

TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI)

A REFERENCE MODEL IN PERCUTANEOUS CARDIOVASCULAR INTERVENTIONS

PhD Dissertation

Rui Campante Teles

Lisbon | July 2023

Supervisors

Doctor Ana Maria Branco Aleixo

*Clinical Specialist in the Field of Cardiology and Internal Medicine,
according to number 6, article 34 of the RJGDES*

Doctor Pedro Alexandre Castro de Araújo Gonçalves

*Invited Assistant Professor at Faculdade de Ciências Médicas |
INOVA Medical School of NOVA University Lisbon*

Background

- ❖ Cardiovascular diseases are the leading causes of death and hospitalization * §

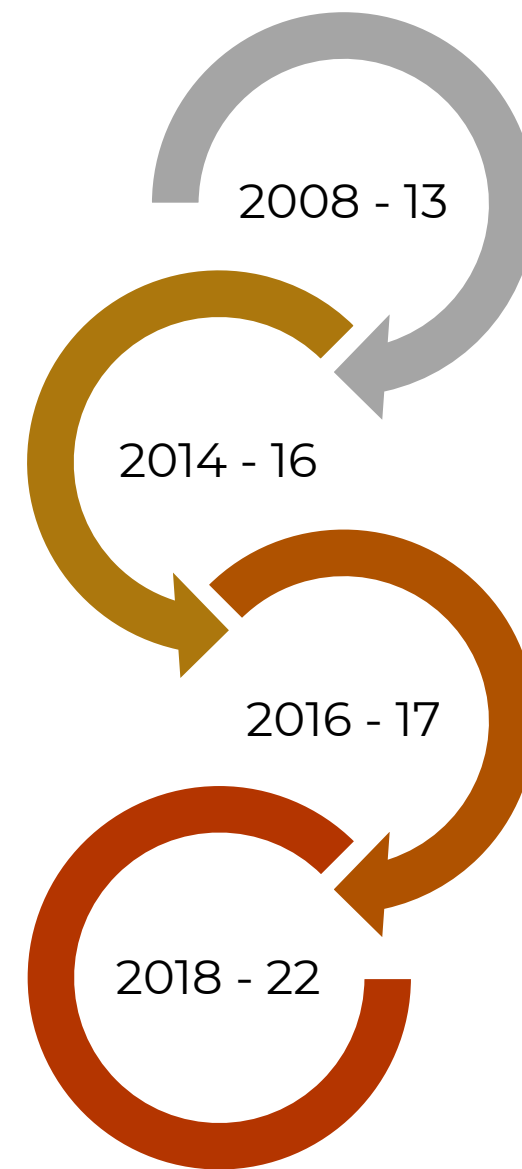
Life-expectancy (1990 → 2020)

@ born ↑ 9,6% (73,9 to 81,1 years)

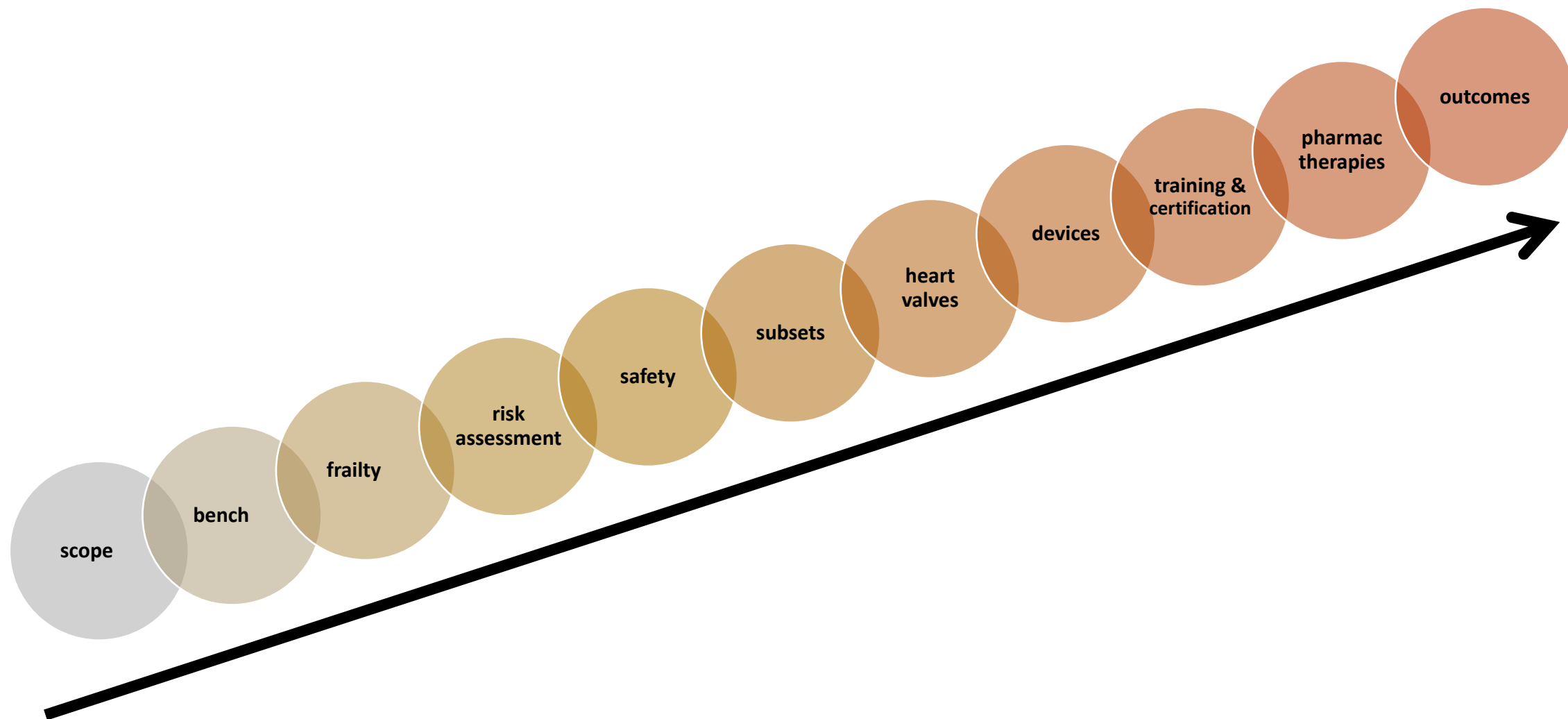
@ 65 years ↑ 5,1% (80,6 to 84,7 years)

- ❖ Myocardial revascularization pioneered the interventional cardiology (IC) three decades ago
- ❖ *The current thesis details a structured paradigm shift in this area along the percutaneous aortic valve intervention program*

Background



Coherence of research



1. scope and innovation

15 years of intervention with percutaneous aortic valves (TAVI) constitute a reference model in the history of contemporary cardiovascular disease



2. bench

In vitro evaluation of implantation depth in valve-in-valve using different transcatheter heart valves



Matheus Simonato^{1,2}; Ali N. Azadani³, PhD; John Webb¹, MD; Jonathon Leipsic¹, MD; Ran Kornowski⁴, MD; Alec Vahanian⁵, MD; David Wood⁶, MD; Nicolo Piazza⁷, MD; Susheel Kodali⁸, MD; Jian Ye¹, MD; Brian Whisenant⁹, MD; Diego Gaia², MD; Mina Aziz¹, MD; Tilak Pasala⁹, MD; Julinda Mehilli¹⁰, MD; Harindra C. Wijesundera¹¹, MD; Didier Tchetché¹², MD; Neil Moat¹³, MD; Rui Teles¹⁴, MD; Anna Sonia Petronio¹⁵, MD; David Hildick-Smith¹⁶, MD; Uri Landes⁴, MD; Stephan Windecker¹⁷, MD; Yaron Arbel¹⁸, MD; Oscar Mendiz¹⁹, MD; Raj Makkar²⁰, MD; Elaine Tseng²¹, MD; Danny Dvir^{1,22*}, MD

bench

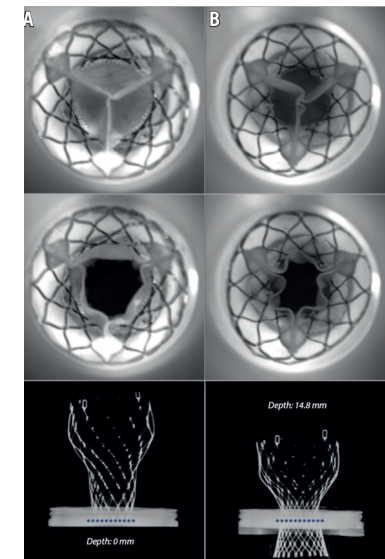
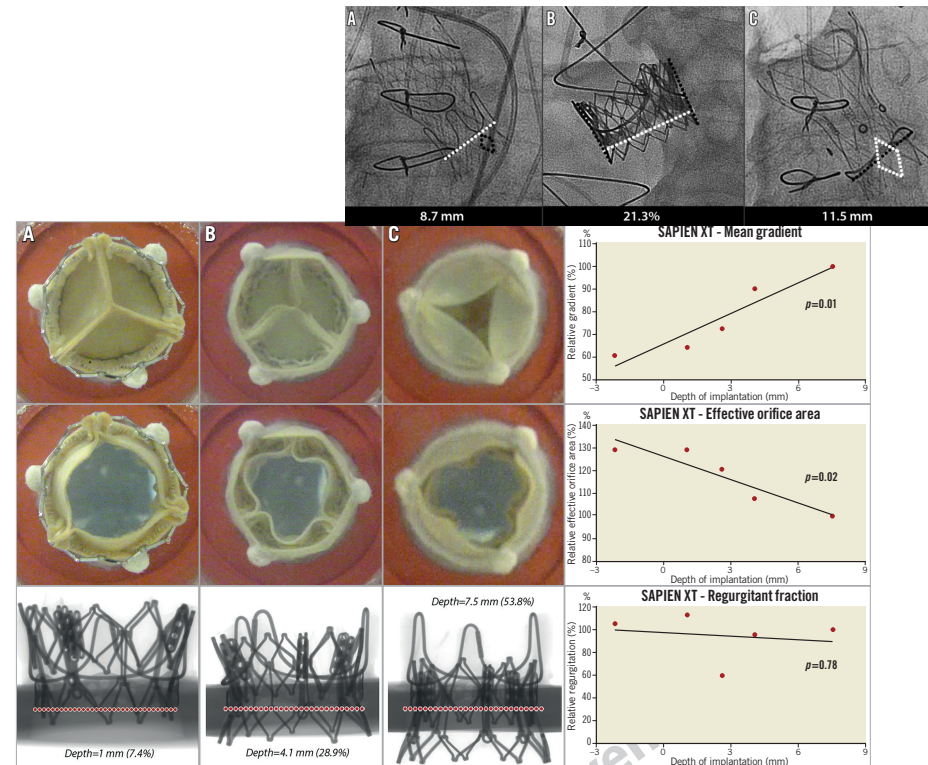
- 28 simulations
- TAVI-in-SAVR (ViV)

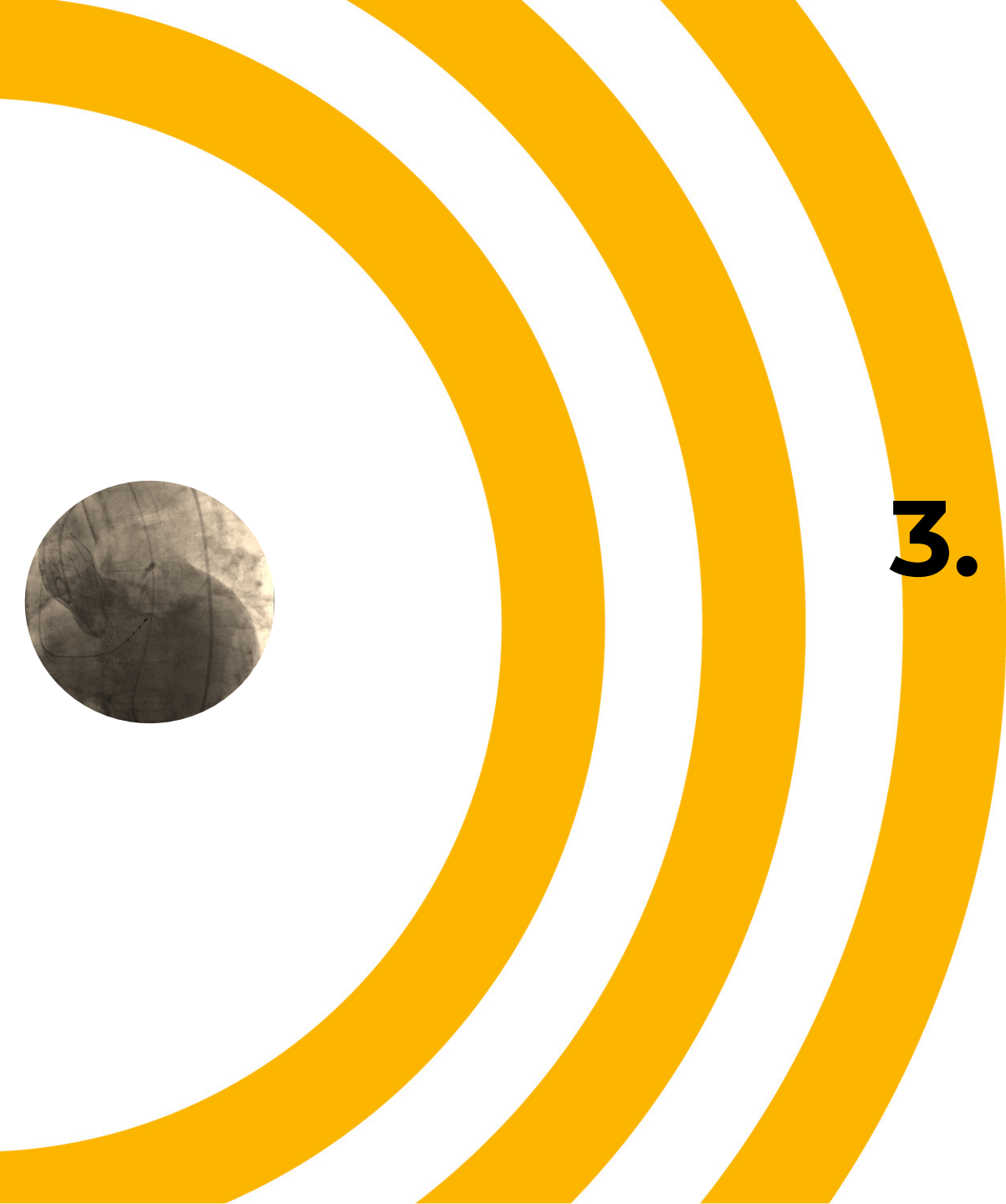
SAVR

Epic | CE | Trifecta 19mm

TAVI

CoreValve | Sapiens XT | Portico





3. multidisciplinary risk assessment

Surgical versus transcatheter aortic valve replacement in low-risk patients: A long-term propensity score-matched analysis

Catarina Brízido MD¹ | Márcio Madeira MD² | João Brito MD¹ |
Sérgio Madeira MD¹ | Rui Campante Teles MD^{1,3} | Luís Raposo MD^{1,3} |
Henrique Mesquita Gabriel MD¹ | Tiago Nolasco MD² |
Pedro de Araújo Gonçalves MD, PhD^{1,3} | Miguel Sousa-Uva MD, PhD² |
Miguel Abecasis MD² | Manuel de Sousa Almeida MD, PhD^{1,3} |
José Pedro Neves MD² | Miguel Mendes MD¹

multidisciplinary risk assessment

VCROSS registry (Valve Catheter Restorative Operation on Santa cruz hoSpital) & CTS
2009-17

158 matched pts @ 4,5 years FUP

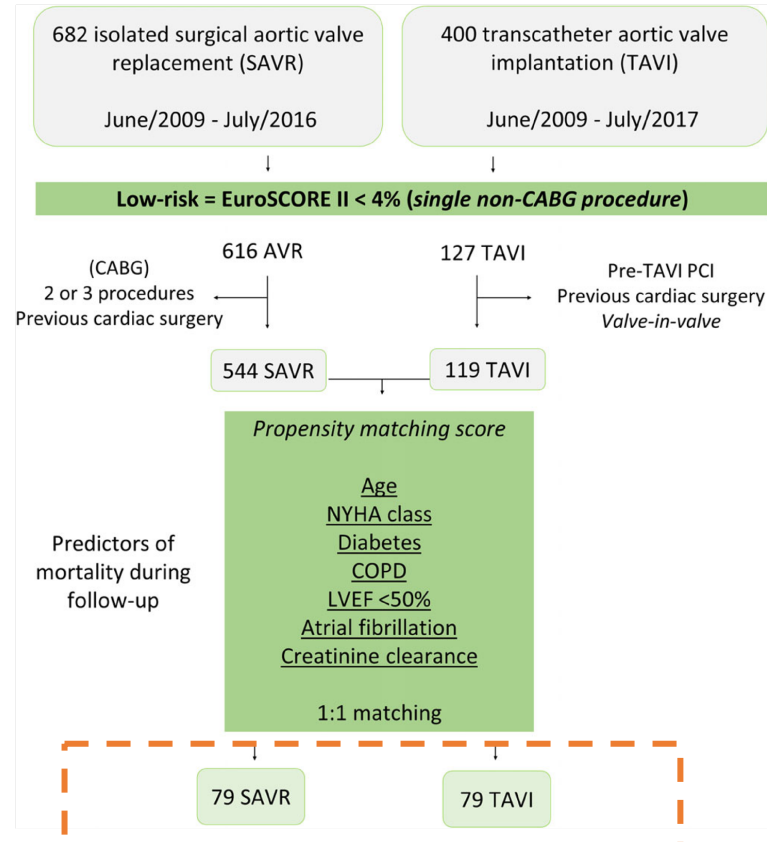
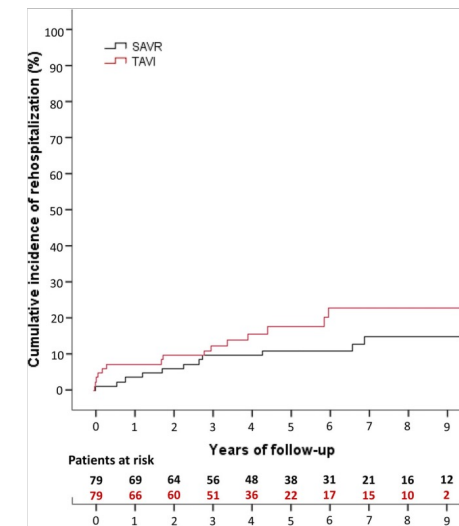
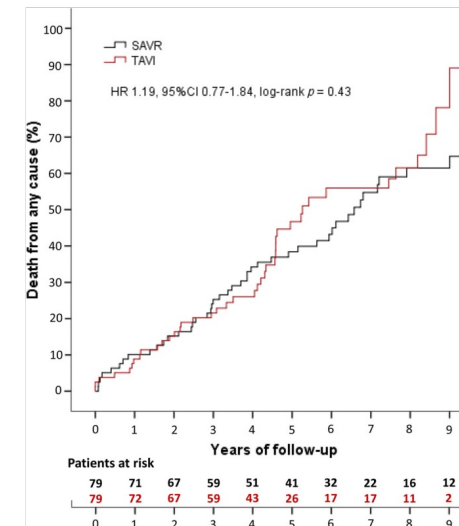


TABLE 7 Long-term outcomes for the propensity-matched population

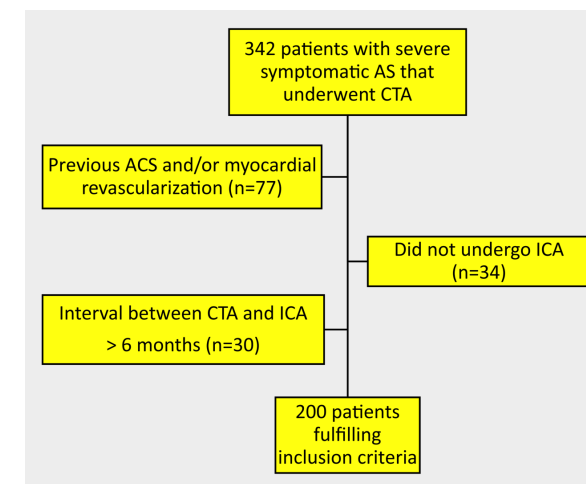
	SAVR (n = 79)	TAVI (n = 79)	p-value
All-cause mortality estimates at 1 year	10.1%	8.9%	0.78
All-cause mortality estimates at 2 years	15.2%	15.2%	0.98
All-cause mortality estimates at 3 years	25.3%	21.6%	0.62
Cumulative incidence of rehospitalizations during follow-up	15.4% (8.0-24.9)	23.6% (13.5-35.3)	0.23
Endocarditis	2	2	1.0
Valve thrombosis	0	0	NA



HSC
2015-18
200 pts

Diagnostic accuracy of computed tomography angiography for the exclusion of coronary artery disease in candidates for transcatheter aortic valve implantation

Christopher Strong^{1*}, António Ferreira¹, Rui Campante Teles¹, Gustavo Mendes¹, João Abecasis¹, Gonçalo Cardoso¹, Sara Guerreiro¹, Pedro Freitas¹, Ana Coutinho Santos², Carla Saraiva², João Brito¹, Luís Raposo¹, Pedro de Araújo Gonçalves¹, Henrique Mesquita Gabriel¹, Manuel de Sousa Almeida¹ & Miguel Mendes¹



	TP	FP	TN	FN	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Patient-based analysis (n = 200)								
>Including those with NE segments	69	76	55	0	100% (94.8–100%)	42% (33.4–50.9%)	47.6% (44.0–51.2%)	100% (92.2–100%)
>Excluding those with NE segments	10	5	55	0	100% (69.2–100%)	91.7% (81.6–97.2%)	66.7% (46.4–82.2%)	100% (92.2–100%)

* NE- non-evaluable

4. safety and vascular access

RNCI-VaP
14 centres
2007-18
n=2.346
259 days FUP

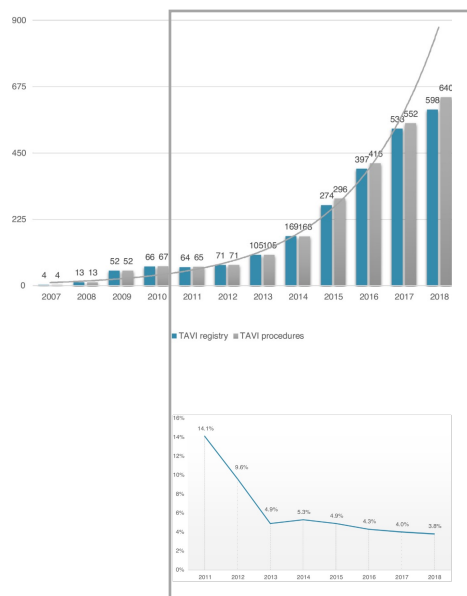
ORIGINAL ARTICLE

Short and long-term clinical impact of transcatheter aortic valve implantation in Portugal according to different access routes: Data from the Portuguese National Registry of TAVI

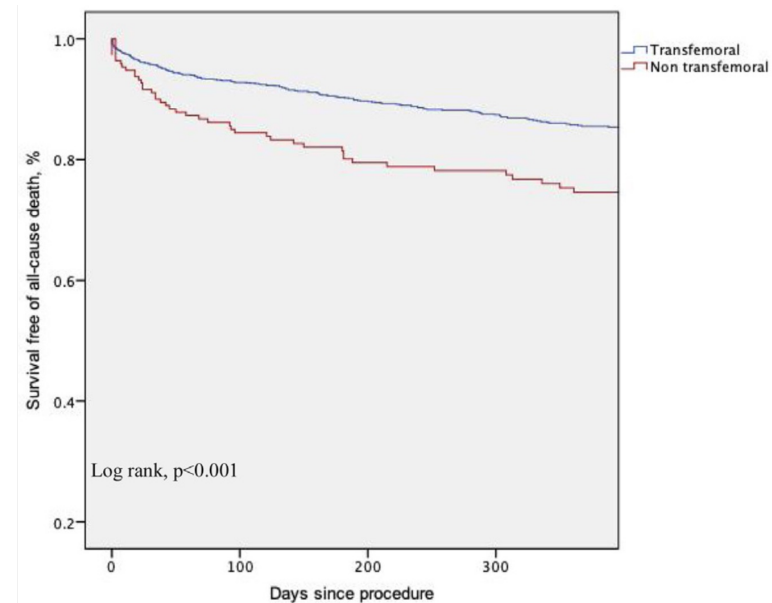
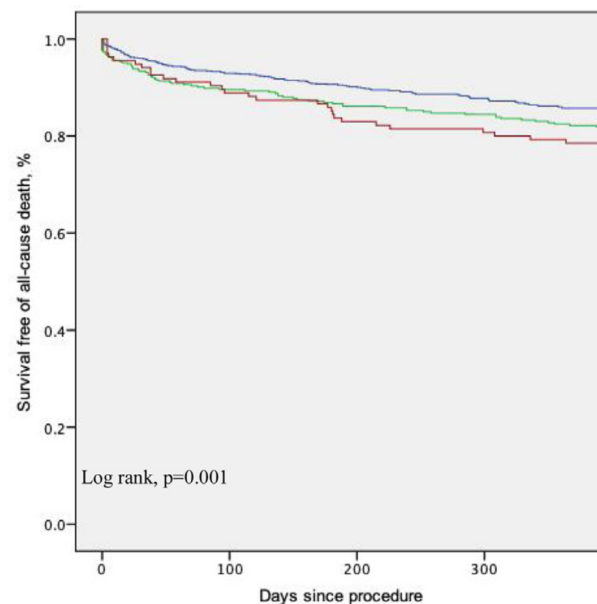
Cláudio Guerreiro^a, Pedro Carrilho Ferreira^b, Rui Campante Teles^{c,d,*}, Pedro Braga^a, Pedro Canas da Silva^b, Lino Patrício^e, João Carlos Silva^f, José Baptista^g, Manuel de Sousa Almeida^{c,d}, Vasco Gama Ribeiro^h, Bruno Silvaⁱ, João Brito^{c,d}, Eduardo Infante Oliveira^b, Duarte Cacula^e, Sérgio Madeira^{c,d}, João Silveira^j



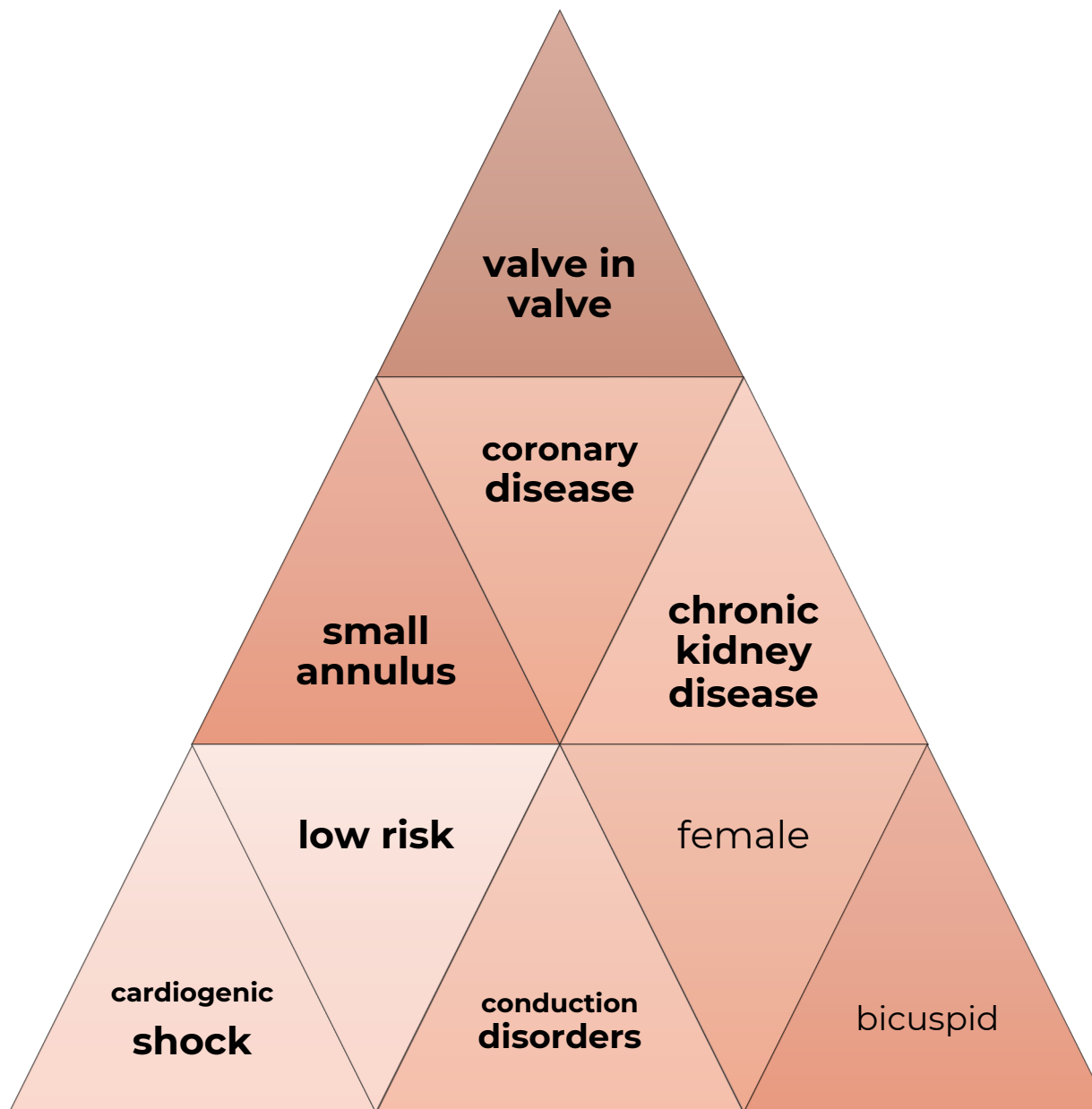
Annual number



Mortality



5. procedural subsets and outcomes



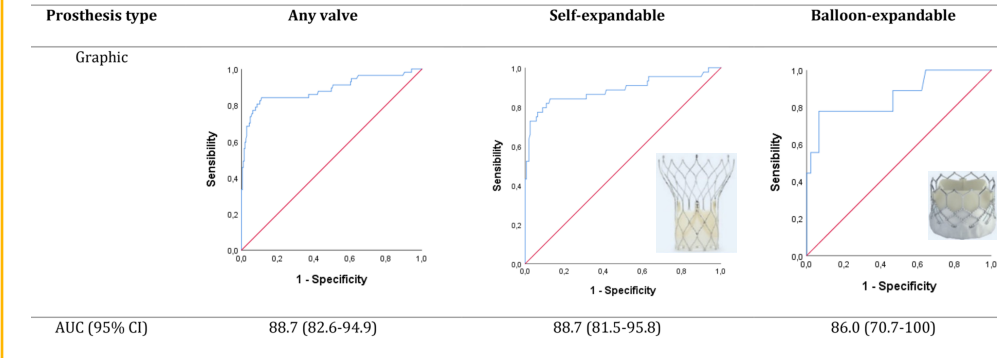
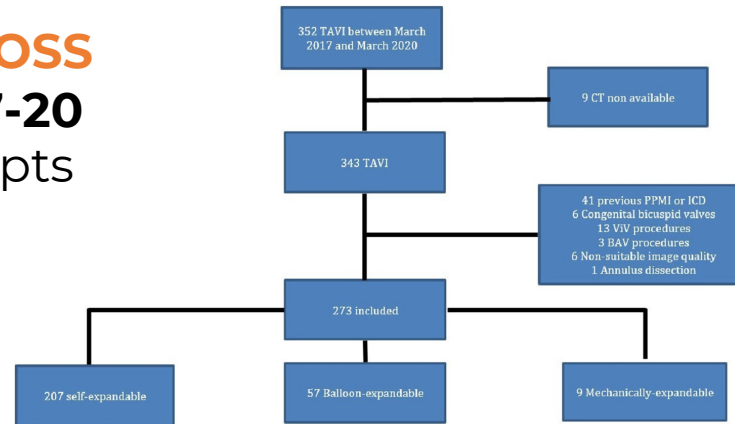
Predictors of pacemaker implantation after TAVI in a registry including self, balloon and mechanical expandable valves

subsets and outcomes



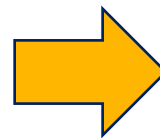
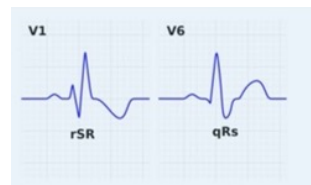
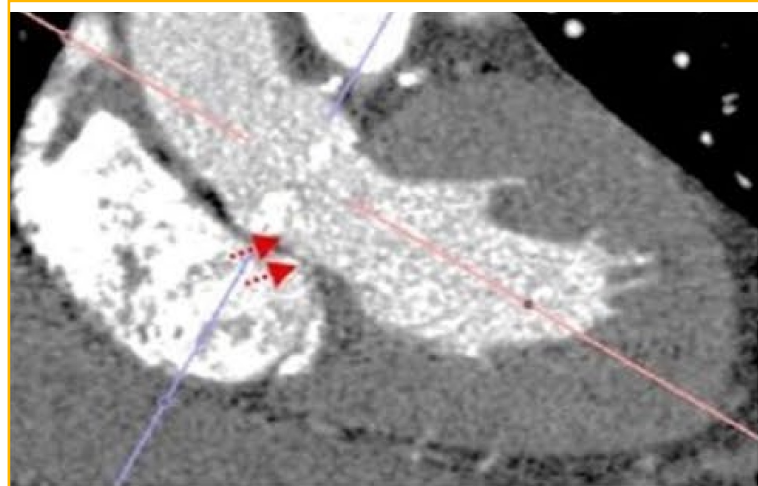
Francisco Gama¹ · Pedro de Araújo Gonçalves^{1,2,3} · João Abecasis¹ · António Miguel Ferreira¹ · Pedro Freitas¹ · Mariana Gonçalves^{1,2} · Salomé Carvalho¹ · Afonso Félix Oliveira^{1,2,4} · Henrique Mesquita Gabriel^{1,2} · João Brito^{1,2} · Luís Raposo^{1,2} · Pedro Adragão¹ · Manuel de Sousa Almeida^{1,2,3} · Rui Campante Teles^{1,2,3}

VCROSS
2017-20
352 pts



Corevalve®, n (%)	105 (38.5)
Portico®, n (%)	49 (17.9)
Edwards®, n (%)	61 (22.3)
Accurate®, n (%)	32 (11.7)
Lotus®, n (%)	9 (3.3)
Symetis®, n (%)	17 (6.2)

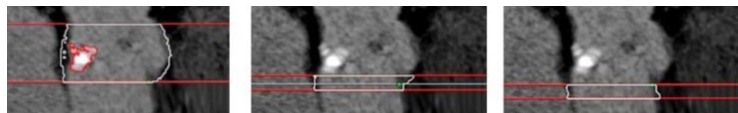
Cut-off	MS length, mm	95% CI
Optimal	7.69	83.5-91.6
95% Specificity	7.22	92.2-98.1
95% Sensitivity	10.8	85.4-98.9



total
leaflet

device
landing zone

LVOT



Transcatheter Aortic Valve Implantation in Failed Bioprosthetic Surgical Valves

55 centres
2007-13
n=459

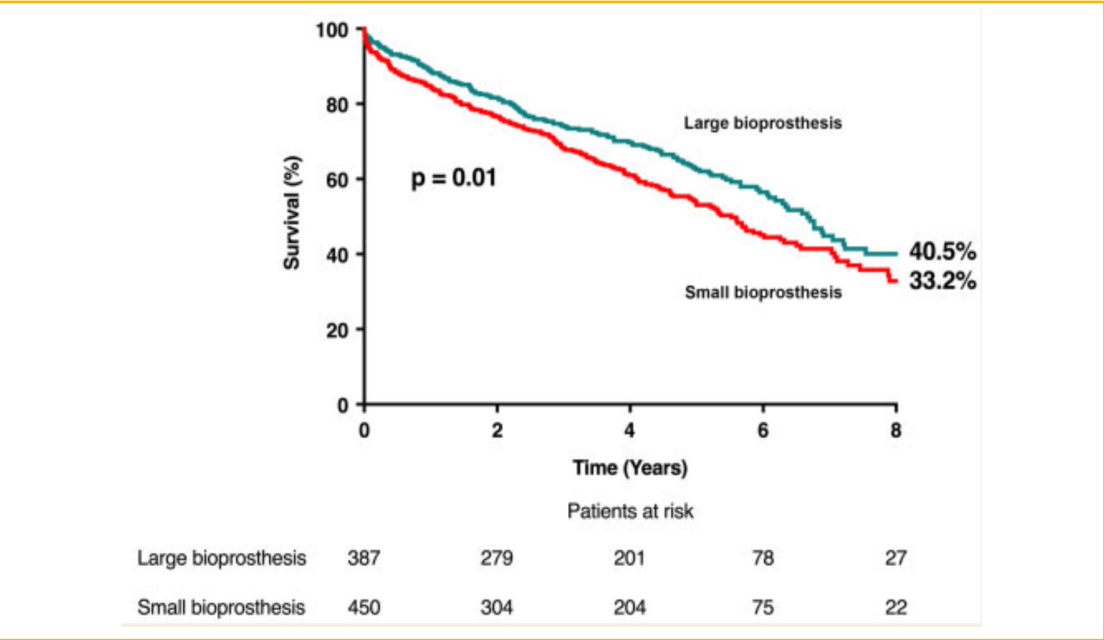
Danny Dvir, MD; John G. Webb, MD; Sabine Bleiziffer, MD; Miralem Pasic, MD, PhD; Ron Waksman, MD; Susheel Kodali, MD; Marco Barbanti, MD; Azeem Latib, MD; Ulrich Schaefer, MD; Josep Rodés-Cabau, MD; Hendrik Treede, MD; Nicolo Piazza, MD, PhD; David Hildick-Smith, MD; Dominique Himbert, MD; Thomas Walther, MD; Christian Hengstenberg, MD; Henrik Nissen, MD, PhD; Raffi Bekerredjian, MD; Patrizia Presbitero, MD; Enrico Ferrari, MD; Amit Segev, MD; Arend de Weger, MD; Stephan Windecker, MD; Neil E. Moat, FRCS; Massimo Napodano, MD; Manuel Wilbring, MD; Alfredo G. Cerillo, MD; Stephen Brecker, MD; Didier Tchetché, MD; Thierry Lefèvre, MD; Federico De Marco, MD; Claudia Fiorina, MD; Anna Sonia Petronio, MD; Rui C. Teles, MD; Luca Testa, MD; Jean-Claude Laborde, MD; Martin B. Leon, MD; Ran Kornowski, MD; for the Valve-in-Valve International Data Registry Investigators

Long-term outcomes after transcatheter aortic valve implantation in failed bioprosthetic valves

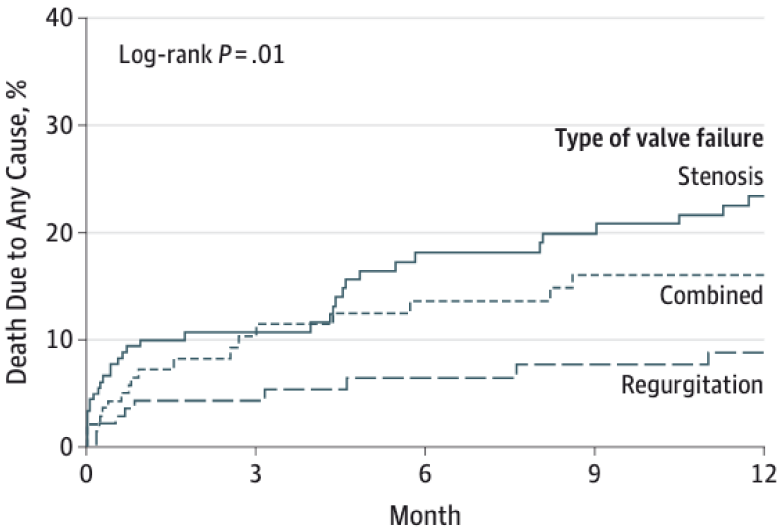
subsets and outcomes

180 centres
2014-19
FUP 3,9 y
n=1.006

Sabine Bleiziffer^{1†}, Matheus Simonato^{2†}, John G. Webb³, Josep Rodés-Cabau⁴, Philippe Pibarot⁴, Ran Kornowski⁵, Stephan Windecker⁶, Magdalena Erlebach⁷, Alison Duncan⁸, Moritz Seiffert⁹, Axel Unbehaun¹⁰, Christian Frerker¹¹, Lars Conzelmann¹², Harindra Wijesundera¹³, Won-Keun Kim¹⁴, Matteo Montorfano¹⁵, Azeem Latib¹⁶, Didier Tchetché¹⁷, Abdelhakim Allali¹⁸, Mohamed Abdel-Wahab¹⁹, Katia Orvin⁵, Stefan Stortecky⁶, Henrik Nissen²⁰, Andreas Holzamer²¹, Marina Urena²², Luca Testa²³, Marco Agrifoglio²⁴, Brian Whisenant²⁵, Janarthanan Sathanathan³, Massimo Napodano²⁶, Antonio Landi²⁶, Claudia Fiorina²⁷, Armin Zittermann¹, Verena Veulemans²⁸, Jan-Malte Sinning²⁹, Francesco Saia³⁰, Stephen Brecker³¹, Patrizia Presbitero³², Ole De Backer³³, Lars Søndergaard³³, Giuseppe Bruschi³⁴, Luis Nombela Franco³⁵, Anna Sonia Petronio³⁶, Marco Barbanti³⁷, Alfredo Cerillo³⁸, Konstantinos Spargias³⁹, Joachim Schofer⁴⁰, Mauricio Cohen⁴¹, Antonio Muñoz-García⁴², Ariel Finkelstein⁴³, Matti Adam¹¹, Vicenç Serra⁴⁴, Rui Campante Teles⁴⁵, Didier Champagnac⁴⁶, Alessandro Iadanza⁴⁷, Piotr Chodor⁴⁸, Holger Eggebrecht⁴⁹, Robert Welsh⁵⁰, Adriano Caixeta⁵¹, Stefano Salizzoni⁵², Antonio Dager⁵³, Vincent Auffret⁵⁴, Asim Cheema⁵⁵, Timm Ubben⁵⁶, Marco Ancona¹⁵, Tanja Rudolph¹, Jan Gummert¹, Elaine Tseng⁵⁷, Stephane Noble⁵⁸, Matjaz Bunc⁵⁹, David Roberts⁶⁰, Malek Kass⁶¹, Anuj Gupta⁶², Martin B. Leon⁶³, and Danny Dvir^{64,65*}



A Mechanism of surgical valve failure



No. at risk by type of valve failure

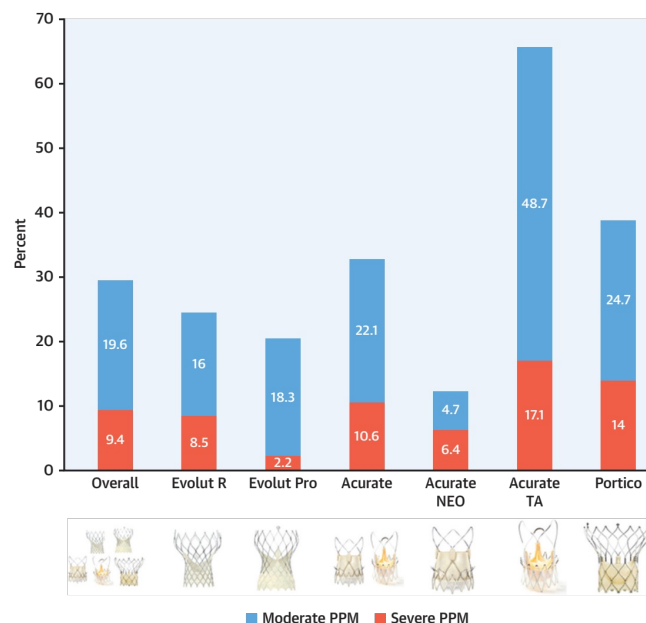
Stenosis	181	112	98	91	86
Regurgitation	139	92	84	78	76
Combined	139	85	76	68	66

Transcatheter Self-Expandable Valve Implantation for Aortic Stenosis in Small Aortic Annuli

The TAVI-SMALL Registry

Damiano Regazzoli, MD,^{a,*} Mauro Chiarito, MD,^{a,b,*} Francesco Cannata, MD,^{a,b} Matteo Pagnesi, MD,^c Mizuki Miura, MD,^d Francesca Ziviello, MD,^e Andrea Picci, MD,^f Jörg Reifart, MD,^g Federico De Marco, MD,^h Francesco Bedogni, MD,^h Marianna Adamo, MD,ⁱ Salvatore Curello, MD,ⁱ Rui Teles, MD,^j Maurizio Taramasso, MD,^d Marco Barbanti, MD,^f Corrado Tamburino, MD,^f Giulio G. Stefanini, MD, PhD,^{a,b} Antonio Mangieri, MD,^{c,k} Francesco Giannini, MD,^{c,k} Paolo A. Pagnotta, MD,^a Francesco Maisano, MD,^d Won-Keun Kim, MD,^g Nicolas M. Van Mieghem, MD, PhD,^e Antonio Colombo, MD,^{c,k} Bernhard Reimers, MD,^a Azeem Latib, MD,^{c,l} on behalf of the TAVI-SMALL Investigators

CENTRAL ILLUSTRATION Moderate and Severe Prosthesis-Patient Mismatch in Patients With Aortic Stenosis and Small Aortic Annuli Treated With Self-Expandable Valves



9 centres
2011-18

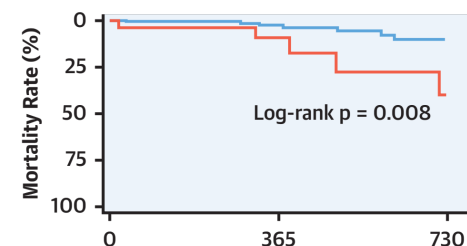
A < 400 mm²
P < 72 mm

< 859 pts
* 445 pts >

Predictors and Clinical Impact of Prosthesis-Patient Mismatch After Self-Expandable TAVR in Small Annuli

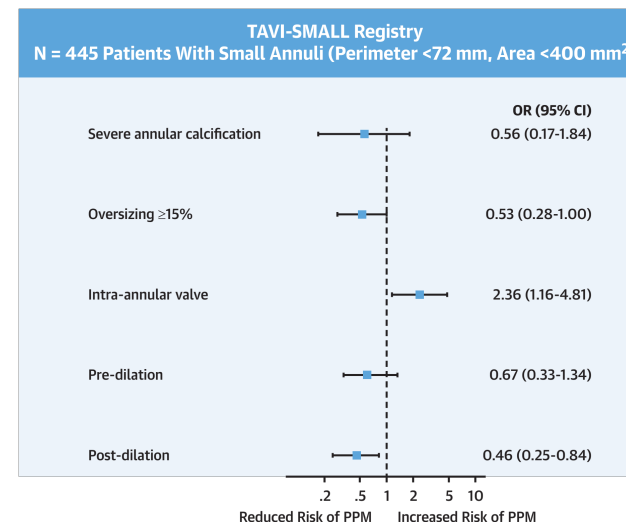
subsets and outcomes

Pier Pasquale Leone, MD,^{a,b,*} Damiano Regazzoli, MD,^{b,*} Matteo Pagnesi, MD,^c Jorge Sanz-Sanchez, MD, PhD,^b Mauro Chiarito, MD,^{a,b} Francesco Cannata, MD,^{a,b} Nicolas M. Van Mieghem, MD, PhD,^d Marco Barbanti, MD,^e Corrado Tamburino, MD,^e Rui Teles, MD,^f Marianna Adamo, MD,^g Mizuki Miura, MD, PhD,^h Francesco Maisano, MD,^h Won-Keun Kim, MD,ⁱ Francesco Bedogni, MD,^j Giulio Stefanini, MD, PhD, MSc,^{a,b} Antonio Mangieri, MD,^k Francesco Giannini, MD,^k Antonio Colombo, MD,^{b,k} Bernhard Reimers, MD,^b Azeem Latib, MB BCh,^l on behalf of the TAVI-SMALL Investigators



No. at risk:			
Days Since Procedure			
Severe PPM	42	17	4
No PPM	316	91	24

— No PPM — Severe PPM



6. the heart valves spectrum



Technicalities

Disparities

AORTIC

MITRAL

TRICUSPID

PVL

**Septal
ablation**

ACHD

VSD

ASD

PFO

LAAO

PTE

left atrial appendage occlusion (LAAO)

atrial septal defect (ASD) closure

patent foramen ovale (PFO) closure

pulmonary embolism thrombectomy (PTE)

percutaneous paravalvular leaks (PVL) closure

septal ablation for hypertrophic obstructive cardiomyopathy

ventricular septal defect (VSD) closure

transcatheter interventions in grown-up congenital heart (GUCH) disease

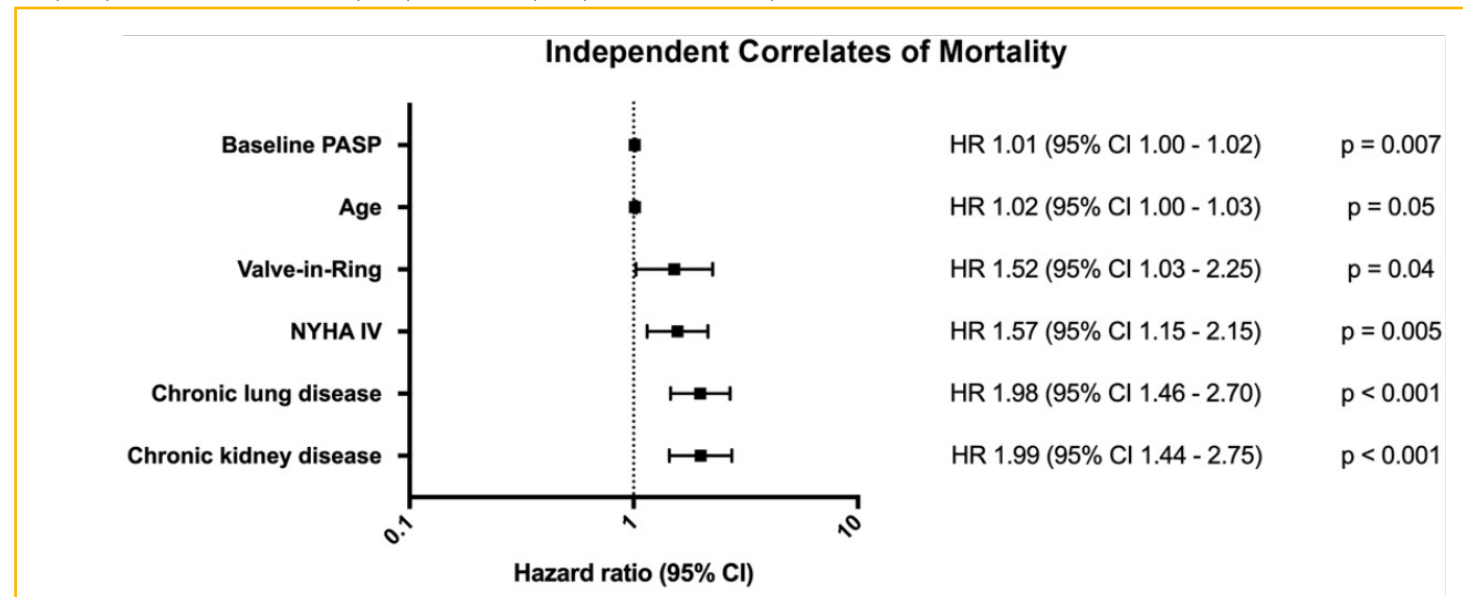
Transcatheter Mitral Valve Replacement After Surgical Repair or Replacement

Comprehensive Midterm Evaluation of Valve-in-Valve and Valve-in-Ring Implantation From the VIVID Registry

the heart valves spectrum

Matheus Simonato, MD; Brian Whisenant, MD; Henrique Barbosa Ribeiro, MD; Anna Sonia Petronio, MD; Abdelhakim Allali^{1b}, MD; Didier Champagnac, MD; John G. Webb, MD; Ran Kornowski, MD; Mayra Guerrero, MD; Harindra MD; Sabine Bleiziffer, MD; Tanja Rudolph, MD; Alessandro Iadanza^{1b}, MD; Ste-Wijeyundera, MD; Lars Søndergaard, MD; Ole De Backer^{1b}, MD; Pedro fano Salizzoni^{1b}, MD; Marco Agrifoglio, MD; Luis Nombela-Franco, MD; Niko-Villablanca, MD; Charanjit Rihal, MD; Mackram Eleid^{1b}, MD; Jörg Kempfert, MD; laos Bonaros, MD; Malek Kass, MD; Giuseppe Bruschi, MD; Nicolas Amabile, MD; Axel Unbehau, MD; Magdalena Erlebach, MD; Filip Casselman, MD; MD; Adnan Chhatriwalla^{1b}, MD; Antonio Messina^{1b}, MD; Sameer A. Hirji, MD; Matti Adam, MD; Matteo Montorfano, MD; Marco Ancona^{1b}, MD; Francesco MD, MPH; Martin Andreas, MD; Robert Welsh, MD; Wolfgang Schoels, MD; Saia, MD; Timm Ubben, MD; Felix Meincke, MD; Massimo Napodano, MD; Farrel Hellig, MD; Stephan Windecker^{1b}, MD; Stefan Stortecky, MD; Francesco Maisano, MD; Gregg W. Stone, MD; Danny Dvir^{1b}, MD

90 centres
2006-20
1.079 pts
857 ViV | 222 ViR



Na cauda do cometa. Limitações para implantação de válvulas aórticas percutâneas transcâter em Portugal

Trailing behind: Limitations on transcatheter aortic valve implantation in Portugal

Rui Campante Teles

2013

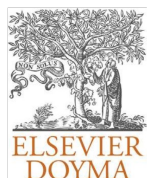
“A momentary lapse of opinion”: The reader should be aware of the iatrogenic potential of this publication

«Um lapso de opinião momentâneo»: O leitor deve estar consciente do potencial iatrogénico desta publicação

Rui Campante Teles^{a,b,c}

2020

the heart valves spectrum



Revista Portuguesa de
Cardiologia
Portuguese Journal of **Cardiology**
www.revportcardiol.org



POSITION STATEMENT

Position statement on transcatheter aortic valve implantation in Portugal[☆]

Rui Campante Teles^{a,*}, Vasco Gama Ribeiro^b, Lino Patrício^c, José Pedro Neves^d, Luís Vouga^e, José Fragata^f, Manuel Almeida^a, Pedro Braga^b, Duarte Cacela^c, Miguel Abecasis^d, Pedro Canas da Silva^g, Helder Pereira^h

Position statement on transcatheter aortic valve implantation in Portugal

803

Table 1 European Society of Cardiology/European Association for Cardio-Thoracic Surgery guidelines for the use of TAVI according to class of recommendation and level of evidence.³

ESC/EACTS recommendation	Class of recommendation	Level of evidence	Reference
TAVI should only be undertaken with a multidisciplinary 'heart team' including cardiologists and cardiac surgeons and other specialists if necessary.	I	C	
TAVI should only be performed in hospitals with cardiac surgery on-site.	I	C	
TAVI is indicated in patients with severe symptomatic aortic stenosis who are not suitable for SAVR and who are likely to gain improvement in their quality of life and to have a life expectancy of more than one year after consideration of their comorbidities.	I	B	7
TAVI should be considered in high-risk patients with severe symptomatic aortic stenosis who may still be suitable for surgery, but in whom TAVI is favored by a heart team based on the individual risk profile and anatomic suitability.	Ila	B	19

SAVR: surgical aortic valve replacement; TAVI: transcatheter aortic valve implantation.

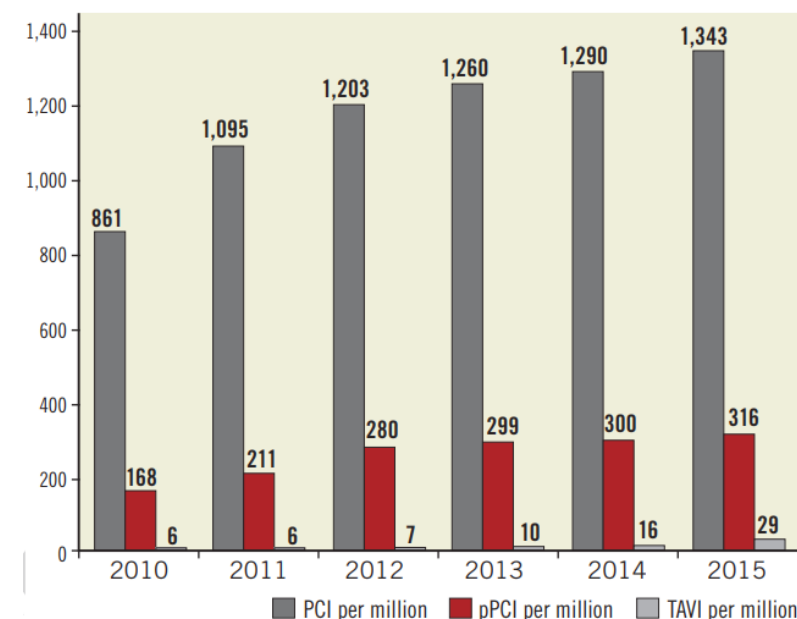
PORTUGUESE ASSOCIATION OF CARDIOVASCULAR INTERVENTION



Portugal: coronary and structural heart interventions from 2010 to 2015

Rui Campante Teles^{1,2*}, MD; Gustavo Pires-Morais^{2,3}, MD; Pedro Canas da Silva⁴, MD; Rui Cruz Ferreira⁵, MD; Manuel de Sousa Almeida¹, MD; Filipe Seixo⁶, MD; Marco Costa⁷, MD; Vasco Gama Ribeiro³, MD; Jorge Marques⁸, MD; João Carlos Silva⁹, MD; Helder Pereira¹⁰, MD; Pedro Farto e Abreu¹¹, MD; Henrique Carvalho¹², PhD; Eduardo Infante de Oliveira^{2,4}, MD; on behalf of the Registo Nacional de Cardiologia de Intervenção (RNCI) investigators

EuroIntervention 2017;13:255-258



7. interventional devices

18 centres
2019
286 pts



Transcatheter Aortic Valve Replacement With the LOTUS Edge System

Early European Experience

Xavier Armario, MD,^a Liesbeth Rosseel, MD,^a Rajesh Kharbanda, MD, PhD,^b Saib Khogali, MD,^c Mohamed Abdel-Wahab, MD,^d Nicolas M. Van Mieghem, MD, PhD,^e Didier Tchétché, MD,^f Nicolas Dumonteil, MD,^f Ole De Backer, MD, PhD,^g James Cotton, MD,^h Brian McGrath, MB BCh,^a Deepu Balakrishnan, MD,^c Noman Ali, MD, PhD,^h Serdar Farhan, MD,^d Jubin Joseph, MD, PhD,^b Gaetan Charbonnier, MD,^f Taishi Okuno, MD,ⁱ Fiachra McHugh, MD,^a David Hildick-Smith, MD,^j Nicole Gilgen, MD,^k Thijmen Hokken, MD,^e Mark S. Spence, MD,^l Christian Frerker, MD,^m Marco Angelillis, MD,ⁿ Marek Grygier, MD,^o James Cockburn, MD,^j Henrik Bjursten, MD,^p Raban V. Jeger, MD,^k Rui Teles, MD,^{qr} Anna S. Petronio, MD,ⁿ Thomas Pilgrim, MD,ⁱ Jan-Malte Sinning, MD,^s Georg Nickenig, MD,^a Lars Søndergaard, MD,^g Daniel J. Blackman, MD,^h Darren Mylotte, MB BCh, MD, PhD^{a,t}

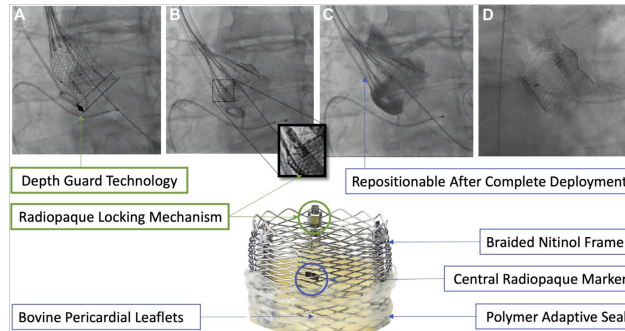


TABLE 5 Clinical Outcomes at 30 Days

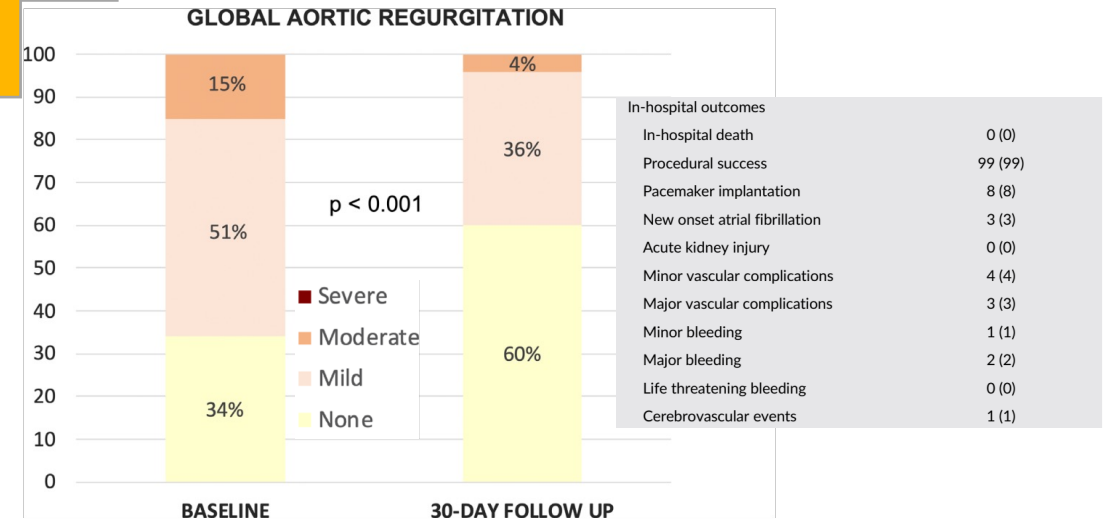
	All Patients (N = 286)	Noncomplex Anatomy (n = 149)	Complex Anatomy (n = 137)	p Value
Mortality	7 (2.4)	3 (2.0)	4 (2.9)	0.62
Cardiovascular	6 (2.1)	3 (2.0)	3 (2.2)	0.92
Noncardiovascular	1 (0.3)	0 (0.0)	1 (0.7)	0.30
Stroke	10 (3.5)	6 (4.0)	4 (2.9)	0.61
Nondisabling	7 (2.4)	4 (2.7)	2 (1.5)	0.47
Disabling	3 (1.0)	2 (1.3)	2 (1.5)	0.93
Myocardial infarction	1 (0.3)	0 (0.0)	1 (0.7)	0.30
Clinical valve thrombosis	3 (1.0)	0 (0.0)	3 (2.2)	0.07
Valve endocarditis	0 (0.0)	0 (0.0)	0 (0.0)	—
Repeated procedure for valve-related dysfunction	0 (0.0)	0 (0.0)	0 (0.0)	—
New PPM implantation	74 (25.9)	49 (32.9)	25 (18.2)	0.005
Among PPM-naïve patients	74 (30.8)	49 (37.1)	25 (23.1)	0.02
NYHA functional class III or IV (n = 250)	30 (12.0)	18 (13.4)	12 (10.3)	0.45
Aortic valve area, cm ²	1.9 ± 0.9	1.8 ± 0.5	2.0 ± 1.3	0.25
Mean transvalvular gradient, mm Hg	11.9 ± 5.7	11.4 ± 6.0	12.6 ± 5.3	0.11
Paravalvular leak (n = 250)				
None or trace	211 (84.4)	116 (84.7)	95 (84.1)	0.90
Mild	34 (13.6)	16 (11.7)	18 (15.9)	0.33
Moderate	5 (2.0)	5 (3.6)	0 (0.0)	0.04
Severe	0 (0.0)	0 (0.0)	0 (0.0)	—

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interventional devices

Next-generation balloon-expandable Myval transcatheter heart valve in low-risk aortic stenosis patients

Mario García-Gómez MD¹ | Jose Raúl Delgado-Arana MD¹ | Jonathan Halim MD² | Federico De Marco MD³ | Carlo Trani MD⁴ | Pedro Martin MD⁵ | Kim Won-Keun MD⁶ | Matteo Montorfano MD⁷ | Peter den Heijer MD² | Francesco Bedogni MD³ | Gennaro Sardella MD⁸ | Alexander J. J. IJsselmuiden MD² | Rui Campante Teles MD⁹ | Christian H. Aristizabal-Duque MD¹ | Ximena Gordillo MD¹ | Sandra Santos-Martinez MD¹ | Alejandro Barrero MD¹ | Itziar Gómez-Salvador MSc¹ | Marco Ancona MD⁷ | Alfredo Redondo MD¹ | J. Alberto San Román MD, PhD¹ | Ignacio J. Amat-Santos MD, PhD¹



8. training and certification

2020 EAPCI Core Curriculum for Percutaneous Cardiovascular Interventions

Eric Van Belle^{1*}, MD, PhD; Rui C. Teles², MD; Stylianos A. Pyxaras³, MD; Oliver Kalpak⁴, MD; Thomas Johnson⁵, BSc, MBBS, MD, FRCP; Israel Moshe Barbash⁶, MD; Giuseppe De Luca⁷, MD; Jorgo Kostov⁴, MD; Radoslaw Parma⁸, MD, PhD; Flavien Vincent¹, MD; Salvatore Brugaletta⁹, MD, PhD; Nicolas Debry¹, MD; Gabor G. Toth¹⁰, MD, PhD; Ziyad Ghazzal¹¹, MD; Pierre Deharo¹², MD; Dejan Milasinovic¹³, MD; Klaus Kaspar¹⁴, MD; Francesco Saia¹⁵, MD, PhD; Josepa Mauri¹⁶, MD; Jürgen Kammler¹⁷, MD; Douglas Muir¹⁸, MD; Stephen O'Connor¹⁹, MD; Julinda Mehilli²⁰, MD; Holger Thiele²¹, MD; Daniel Weilenmann²², MD; Nils Witt²³, MD; Francis Joshi²⁴, MD; Rajesh Kharbanda²⁵, MD; Zsolt Piroth²⁶, MD; Wojciech Wojakowski⁸, MD; Alexander Geppert²⁷, MD; Giuseppe Di Gioia²⁸, MD; Gustavo Pires-Morais²⁹, MD; Anna Sonia Petronio³⁰, MD, FESC; Rodrigo Estévez-Loureiro³¹, MD; Zoltan Ruzsa³², MD, PhD; Joelle Kefer³³, MD, PhD; Vijay Kunadian³⁴, MD; Nicolas Van Mieghem³⁵, MD, PhD; Stephan Windecker³⁶, MD; Andreas Baumbach³⁷, MD, FESC; Michael Haude³⁸, MD; Dariusz Dudek³⁹, MD, PhD; Committee for Education and Training of the European Association of Percutaneous Cardiovascular Interventions (EAPCI), a branch of the European Society of Cardiology

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training and certification



Table 3. Level of competence translating into interventional cardiology skills.

Technique	Description of competence	Level of competence
Peripheral venous access	Performance as first operator and teaching/supervision to more junior colleagues	V
Radial access	Performance as first operator and teaching/supervision to more junior colleagues	V
Femoral access <10 Fr	Performance as first operator and teaching/supervision to more junior colleagues	V
Femoral access ≥10 Fr	Performance with reactive supervision, i.e., on request and quickly available	III
Closure devices <9 Fr	Performance as first operator and teaching/supervision to more junior colleagues	V
Closure devices ≥9 Fr	Performance with reactive supervision, i.e., on request and quickly available	III
Interpretation of multislice CT for TAVI	Performance as second operator and/or with direct, proactive supervision	II
TAVI	Performance as second operator and/or with direct, proactive supervision	II

Conclusions



Basic research

Patient management

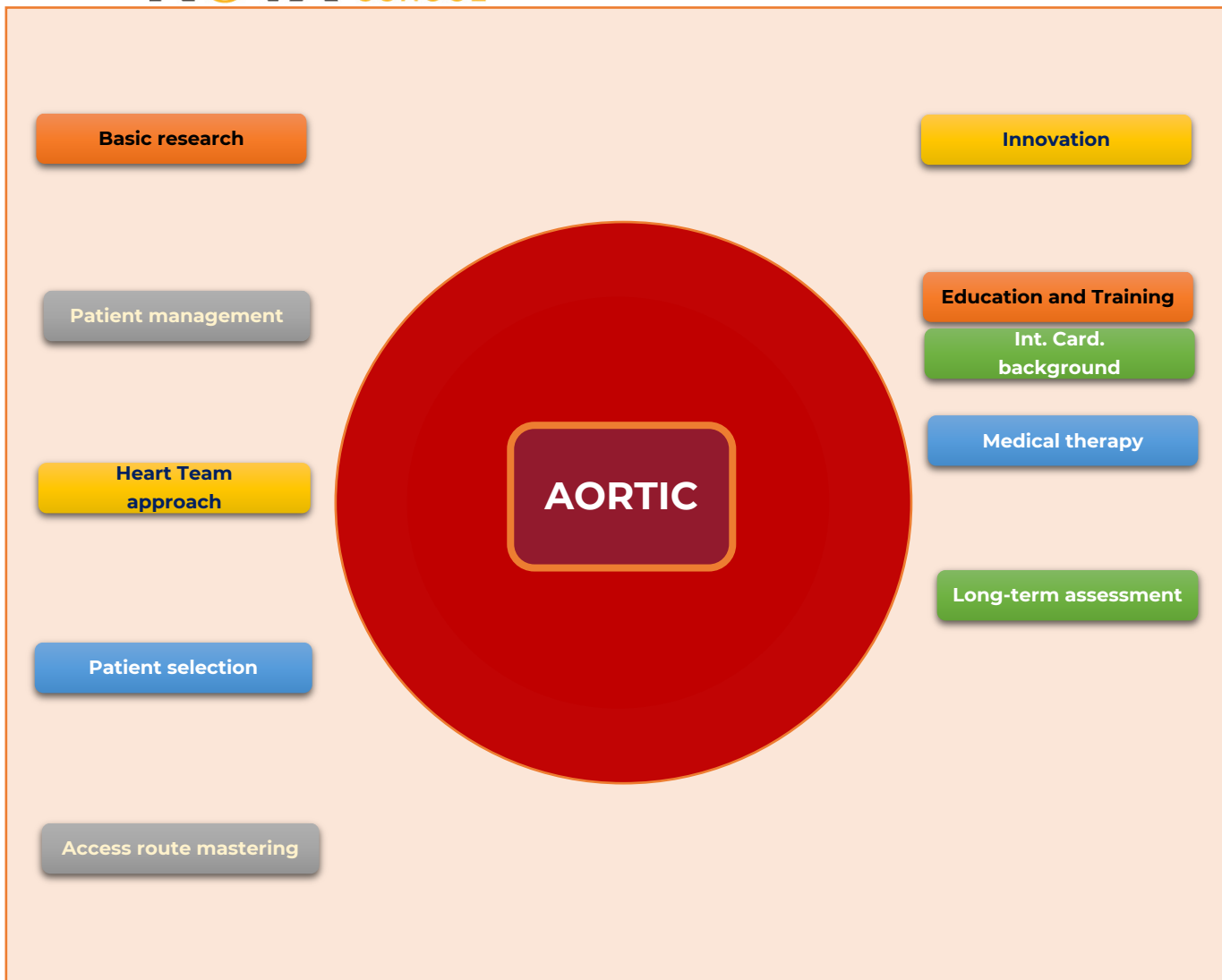
Heart Team
approach

Patient selection

Access route mastering

Conclusions

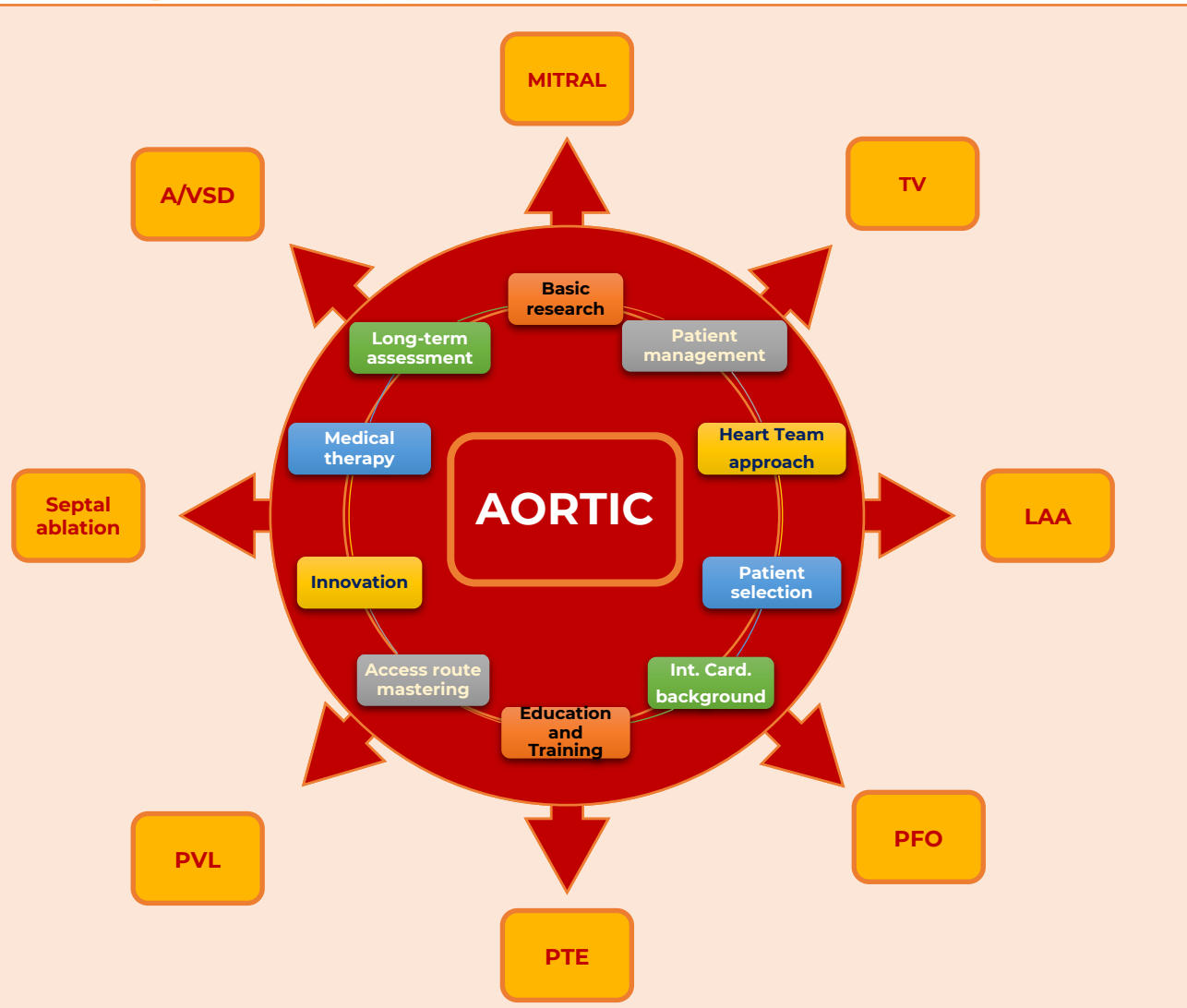
1. **Basic research** plays a role
2. **A comprehensive stratification** is essential.
3. **The multidisciplinary team** remains the assessment pillar
4. **Periprocedural results** are influenced by distinct subsets
5. **Access routes** have a major impact



Conclusions

6. **Device iteration** is critical and endless
7. **SHD education and training** should be planned in a solid IC background
8. **Valve thrombosis and cerebral ischemic events** remain a challenge
9. **Long-term assessment of patient outcomes** is essential

Conclusions



The transcatheter aortic valve interventions became a reference model that intersected and changed the entire cardiology spectrum

In a gentle way, you can shake the world

Mahatma Gandhi



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The cardiac surgeons

The imaging specialists

The anesthesiologists

All cardiologists

Nurses

Technicians

Allied Professionals

Research Department