

- Intravenous drug users represent a risk group of fairly young people (median age 30–40 years).
- The tricuspid valve is infected in more than 50% of cases, followed by the aortic valve in 25% and the mitral valve in 20%, with mixed right-sided and left-sided infective endocarditis in a few instances.
- 60–80% of patients have no known preexisting valve lesions.
- The pathogens usually originate from the skin, explaining the predominance of *Staph aureus*. *Pseudomonas aeruginosa* and fungi are also encountered and produce severe forms of infective endocarditis.
- In HIV-1-positive intravenous drug users, both the risk of and mortality from infective endocarditis rise inversely to the CD4 count; risk is unaffected in patients with CD4 counts of more than 500 cells per microL, but increases four-fold in those with CD4 counts of less than 200 cells per microL
- HIV-1-positive patients sometimes present with infective endocarditis caused by unusual organisms, including *Bartonella*, *Salmonella*, and *Listeria*.

iv drug use

risk factors

- Risk of native-valve disease is classically associated with congenital heart disease and chronic rheumatic heart disease.
- mitral valve prolapse is a more controversial issue; patients with valve regurgitation have an increased risk of infective endocarditis.
- Degenerative valve lesions are a primary cause of senile aortic stenosis or mitral regurgitation, which are risk factors for infective endocarditis.
- 1–5% of individuals with infective endocarditis have prosthetic-valve endocarditis. Whether mechanical valves or bioprostheses are more prone to infection remains unresolved.
- IV drug use
- Nosocomial endocarditis
- Haemodialysis

Endocarditis  
[created by Paul Young 02/10/07]

prosthetic valve endocarditis

- PVE is classified as either early or late infection, depending on whether the infection arises within 60 days of surgery or later.
- The condition peaks during the first 2 months after valve implantation and is often due to *Staphylococcus epidermidis* or *Staph aureus*.
- Progressive endothelialisation of the prosthetic material over 2–6 months reduces the susceptibility of the valve to infection.
- Late PVE is often due to other organisms: eg, streptococci and gram-negative bacteria of the HACEK group, *Haemophilus* spp, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella kingae*

therapy

nosocomial endocarditis

- Nosocomial endocarditis is a growing category
- Less than 50% of patients had cardiac predisposing factors.
- Predominant pathogens were staphylococci and enterococci, and were frequently associated with catheters or medicosurgical procedures.
- The authors of one study estimated that up to 13% of nosocomial *Staph aureus* bacteraemia were responsible for subsequent infective endocarditis. Moreover, possible right-sided nosocomial endocarditis was reported in 5% of bone-marrow transplant recipients who had central venous catheters.
- Nosocomial endocarditis is important because its case fatality rate is greater than 50%.
- Another iatrogenic risk for infective endocarditis is haemodialysis. The disease is two to three times more frequent in haemodialysis patients than in peritoneal dialysis patients or in the general population. More than 50% of cases are due to *Staph aureus*.

rare cause of endocarditis that are culture negative

*Brucella*  
*C. burnetti*  
*Bartonella*  
*Chlamydia*  
*Mycoplasma*  
*Legionella*  
*Whipples*

Dose and route	Duration (weeks)	Comments	Dose and route	Duration (weeks)	Comments
<b>Penicillin-susceptible viridans streptococci and Strep bovis</b>					
Procain 6x2-3 million U daily IV	4	Preferred in patients older than age 65 years or with impaired renal function	<b>Native valves</b>		
Ceftriaxone* 1x2 g daily IV or IM	4		Meticillin-susceptible staphylococci	6x2 g daily IV	4-6
Procain 6x2-8 million benzylpenicillin U daily IV with gentamicin 3x1 mg/kg daily IV or IM	2	Gentamicin once daily might be adequate	Flucloxacillin, or oxacillin, or nafcillin with gentamicin (optional)	3x1 mg/kg daily 3-5 days IV or IM	
Ceftriaxone* 1x2 g daily IV or IM	2		Cefazolin (or other first generation cephalosporins) with gentamicin (optional)	3x2 g daily IV	4-6
Vancomycin 1x4 mg/kg daily IV 2x15 mg/kg daily IV	2	Recommended for patients allergic to beta lactam	Vancomycin	2x15 mg/kg daily IV	4-6
<b>Intermediate penicillin-resistant (MIC 0.1-1 mg/L) viridans streptococci and Strep bovis</b>					
Procain 6x3 million U daily IV	4	Gentamicin once daily might be adequate	<b>Meticillin-resistant staphylococci</b>		
benzylpenicillin 3x1 mg/kg daily with gentamicin IV or IM	2		Vancomycin	2x15 mg/kg daily IV	4-6
Vancomycin 2x15 mg/kg daily IV	4	Recommended against highly resistant strains or for patients allergic to beta lactam	<b>Prosthetic valves</b>		
<b>Enterococcus spp†</b>					
Procain 6x3-5 million benzylpenicillin U/daily IV with gentamicin 3x1 mg/kg daily IV or IM	4-6	6 weeks' therapy recommended for patients with >3 months symptoms	Meticillin-susceptible staphylococci*	6x2 g daily IV	>6
Ampicillin 6x2 g/daily IV with gentamicin 3x1 mg/kg daily IV or IM	4-6	Gentamicin once daily might be adequate	Flucloxacillin, or oxacillin, or nafcillin with rifampicin	3x300 mg daily orally	>6
Vancomycin 2x15 mg/kg daily IV with gentamicin 3x1 mg/kg daily IV or IM	4-6	Monitor drug serum concentrations and renal function	and gentamicin	3x1 mg/kg daily 2 IV or IM	
<b>Microorganisms of the HACEK group‡</b>					
Ceftriaxone* 1x2 g daily IV or IM	4		Vancomycin	2x15 mg/kg daily IV	>6
Ampicillin 6x2 g daily IV with gentamicin 3x1 mg/kg daily IV or IM	4	Gentamicin once daily might be adequate	with rifampicin orally	3x300 mg daily >6	
			and gentamicin	3x1 mg/kg daily 2 IV or IM	

IV=intravenous, IM=intramuscular. \*Preferred for outpatient treatment. †Treatment of endocarditis due to vancomycin-resistant enterococci depends on careful assessment of susceptibility to alternative antibiotics, including new streptogramin combination quinupristin/dalfopristin. ‡Includes *Haemophilus* spp, *Actinomyces* spp, *C. hominis*, *E. corrodens*, and *K. kingae*. Adapted from references 79-81 with permission from Mosby.

IV=intravenous, IM=intramuscular. \*Rifampicin plays a special part in prosthetic device infection, because it helps kill bacteria attached to foreign material. Rifampicin should never be used alone, because it selects for resistance at a high frequency (about 10%). Adapted from references 79-81 with permission from Mosby.