Endocardite su Protesi

UNA PATOLOGIA CON MORTALITA' OSPEDALIERA SUPERIORE ALLO STEMI CHE RICHIEDE RIGOROSI PROTOCOLLI DIAGNOSTICI E TERAPEUTICI

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Dichiarazione

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Prosthetic Valve Endocarditis: Extent of Clinical Issue

Table 2 | Prospective studies of patients with infective endocarditis

Characteristics	AEPEI Study[69]	ICE Study[71]	Euro Heart Survey[72]	SEI study	RIEI Study	Monaldi Cohort
n	390	2,781	159			
Mean age (years)	59	58	56			
Male (%)	71	68	70			
IE affecting native valve (%)	79	72	74			
IE affecting valve prosthesis (%)	16	21	26	**25.6%**	**16.7%**	**17.8%**
Pacemaker and/or ICD (%)	5	7	NR			
Current intravenous drug use (%)	6	10	5			
Valvular surgery during the acute phase (%)	49	48	52			
In-hospital mortality (%)	16	18	13			
Causative micro-organism						
All *Streptococcaceae* (%)	58	39	42			
Oral *Streptococci* (%)	17	17	13			
Other *Streptococci* (%)	33	12	15			
Enterococci (%)	8	10	14			
All *Staphylococci* (%)	29	42	NR			
Staphylococcus aureus (%)	23	31	33			
Coagulase-negative *Staphylococci* (%)	6	11	NR			

Iung, B. & Vahanian, A. *Nat. Rev. Cardiol.* 8, 162–172 (2011);

JAMA 2002; 288: 75–81
Arch Intern Med 2009; 169(5): 463-73
Heart 2005; 91: 571–575
Infection 2012; 40(5): 527-535
Journal of Cardiovascular Medicine 2008; 9: 508-514
Unpublished data

PROSTHETIC VALVE IE

>90% LEFT-SIDED

Incidence: 0.3-1.2% pt-year

Onset:
- EARLY: <2 months
- INTERMEDIATE: >2-<12 months
- LATE: >12 months

MORTALITY
20-40%

Adapted from Que & Moreillon, *Nat Rev Cardiol* 2011

Clinical Presentation, Etiology, and Outcome of Infective Endocarditis in the 21st Century

The International Collaboration on Endocarditis–Prospective Cohort Study

Table 4. Microbiologic Etiology by Region in 2781 Patients With Definite Endocarditis

Cause of Endocarditis	No. (%) of Patients[a]						*P* Value for the Difference Between Regions
	Total Cohort (N=2781)	Patients Admitted Directly to Study Sites Only[b] (n=1558)	Region				
			North America (n=597)	South America (n=254)	Europe (n=1213)	Other (n=717)	
Staphylococcus aureus	**869** (31)	487 (31)	256 (43)	43 (17)	339 (28)	231 (32)	<.001
Coagulase-negative staphylococcus	**304** (11)	161 (10)	69 (12)	18 (7)	156 (13)	61 (9)	.005
Viridans group streptococci	**483** (17)	288 (19)	54 (9)	66 (26)	198 (16)	165 (23)	<.001
Streptococcus bovis	**165** (6)	101 (7)	9 (2)	17 (7)	116 (10)	23 (3)	<.001
Other streptococci	**162** (6)	101 (7)	38 (6)	16 (6)	66 (5)	42 (6)	.86
Enterococcus species	**283** (10)	158 (10)	78 (13)	21 (8)	111 (9)	73 (10)	.05
HACEK	**44** (2)	26 (2)	2 (0.3)	6 (2)	19 (2)	17 (2)	.02
Fungi/yeast	**45** (2)	25 (2)	20 (3)	3 (1)	13 (1)	9 (1)	.002
Polymicrobial	**28** (1)	23 (2)	8 (1)	1 (0.4)	13 (1)	6 (0.8)	.60
Negative culture findings	**277** (10)	122 (8)	41 (7)	51 (20)	123 (10)	62 (9)	<.001
Other	**121** (4)	66 (4)	22 (4)	12 (5)	59 (5)	28 (4)	.61

Murdoch DR *et al. Arch Intern Med* 2009;169:463-473

Clinical Presentation, Etiology, and Outcome of Infective Endocarditis in the 21st Century

The International Collab

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Fungi/yeast	**45** (2)	
Polymicrobial	**28** (1)	
Negative culture findings	**277** (10)	
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Negative culture findings	**277** (10)
Other	**121** (4)

Clinical Presentation, Etiology, and Outcome of Infective Endocarditis in the 21st Century

The International Collaboration on Endocarditis–Prospective Cohort Study

Table 5. Microbiologic Etiology by IE Type in 2781 Patients With Definite Endocarditis

	No. (%) of Patients[a]			
	Native Valve IE		Intracardiac Device IE	
Cause of Endocarditis	Drug Abusers (n=237)	Not Drug Abusers (n=1644)	PVIE (n=563)	Other Devices (n=172)[b]
Staphylococcus aureus	160 (68)	457 (28)	129 (23)	60 (35)
Coagulase-negative staphylococcus	7 (3)	148 (9)	95 (17)	45 (26)
Viridans group streptococci	24 (10)	345 (21)	70 (12)	14 (8)
Streptococcus bovis	3 (1)	119 (7)	29 (5)	5 (3)
Other streptococci	5 (2)	118 (7)	26 (5)	7 (4)
Enterococcus species	11 (5)	179 (11)	70 (12)	10 (6)
HACEK	0 (0)	30 (2)	13 (2)	1 (0.5)
Fungi/yeast	3 (1)	16 (1)	23 (4)	2 (1)
Polymicrobial	6 (3)	16 (1)	5 (0.8)	0 (0)
Negative culture findings	12 (5)	154 (9)	65 (12)	18 (11)
Other	6 (3)	62 (4)	38 (7)	10 (6)
Surgical therapy	89/234 (38)[c]	784/1639 (48)	274/561 (49)	104/172 (61)
In-hospital mortality	23/236 (10)[c]	281/1643 (17)	131/561 (23)	17/172 (10)

Murdoch DR *et al. Arch Intern Med* 2009;169:463-473

Clinical Presentation, Etiology, and Outcome of Infective Endocarditis in the 21st Century

The International Collaboration on Endocarditis–Prospective Cohort Study

Cause of Endocarditis	PVIE (n=563)
Staphylococcus aureus	129 (23)
Coagulase-negative staphylococcus	95 (17)
Viridans group streptococci	70 (12)
Streptococcus bovis	29 (5)
Other streptococci	26 (5)
Enterococcus species	70 (12)
HACEK	13 (2)
Fungi/yeast	23 (4)
Polymicrobial	5 (0.8)
Negative culture findings	65 (12)
Other	38 (7)
Surgical therapy	274/561 (49)
In-hospital mortality	131/561 (23)

Murdoch DR *et al. Arch Intern Med* 2009;169:463-473

STUDIO ENDOCARDITI ITALIANO

Epidemiology, characteristics, and outcome of infective endocarditis in Italy: the *Italian Study on Endocarditis*

SEI: national multicenter collaboration involving investigators from 24 centers (mostly I.D.) throughout Italy

January 2004 → December 2009

1082 consecutive pts with definite IE

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

STUDIO ENDOCARDITI ITALIANO

Baseline characteristics

	NV-IE 753 (69.6%)	PV-IE 277 (25.6%)	CIED-IE 52 (4.8%)
Age, median [IQR], years	62 [46-72]	69 [61-75]	67 [61-77]
Male gender	535/753 (71.0)	178/277 (64.2)	41/52 (78.8)
Comorbidities			
Hemodialysis	19/750 (2.5)	2/275 (0.7)	2/52 (3.8)
Diabetes Mellitus	126/746 (16.9)	60/276 (21.7)	14/52 (26.9)
HIV infection	29/735 (3.9)	4/271 (1.5)	1/52 (1.9)
Malignancy	100/741 (13.5)	22/274 (8.0)	6/52 (11.5)
Chronic liver disease	148/724 (20.4)	37/269 (13.7)	5/50 (10.0)
Immunosuppression	50/753 (6.6)	9/277 (3.2)	3/52 (5.8)
Intravenous drug abuse	86/739 (11.6)	12/273 (4.4)	2/51 (3.9)

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

STUDIO ENDOCARDITI ITALIANO

Predisposing conditions

	NV-IE 753 (69.6%)	PV-IE 277 (25.6%)	CIED-IE 52 (4.8%)
Previous IE	33/716 (4.6)	56/266 (21.0)	3/50 (6.0)
Previous hospitalisation within 180 days	225/732 (30.7)	124/267 (46.4)	21/50 (42.0)
Invasive procedures within 180 days			
Dental procedures	66/710 (9.3)	16/266 (6.0)	3/48 (6.2)
Colon	31/737 (4.2)	12/272 (4.4)	3/51 (5.9)
EGDS	33/739 (4.5)	6/272 (2.2)	2/50 (4.0)
Cystoscopy	16/737 (2.2)	0/268 (0.0)	1/52 (1.9)
Others	113/731 (15.4)	54/271 (19.9)	13/52 (25.0)
Intravascular access devices			
<60 days	58/751 (7.7)	26/275 (9.4)	2/52 (3.8)
>60 days	34/751 (4.5)	3/275 (1.1)	3/52 (5.8)

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

Predisposing conditions

	NV-IE 753 (69.6%)	PV-IE 277 (25.6%)	CIED-IE 52 (4.8%)
- Congenital heart diseases	67/736 (9.1)	15/264 (5.7)	2/51 (3.9)
- Native valve predisposition	285/753 (37.8)	-	-
Rheumatic valve disease	37/285 (13.0)	-	-
Mitral valve insufficiency	80/285 (28.1)	-	-
Mitral valve stenosis	3/285 (1.1)	-	-
Aortic valve insufficiency	32/285 (11.2)	-	-
Aortic valve stenosis	20/285 (7.0)	-	-
Multiple predisposing conditions	46/285 (16.1)	-	-
Others	67/285 (23.5)	-	-
- Time of acquisition of PV-IE			
Early	-	41/277 (14.8)	-
Late	-	236/277 (85.2)	-

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

PV-IE: Microbial aetiology by time of acquisition

	Early PV-IE N=41 0-2 mo	Late PV-IE N=235 > 2 mo
S. aureus	34.1	15.7
CoNS	24.4	16.6
Enterococcus spp	12.2	18.7
S. bovis	4.9	10.6
viridans streptococci	0	9.4
other streptococci	0	2.5
Fungi	2.4	3.0
Others	12.2	7.6
Polymicrobial	4.9	4.2
Negative findings	4.9	11.5

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

STUDIO ENDOCARDITI ITALIANO

Univariate analysis of risk factors for in-hospital death

Risk factor	Death	Univariate analysis	
	n.(%)	OR (IC95%)	P value
Female vs. Male	67/328 (20.4) vs. 96/754 (12.7)	0.56 (0.40-0.80)	0.002
<65 years vs. ≥65 years	57/531 (11.5) vs. 106/551 (23.1)	0.50 (0.35-0.71)	<0.0001
HCa-IE vs. Ca-IE	77/333 (23.1) vs. 86/749 (11.5)	2.31 (1.65-3.25)	<0.0001
PV-IE vs. NV-IE	66/277 (23.8) vs. 92/753 (12.2)	2.24 (1.58-3.19)	<0.0001
DM vs. not	45/200 (22.5) vs. 118/874 (13.5)	1.86 (1.26-2.73)	0.002
Malignancy vs. not	29/128 (22.7) vs. 133/939 (14.2)	1.77 (1.12-2.79)	0.017
Immunosuppression vs. not	15/62 (24.2) vs. 148/1020 (14.5)	1.88 (1.02-3.45)	0.045
Intravascular access devices	36/126 (28.6) vs. 127/952 (13.3)	2.59 (1.69-3.99)	<0.0001
Stroke vs. not	52/160 (32.5) vs. 101/894 (11.3)	3.78 (2.55-5.58)	<0.0001
CHF vs. not	108/412 (26.2) vs. 45/635 (7.1)	4.65 (3.20-6.77)	<0.0001
Intracardiac abscess vs. not	31/131 (23.7) vs. 110/900 (12.2)	2.22 (1.42-3.49)	0.001
Arrhythmias vs. not	31/154 (20.1) vs. 112/877 (12.8)	1.72 (1.10-2.67)	0.022
Surgery vs. not	51/494 (10.3) vs. 112/588 (19.0)	0.48 (0.34-0.69)	<0.0001
S. aureus vs. not	57/237 (24.1) vs. 105/838 (12.5)	2.21 (1.54-3.17)	<0.0001
S. bovis vs. not	9/119 (7.6) vs. 153/956 (16.0)	0.42 (0.21-0.86)	0.014
viridans streptococci vs. Not	11/192 (5.7) vs. 151/883 (17.1)	0.29 (0.15-0.55)	<0.0001

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

STUDIO ENDOCARDITI ITALIANO

Multivariate analysis of risk factors for in-hospital death

Risk factor	OR (IC95%)	P value
Health Care- Ass IE	1.90 (1.23-2.92)	0.003
Prosthetic Valve-IE	2.27 (1.45-3.56)	<0.0001
Stroke	3.08 (1.88-5.02)	<0.0001
Heart Failure	6.33 (3.99-10.06)	<0.0001
Surgery	0.31 (0.19-0.50)	<0.0001
S. aureus	1.92 (1.2-3.09)	0.006

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

STUDIO ENDOCARDITI ITALIANO

In-hospital mortality	163/1082 (15.1)	
LEFT-SIDED IE	15.6%	**p<0.001**
RIGHT-SIDED IE	10.6%	
NV-IE	12.2%	
PV-IE	23.8%	**p<0.001**
CIED-IE	9.6%	
MRSA infections	40.3%	**p<0.0001**
MSSA infections	17.2%	

Leone S, Ravasio V, Durante-Mangoni E, et al. Infection 2012; 40(5):527-535

Diagnostic approach to prosthetic valve endocarditis

European Heart Journal Advance Access published August 29, 2015

European Heart Journal
doi:10.1093/eurheartj/ehv319

ESC GUIDELINES

2015 ESC Guidelines for the management of infective endocarditis

The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC)

Clues for PVE diagnosis

- Early after Surgery

Post-op fever → **2 sets blood cultures**

LDH not declining or increasing

CRP raised

Abnormal findings on post-op echo

- Late after Surgery

Unexplained fever

Fever without target organ involv.

Relapsing fever after antibiotics

Diastolic heart murmur

Increased trans-valvular gradients on echo

Paravalvular leak after an invasive procedure

New onset paravalvular leak

Durante-Mangoni E. Personal experience

Sources of PVE

- Colon
- Mouth
- Urinary tract
- Female genital tract

- Any invasive procedure
- Indwelling catheters
- Haemodialysis

Durante-Mangoni E. Personal experience

How to obtain a correct diagnosis of PVE

- No rush for antibiotics
- 2 sets of blood cultures daily for 2-3 days
- Immediate antibiotics only in severe sepsis or septic shock (refractory hypotension + ↑ lactates)

- Start antibiotics after 2 blood cultures are positive

Durante-Mangoni E. Based on existing evidence and best practice

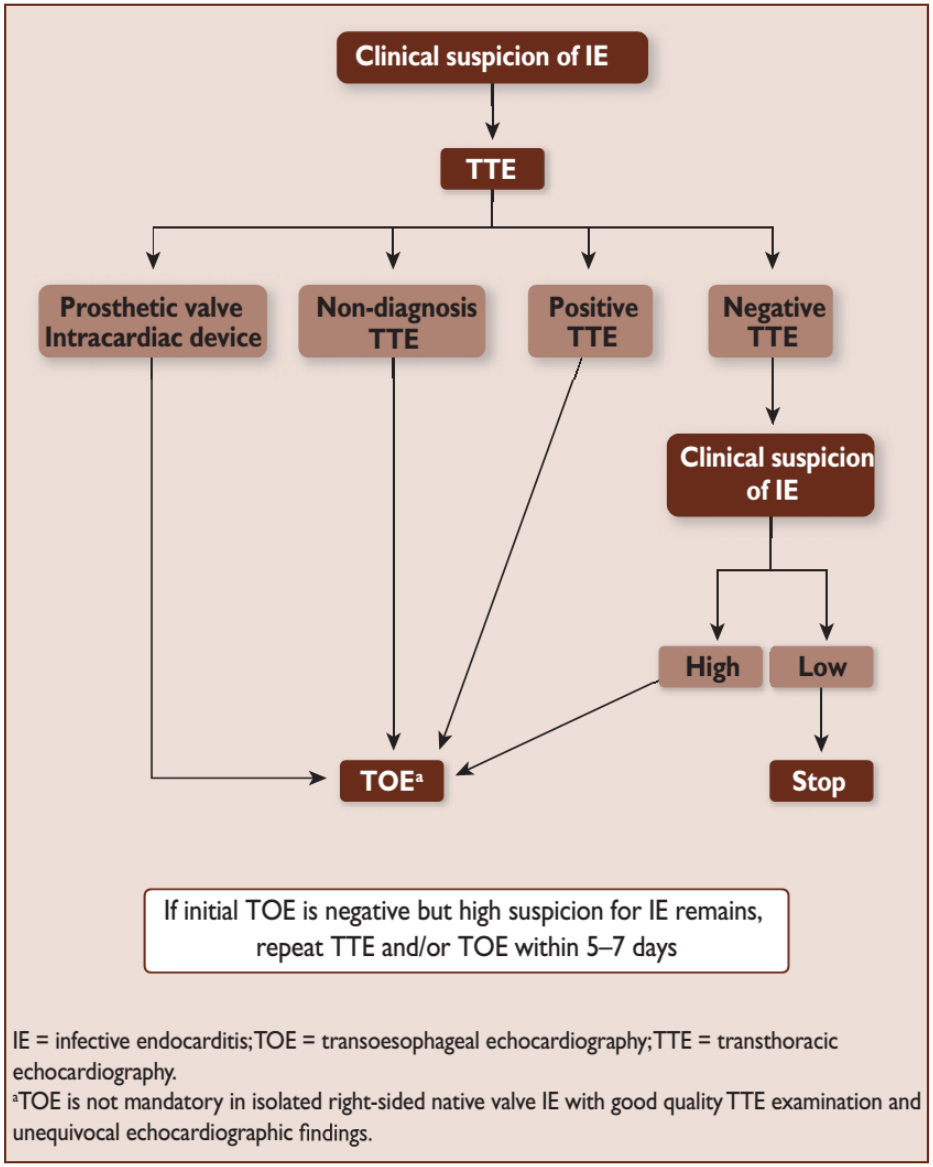

Figure 1 Indications for echocardiography in suspected infective endocarditis.

Table 14 Definitions of the terms used in the European Society of Cardiology 2015 modified criteria for the diagnosis of infective endocarditis

2. Imaging positive for IE

a. Echocardiogram positive for IE:
- Vegetation;
- Abscess, pseudoaneurysm, intracardiac fistula;
- Valvular perforation or aneurysm;
- New partial dehiscence of prosthetic valve.

b. Abnormal activity around the site of prosthetic valve implantation detected by ^{18}F-FDG PET/CT (only if the prosthesis was implanted for >3 months) or radiolabelled leukocytes SPECT/CT.

c. Definite paravalvular lesions by cardiac CT.

Therapeutic approach to prosthetic valve endocarditis

European Heart Journal Advance Access published August 29, 2015

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ESC GUIDELINES

2015 ESC Guidelines for the management of infective endocarditis

The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC)

Table 16 Antibiotic treatment of infective endocarditis due to oral streptococci and *Streptococcus* bovis group[a]

Antibiotic	Dosage and route	Duration (weeks)	Class[b]	Level[c]	Ref.[d]	Comments
Strains penicillin-susceptible (MIC ≤ 0.125 mg/L) oral and digestive streptococci						
Standard treatment: 4-week duration						
Penicillin G *or* Amoxicillin[e] *or* Ceftriaxone[f]	12–18 million U/day i.v. either in 4–6 doses or continuously 100–200 mg/kg/day i.v. in 4–6 doses 2 g/day i.v. or i.m. in 1 dose	4 4 4	I I I	B B B	6,8, 135–139	Preferred in patients > 65 years or with impaired renal or VIII (vestibulocochlear) cranial nerve functions. 6-week therapy recommended for patients with PVE
	Paediatric doses:[g] Penicillin G 200,000 U/kg/day i.v. in 4–6 divided doses Amoxicillin 300 mg/kg/day i.v. in 4–6 equally divided doses Ceftriaxone 100 mg/kg/day i.v. or i.m. in 1 dose					
Standard treatment: 2-week duration						
Penicillin G *or* Amoxicillin[e] *or* Ceftriaxone[f] combined with Gentamicin[h] *or* Netilmicin	12–18 million U/day i.v. either in 4–6 doses or continuously 100–200 mg/kg/day i.v. in 4–6 doses 2 g/day i.v. or i.m. in 1 dose 3 mg/kg/day i.v. or i.m. in 1 dose 4–5 mg/kg/day i.v. in 1 dose	2 2 2 2 2	I I I I I	B B B B B	6,8, 127, 135–138	Only recommended in patients with non-complicated NVE with normal renal function. Netilmicin is not available in all European countries.
	Paediatric doses:[g] Penicillin G, amoxicillin, and ceftriaxone as above Gentamicin 3 mg/kg/day i.v. or i.m. in 1 dose or 3 equally divided doses					

Table 17 Antibiotic treatment of infective endocarditis due to *Staphylococcus* spp.

Antibiotic	Dosage and route	Duration (weeks)	Class[i]	Level[j]	Ref.[k]	Comments
Prosthetic valves						
Methicillin-susceptible staphylococci						
(Flu)cloxacillin *or* oxacillin with Rifampin[e] and Gentamicin[f]	12 g/day i.v. in 4–6 doses	≥ 6	I	B	6,8, 135, 136	Starting rifampin 3–5 days later than vancomycin and gentamicin has been suggested by some experts. Gentamicin can be given in a single daily dose in order to reduce renal toxicity
	900–1200 mg i.v. or orally in 2 or 3 divided doses	≥ 6	I	B		
	3 mg/kg/day i.v. or i.m. in 1 or 2 doses	2	I	B		
	Paediatric doses:[g] Oxacillin and (flu)cloxacillin as above Rifampin 20 mg/kg/day i.v. or orally in 3 equally divided doses					
Penicillin-allergic patients[h] and methicillin-resistant staphylococci						
Vancomycin[b] with Rifampin[e] and Gentamicin[f]	30–60 mg/kg/day i.v. in 2–3 doses	≥ 6	I	B	6,8, 135, 136	**Cephalosporins** (cefazolin 6 g/day or cefotaxime 6 g/day i.v. in 3 doses) are recommended for penicillin-allergic patients with non-anaphylactic reactions with methicillin-susceptible endocarditis. Starting rifampin 3–5 days later than vancomycin and gentamicin has been suggested by some experts. Gentamicin can be given in a single daily dose in order to reduce renal toxicity
	900–1200 mg i.v. or orally in 2 or 3 divided doses	≥ 6	I	B		
	3 mg/kg/day i.v. or i.m. in 1 or 2 doses	2	I	B		
	Paediatric dosing:[g] As above					

Table 18 **Antibiotic treatment of infective endocarditis due to *Enterococcus* spp.**

Antibiotic	Dosage and route	Duration, weeks	Class[g]	Level[h]	Ref.[i]	Comments
Beta-lactam and gentamicin-susceptible strains (for resistant isolates see [a,b,c])						
Amoxicillin* with Gentamicin[d]	200 mg/kg/day i.v. in 4–6 doses	4–6	I	B	6,8, 129, 135, 136, 186	6-week therapy recommended for patients with >3 months symptoms or PVE
	3 mg/kg/day i.v. or i.m. in 1 dose	2–6**	I	B		
	Paediatric doses:[e] Ampicillin 300 mg/kg/day i.v. in 4–6 equally divided doses Gentamicin 3 mg/kg/day i.v. or i.m. in 3 equally divided doses					
Ampicillin with Ceftriaxone	200 mg/kg/day i.v. in 4–6 doses	6	I	B	183–185	This combination is active against *Enterococcus faecalis* strains with and without HLAR, being the combination of choice in patients with HLAR *E. faecalis* endocarditis. This combination is not active against *E. faecium*
	4 g/day i.v. or i.m. in 2 doses	6	I	B		
	Paediatric doses:[e] Amoxicillin as above Ceftriaxone 100 mg/kg/12 h i.v. or i.m.					
Vancomycin[f] with Gentamicin[d]	30 mg/kg/day i.v. in 2 doses	6	I	C		
	3 mg/kg/day i.v. or i.m. in 1 dose	6	I	C		
	Paediatric doses:[e] Vancomycin 40 mg/kg/day i.v. in 2–3 equally divided doses. Gentamicin as above					

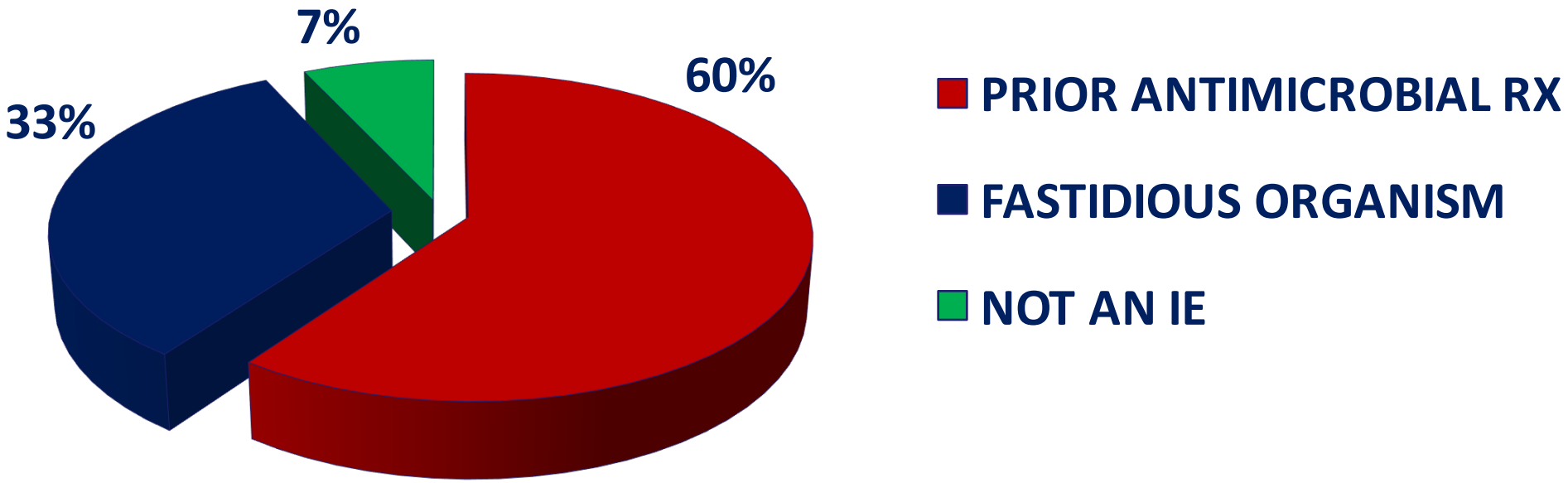
Table 20 **Proposed antibiotic regimens for initial empirical treatment of infective endocarditis in acute severely ill patients (before pathogen identification)[a]**

Antibiotic	Dosage and route	Class[b]	Level[c]	Comments
Community-acquired native valves or late prosthetic valves (≥12 months post surgery) endocarditis				
Ampicillin with (Flu)cloxacillin *or* oxacillin with Gentamicin[d]	12 g/day i.v. in 4–6 doses 12 g/day i.v. in 4–6 doses 3 mg/kg/day i.v. or i.m. in 1 dose	**IIa**	C	Patients with BCNIE should be treated in consultation with an ID specialist.
Vancomycin[d] with Gentamicin[d]	30–60 mg/kg/day i.v. in 2–3 doses 3 mg/kg/day i.v. or i.m. in 1 dose	**IIb**	C	For penicillin-allergic patients
Early PVE (<12 months post surgery) or nosocomial and non-nosocomial healthcare associated endocarditis				
Vancomycin[d] with Gentamicin[d] with Rifampin	30 mg/kg/day i.v. in 2 doses 3 mg/kg/day i.v. or i.m. in 1 dose 900–1200 mg i.v. or orally in 2 or 3 divided doses	**IIb**	C	Rifampin is only recommended for PVE and it should be started 3–5 days later than vancomycin and gentamicin has been suggested by some experts. In healthcare associated native valve endocarditis, some experts recommend in settings with a prevalence of MRSA infections >5% the combination of cloxacillin plus vancomycin until they have the final S. aureus identification

Come comportarsi nelle endocarditi ed emocolture negative?

Culture-negative IE: causes

There are 2 major causes of CNIE



Houpikian and Raoult. Medicine. 2005:84:162-73
Moreillon and Que. Lancet. 2004:363:139-49

Molecular biology - Nucleic acid amplification

PCR on whole blood samples

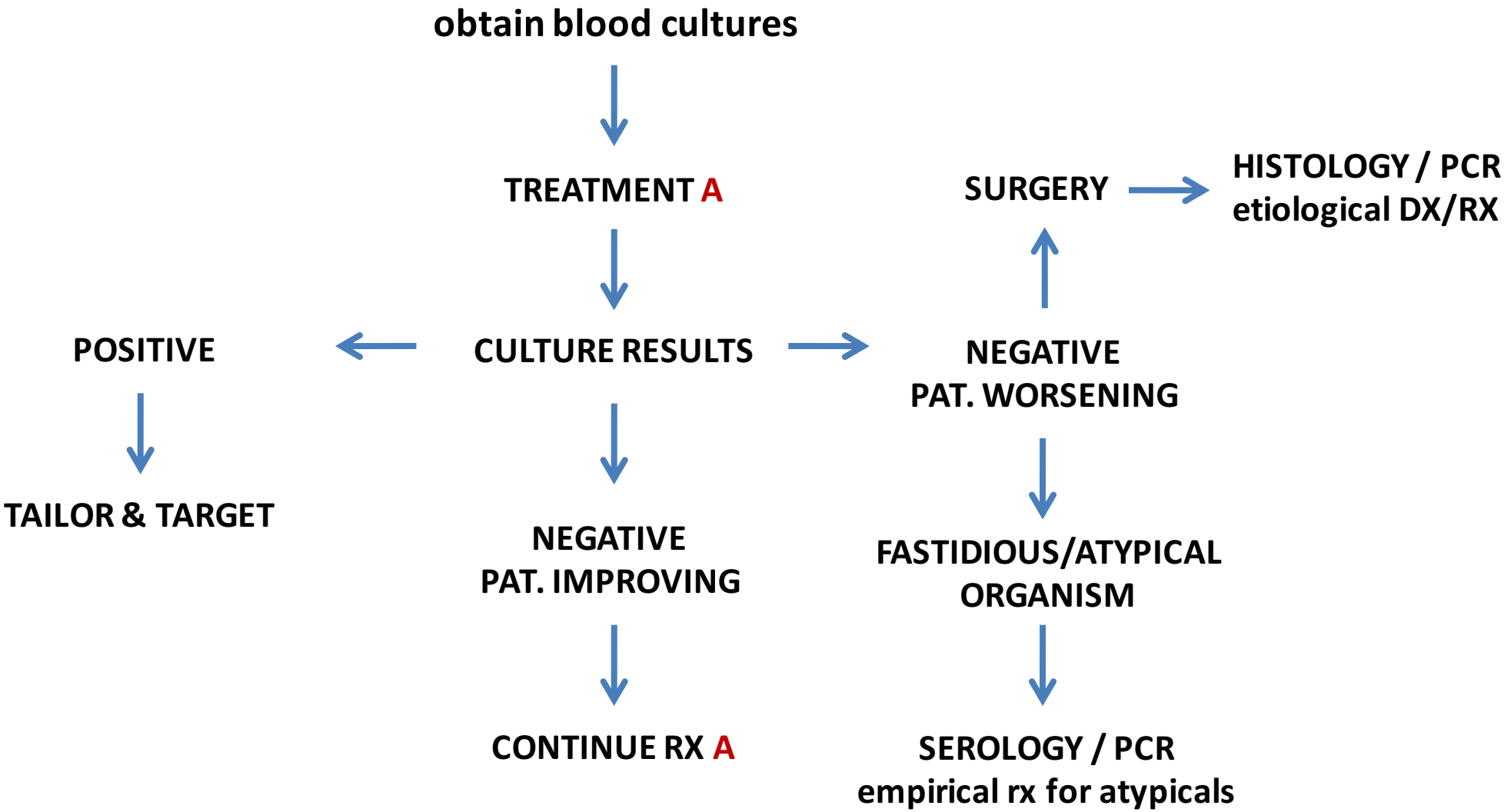
- Broad range assays for bacteria (targeting 16S rRNA) or fungi (18S rRNA) => allows to go down to species identification
- Low sensitivity, good specificity
- Real-time nested-PCR: more sensitive than PCR
- LightCycler SeptiFast: RT-PCR assay, detects 19 bacterial and 6 fungal species
  - Less sensitive than blood culture (11/50 *vs* 19/50), but …
  - may turn out positive in patients who have taken antibiotics

Rothman et al. J Infect Dis. 2002;186:1677-81 Casalta et al. Eur J Clin Microbiol Infect Dis. 2009 Jun: 28(6): 569-573
Zeaiter et al. J Clin Microbiol. 2003;41:919-25; Fenollar et al. J Clin Microbiol. 2004;42:4919-24

Table 20 **Proposed antibiotic regimens for initial empirical treatment of infective endocarditis in acute severely ill patients (before pathogen identification)[a]**

Antibiotic	Dosage and route	Class[b]	Level[c]	Comments
Community-acquired native valves or late prosthetic valves (≥12 months post surgery) endocarditis				
Ampicillin with (Flu)cloxacillin *or* oxacillin with Gentamicin[d]	12 g/day i.v. in 4–6 doses 12 g/day i.v. in 4–6 doses 3 mg/kg/day i.v. or i.m. in 1 dose	IIa	C	Patients with BCNIE should be treated in consultation with an ID specialist.
Vancomycin[d] with Gentamicin[d]	30–60 mg/kg/day i.v. in 2–3 doses 3 mg/kg/day i.v. or i.m. in 1 dose	IIb	C	For penicillin-allergic patients
Early PVE (<12 months post surgery) or nosocomial and non-nosocomial healthcare associated endocarditis				
Vancomycin[d] with Gentamicin[d] with Rifampin	30 mg/kg/day i.v. in 2 doses 3 mg/kg/day i.v. or i.m. in 1 dose 900–1200 mg i.v. or orally in 2 or 3 divided doses	IIb	C	Rifampin is only recommended for PVE and it should be started 3–5 days later than vancomycin and gentamicin has been suggested by some experts. In healthcare associated native valve endocarditis, some experts recommend in settings with a prevalence of MRSA infections >5% the combination of cloxacillin plus vancomycin until they have the final S. aureus identification

Empirical treatment of CNIE: the role of rx response



EDM 2013

Am Heart J 2005;150:1086-91

The use and effect of surgical therapy for prosthetic valve infective endocarditis: A propensity analysis of a multicenter, international cohort

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355 patients with PVIE

148 (42%) underwent cardiac surgery at a median time of 12 days from hospital admission

definite infective endocarditis (IE) diagnosed between 1984 and 1999 using the Duke criteria

Table I. Characteristics of patients with PVIE

	Surgery (n = 148)	No surgery (n = 207)	*P*
Age	62.0 (50-71)	70.0 (56-76)	<.001
Male sex	71.6 (106/148)	59.9 (124/207)	.023
Diabetes mellitus	7.8 (8/102)	19.8 (22/111)	.012
Chronic IV catheter	3.2 (3/93)	4.2 (4/96)	.732
Congenital heart disease	5.7 (7/123)	12.4 (17/137)	.062
History of cancer	6.9 (7/102)	6.3 (7/111)	.870
Dialysis dependent	1.0 (1/102)	1.8 (2/111)	.611
Other chronic disease	21.5 (20/93)	33.3 (32/96)	.069
Community acquisition	65.7 (67/102)	75.7 (84/111)	.109
Hospital referral	56.9 (58/102)	37.8 (42/111)	.005
Microbiology			
Viridans group streptococci	10.1 (15/148)	21.7 (45/207)	.040
Staphylococcus aureus	12.8 (19/148)	18.8 (39/207)	.132
Coagulase-negative staphylococci	25.0 (37/148)	8.2 (17/207)	<.001
Enterococci	9.5 (14/148)	14.0 (29/207)	.195
S bovis	2.0 (3/148)	10.1 (21/207)	.003
No growth	6.1 (9/148)	3.4 (7/207)	.227
Echocardiography			
Transthoracic only	19.6 (29/148)	19.3 (40/207)	.949
Transesophageal only	29.1 (43/148)	25.6 (53/207)	.471
Both transthoracic and transesophageal	43.9 (65/148)	42.0 (87/207)	.723

Wang A. Am Heart J 2005; 150: 1086

Table II. Complications and outcomes of patients with PVIE

	Surgery (n = 148)	No surgery (n = 207)	*P*
CHF	53.4 (79/148)	28.0 (58/207)	<.001
Systemic embolization	25.0 (37/148)	29.0 (60/207)	.406
Brain embolization	19.4 (27/139)	18.5 (34/184)	.830
Intracardiac abscess	35.1 (52/148)	8.2 (17/207)	<.001
Inhospital death	25.0 (36/144)	23.4 (47/201)	.729

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How long antibiotics should be administered before surgery in PVE

- Cardiogenic shock
  - Immediate surgery
- Haemodynamic instability
  - Wait for the first negative blood culture
- Haemodynamic stability
  - At the end of the first 2 weeks of antibiotics
  - **BUT, continuous clinical monitoring, renal function, CRP, LDH, LVDs, LVDd**
  - **Support cardiac function as per current GL**

Durante-Mangoni E. Personal experience

Table 4 Non-specific prevention measures to be followed in high-risk and intermediate-risk patients

These measures should ideally be applied to the general population and particularly reinforced in high-risk patients:
• Strict dental and cutaneous hygiene. Dental follow-up should be performed twice a year in high-risk patients and yearly in the others.
• Disinfection of wounds.
• Eradication or decrease of chronic bacterial carriage: skin, urine.
• Curative antibiotics for any focus of bacterial infection.
• No self-medication with antibiotics.
• Strict infection control measures for any at-risk procedure.
• Discourage piercing and tattooing.
• Limit the use of infusion catheters and invasive procedure when possible. Favour peripheral over central catheters, and systematic replacement of the peripheral catheter every 3–4 days. Strict adherence to care bundles for central and peripheral cannulae should be performed.

Table 5 **Recommendations for prophylaxis of infective endocarditis in the highest-risk patients according to the type of at-risk procedure**

Recommendations	Class[a]	Level[b]
A. Dental procedures		
• Antibiotic prophylaxis should only be considered for dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa	IIa	C

Prophylaxis not recommended for local anaesthetic injections in non-infected tissues, treatment of superficial caries, removal of sutures, orthodontic procedures, deciduous teeth shedding or trauma, bronchoscopy or laryngoscopy, gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery, TOE, or any skin and soft tissue procedures.

Table 3 **Cardiac conditions at highest risk of infective endocarditis for which prophylaxis should be considered when a high-risk procedure is performed**

Recommendations	Class[a]	Level[b]
Antibiotic prophylaxis should be considered for patients at highest risk for IE: (1) Patients with any prosthetic valve, including a transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair. (2) Patients with a previous episode of IE. (3) Patients with CHD: (a) Any type of cyanotic CHD. (b) Any type of CHD repaired with a prosthetic material, whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains.	IIa	C
Antibiotic prophylaxis is not recommended in other forms of valvular or CHD.	III	C

Table 6 Recommended prophylaxis for high-risk dental procedures in high-risk patients

Situation	Antibiotic	Single-dose 30–60 minutes before procedure	
		Adults	Children
No allergy to penicillin or ampicillin	Amoxicillin or ampicillin[a]	2 g orally or i.v.	50 mg/kg orally or i.v.
Allergy to penicillin or ampicillin	Clindamycin	600 mg orally or i.v.	20 mg/kg orally or i.v.