



Convegno Nazionale

# La Gestione Appropriata delle Infezioni in Riabilitazione: indicazioni strategiche



Cona (Fe) 20 Giugno 2019

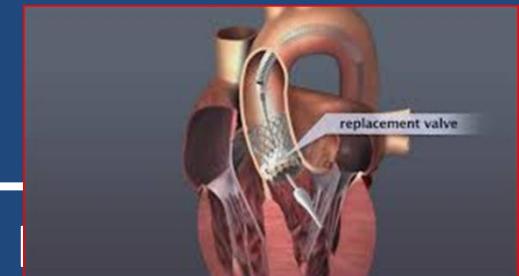
Aula Congressuale

Nuovo Arcispedale S. Anna, Via A. Moro n. 8

*Infezioni da  
devices ed  
endocarditi*

*Marco Rizzi*

# Uomo, 83 aa



- Paziente iperteso, dislipidemico, con vasculopatia e insufficienza renale cronica.
- Marzo 2017 TAVR per stenosi valvolare aortica grave (complicanze aritmiche)
- 20-31 maggio: ricovero in altra sede per «shock settico da MSSA»
- 02/06 ricovero presso nostro H per shock settico (ancora MSSA)
- 02/06 TTE: nulla di rilevante (minimo leak perivalvolare...)
- 05/06 TTE: nulla di rilevante
- 07/06 TEE: nulla di rilevante
- 11/06 TC/PET: captazione polo splenico inferiore (SUV 6.1)
- 21/06 TEE: **formazione flottante sottovalvolare aortica 11x5 mm**

Latib A et al.  
TAVR-Associated prosthetic valve infective endocarditis  
J Am Coll Cardiology 2014;64:2176-2178 (lettera)

- 2.572 procedure in 14 centri (studio retrospettivo)
- 29 casi di endocardite (1,13%):
  - accesso transfemorale 1,10%
  - accesso transapicale 1,98%
  - con pallone di espansione 1,93%
  - ad autoespansione 0,45%



# Journal of Infection 2015 (review)

## Infective endocarditis in patients with an implanted transcatheter aortic valve: Clinical characteristics and outcome of a new entity<sup>☆</sup>

Juan M. Pericas <sup>a,\*\*</sup>, Jaume Llopis <sup>b</sup>, Carlos Cervera <sup>a</sup>,  
 Emilio Sacanella <sup>c</sup>, Carlos Falces <sup>d</sup>, Rut Andrea <sup>d</sup>,  
 Cristina Garcia de la Maria <sup>a</sup>, Salvador Ninot <sup>e</sup>, Barbara Vidal <sup>d</sup>,  
 Manel Almela <sup>f</sup>, Juan C. Pare <sup>d</sup>, Manel Sabaté <sup>d</sup>,  
 Asunción Moreno <sup>a</sup>, Francesc Marco <sup>g</sup>, Carlos A. Mestres <sup>e</sup>,  
 Jose M. Miro <sup>a,\*</sup>, the Hospital Clinic Endocarditis Study Group <sup>h</sup>

**Table 1** Summary of the estimated incidence of infective endocarditis in the main published TAVI cohorts (N ≥ 100).

Cohort	N	Follow-up, yr.	N. of cases with IE	Incidence of IE/yr. (%)
PARTNER B	699	2	3	0.2
SOURCE <sup>2</sup>	1387	2	10	0.3
Gurvitch et al. <sup>3</sup>	270	3	1	0.2
Buellesfeld et al. <sup>4</sup>	126	2	2	0.8
Puls et al. <sup>6</sup>	180	1	5	3.4
Prince Charles Registry <sup>7</sup>	132	4	4	0.8
Doss et al. <sup>8</sup>	100	3.8	0	0.0
Latib et al. <sup>33</sup>	2572	1	29	1.1
Hospital Clinic, Barcelona, Spain	40	3	1	0.8

PVE: 0.3-1.0 per 100 patient.years (ICE-PCS; 556 PVE episodes)  
*Wang A et al. Contemporary clinical profile and outcome of prosthetic valve endocarditis. JAMA 2007;297:1354-1361.*



## Infective endocarditis in patients with an implanted transcatheter aortic valve: Clinical characteristics and outcome of a new entity\*

Juan M. Pericas <sup>a,\*\*</sup>, Jaume Llopis <sup>b</sup>, Carlos Cervera <sup>a</sup>,  
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 Jose M. Miro <sup>a,\*</sup>, the Hospital Clinic Endocarditis Study Group<sup>h</sup>



**versus**

# Contemporary Clinical Profile and Outcome of Prosthetic Valve Endocarditis

Andrew Wang, MD

Eugene Athan, MD

Paul A. Pappas, MS

Vance G. Fowler, Jr, MD, MHS

Lars Olaison, MD

Carlos Paré, MD

Benito Almirante, MD

Patricia Muñoz, MD

Marco Rizzi, MD

**Context** Prosthetic valve endocarditis (PVE) is associated with significant mortality and morbidity. The contemporary clinical profile and outcome of PVE are not well defined.

**Objectives** To describe the prevalence, clinical characteristics, and outcome of PVE, with attention to health care-associated infection, and to determine prognostic factors associated with in-hospital mortality.

**Design, Setting, and Participants** Prospective, observational cohort study conducted at 61 medical centers in 28 countries, including 556 patients with definite PVE as defined by Duke University diagnostic criteria who were enrolled in the International Collaboration on Endocarditis-Prospective Cohort Study from June 2000 to August 2005.

**Main Outcome Measure** In-hospital mortality.

**Results** Definite PVE was present in 556 (20.1%) of 2,770 patients with infective endo-

Charlson index (median): 7

clinical characteristics	TAVI (N=31)	PVE (N=556)
age (years-mean)	81	65
early (within 60 days)	19.4%	13.8%
health-care associated	71.0%	36.5%
<i>S. aureus</i>	6.5%	23.0%
CONS	19.4%	16.9%
enterococci	35.5%	12.8%
periannular abscess	38.7%	+ 5 fistulas (16%)!
heart failure	41.9%	32.9%
CNS emboli	10.0%	
surgery within episode	32.3%	
in-hospital death	29.0%	22.8%

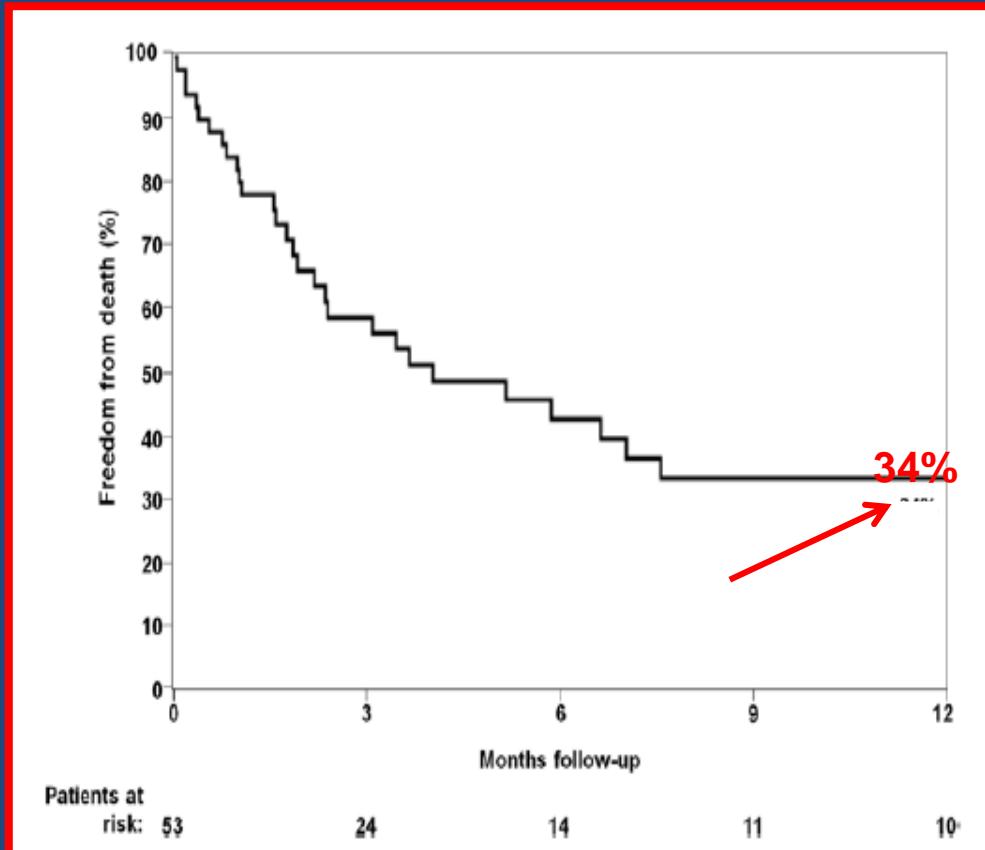
no absolute controindication  
to surgery?

## Infective Endocarditis After Transcatheter Aortic Valve Implantation Results From a Large Multicenter Registry

Ignacio J. Amat-Santos, MD; David Messika-Zeitoun, MD, PhD; Helene Eltchaninoff, MD;

(*Circulation*. 2015;131:1566-1574. DOI: 10.1161/CIRCULATIONAHA.114.014089.)

- Multicenter registry (Europa+Americhe)
- 53 / 7,944 pts
- 1-y incidence: 0.5%
- In-hospital mortality 47.2%
- Explantation: 7.6%
- Valve-in-valve: 3.8%



## Association Between Transcatheter Aortic Valve Replacement and Subsequent Infective Endocarditis and In-Hospital Death

Ander Reguelo, MD; Axel Linke, MD; Azeem Latib, MD; Nikolaj Ihlemann, MD; Marina Urena, MD; Thomas Walther, MD; Oliver Husser, MD;

JAMA 2016  
*(Regueiro et al)*

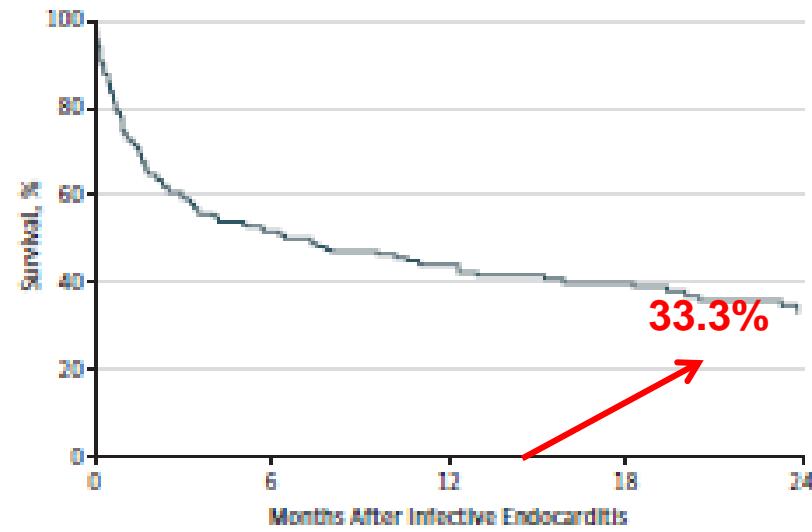
- Registro: Europa + Americhe
- 20.006 procedure in 47 centri
- 250 casi di endocardite (1,13%):
  - incidenza: 1,1 per 100 persone-anno
  - età media: 78,9 anni
  - health care-associated 52.8%
- Fattori associati con rischi di endocardite:
  - sesso maschile (HR 1,69)
  - diabete mellito (HR 1,52)
  - insufficienza aortica moderata-grave dopo TAVR (HR 2.05)
- CNS emboli (stroke) 10.5%
- Other systemic emboli 9.2%

## Association Between Transcatheter Aortic Valve Replacement and Subsequent Infective Endocarditis and In-Hospital Death

Ander Regueiro, MD; Axel Linke, MD; Azeem Latib, MD; Nikolaj Ihlemann, MD; Marina Urena, MD; Thomas Walther, MD; Oliver Husser, MD;

- Clinical course
  - surgery (with valve explantation)
  - surgery (without valve explantation)
  - valve-in-valve procedure
  - in-hospital death
- Follow-up (171.5 persons-years)
  - recurrence of IE
  - death
  - 2-years mortality rate

**Figure 2. Survival Curve for Patients With Infective Endocarditis After Transcatheter Aortic Valve Replacement in the Global Study Cohort**



Kaplan-Meier survival curve during the 24-month follow-up after infective endocarditis following transcatheter aortic valve replacement. Median follow-up of 10.5 months (interquartile range, 3-21 months). Follow-up time was not available for 3 patients.

31.5%

66.7%

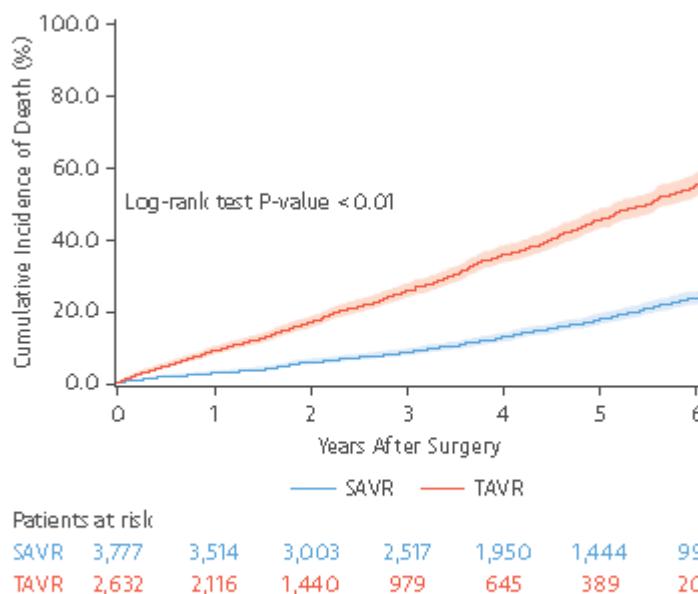
- 2-years mortality rate in TAVR pts without IE
  - 22% (Reardon MJ 2015)
  - 34% (Kodali SK 2012)



# Long-Term Risk of Infective Endocarditis After Transcatheter Aortic Valve Replacement

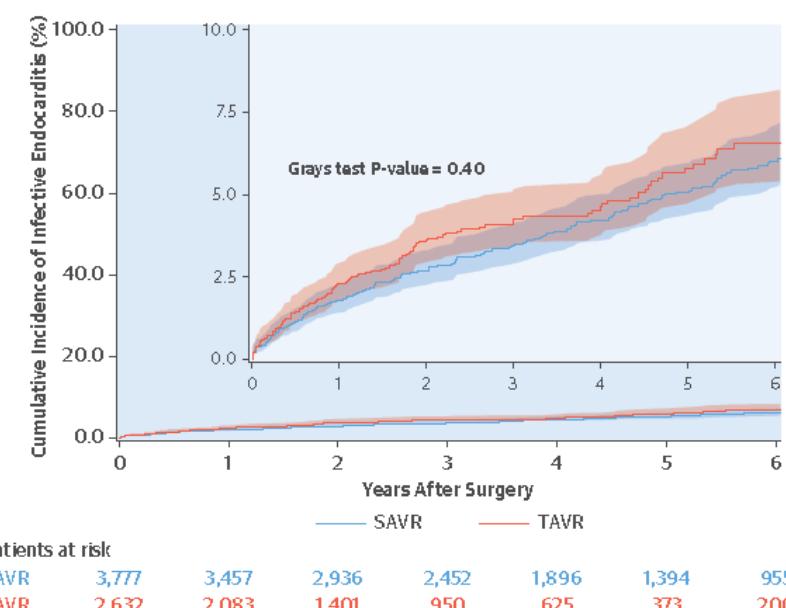
Jawad H. Butt, MD,<sup>a</sup> Nikolaj Ihlemann, MD, PhD,<sup>a</sup> Ole De Backer, MD, PhD,<sup>a</sup> Lars Søndergaard, MD, DMSc,<sup>a</sup> Eva Havers-Borgersen, MB,<sup>b,c,d</sup> Gunnar H. Gislason, MD, PhD,<sup>b,c,d</sup> Christian Torp-Pedersen, MD, DMSc,<sup>e</sup> Lars Køber, MD, DMSc,<sup>f</sup> Emil L. Fosbøl, MD, PhD<sup>a</sup>

**FIGURE 1** Death After TAVR and SAVR



Kaplan-Meier curves for death in patients undergoing TAVR and SAVR. SAVR = surgical aortic valve replacement; TAVR = transcatheter aortic valve replacement.

**CENTRAL ILLUSTRATION** Infective Endocarditis After Transcatheter Aortic Valve Replacement and Surgical Aortic Valve Replacement



Butt, J.H. et al. J Am Coll Cardiol. 2019;73(13):1646-55.

Cumulative incidence of infective endocarditis in patients undergoing TAVR and SAVR. SAVR = surgical aortic valve replacement; TAVR = transcatheter aortic valve replacement.

# *The* NEW ENGLAND JOURNAL *of* MEDICINE

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## Transcatheter Aortic-Valve Replacement with a Balloon-Expandable Valve in Low-Risk Patients

M.J. Mack, M.B. Leon, V.H. Thourani, R. Makkar, S.K. Kodali, M. Russo, S.R. Kapadia, S.C. Malaisrie, D.J. Cohen, P. Pibarot, J. Leipsic, R.T. Hahn, P. Blanke, M.R. Williams, J.M. McCabe, D.L. Brown, V. Babaliaros, S. Goldman, W.Y. Szeto, P. Genereux, A. Pershad, S.J. Pocock, M.C. Alu, J.G. Webb, and C.R. Smith,  
for the PARTNER 3 Investigators\*

March 16, 2019

➤ 950 pts

Table S9. Clinical Outcomes for the Primary Composite Endpoint and Important Secondary Endpoints at 30 Days and 1 Year

	30 Days			1 Year		
	TAVR (N = 496)	Surgery (N = 454)	Treatment Effect [95% CI]	TAVR (N = 496)	Surgery (N = 454)	Treatment Effect [95% CI]
Acute Kidney Injury Stage II or III‡	0.4% (2)	1.8% (8)	NA	NA	NA	NA
Requirement for renal replacement‡	0.2% (1)	0.7% (3)	0.30 [0.03, 2.93]	0.2% (1)	0.7% (3)	0.30 [0.03, 2.93]
New permanent pacemaker	6.5% (32)	4.0% (18)	1.66 [0.93, 2.96]	7.3% (36)	5.4% (24)	1.39 [0.83, 2.33]
New permanent pacemaker (Baseline pacemaker excluded)	6.6% (32)	4.1% (18)	1.65 [0.92, 2.95]	7.5% (36)	5.5% (24)	1.38 [0.82, 2.32]
New LBBB	22.0% (106)	8.0% (35)	3.17 [2.13, 4.72]	23.7% (114)	8.0% (35)	3.43 [2.32, 5.08]
New onset atrial fibrillation	5.0% (21)	39.5% (145)	0.10 [0.06, 0.16]	7.0% (29)	40.9% (150)	0.13 [0.09, 0.20]
Coronary obstruction requiring intervention	0.2% (1)	0.7% (3)	0.30 [0.03, 2.93]	0.2% (1)	0.7% (3)	0.30 [0.03, 2.93]
Aortic Valve Re-intervention	0.0% (0)	0.0% (0)	N/A	0.6% (3)	0.5% (2)	1.33 [0.22, 7.95]
Endocarditis	0.0% (0)	0.2% (1)	0.00 [N/A]	0.2% (1)	0.5% (2)	0.44 [0.04, 4.89]
Asymptomatic Valve thrombosis	0.2% (1)	0.0% (0)	N/A	1.0% (5)	0.2% (1)	4.47 [0.52, 38.24]
Discharged to home/self-care§	475/495 (96.0%)	331/453 (73.1%)	22.9% [18.45%, 27.33%]	N/A	N/A	N/A
NYHA Class II/III/IV§	97/493 (19.7%)	144/433 (33.3%)	-13.6% [-19.24%, -7.92%]	85/480 (17.7%)	68/407 (16.7%)	1.0% [-3.98%, 5.98%]
Six-minute walk test distance (m) change from baseline¶	17.2 ± 4.63	-15.2 ± 6.27	33.7 [19.9, 47.4]	15.4 ± 5.30	15.1 ± 5.85	-1.4 [-15.2, 12.5]
KCCQ-OS score change from baseline¶	18.5 ± 0.83	2.5 ± 1.05	16.1 [14.2, 18.0]	19.4 ± 0.87	17.4 ± 0.99	1.8 [0.2, 3.4]

ORIGINAL ARTICLE

## Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients

Jeffrey J. Popma, M.D., G. Michael Deeb, M.D., Steven J. Yakubov, M.D.,  
Mubashir Mumtaz, M.D., Hemal Gada, M.D., Daniel O'Hair, M.D.,  
Tanvir Bajwa, M.D., John C. Heiser, M.D., William Merhi, D.O.,  
Neal S. Kleiman, M.D., Judah Askew, M.D., Paul Sorajja, M.D.,  
Joshua Rovin, M.D., Stanley J. Chetcuti, M.D., David H. Adams, M.D.,  
Paul S. Teirstein, M.D., George L. Zorn III, M.D., John K. Forrest, M.D.,  
Didier Tchétché, M.D., Jon Resar, M.D., Antony Walton, M.D.,  
Nicolo Piazza, M.D., Ph.D., Basel Ramlawi, M.D., Newell Robinson, M.D.,  
George Petrossian, M.D., Thomas G. Gleason, M.D., Jae K. Oh, M.D.,  
Michael J. Boulware, Ph.D., Hongyan Qiao, Ph.D., Andrew S. Mugglin, Ph.D.,  
and Michael J. Reardon, M.D., for the Evolut Low Risk Trial Investigators\*

March 16, 2019  
➤ 1,403 pts

## Transcatheter Aortic-Valve Replacement with a Self-Expanding Valve in Low-Risk Patients

Jeffrey J. Popma, M.D., C. Michael Doob, M.D., Steven J. Yaluboy, M.D.,  
 Muhamir Murinza, M.D., Hemal Gada, M.D., Daniel O'Hair, M.D.,  
 Tanvir Baiwa, M.D., John C. Heiser, M.D., William Merhi, O.D.,  
 Neal S. Kleinman, M.D., Judah Askew, M.D., Paul Sorajja, M.D.,  
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 Nicholas J. Schaff, M.D., Michael J. Boulware, M.D., Niranjan Rao, M.D.,  
 George Petrossian, M.D., Thomas G. Gleason, M.D., Jae K. Oh, M.D.,  
 Michael J. Boulware, Ph.D., Hongyan Qiao, Ph.D., Andrew S. Mugglin, Ph.D.,  
 and Michael J. Reardon, M.D., for the Evolut Low Risk Trial Investigators\*

Table S7. Clinical Outcomes at 30 Days and 1 Year (ITT Population).

	30 Days			1 Year		
	TAVR – Surgery			TAVR – Surgery		
	TAVR	Surgery	(95% BCI)	TAVR	Surgery	(95% BCI)
Death from any cause – %	0.5	0.8	-0.3 (-1.2, 0.6)	2.4	2.9	-0.5 (-2.4, 1.3)
Cardiovascular – %	0.5	0.6	-0.1 (-1.0, 0.7)	1.7	2.6	-0.9 (-2.6, 0.7)
All stroke – %	2.1	1.9	0.2 (-1.2, 1.7)	4.0	4.2	-0.2 (-2.4, 2.0)
Disabling stroke – %	0.4	0.9	-0.5 (-1.5, 0.3)	0.8	2.1	-1.3 (-2.7, -0.0)
Non-disabling stroke – %	1.9	1.1	0.8 (-0.4, 2.1)	3.3	2.4	0.9 (-1.0, 2.7)
Transient ischemic attack – %	0.5	0.2	0.3 (-0.4, 1.0)	1.6	1.9	-0.3 (-1.8, 1.2)
Myocardial infarction – %	0.9	0.6	0.3 (-0.7, 1.2)	1.7	1.6	0.1 (-1.4, 1.5)
Endocarditis – %	0.1	0.2	-0.1 (-0.7, 0.3)	0.2	0.4	-0.1 (-0.8, 0.5)
Valve thrombosis – %	0.1	0.1	0.0 (-0.4, 0.4)	0.3	0.3	-0.0 (-0.8, 0.7)
Aortic reintervention – %	0.2	0.4	-0.1 (-0.8, 0.5)	0.7	0.6	0.1 (-0.9, 1.0)
Heart failure rehospitalization – %	0.9	1.1	-0.2 (-1.2, 0.9)	3.6	6.7	-3.1 (-5.6, -0.6)

Values are estimated incidence (median of the posterior probability distribution as calculated by Bayesian analysis). TAVR = transcatheter aortic-valve replacement; BCI = Bayesian credible interval. The Bayesian credibility intervals for secondary outcomes use marginal posterior distributions that are likely narrower than those based on a true multi-dimensional posterior for the collection of outcomes. Caution should be exercised for drawing inference about absolute treatment effects with the 95% BCI due to multiple secondary end point comparisons.

## Active infective prosthetic endocarditis after percutaneous edge-to-edge mitral valve repair

Jens-Gerrit Kluge\*, Andreas Hagendorff, Dietrich Pfeiffer, Daniel Jurisch, and Adrienn Tarr

Division of Cardiology and Angiology, Department of Internal Medicine, Neurology und Dermatology, University Hospital Leipzig, Liebigstraße 20, 04103 Leipzig, Germany



MitraClip EU Registration: 2008.

MitraClip STS/ACC TVT™ Registry  
2016: > 4,000 pts

The MitraClip procedure (Abbott Vascular, Santa Clara, CA) was introduced in 2003. As of July 2017, >50,000 patients have been treated worldwide.<sup>1</sup> Six cases of infective endocarditis (IE) after repair with the MitraClip have been reported.<sup>2</sup> Three of the six were caused by *Staphylococcus aureus*, and two of these patients died. Most of the patients were treated surgically.<sup>2,3</sup>

Roslan et al 2018



MITRA SWISS newsletter N. 4 - May 2018

FIGURE 1. NUMBER OF PATIENTS INCLUDED PER YEAR

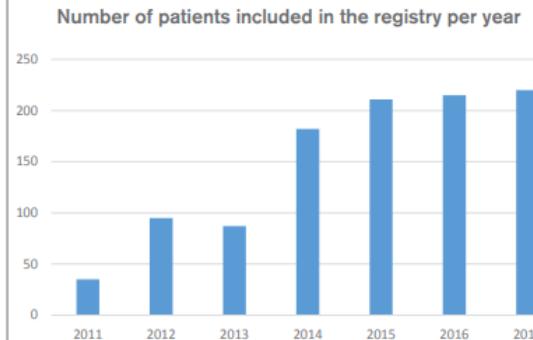
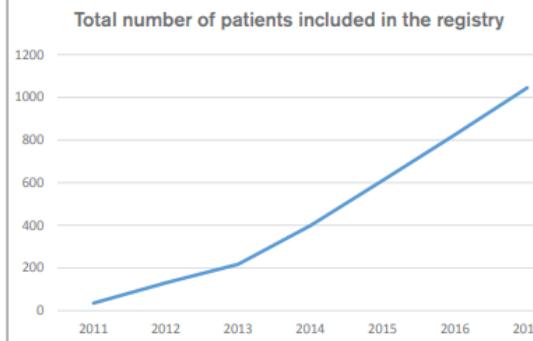


FIGURE 2. PROGRESSION OF REGISTRY POPULATION



Study Contact

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Data 8 of 8



SIMIT 2013 - Epidemiologia delle endocarditi infettive in Italia - Marco Rizzi

22

<b>SEI (2004-2011): 1722 episodi</b>	<b>N (%)</b>
<b>Definite secondo Duke criteria</b>	<b>1539 (89,4)</b>
<b>Sesso maschile</b>	<b>1211 (70,3)</b>
<b>Età (mediana, range interquartile)</b>	<b>65 (50-74)</b>
<b>LS-NVE</b>	<b>1011 (58,7)</b>
<b>LS-PVE</b>	<b>460 (26,7)</b>
<b>RS-NVE</b>	<b>118 (6,9)</b>
<b>RS-PVE</b>	<b>11 (0,6)</b>
<b>CIED-IE</b>	<b>122 (7,1)</b>

**460 casi PVE, 166 (36,1%) operati  
Mortalità intraospedaliera 86/460 (18,7%)**

# In-Hospital and 1-Year Mortality in Patients Undergoing Early Surgery for Prosthetic Valve Endocarditis

Tahaniyat Lalani, MD, MHS; Vivian H. Chu, MD, MHS; Lawrence P. Park, PhD; Enrico Cecchi, MD; G. Ralph Corey, MD; Emanuele Durante-Mangoni, MD; Vance G. Fowler Jr, MD, MHS; David Gordon, MBBS, PhD, FRCPA, FRACP, FFoSc; Paolo Grossi, MD, PhD; Margaret Hannan, MD; Bruno Hoen, MD, PhD; Patricia Muñoz, MD, PhD; Hussien Rizk, MD; Souha S. Kanj, MD; Christine Selton-Suty, MD; Daniel J. Sexton, MD; Denis Spelman, MD; Veronica Ravasio, MD; Marie Françoise Tripodi, MD; Andrew Wang, MD; for the International Collaboration on Endocarditis-Prospective Cohort Study Investigators

*JAMA Intern Med.* 2013;173(16):1495-1504. doi:10.1001/jamainternmed.2013.8203

- 1,025/4,166 (24.6%) pts from ICE-PCS study (2000-2006)
- In-hospital mortality 19.5%
- 1-year mortality 32.1%
- Early surgery (during initial hospitalization) 47.8%

# CIED (Cardiac Implantable Electronic Devices)

- PM: Pace Maker
- ICD: Implantable Cardioverter Defibrillator
- CRTD: Cardiac Resynchronization Therapy Device

## Registro Italiano Pacemaker e Defibrillatori

### Bollettino Periodico 2016

#### Associazione Italiana di Aritmologia e Cardiostimolazione

Alessandro Proclemer<sup>1</sup>, Massimo Zecchin<sup>2</sup>, Antonio D'Onofrio<sup>3</sup>, Giuseppe Boriani<sup>4</sup>

con la collaborazione di:

Domenico Facchin<sup>1</sup>, Luca Rebellato<sup>1</sup>, Marco Ghidina<sup>1</sup>, Giulia Bianco<sup>1</sup>, Emanuela Bernardelli<sup>1</sup>, Elsa Pucher<sup>1</sup>, Dario Gregori<sup>5</sup>

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<sup>5</sup>Dipartimento di Medicina Ambientale e Salute Pubblica, Università degli Studi, Padova

## Bollettino 2016

- N. Centri: 204
- N. PM impiantati: 23.496
- N. ICD impiantati: 20.350

## Stima nazionale

- N. Centri circa 400
- N. CIED impiantati circa 90.000

Portatori di CIED: circa 0,5% della popolazione

# CIED - Rischio di infezione

## Deutsches Ärzteblatt International

Dtsch Arztebl Int. 2018 Jun; 115(26): 445-452.  
Published online 2018 Jun 29. doi: [10.3238/arztebl.2018.0445](https://doi.org/10.3238/arztebl.2018.0445)

Review Article

### The Diagnosis and Treatment of Pacemaker-Associated Infection

Michael Döring, Dr. med.,<sup>1,\*</sup> Sergio Richter, PD Dr. med.,<sup>1</sup> and Gerhard Hindricks, Prof. Dr. med.<sup>1</sup>

► Author information ► Article notes ► Copyright and License information Disclaimer

See letter "Correspondence (reply); In Reply" in volume 115 on page 445.

See letter "Correspondence (letter to the editor); Monitoring Sterile Pacemaker Implants" in volume 115 on page 445.

This article has been cited by other articles in PMC.

PMCID: PMC6071308  
PMID: 30017027

- |                        |     |
|------------------------|-----|
| ➤ Early (28 gg):       | 25% |
| ➤ Late (28 gg-1 anno): | 33% |
| ➤ Delayed (>1 anno):   | 42% |

- PM: primo anno 0,5-1,0%
- ICD: a 6 mesi 1,7%; a 2 anni 9,5%
- CRTD: a 6 mesi >2%
  
- Revisione/sostituzione: rischio infettivo x 2-4
  
- Mortalità intraospedaliera associata ad infezione di CIED: 3,9-9,6%

# CIED

Table 1

## Risk factors for the development of infection

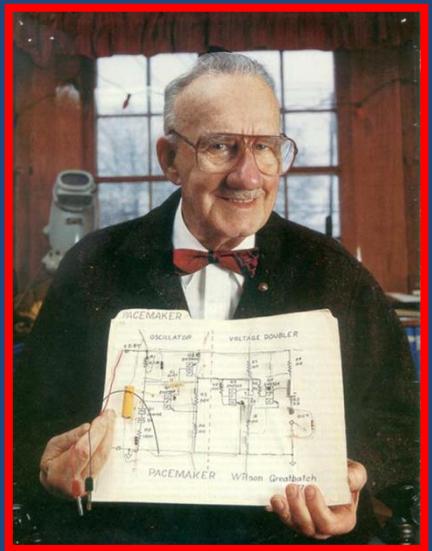
Risk factors	Relative risk [95% confidence interval]
<b>Patient-related factors</b>	
Terminal kidney failure	8.7 [3.4; 22.3]
Fever <24 h prior to implantation	5.8 [2.0; 17.0]
Corticosteroid therapy	3.4 [1.6; 7.3]
Kidney failure	3.0 [1.4; 6.6]
Chronic obstructive pulmonary disease	3.0 [1.8; 4.9]
Age >60 years	2.5 [1.2; 4.0]
Malignant disease	2.2 [1.3; 4.0]
Diabetes mellitus	2.1 [1.6; 2.7]
Heart failure	1.7 [1.1; 2.4]
Oral anticoagulation	1.6 [1.0; 2.5]
Female sex	0.7 [0.6; 0.8]
<b>Surgery-related factors</b>	
Postoperative hematoma formation	8.5 [4.0; 17.9]
Abdominal device pocket	4.0 [2.5; 6.5]
Temporary stimulation	2.3 [1.4; 3.9]
Previous infection	1.6 [0.9; 2.8]
>3 People in the operating theater	1.5 [0.8; 2.8]
Surgery time	1.0 [1.0; 1.1]
Perioperative antibiotic prophylaxis	0.3 [0.2; 0.6]
<b>Implant-related factors</b>	
≥ 4 Previous procedures	8.7 [3.6; 20.8]
Lead repositioning due to dislocation	6.4 [2.9; 13.8]
Revision procedures	2.0 [1.5; 2.7]
Device replacement	1.7 [1.2; 2.5]
Dual-chamber system	1.5 [1.0; 2.1]

Relative risk for the development of device-associated infection depending on various factors (modified from [17, 18, 20, 21, 39, e15]). The baseline risk for the development of infection is 0.5%-1% in the first 6-12 months following cardiac pacemaker implantation.

# CIED

Espianto!

- (Early postimplantation inflammation)
- Early superficial site infection
- Pocket infection
- Systemic infection



Primo impianto di pace maker: 1960  
Wilson Greatbatch

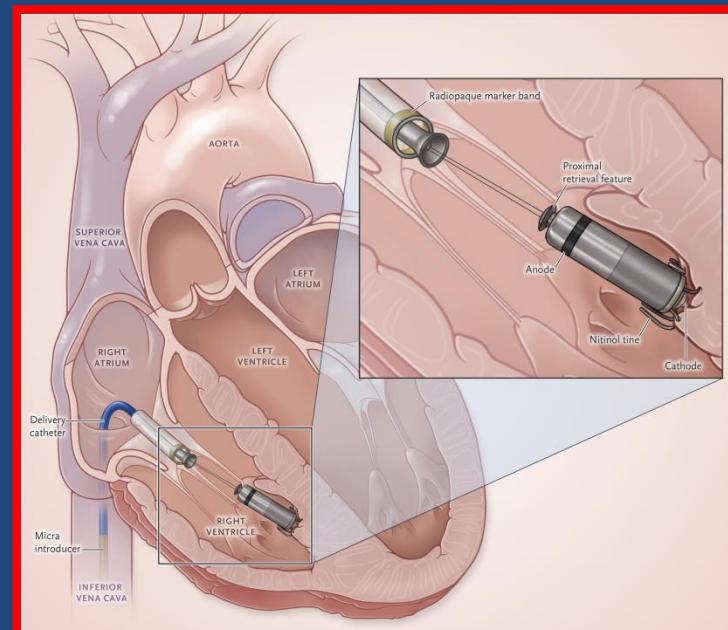
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## A Leadless Intracardiac Transcatheter Pacing System

Dwight Reynolds, M.D., Gabor Z. Duray, M.D., Ph.D., Razali Omar, M.D.,  
Kyoko Soejima, M.D., Petr Neuzil, M.D., Shu Zhang, M.D.,  
Calambur Narasimhan, M.D., Clemens Steinwender, M.D.,  
Josep Brugada, M.D., Ph.D., Michael Lloyd, M.D., Paul R. Roberts, M.D.,  
Venkata Sagi, M.D., John Hummel, M.D., Maria Grazia Bongiorni, M.D.,  
Reinoud E. Knops, M.D., Christopher R. Ellis, M.D., Charles C. Gornick, M.D.,  
Matthew A. Bernabei, M.D., Verla Laager, M.A., Kurt Stromberg, M.S.,  
Eric R. Williams, B.S., J. Harrison Hudnall, B.S., and Philippe Ritter, M.D.,  
for the Micra Transcatheter Pacing Study Group\*

ABSTRACT



# MODIFIED DUKE CRITERIA- MAJOR CRITERIA

## 1. Positive blood culture

- Typical microorganisms for IE from 2 separate blood cultures  
*Or*
- Persistently positive blood culture, defined as recovery of a microorganism consistent with infective endocarditis from:
  - Blood cultures drawn >12 h apart; *or*
  - All of 3 or a majority of ≥4 separate blood cultures, with first and last drawn at least 1 h apart  
*Or*
  - Single positive blood culture for *Coxiella burnetii* or phase I IgG antibody titer of >1:800

## 2. Evidence of Endocardial involvement

- Positive echocardiogram
  - Oscillating intracardiac mass on valve or supporting structures or in the path of regurgitant jets or in implanted material, in the absence of an alternative anatomic explanation, *or*
  - Abscess, *or*
  - New partial dehiscence of prosthetic valve,  
*Or*
- New valvular regurgitation (increase or change in preexisting murmur not sufficient)

## minor criteria

1. Predisposing factor <sup>a</sup>
2. Temperature >38°C
3. Vascular phenomena <sup>b</sup>
4. Immunologic phenomena <sup>c</sup>
5. Microbiologic evidence <sup>d</sup>

➤ Prima dell'inizio della terapia antimicrobica, raccogliere almeno 4, meglio 6 campioni di sanguem di volume adeguato.

## Definite infective endocarditis

### Pathologic criteria

- (1) Microorganisms demonstrated by culture or histologic examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or
- (2) Pathologic lesions; vegetation or intracardiac abscess confirmed by histologic examination showing active endocarditis

### Clinical criteria<sup>a</sup>

- (1) 2 major criteria; or
- (2) 1 major criterion and 3 minor criteria; or
- (3) 5 minor criteria

## Possible infective endocarditis

- (1) **1 major criterion and 1 minor criterion;** or
- (2) **3 minor criteria**

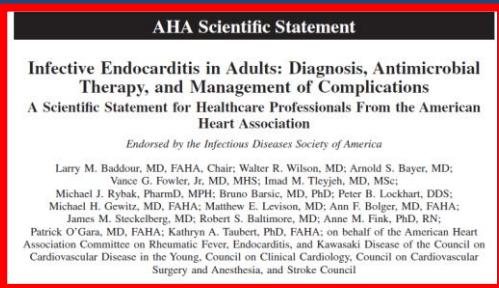
## Rejected

- (1) Firm alternate diagnosis explaining evidence of infective endocarditis; or
- (2) Resolution of infective endocarditis syndrome with antibiotic therapy for ≤4 days; or
- (3) No pathologic evidence of infective endocarditis at surgery or autopsy, with antibiotic therapy for ≤4 days; or
- (4) Does not meet criteria for possible infective endocarditis, as above

# PVE & PET/CT



- «promising results for WBC SPECT/CT and  $^{18}\text{F}$ -FDG PET/CT...»
- «...reduction in the rate of misdiagnosed possible IE...»
- «it could be employed to monitor response to antimicrobial treatment...»



- « More study is needed to define the utility of  $^{18}\text{F}$ -fluoro-deoxyglucose positron emission tomography/CT in the diagnosis and management of IE...»

➤ Ruolo oggi codificato per PVE e CIED-associated IE

# PVE & PET/CT: A new golden grail?

Holvoet W et al

*Acta cardiologica 2017*

Il metabolismo miocardico dipende da insulinemia, glicemia, livello dei FFA

Possibile riduzione «segnale di fondo» con:

- dieta «Atkins style», carbohydrate-restricted e fat-allowed (Balink 2011, Coulden 2012) e/o digiuno (12 ore?)
- eparina pre<sup>18</sup>F-FDG (Sholtens 2016)
- acquisizione immagini ritardata (2-3 h) (Caldarella 2013, Treglia 2013)

# Ecocardiogramma transesofageo

- Fondamentale per:
  - PVE
  - CIED-associated IE
- Dipendente da:
  - operatore
  - strumento
  - durata dell'esame

# TC

Sempre indicata per studio mediastino in caso di reintervento

La angioTC può sostituire la coronarografia (ad esempio, se vegetazioni valvolari aortiche ne controindicano l'esecuzione)

# Heart Valve Clinics & Endocarditis Teams

- Bothelo-Nevers E et al
  - Dramatic reduction in infective endocarditis-related mortality with a management-based approach
  - Arch Intern Med 2009;169:1290-1298
- Vahanian A et al
  - Guidelines on the management of valvular heart disease (version 2012)
  - Eur Heart J 2012;33:2451-2496
- Lancellotti et al
  - ESC Working Group on Valvular Heart Disease position paper - heart valve clinics: organization, structure, and experience
  - Eur Heart J 2013;34:1597-1606
- Chirillo F et al
  - Impact of a multidisciplinary management strategy on the outcome of patients with native valve endocarditis (NVE)
  - Am J Cardiol 2013;112:1171-1176

# Profilassi dell'endocardite infettiva - 1

## Pazienti ad alto rischio

- Prosthetic heart valves, including mechanical, bioprosthetic, and homograft valves (transcatheter-implanted as well as surgically implanted valves are included)
- Prosthetic material used for cardiac valve repair, such as annuloplasty rings and chords
- A prior history of IE
- Unrepaired cyanotic congenital heart disease
- Repaired congenital heart disease with residual shunts or valvular regurgitation at the site or adjacent to the site of the prosthetic patch or prosthetic device
- Repaired congenital heart defects with catheter-based intervention involving an occlusion device or stent during the first six months after the procedure
- Valve regurgitation due to a structurally abnormal valve in a transplanted heart

## Procedure ad alto rischio

- Dental procedures that involve manipulation of either gingival tissue or the periapical region of teeth or perforation of the oral mucosa; this includes routine dental cleaning.
- Procedures of the respiratory tract that involve incision or biopsy of the respiratory mucosa
- Gastrointestinal (GI) or genitourinary (GU) procedures in patients with ongoing GI or GU tract infection
- Procedures on infected skin, skin structure, or musculoskeletal tissue
- Surgery to place prosthetic heart valves or prosthetic intravascular or intracardiac materials

# Profilassi dell'endocardite infettiva-2

## Antibiotic regimens for prevention of endocarditis prior to dental and respiratory procedures

Situation	Agent	Regimen: Single dose*	
		Adults	Children <sup>¶</sup>
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin	2 g IM or IV	50 mg/kg IM or IV
	OR		
	Cefazolin or ceftriaxone <sup>Δ</sup>	1 g IM or IV	50 mg/kg IM or IV
Allergic to penicillins - oral	Cephalexin <sup>Δ◊</sup>	2 g	50 mg/kg
	OR		
	Clindamycin	600 mg	20 mg/kg
	OR		
	Azithromycin or clarithromycin	500 mg	15 mg/kg
Allergic to penicillins and unable to take oral medication	Cefazolin or ceftriaxone <sup>Δ</sup>	1 g IM or IV	50 mg/kg IM or IV
	OR		
	Clindamycin	600 mg IM or IV	20 mg/kg IM or IV
	OR		
	Vancomycin	15 to 20 mg/kg, not to exceed 2 g per dose	15 mg/kg to a maximum dose of 1 g

*Graxie per l'attenxione*



*— Finis —*