Sistema Socio Sanitario
Regione Lombardia
ASST Papa Giovanni XXIII

Convegno Internazionale

GIORNATE INFETTIVOLOGICHE "LUIGI SACCO" 2019

MILANO, 28-29 MAGGIO 2019

OSPEDALE LUIGI SACCO POLO UNIVERSITARIO – ASST FATEBENEFRATELLI SACCO

AULA MAGNA POLO LITA

SIMPOSIO VI
ENDOCARDITE INFETTIVA

Moderatori: C. Filice (Pavia), F. Franzetti (Milano)

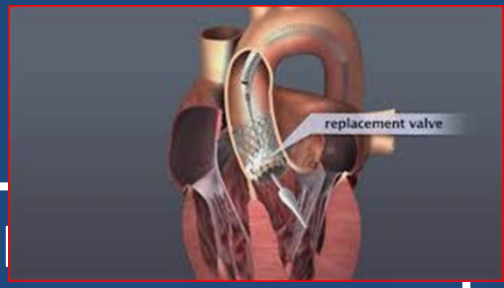
Quadri clinici
M. Rizzi (Bergamo)

Ecografia
A.P. Barosi (Milano)

Terapia
P. Viale (Bologna)

Terapia chirurgica
C. Antona (Milano)

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) 70, 565–576

ELSEVIER

BIAMM British Infection Association

www.elsevierhealth.com/journals/jinf

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

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

Journal of Infection 2015 (review)

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[2]	1387	2	10	0.3
Gurvitch et al.[3]	270	3	1	0.2
Buellesfeld et al.[4]	126	2	2	0.8
Puls et al.[6]	180	1	5	3.4
Prince Charles Registry[7]	132	4	4	0.8
Doss et al.[8]	100	3.8	0	0.0
Latib et al.[33]	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.

Journal of Infection (2015) 70, 565–576

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

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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 2670 patients with infective en-

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%
S. aureus	6.5%	23.0%
CONS	19.4%	16.9%
enterococci	35.5%	12.8%
periannular abscess	38.7%	
heart failure	41.9%	32.9%
CNS emboli	10.0%	
surgery within episode	32.3%	
in-hospital death	29.0%	22.8%

+ 5 fistulas (16%)!

no absolute controindication to surgery?

Valvular Heart Disease

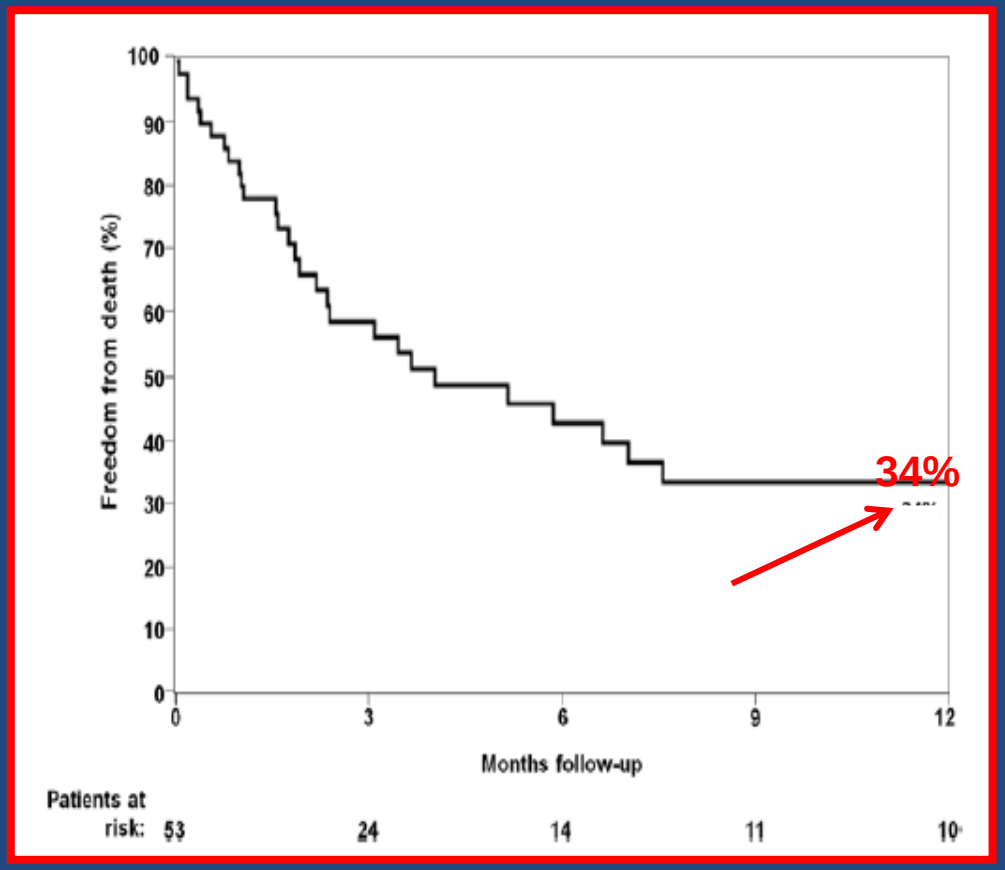
Infective Endocarditis After Transcatheter Aortic Valve Implantation

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%



JAMA | Original Investigation

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;

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%

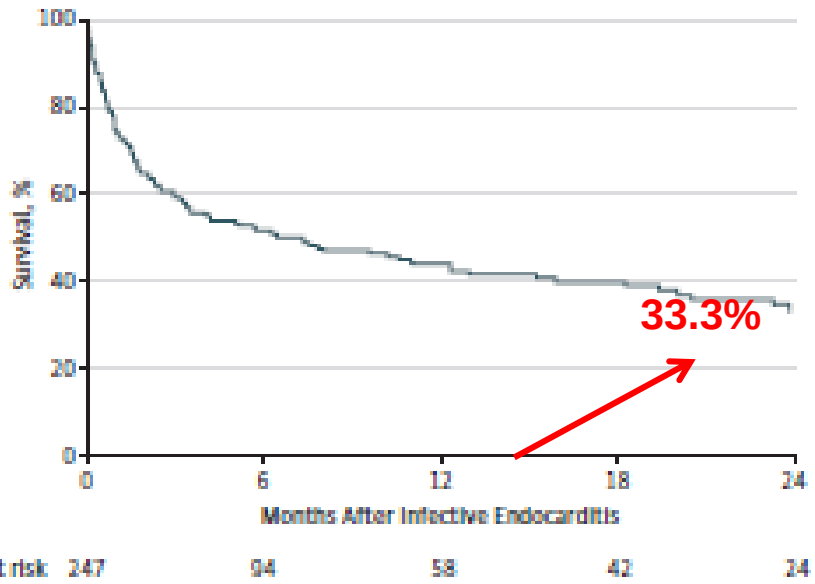
JAMA | Original Investigation

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 31.5%
  - 2-years mortality rate 66.7%

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.

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

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MAY 2, 2019 VOL. 380 NO. 18

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

The NEW ENGLAND JOURNAL of MEDICINE

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

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]

Except where otherwise specified, data are Kaplan-Meier estimates % (number of patients with event) or Mean ± SE

The NEW ENGLAND JOURNAL of MEDICINE

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

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

	30 Days			1 Year		
	TAVR	Surgery	TAVR – Surgery (95% BCI)	TAVR	Surgery	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.

IMAGE FOCUS

doi:10.1093/ejechocard/jer062
Online publish-ahead-of-print 23 July 2011

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

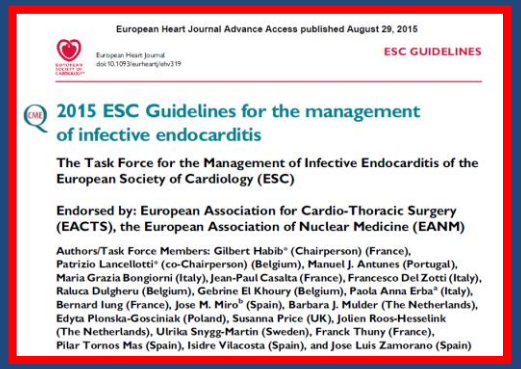
Jens-Gerrit Kluge*, Andreas Hagendorff, Dietrich Pfeiffer, Daniel Jurisch, and Adrienn Tarr

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: over 4,000 pts

PVE & PET/CT



European Heart Journal Advance Access published August 29, 2015

European Heart Journal
doi:10.1093/eurheartj/ehv319

ESC GUIDELINES

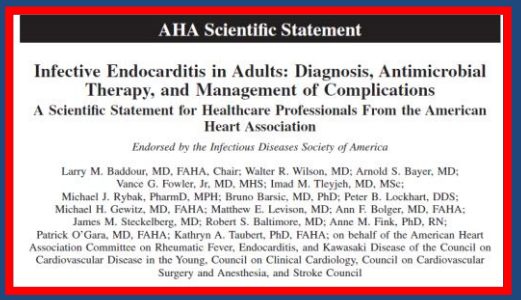
2015 ESC Guidelines for the management of infective endocarditis

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

Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM)

Authors/Task Force Members: Gilbert Habib* (Chairperson) (France), Patrizio Lancellotti* (co-Chairperson) (Belgium), Manuel J. Antunes (Portugal), Maria Grazia Bongiorni (Italy), Jean-Paul Casalta (France), Francesco Del Zotti (Italy), Raluca Dulgheru (Belgium), Gebrine El Khoury (Belgium), Paola Anna Erba* (Italy), Bernard Iung (France), Jose M. Miro* (Spain), Barbara J. Mulder (The Netherlands), Edyta Plonska-Gosciniak (Poland), Susanna Price (UK), Jolien Roos-Hesselink (The Netherlands), Ulrika Snygg-Martin (Sweden), Franck Thuny (France), Pilar Tornos Mas (Spain), Isidre Vilacosta (Spain), and Jose Luis Zamorano (Spain)

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



AHA Scientific Statement

Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications

A Scientific Statement for Healthcare Professionals From the American Heart Association

Endorsed by the Infectious Diseases Society of America

Larry M. Baddour, MD, FAHA, Chair; Walter R. Wilson, MD; Arnold S. Bayer, MD; Vance G. Fowler, Jr, MD, MHS; Imad M. Tleyjeh, MD, MSc; Michael J. Rybak, PharmD, MPH; Bruno Barsic, MD, PhD; Peter B. Lockhart, DDS; Michael H. Gewitz, MD, FAHA; Matthew E. Levison, MD; Ann F. Bolger, MD, FAHA; James M. Steckelberg, MD; Robert S. Baltimore, MD; Anne M. Fink, PhD, RN; Patrick O'Gara, MD, FAHA; Kathryn A. Taubert, PhD, FAHA; on behalf of the American Heart Association Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young, Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and Stroke Council

- «More study is needed to define the utility of ^{18}F-fluoro-deoxyglucose positron emission tomography/CT in the diagnosis and management of 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 and fat-allowed (Balink 2011, Coulden 2012) e/o digiuno (12 ore?)
- eparina pre 18F-FDG (Sholtens 2016)
- acquisizione immagini ritardata (2-3 h) (Caldarella 2013, Treglia 2013)

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 Grooup 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 wiht native valve endocarditis (NVE)
  - Am J Cardiol 2013;112:1171-1176

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
  - «… Preliminary results from our center showed that there were unfounded modifications in antimicrobial therapy and that surgeons indications differed from one surgeon to another…»
  - Confronto storico (1991-2001 versus 2002-2006); 333 paz
  - «…development of medical-surgical local guidelines modeled according to the protocols developed to treat cancers… in such instances all patients benefit from the same adequate treatment, whoever the physician in charge…»
  - 1-year mortality: 18.5% vs 8.2%

Chambers J et al

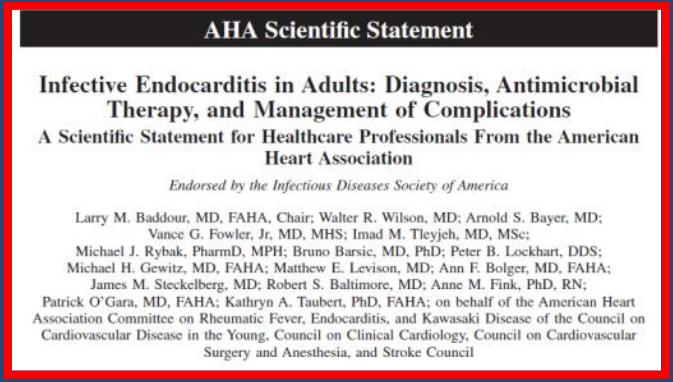
The infective endocarditis team: recommendations from an international working group

Heart 2014;100:524-527

ORGANISATION AT CARDIOTHORACIC CENTRES

- Because IE is uncommon, a dedicated MDT with appropriate experience is best placed to provide or advise on high quality care.
- At surgical centres, the team should include consultants in: cardiology with specialist competencies in valve disease, echocardiography (often doubling as the specialist in valve disease), surgery with expertise in complex valve surgery, infectious diseases and/or medical microbiology (depending on the local model ofservice delivery).
- All cases should be discussed immediately on transfer or admission by the specialist cardiologist, the infection specialist and cardiac surgeon.

Heart Valve Clinics & Endocarditis Teams



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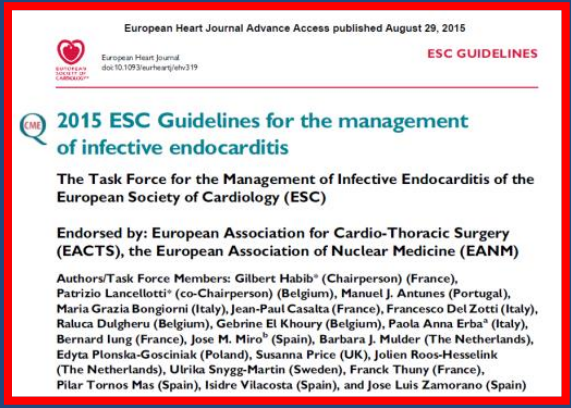
- Decisions on the indication and timing of surgical intervention should be determined by a multispecialty team with expertise in cardiology, imaging, cardiothoracic surgery, and infectious diseases.



European Heart Journal Advance Access published August 29, 2015

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Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM)

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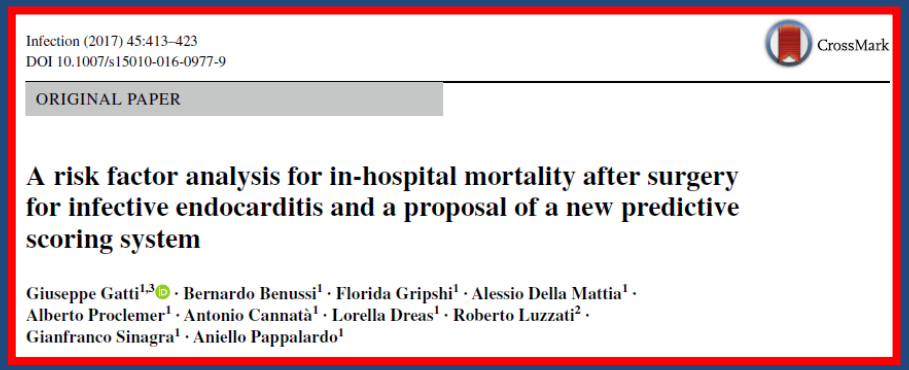
- The present Task Force on the management of IE of the ESC strongly supports the management of patients with IE in reference centres by a specialized team (the «Endocarditis Team»).

Scores

- EuroSCORE
- Society of Thoracic Surgeons Endocarditis Score



Infection (2017) 45:413–423
DOI 10.1007/s15010-016-0977-9

CrossMark

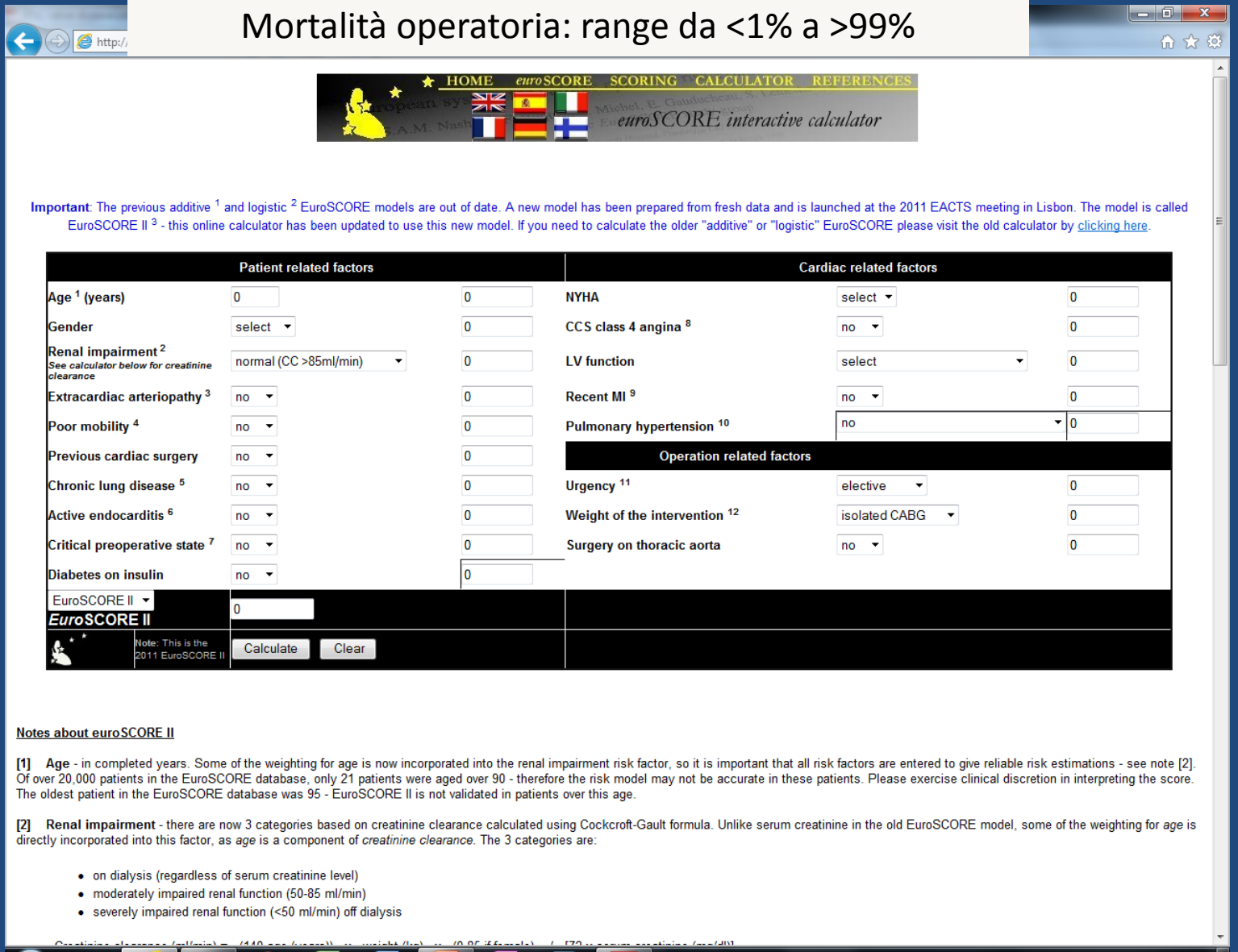
ORIGINAL PAPER

A risk factor analysis for in-hospital mortality after surgery for infective endocarditis and a proposal of a new predictive scoring system

Giuseppe Gatti[1,3] · Bernardo Benussi[1] · Florida Gripshi[1] · Alessio Della Mattia[1] · Alberto Proclemer[1] · Antonio Cannatà[1] · Lorella Dreas[1] · Roberto Luzzati[2] · Gianfranco Sinagra[1] · Aniello Pappalardo[1]

EuroSCORE II (http://www.euroscore.org)

European **S**ystem for **C**ardiac **O**perative **R**isk **E**valuation
Mortalità operatoria: range da <1% a >99%



HOME euroSCORE SCORING CALCULATOR REFERENCES

euroSCORE interactive calculator

Important: The previous additive [1] and logistic [2] EuroSCORE models are out of date. A new model has been prepared from fresh data and is launched at the 2011 EACTS meeting in Lisbon. The model is called EuroSCORE II [3] - this online calculator has been updated to use this new model. If you need to calculate the older "additive" or "logistic" EuroSCORE please visit the old calculator by clicking here.

Patient related factors			Cardiac related factors		
Age [1] (years)	0	0	NYHA	select	0
Gender	select	0	CCS class 4 angina [8]	no	0
Renal impairment [2] *See calculator below for creatinine clearance*	normal (CC >85ml/min)	0	LV function	select	0
Extracardiac arteriopathy [3]	no	0	Recent MI [9]	no	0
Poor mobility [4]	no	0	Pulmonary hypertension [10]	no	0
Previous cardiac surgery	no	0	**Operation related factors**		
Chronic lung disease [5]	no	0	Urgency [11]	elective	0
Active endocarditis [6]	no	0	Weight of the intervention [12]	isolated CABG	0
Critical preoperative state [7]	no	0	Surgery on thoracic aorta	no	0
Diabetes on insulin	no	0			
EuroSCORE II	0				
EuroSCORE II					
Note: This is the 2011 EuroSCORE II	Calculate	Clear			

Notes about euroSCORE II

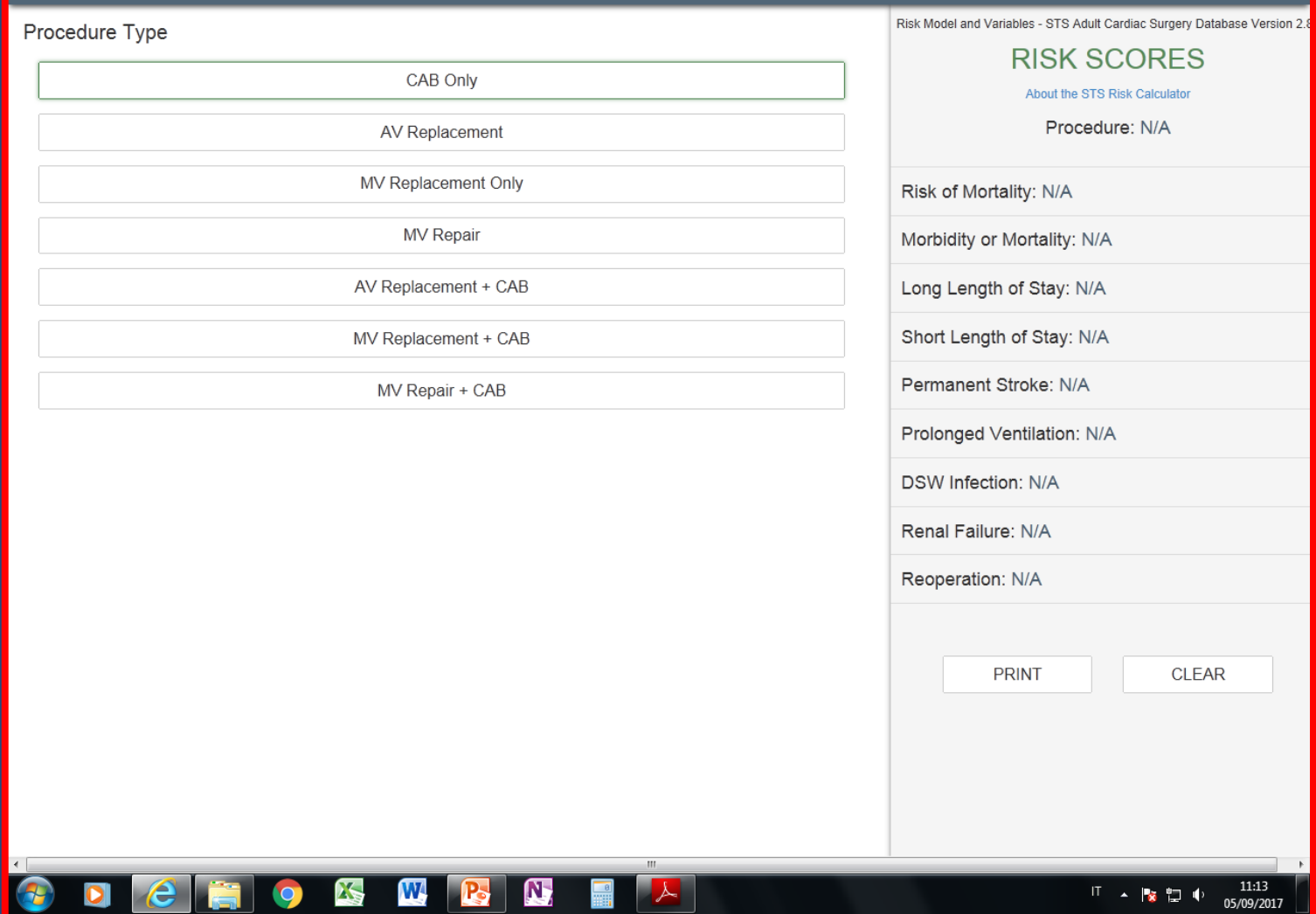
[1] Age - in completed years. Some of the weighting for age is now incorporated into the renal impairment risk factor, so it is important that all risk factors are entered to give reliable risk estimations - see note [2]. Of over 20,000 patients in the EuroSCORE database, only 21 patients were aged over 90 - therefore the risk model may not be accurate in these patients. Please exercise clinical discretion in interpreting the score. The oldest patient in the EuroSCORE database was 95 - EuroSCORE II is not validated in patients over this age.

[2] Renal impairment - there are now 3 categories based on creatinine clearance calculated using Cockcroft-Gault formula. Unlike serum creatinine in the old EuroSCORE model, some of the weighting for *age* is directly incorporated into this factor, as *age* is a component of *creatinine clearance*. The 3 categories are:

- on dialysis (regardless of serum creatinine level)
- moderately impaired renal function (50-85 ml/min)
- severely impaired renal function (<50 ml/min) off dialysis

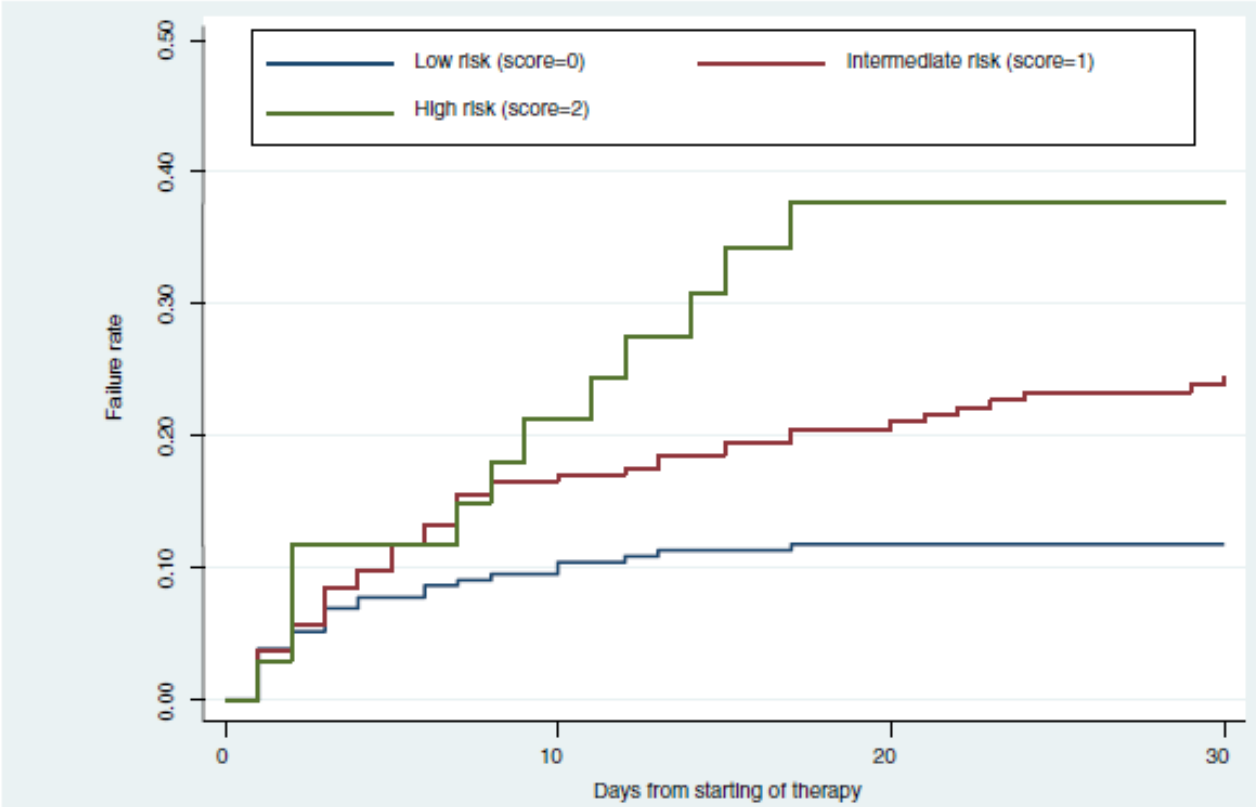
Society of Thoracic Surgeons Endocarditis Score (http://riskcalc.sts.org/stswebriskcalc/#/calculate)

Mortality, lenght of stay, prolonged ventilation, renal failure, stroke, reoperation, …



RESEARCH ARTICLE Open Access
Predicting the occurrence of embolic events: an analysis of 1456 episodes of infective endocarditis from the Italian Study on Endocarditis (SEI)

LS-IE: embolic events for different risk categories (failure rates)



Number at risk

Score = 0	**232**	(22)	**206**	(5)	**176**	(0)	**137**
Score = 1	**215**	(35)	**171**	(8)	**150**	(6)	**118**
Score = 2	**34**	(7)	**25**	(5)	**17**	(0)	**10**

Figure 3 Left-sided IE: Kaplan-Meier plots of failure rates (embolic events) for different risk categories. Bold numbers: number of patients at risk at any given time. Numbers in parentheses: number of embolic events that occurred in each time interval.

BMC Infectious Diseases

RESEARCH ARTICLE Open Access

Predicting the occurrence of embolic events: an analysis of 1456 episodes of infective endocarditis from the Italian Study on Endocarditis (SEI)

Marco Rizzi[1*], Veronica Ravasio[1], Alessandra Carobbio[2], Irene Mattucci[3], Massimo Crapis[4], Roberto Stellini[5], Maria Bruna Pastico[6], Pierangelo Chinello[7], Marco Falcone[8], Paolo Grossi[9], Francesco Barbaro[10], Angelo Pan[11], Pierluigi Viale[12], Emanuele Durante-Mangoni[13] and Investigators of the Italian Study on Endocarditis

Table 5 Left-sided IE: 30-day probability (%) of embolic events per risk category

Time from start of therapy (d)	Low (0)	*Intermediate* (1)	*High* (2)
0	11.78	24.54	37.73
1	7.90	20.82	34.79
2	6.61	18.95	25.97
3	4.88	16.13	25.97
4	4.01	14.70	25.97
5	4.01	12.78	25.97
6	3.14	11.34	25.97
7	2.71	8.95	22.81
15	0.48	5.02	3.46
30	0.00	0.00	0.00

Note: numbers represent the probability (%) of embolism at the end of a given time interval. Time 0 values include embolic events occurred on the first calendar day of therapy; day 1 values represent the risk at the end of the first calendar day of therapy.

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Prediction of Symptomatic Embolism in Infective Endocarditis

Construction and Validation of a Risk Calculator in a Multicenter Cohort

Sandrine Hubert, MD,*† Franck Thuny, MD, PhD,*‡§ Noemie Resseguier, MD,‖ Roch Giorgi, MD, PhD,‖ Christophe Tribouilloy, MD, PhD,¶# Yvan Le Dolley, MD,* Jean-Paul Casalta, MD,** Alberto Riberi, MD,† Florent Chevalier, MD,¶ Dan Rusinaru, MD,¶ Dorothée Malaquin, MD,¶ Jean Paul Remadi, MD,†† Ammar Ben Ammar, MD,‡‡ Jean Francois Avierinos, MD,* Frederic Collart, MD,† Didier Raoult, MD, PhD,‡** Gilbert Habib, MD*

Marseille and Amiens, France

Variable		Multivariate Analysis	
	Univariate Analysis p Value	Hazard Ratio (95% Confidence Interval)	p Value
Age	0.15	1.01 (0.99–1.03)	0.18
Diabetes	0.05	1.30 (0.61–2.80)	0.50
Previous embolism	0.04	1.40 (0.74–2.65)	0.30
Atrial fibrillation	0.07	1.66 (0.81–3.41)	0.17
Vegetation length (mm) (stratified) *	0.001		
>0 to ≤10		1.26 (0.24–6.69)	0.79
>10		4.46 (1.06–18.88)	0.04
Staphylococcus aureus	0.07	1.78 (0.85–3.76)	0.13

* Absence of visible vegetation was the reference state.

Prediction of Systemic Septic Embolism in Patients With Left-Sided Infective Endocarditis

JACC VOL. 69, NO. 15, 2017
APRIL 18, 2017:1930–6

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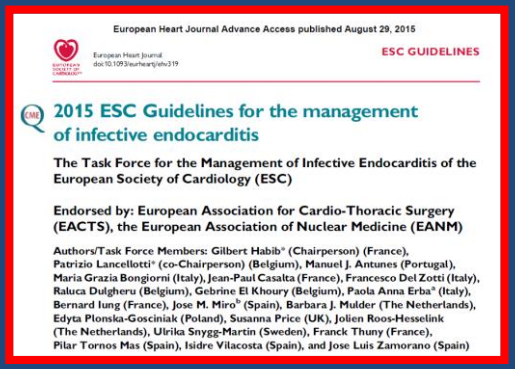
Overall, of the risk stratification schemas for EC in patients with infective endocarditis, the French and the Italian scoring systems had moderate predictive power, but the Italian scheme may offer better predictive capacity and may be simpler to apply.

NVE o PVE?



European Heart Journal Advance Access published August 29, 2015

European Heart Journal doi:10.1093/eurheartj/ehv319

ESC GUIDELINES

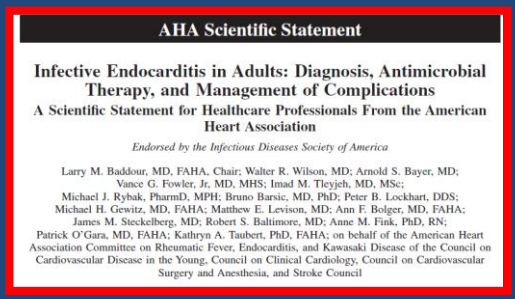
2015 ESC Guidelines for the management of infective endocarditis

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

Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM)

Authors/Task Force Members: Gilbert Habib* (Chairperson) (France), Patrizio Lancellotti* (co-Chairperson) (Belgium), Manuel J. Antunes (Portugal), Maria Grazia Bongiorni (Italy), Jean-Paul Casalta (France), Francesco Del Zotti (Italy), Raluca Dulgheru (Belgium), Gebrine El Khoury (Belgium), Paola Anna Erba* (Italy), Bernard Iung (France), Jose M. Miro* (Spain), Barbara J. Mulder (The Netherlands), Edyta Plonska-Gosciniak (Poland), Susanna Price (UK), Jolien Roos-Hesselink (The Netherlands), Ulrika Snygg-Martin (Sweden), Franck Thuny (France), Pilar Tornos Mas (Spain), Isidre Vilacosta (Spain), and Jose Luis Zamorano (Spain)

«In NVE endocarditis valve replacement by a prosthesis during antibiotic therapy, the postoperative antibiotic regimen should be that recommended for NVE, not for PVE»



AHA Scientific Statement

Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications

A Scientific Statement for Healthcare Professionals From the American Heart Association

Endorsed by the Infectious Diseases Society of America

Larry M. Baddour, MD, FAHA, Chair; Walter R. Wilson, MD; Arnold S. Bayer, MD; Vance G. Fowler, Jr, MD, MHS; Imad M. Tleyjeh, MD, MSc; Michael J. Rybak, PharmD, MPH; Bruno Bursic, MD, PhD; Peter B. Lockhart, DDS; Michael H. Gewitz, MD, FAHA; Matthew E. Levison, MD; Ann F. Bolger, MD, FAHA; James M. Steckelberg, MD; Robert S. Baltimore, MD; Anne M. Fink, PhD, RN; Patrick O'Gara, MD, FAHA; Kathryn A. Taubert, PhD, FAHA; on behalf of the American Heart Association Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young, Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and Stroke Council

«For patients with NVE who undergo valve resection with prosthetic valve replacement or repair with an annuloplasty ring, there is a lack of consensus as to whether the postoperative treatment regimen should be one that is recommended for prosthetic valve treatment rather than one that is recommended for native valve treatment»

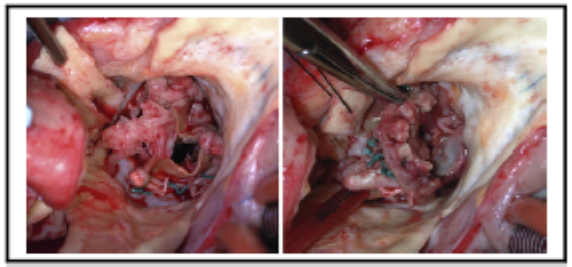
ACQUIRED: AATS EXPERT CONSENSUS GUIDELINES: ENDOCARDITIS

2016 The American Association for Thoracic Surgery (AATS) consensus guidelines: Surgical treatment of infective endocarditis: Executive summary

AATS Surgical Treatment of Infective Endocarditis Consensus Guidelines Writing Committee Chairs: Gösta B. Pettersson, MD, PhD,[a] and Joseph S. Coselli, MD[b,c]

Writing Committee: Gösta B. Pettersson, MD, PhD,[a] Joseph S. Coselli, MD,[b,c] Syed T. Hussain, MD,[a] Brian Griffin, MD,[d] Eugene H. Blackstone, MD,[a] Steven M. Gordon, MD,[e] Scott A. LeMaire, MD,[b,c] and Laila E. Woc-Colburn, MD[f]

Invited Experts: See Appendix E1.



Vegetation and dehiscence in prosthetic valve endocarditis—a surgical disease.

Central Message

These guidelines describe diagnosis, indications, timing, surgical treatment, and perioperative care for patients with infective endocarditis and early surgeon involvement in team decision-making.

See Editorial Commentary page 1259.

Pettersson GB et al. J Thorac Cardiovasc Surg 2017;153:1241-1258.

ACQUIRED: AATS EXPERT CONSENSUS GUIDELINES: ENDOCARDITIS

2016 The American Association for Thoracic Surgery (AATS) consensus guidelines: Surgical treatment of infective endocarditis: Executive summary

AATS Surgical Treatment of Infective Endocarditis Consensus Guidelines Writing Committee Chairs:

Writing Committee:

Invited Experts:

Should additional prostheses and vascular graft not proved to be infected to be removed and replaced?

A vascular graft surrounded by pus is infected and should be removed. Often however, there is no obvious sign of infection, and removal or not is a matter of judgement.

Should Additional Prostheses and Vascular Grafts Not Proved to Be Infected Be Removed and Replaced? (Table 6-2)

A vascular graft surrounded by pus is infected and should be removed. Often, however, there is no obvious sign of infection, and removal or not is a matter of judgment.

Tornos P et al., 1999
Infective endocarditis due to *S. aureus*.
Deleterious effect of anticoagulant therapy

- *S. aureus* NVE (N=35): 22% had a stroke (all ischemic at onset; 57% became hemorrhagic).

- *S. aureus* PVE (N=21): 52% had a stroke (half hemorrhagic at onset, the remaining converted within 72h hours).

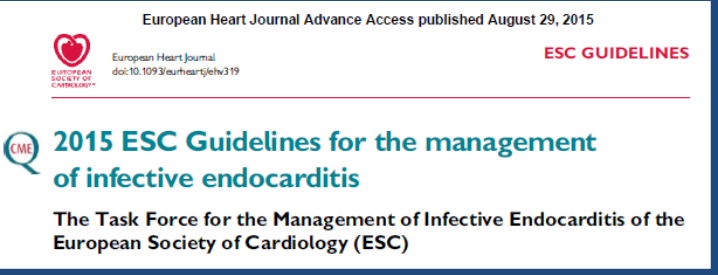
AHA / IDSA 2015 - 2

"… Some authorities recommend continuation of anticoagulant therapy in pts with mechanical valve IE. However, the general advice is to discontinue all forms of anticoagulation in pts with mechanical valve IE who have experienced a CNS embolic event for at least 2 weeks ..."

European Society of Cardiology guidelines 2015 Antithrombotic therapy - 1

"…evidence does not support the initiation of medications interfering with the coagulation system as adjunctive therapy for IE…"

"… the risk of intracranial haemorrhage may be increased in patients already on anticoagulant when IE is diagnosed, especially in patients with *S. aureus* PVE…"



European Society of Cardiology guidelines 2015 Antithrombotic therapy - 2

"…the role of bridging therapy with unfractioned or low molecular weight heparin has not been studied in patients with IE, but may have reasonable advantages in special situations (i.e. in unstable patients) before surgical decisions are made or to avoid drug interactions…"

Cathy Sila, *Stroke* 2012

Anticoagulation Should Not Be Used in Most Patients With Stroke With Infective Endocarditis

Cathy Sila, MD

One of the most worrisome consults to the stroke service is the patient with neurological symptoms in the setting of infective endocarditis (IE). Stroke is the main neurological complication of IE and in 50% to 75% is the presenting feature. The most effective strategy for the prevention of a first or recurrent stroke is the prompt institution of appropriate antibiotic therapy, which reduces the risk to 1% to 3% within the first week.[1] Ischemic stroke is 3-fold more common than hemorrhagic stroke. Embolic patterns are seen on diffusion-weighted MR in 92% of patients with stroke or encephalopathy. Initiating anticoagulation may seem reasonable to prevent embolization of infected or bland platelet–fibrin valvular vegetations—perhaps enhanced in the presence of antiphospholipid antibodies—and it is the standard of care for most cardioembolic stroke; however, the stroke risk is similar in the presence or absence of anticoagulants at onset of IE. The most compelling reason to avoid anticoagulation in *Staphylococcus aureus* IE is the predominance of early intracranial hemorrhage and hemorrhagic conversion of ischemic stroke.[1–3] In Tornos' study of IE from *S. aureus*, the risk of stroke with native valve endocarditis was 22%; all were ischemic at onset and 57% became hemorrhagic in the absence of anticoagulation. Patients with prosthetic valve endocarditis were converted from oral anticoagulants to intravenous heparin on admission. Their risk of stroke was substantially higher at 52%; half were hemorrhagic at onset and the remainder converted within 48 to 72 hours. In Heiro's study, the 90-day mortality rate with *S. aureus* IE was 57% of those on anticoagulant therapy versus 20% those without. Typically patients with intracranial hemorrhage were not offered cardiac surgery and died. Anticoagulants should not be initiated for patients with IE with the goal of reducing the risk of stroke. Anticoagulants should be stopped as soon as a diagnosis of IE is suspected, particularly with neurological symptoms to suggest embolism or if *S. aureus* infection is possible. If these concerns can be excluded, a short-acting anticoagulant such as intravenous heparin can be initiated while anticipating a surgical decision.

The poor outcome in *S. aureus* IE and hemorrhagic stroke could be improved by identifying a lesion amenable to endovascular or surgical treatment. Ruptured mycotic aneurysms, documented in <2% of clinical series and 5% to 10% of tissue specimens, are caused by a septic arteritis resulting from embolization to the arterial wall. These lesions are best detected by the "gold standard" cerebral angiogram. Less invasive studies such as contrast-enhanced CT brain scans may be preferred in critically ill patients but only detect 20% of angiographically documented mycotic aneurysms.

Prosthetic valve endocarditis due to *S. aureus* is more likely to be complicated by central nervous system complications, heart failure, and persistent bacteremia despite adequate antibiotic therapy. Our patient presents with several of the risk factors for mortality from IE, a neurological complication, infection with *S. aureus,* and prosthetic valve endocarditis. Additional risk factors include intracranial hemorrhage, advanced age, septic shock, cardiac complications, and the need for urgent surgery. Although surgical risk is increased, multiple retrospective studies have demonstrated a survival benefit with surgery. The risk of stroke for noninfected cardiac valves ranges from 6% to 12% with cardiopulmonary bypass and includes embolization, hypoperfusion, heparin-related hemorrhagic complications, and cerebral edema from disruption of the blood–brain barrier. For these reasons, some advocate delaying surgery for 2 to 3 weeks for IE complicated by stroke. Recent series indicate that early surgery can be accomplished with a similar risk in patients with an otherwise uncomplicated partial and complete middle cerebral artery territory ischemic stroke. Patients with intracranial hemorrhage fare poorly with a surgical mortality risk of 30% to 40% and an even higher mortality rate with medical therapy alone.[3,4]

Because patients with stroke and *S. aureus* prosthetic valve endocarditis can be precipitously unstable and progress before the consult note is typed, our responsibility as a consultant to the cardiac team must be more than making a diagnosis and documenting the neurological deficit. The benefits of diffusion-weighted MRI as the more sensitive modality for

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association. This article is Part 2 in a 3-part series. Parts 1 and 3 appear on pages 1795 and 1799, respectively.
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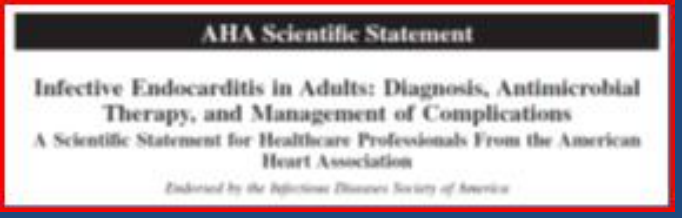
From the Stroke & Cerebrovascular Center, Neurological Institute, University Hospitals–Case Medical Center, Case Western Reserve University School of Medicine, Cleveland, OH.
Correspondence to Cathy Sila, MD, George M. Humphrey II Professor of Neurology, Director, Stroke & Cerebrovascular Center, Neurological Institute, University Hospitals–Case Medical Center, Case Western Reserve University School of Medicine, 11100 Euclid Avenue Hanna 5040, Cleveland, OH 44106. E-mail Cathy.Sila@UHhospitals.org
(*Stroke*. 2011;42:1797-1798.)

Stroke is available at http://stroke.ahajournals.org
DOI: 10.1161/STROKEAHA.110.611699

- … counsel against antithrombotic therapies
- …advocate urgent cerebral angiography in the setting of intracranial hemorrhage (treatment of mycotic aneurism!)
- … encouraging surgery when a stroke is **still** ischemic

Asaithambi G et al
Thrombolysis for ischemic stroke associated with IE
Stroke 2013

- 222 IE pts versus 134,048 pts without IE
- Rate of post-thrombolytic intracerebral hemorrhage 20% versus 6,5%
- … low rates of favorable outcomes mandate caution in using IVT in acute ischemic stroke patients with IE


AHA Scientific Statement

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1. Valve surgery may be considered in IE patients with stroke or subclinical cerebral emboli and residual vegetation without delay if intracranial hemorrhage has been excluded by imaging studies and neurological damage is not severe (ie, coma) (*Class IIb; Level of Evidence B*).
2. In patients with major ischemic stroke or intracranial hemorrhage, it is reasonable to delay valve surgery for at least 4 weeks (*Class IIa; Level of Evidence B*).

Graxie per l'attenxione

— Finis —