamicin 1 mg/kg (every 8 h)§,** (if synergistic in vitro)	Ampicillin 50 mg/kg (every 6 h) plus Gentamicin 1 mg/kg (every 8 h)
For penicillin allergy or ampicillin resistance	Vancomycin 1 g (every 12 h) plus Gentamicin 1 mg/kg (every 8 h)§,** (if synergistic in vitro)	Vancomycin 15 mg/kg (every 12 h) plus Gentamicin 1 mg/kg (every 8 h)

**May need to adjust doses based on renal function or size in adults. †It is usually possible to switch from intravenous to oral antibiotics in children in the first week of therapy for streptococcal infections and methicillin-susceptible staphylococcal infections. Some clinicians prefer to measure serum bactericidal concentrations when switching to oral therapy. ‡Can use penicillin G instead of ampicillin if synergistic with aminoglycosides. §Substitute streptomycin for gentamicin if synergistic and gentamicin-resistant. Consider fluoroquinolone for synergy if resistant to both gentamicin and streptomycin. **More data exist on conventional dosing than on the once daily dosing of aminoglycosides for enterococcal infections*

TABLE 3
Pathogen-specific therapy: Antibiotics of choice for common Gram-negative cocci

	Antibiotic treatment*	
Organism	**Adult dose**	**Paediatric dose**
Haemophilus influenzae, ampicillin susceptible	Ampicillin 2 g (every 6 h)	Ampicillin 50 mg/kg (every 6 h)
H influenzae, ampicillin resistant	Cefuroxime 1.5 g (every 8 h) or Ceftriaxone 1 to 2 g (every 24 h) or Cefotaxime 1 to 2 g (every 8 h)	Cefuroxime 50 mg/kg (every 8 h) or Ceftriaxone 50 mg/kg (every 24 h) or Cefotaxime 50 mg/kg (every 8 h)
Intolerance to beta-lactams	Desensitize to beta-lactam or use chloramphenicol for adults and children or ciprofloxacin for adults only	
Enterobacteriaceae	Ciprofloxacin 500 to 75 mg (bid by mouth) or Trimethoprim/sulphamethoxazole two double strength tablets (bid by mouth) or Ceftriaxone 2 g (every 24 h)† or Cefotaxime 2g (every 8 h)† or Cefipime 2 g (every 8 h) or Gentamicin 2 mg/kg (every 8 h) or Gentamicin 7 mg/kg (every 24 h)	Trimethoprim 5 mg/kg (every 12 h) or Ceftriaxone 50 mg/kg (every 24 h) or Cefotaxime 50 mg/kg (every 8 h) or Cefipime 50 mg/kg (every 8 h) or Gentamicin 2 mg/kg (every 8 h) or Gentamicin 7 mg/kg (every 24 h, intravenous)
Pseudomonas aeruginosa	Two of the following three choices: i] Piperacillin 3 g (every 4 h) or Ceftazidime 2 g (every 8 h) or Cefipime 2 g (every 8 h) or ii] Ciprofloxacin 750 mg (every 12 h by mouth) iii] Gentamicin 7 mg/kg (every 24 h) or Tobramycin 7 mg/kg (every 24 h)	One drug from each of the following groups: i] Piperacillin 50 mg/kg (every 4 h) or Ceftazidime 50 mg/kg (every 8 h) or Cefipime 50 mg/kg (every 8 h) or ii] Gentamicin 2 mg/kg (every 8 h) or 7 mg/kg (every 24 h) or Tobramycin 2 mg/kg (every 8 h) or 7 mg/kg (every 24 h)

**May need to adjust doses based on renal function or size in adults. †If possible, avoid these cephalosporins if pathogen is* Serratia *species,* Enterobacter *species,* Providencia *species,* Morganella *species or* Citrobacter freundii*, due to the possibility of derepressing latent cephalosporinase*

NURSING CARE PLAN FOR SEPTIC ARTHRITIS OR OSTEOMYELITIS

Patients often receive a portion (usually the majority) of intravenous therapy in an outpatient program. In these cases, home care nurses clinically monitor the patients and the intravenous devices, often every day or every other day. A nursing care plan is presented in Table 1. The physician should follow the progress of these patients approximately every week during the intravenous treatment.

PATHOGEN-SPECIFIC THERAPY FOR COMMON PATHOGENS

Variability exists in the therapy of septic arthritis and osteomyelitis. Therapy depends on the pathogen isolated and patient-related specifics that dictate a regimen (eg, known allergies or drug intolerance). Tables 2 and 3 list the antibiotics of choice for the paediatric and adult age groups for some of the most common pathogens, with alternative regimens for patients with penicillin allergy.

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