

**Erasmus MC**

University Medical Center Rotterdam



# **Aortic valve surgery**

## **Are all solutions perfect?**

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Dept. Cardio-thoracic Surgery

Erasmus MC

**Reconstruction of the Aortic Valve and Root: A practical approach**

Homburg, 10 June 2022

# Conflicts of interest

- My institution receives speaking fees from Edwards for my speaking engagements
- None?



# The perfect valve from a patient perspective

- Implanted minimally invasive
- No scar, no pain
- Discharged by dinner time
  
- Lasts a lifetime
- Comes with a great life expectancy
- Allows for living life to the fullest
- No more doctor visits or tests needed
- Uncomplicated pregnancies
- .....?

# Is there a best / perfect heart valve prosthesis?

- Malcolm Gladwell (author of Blink):

*“There is no perfect spaghetti sauce,  
there are only perfect spaghetti sauces”*



Classic Italian  
Sauces



Chunky Garden  
Italian Sauces



Organic Italian  
Sauces



Heart Smart  
Italian Sauces

# Recommendations for prosthetic valve selection (1)

Recommendations	Class	Level
<b><i>Mechanical prostheses</i></b>		
A mechanical prosthesis is recommended according to the desire of the informed patient and if there are no contraindications to long-term anticoagulation.*	I	C
A mechanical prosthesis is recommended in patients at risk of accelerated SVD.**	I	C
A mechanical prosthesis should be considered in patients already on anticoagulation because of a mechanical prosthesis in another valve position.	IIa	C

\* Increased bleeding risk because of comorbidities, adherence concerns or geographic, lifestyle or occupational conditions.

\*\* Young age (<40 years), hyperparathyroidism, haemodialysis.

## Recommendations for prosthetic valve selection (2)

Recommendations	Class	Level
<b><i>Mechanical prostheses (continued)</i></b>		
A mechanical prosthesis should be considered in patients aged <60 years for prostheses in the aortic position and aged <65 years for prostheses in the mitral position.*	<b>IIa</b>	<b>C</b>
A mechanical prosthesis should be considered in patients with a reasonable life expectancy for whom future redo valve surgery or TAVI (if appropriate) would be at high risk.**	<b>IIa</b>	<b>B</b>
A mechanical prosthesis may be considered in patients already on long-term anticoagulation due to the high risk for thromboembolism.**	<b>IIb</b>	<b>C</b>

\* In patients 60–65 years of age who should receive an aortic prosthesis and those between 65 and 70 years of age in the case of mitral prosthesis, both valves are acceptable and the choice requires careful analysis of factors other than age.

\*\* Risk factors for thromboembolism are AF, previous unprovoked proximal deep venous thromboembolism and/or symptomatic pulmonary embolism, hypercoagulable state, antiphospholipid antibody.



## Recommendations for prosthetic valve selection (3)

Recommendations	Class	Level
<b><i>Biological prostheses</i></b>		
A bioprosthesis is recommended according to the desire of the informed patient.	I	C
A bioprosthesis is recommended when good-quality anticoagulation is unlikely (adherence problems, not readily available), contraindicated because of high bleeding risk (previous major bleed, comorbidities, unwillingness, adherence problems, lifestyle, occupation) and in those patients whose life expectancy is lower than the presumed durability of the bioprosthesis.*	I	C
A bioprosthesis is recommended in case of reoperation for mechanical valve thrombosis despite good long-term anticoagulant control.	I	C

\* Life expectancy should be estimated at >10 years according to age, sex, comorbidities, and country-specific life expectancy.

## Recommendations for prosthetic valve selection (4)

Recommendations	Class	Level
<b><i>Biological prostheses (continued)</i></b>		
A bioprosthesis should be considered in patients for whom there is a low likelihood and/or a low operative risk of future redo valve surgery.	<b>IIa</b>	<b>C</b>
A bioprosthesis should be considered in young women contemplating pregnancy.	<b>IIa</b>	<b>C</b>
A bioprosthesis should be considered in patients aged >65 years for a prosthesis in the aortic position or aged >70 years in a mitral position.	<b>IIa</b>	<b>C</b>
A bioprosthesis may be considered in patients already on long-term NOACs due to the high risk for thromboembolism.	<b>IIb</b>	<b>B</b>



## VHD Guidelines 2021: Evidence-based?

- Selected experts in the field undertook a **comprehensive review** of the published evidence for management of a given condition according to ESC Clinical Practice Guidelines Committee

### ESC Levels of evidence



Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small retrospective studies, registries.

**15 Gaps in evidence**

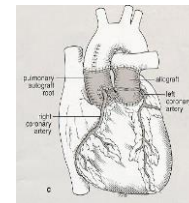
©ESC/EACTS

## VHD Guidelines 2020/2021: All treatment options considered?

Valve replacement is the standard procedure in the majority of patients with aortic regurgitation. Aortic valve-sparing root replacement and valve repair yield good long-term results in selected patients, with low rates of valve-related events as well as good quality of life<sup>131–140</sup> when performed in experienced centres. Aortic valve-sparing root replacement is recommended in younger patients who have an enlargement of the aortic root with normal cusp motion, when performed by experienced surgeons.<sup>133–136,140</sup> In selected patients, aortic valve repair<sup>132,132,137</sup> or the Ross procedure<sup>138,139</sup> may be an alternative to valve replacement, when performed by experienced surgeons.

## Is there a risk in avoiding risk for younger patients with aortic valve disease?





Tom Treasure, Asif Hasan, and Magdi Yacoub argue that a culture of risk avoidance in cardiac surgery may mean patients are not getting the most appropriate treatment



### Taking the long view on risk

Even if meticulous analysis of what we know already defines a type of patient for whom this operation offers the best life time strategy, there would still be obstacles to implementation. Risk avoidance among surgeons is already thought to block the route to cardiac surgery for some adult patients when an operation might be in their best interests. In the case of the Ross operation, intolerance of even a small increase in immediate risk could impede access to a better long term solution for these patients. Cardiac surgeons have achieved remarkable reductions

## Risks of current heart valve substitutes in younger adult patients with aortic valve disease




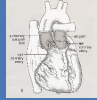
	Mechanical AVR 	Bioprosthetic AVR 	AV repair 	Ross 
Early mortality	3.9%	3.3%	2.6%	2.1%
Late mortality	1.9%/yr	2.4%/yr	1.3%/yr	0.6%/yr

European Heart Journal (2017) 0, 1–8  
 doi:10.1093/eurheartj/ehx199

Circ CVQO 2019

Ann Cardiothorac Surg 2013;2(1):3-9 Circ CVQO 2018

## Risks of current heart valve substitutes in younger adult patients with aortic valve disease

	Mechanical AVR 	Bioprosthetic AVR 	AV repair 	Ross 
Early mortality	3.9%	3.3%	2.6%	2.1%
Late mortality	1.9%/yr	2.4%/yr	1.3%/yr	0.6%/yr
Reop	0.6%/yr	1.8%/yr	2.4%/yr	0.8 + 5%/yr
TE	1.0%/yr	0.2%/yr	0.2%/yr	0.12%/yr
Bleeding	0.8%/yr	0.2%/yr	0.0%/yr	0.14%/yr



**APPLIES ONLY TO COUNTRIES WITH EXCELLENT HEALTH CARE SYSTEM!**

European Heart Journal (2017) 0, 1–8  
doi:10.1093/eurheartj/ehx199

Circ CVQO 2019

Ann Cardiothorac Surg 2013;2(1):3-9 Circ CVQO 2018

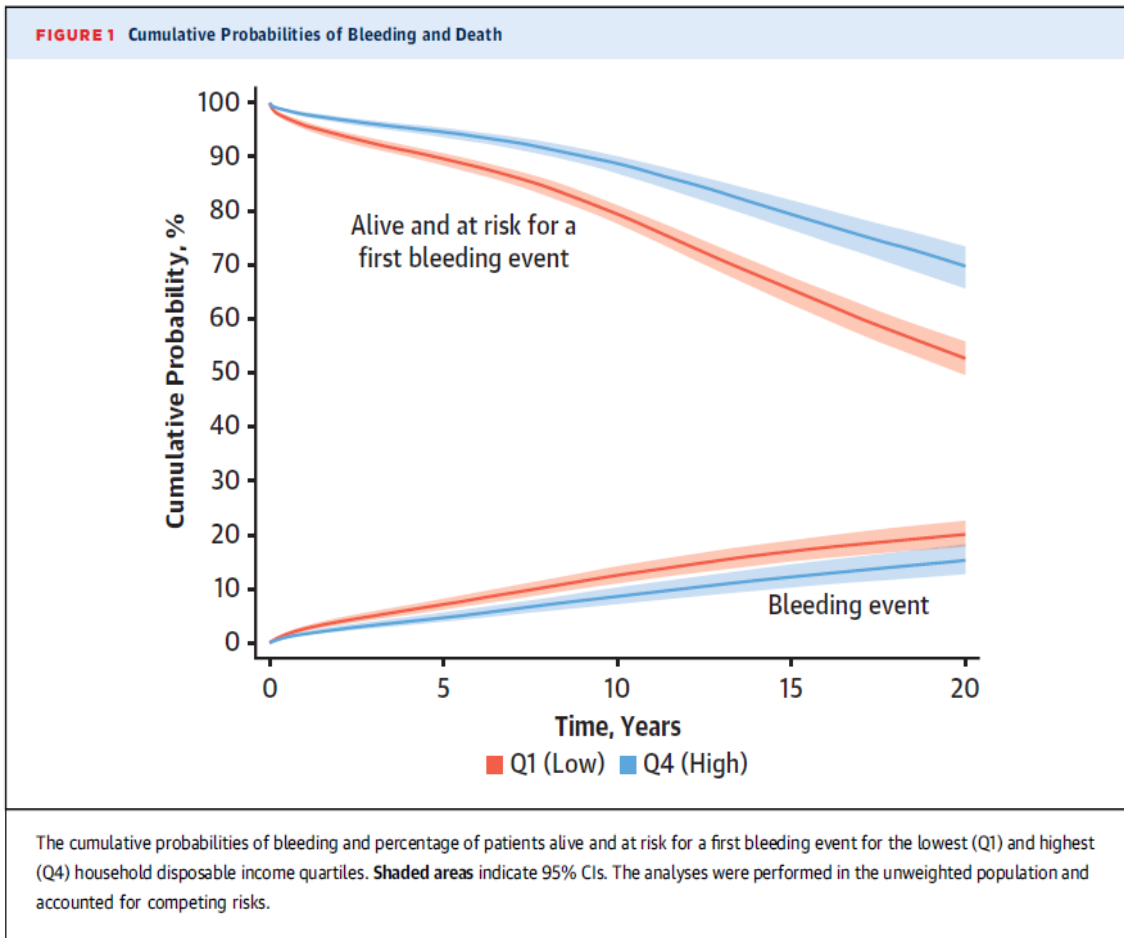
# Late risks in non-elderly adults after AR surgery

	Bentall 	VS ARR 
Late mortality	2.0%/yr	1.5%/yr
Reop	0.5%/yr	1.3%/yr
TE	0.8%/yr	0.4%/yr
Bleeding	0.6%/yr	0.2%/yr

(Ann Thorac Surg 2016;■:■-■)  
 (Ann Thorac Surg 2015;100:1126-31)

# Socioeconomic Status and Risk of Bleeding After Mechanical Aortic Valve Replacement

Magnus Dalén, MD, PhD,<sup>a,b</sup> Michael Persson, MD,<sup>a,b</sup> Natalie Glaser, MD, PhD,<sup>b,c</sup> Ulrik Sartipy, MD, PhD<sup>a,b</sup>

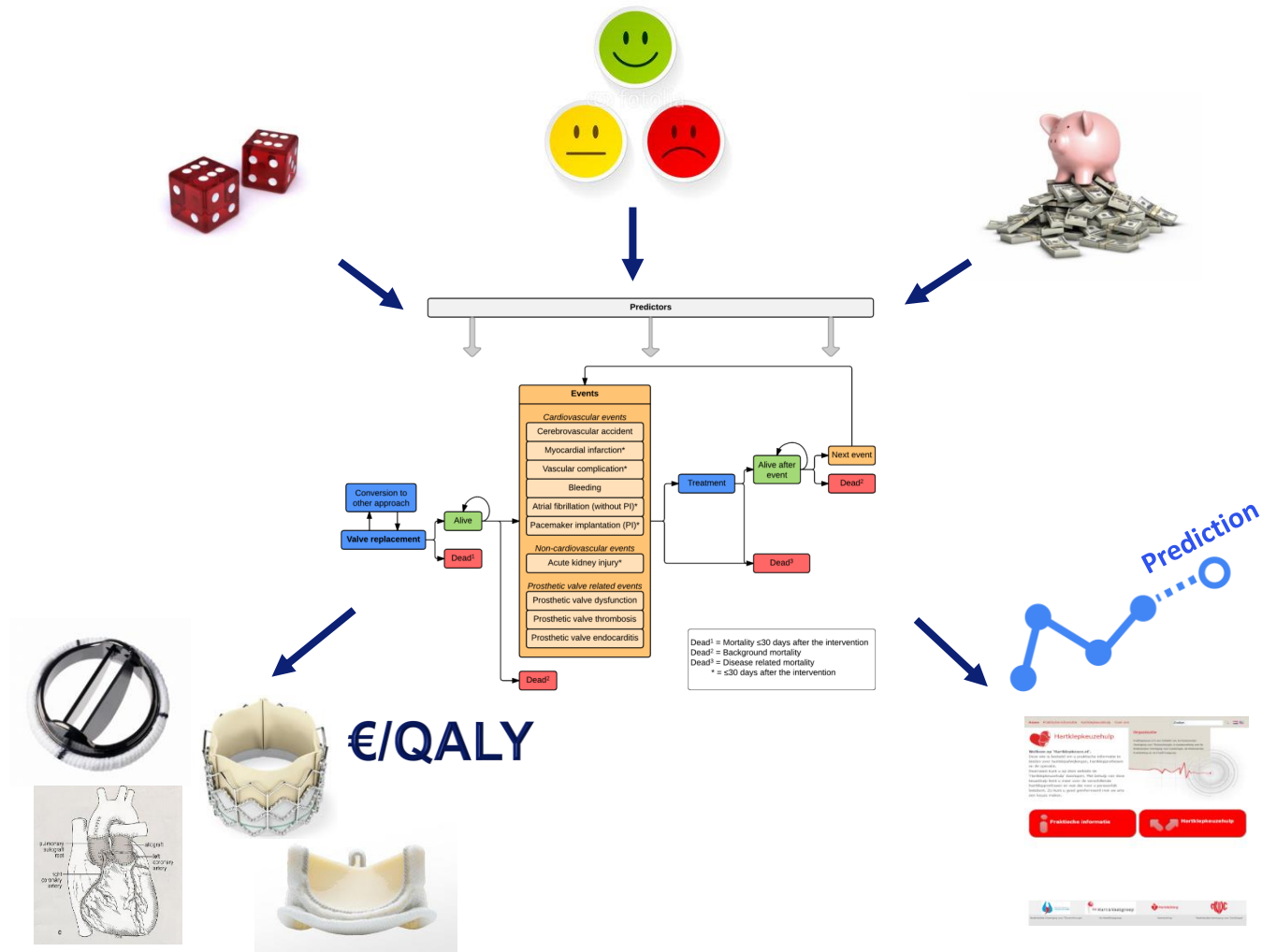




# Quality of life after aortic valve surgery: Replacement versus reconstruction

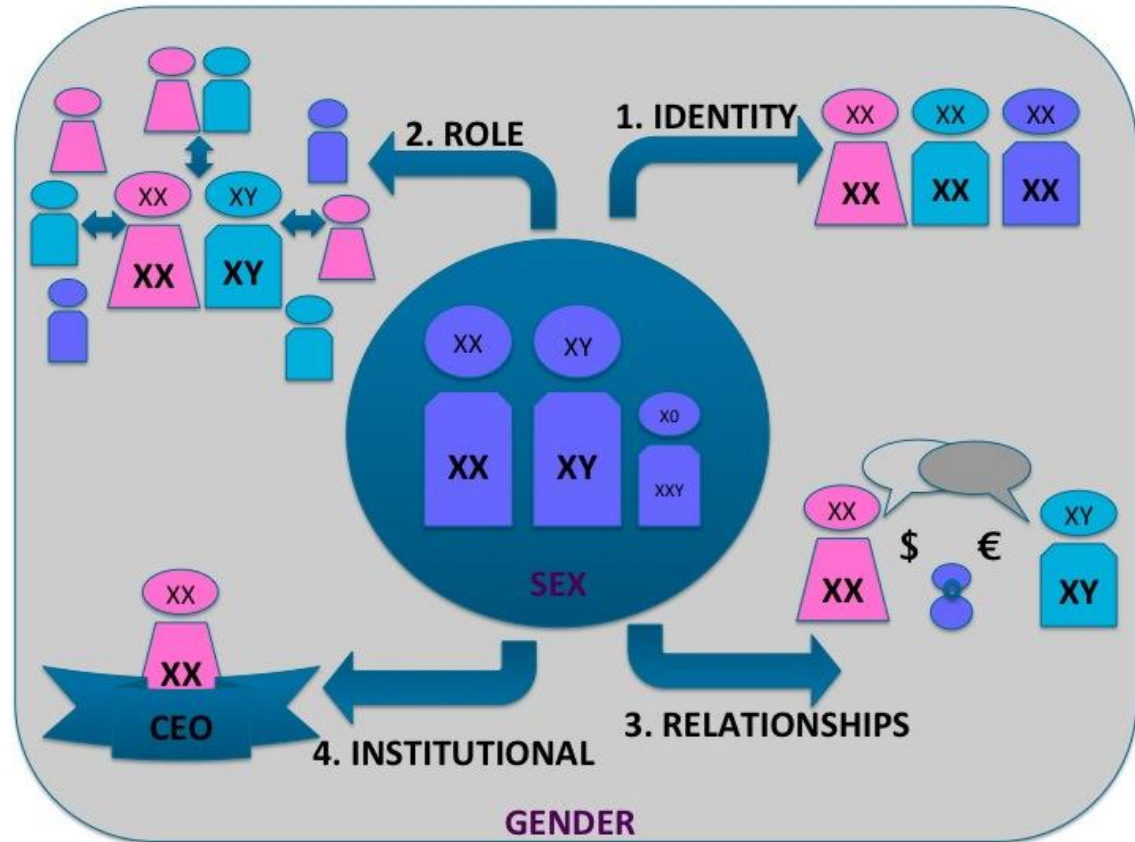
Diana Aicher, MD,<sup>a</sup> Annika Holz,<sup>a</sup> Susanne Feldner, MD,<sup>a</sup> Volker Köllner, MD,<sup>b</sup> and Hans-Joachim Schäfers, MD<sup>a</sup>

- AV repair/Ross vs mechanical AVR associated with:
  - Better physical functioning, general and mental health
  - Less bothered by valve sound
  - Less bothered by doctor visits and blood tests
  - Less concerned about possible bleeding
  - Surprisingly: slightly less worried about possible valve failure



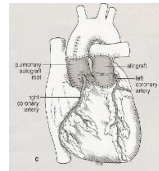
## Sex and gender considerations

- Biologic:
  - Pregnancy
  - Life expectancy
  - .....
- Socio-cultural:
  - Life style
  - Work
  - SES

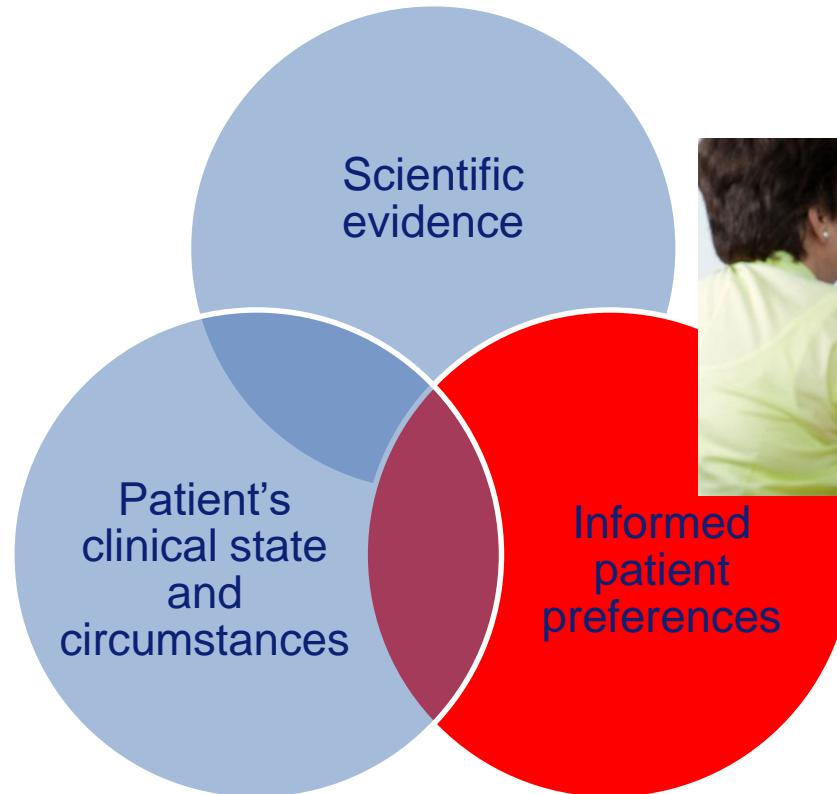


## Age considerations (and geography)

- Age <60 =
  - 0-18 years: somatic growth, hyperactive lifestyle
  - 18-45 years: reproductive phase, career, active lifestyle
  - 45-60 years: (post) menopause, more sedentary life style



# Optimal clinical decision making

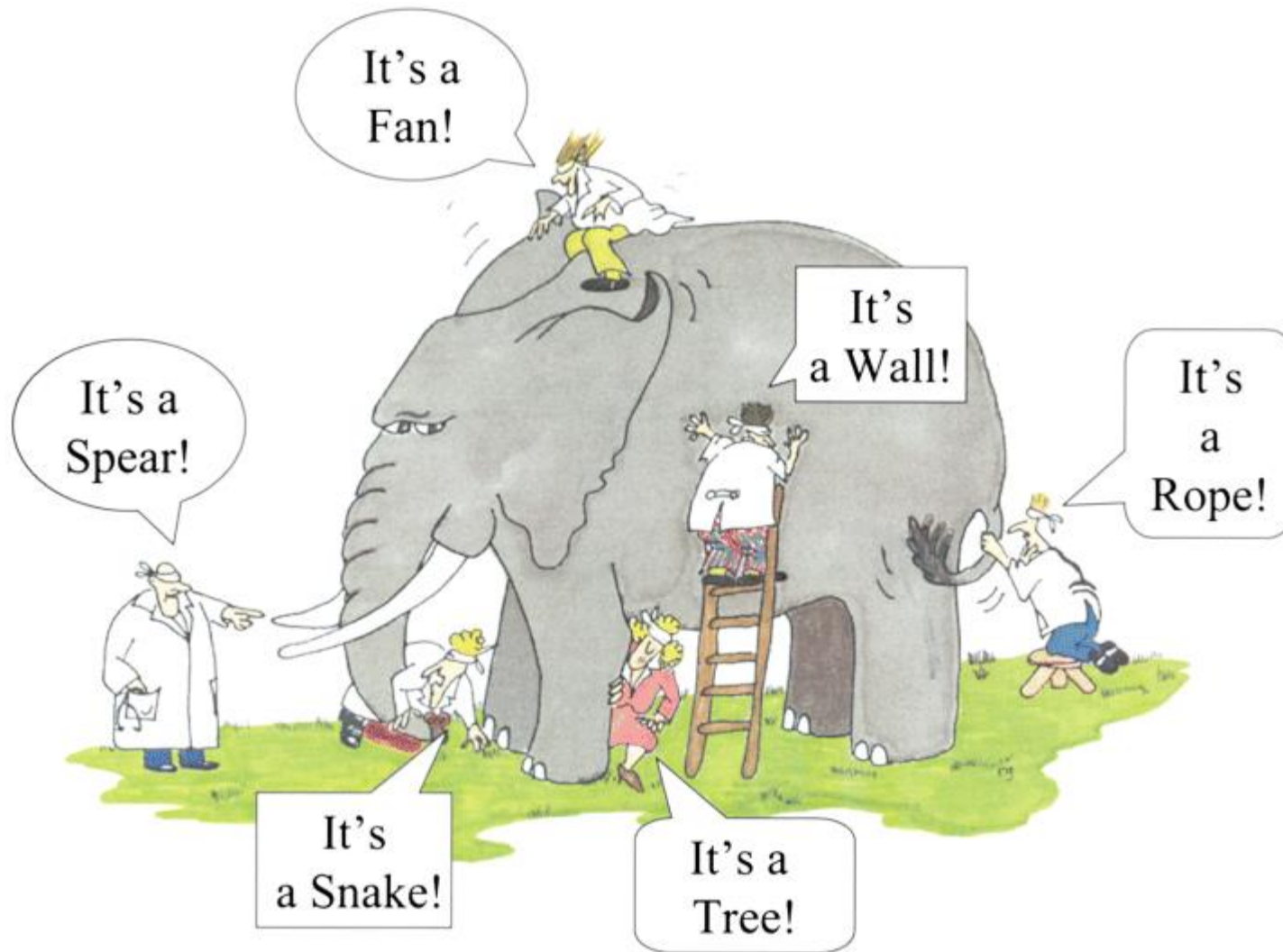


# Patient engagement is here to stay





# Collaborative audit





# From single centre experiences.....

## Results of the Ross operation in a pediatric population<sup>☆</sup>

Mark G. Hazekamp<sup>a,\*</sup>, Heynric B. Grotenhuis<sup>b,c</sup>, Paul H. Schoof<sup>a</sup>, Marie E.B. Rijlaarsdam<sup>b,c</sup>,  
Jaap Ottenkamp<sup>b,c</sup>, Robert A.E. Dion<sup>a</sup>

<sup>a</sup>Department of Cardiothoracic Surgery D6-26, Leiden University Medical Center, 2300 RC Leiden, The Netherlands

<sup>b</sup>Department of Pediatric Cardiology, Leiden University Medical Center, Leiden, The Netherlands

<sup>c</sup>Emma Children's Hospital/AMC, Amsterdam, The Netherlands

Received 21 September 2004; received in revised form 5 January 2005; accepted 12 January 2005; Available online 8 March 2005



## Pediatric Autograft Aortic Root Replacement: A Prospective Follow-Up Study

Johanna J. M. Takkenberg, MD, PhD Arie Pieter Kappetein, MD, PhD,  
Lex A. van Herwerden, MD, PhD, Maarten Witsenburg, MD, PhD,  
Lenny Van Osch-Gevers, MD, PhD, and Ad J. J. C. Bogers, MD, PhD

Departments of Cardiothoracic Surgery and Pediatric Cardiology, Erasmus University Medical Center, Rotterdam, the Netherlands

(Ann Thorac Surg 2005;80:1628–33)

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# From single centre experiences..... To collaborative efforts

## Aortic Valve Insufficiency and Ascending Aorta Aneurysm International Registry

AVIATOR

Diana Aicher, José Aramendi, Jos Bekkers, Eric Bergoend, Alain Berrebi, Joe Bavaria, Michael Borger, Olivier Bouchot, Duke Cameron, Frederiek de Heer, Ruggero De Paulis, Isabella Di Centa, Laurent de Kerchove, Gebrine El Khoury, Jolanda Kluin, Adrian Kolesar, Takashi Kunihara, Jaroslav Hlubocky, Ismail El-Hamamsy, Stéphanie Lejeune, Maciej Matuszewski, Gianclaudio Mecozzi, Wuliya Mijiti, Jan Nijs, Yutaka Okita, Ruggero Paulis, Carlos Porras, Hans-Joachim Schäfers, Igor Rudez, Pallav Shah, Igor Hartzell Schaff, Malakh Shrestha, Johanna Takkenberg, Jean Louis Vanoverschelde, Jan Vojacek, Patrick Yiu, Emmanuel Lansac.



[www.HeartValveSociety.org](http://www.HeartValveSociety.org)  
The  
**Heart Valve Society**

*An International Heart Team. Leaders in  
Evaluation, Management & Research.*

## AVIATOR

## Longitudinal Observational Cohort Study

patients are eligible for the

**Medical registry**

**WHEN:** AR > 1 *and/or*  
Aortic diameter  $\geq$  40 mm

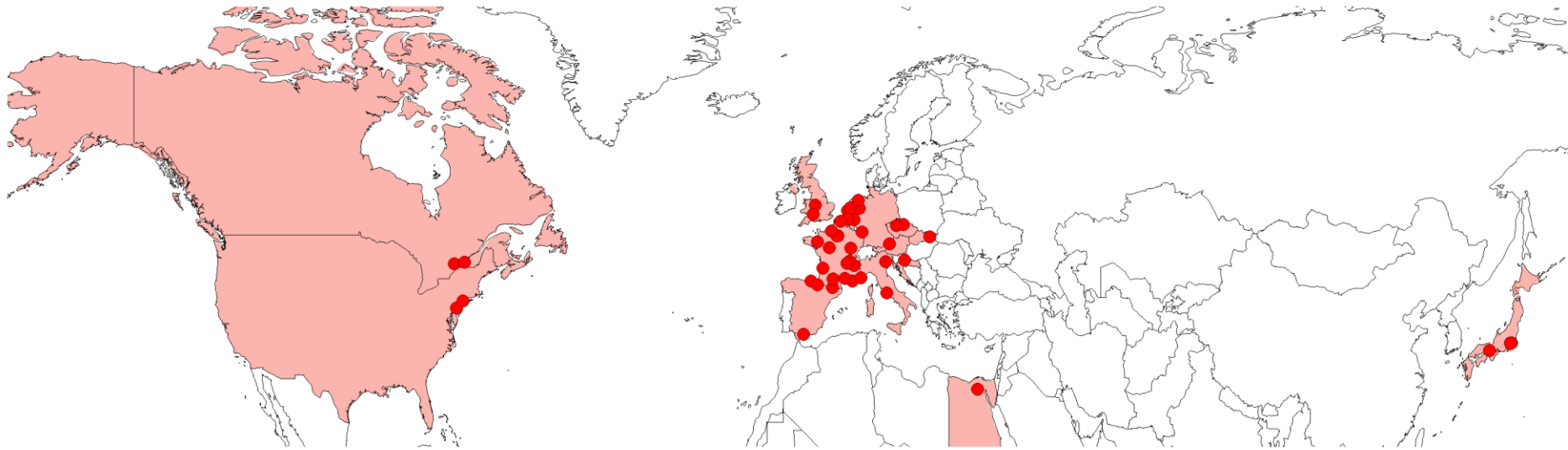
patients are eligible for the

**Surgical registry**

**WHEN:** Operated for  
Isolated Aortic Insufficiency *and/or*  
Ascending Aorta Aneurysm



# Project update



Centers

**45**

Patients

**8756**

ICHOM Set of Patient-Centered Outcome Measures for

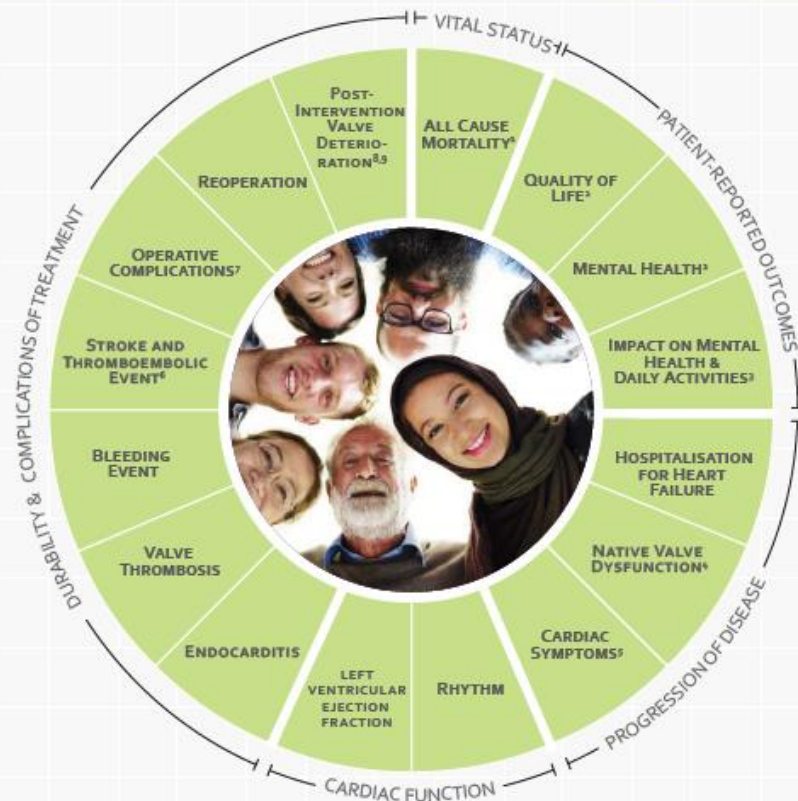
# HEART VALVE DISEASE

IN PARTNERSHIP WITH  **the heart valve**

Population covered: Adults (≥18 years old) with heart valve disease

Treatment approaches covered: Pharmacological, transcatheter/surgical intervention, and communication steps for management, self-care and follow-up care

For a complete overview of the Set, including definitions for each measure, time points for collection, and associated risk factors, visit [ichom.org/medical-conditions/heartvalvedisease](http://ichom.org/medical-conditions/heartvalvedisease)



**Details**

- \* Includes Early Mortality, Late Mortality, Valve-related Mortality and All-cause Mortality
- <sup>1</sup> Defined by the EQ-5D-5L questionnaire
- <sup>2</sup> Defined by the Impact on Mental Health & Daily Activities questionnaire (IMDDV)
- <sup>3</sup> Includes Aortic/Mitral/Tricuspid valve stenosis and Aortic/Mitral/Tricuspid valve regurgitation
- <sup>4</sup> Includes Aortic Regurgitation and NYHA Functional class
- <sup>5</sup> Includes Stroke (ischemic/hemorrhagic) and Thromboembolic event (non-cerebral)
- <sup>6</sup> Includes Conversion to open-heart surgery, Reoperation for bleeding, Periprocedural myocardial infarction, New permanent pacemaker, Major/minor vascular complications, Low-cardiac output syndrome, Hospital stay and ICU stay
- <sup>7</sup> Includes Paravalvular insufficiency and Device migration (only applicable to percutaneous devices)
- <sup>8</sup> Refers to Structural and Non-Structural valve deterioration

 **ICHOM**  
HEART VALVE  
DISEASE

ICHOM Set of Patient-Centered Outcome Measures

## CONTRIBUTORS

For more information about the process of developing a Set of Patient-Centered Outcome Measures, visit [ichom.org/how-we-work](http://ichom.org/how-we-work)

Developed in partnership with:



In collaboration with:



ICHOM Sponsors:

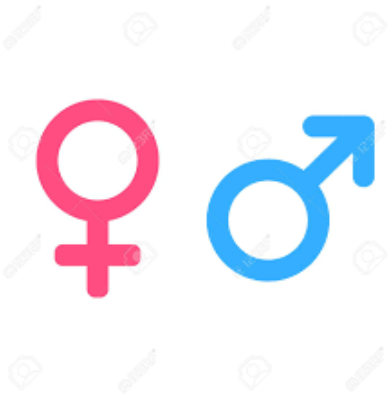


ICHOM Working Group

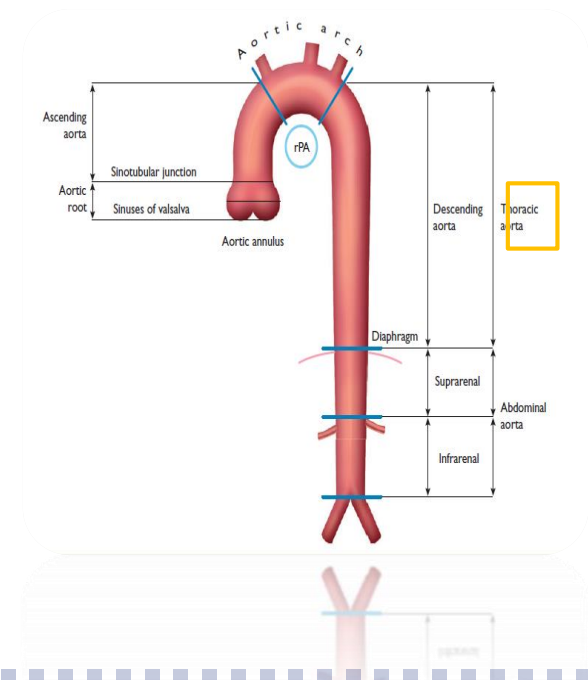




# Research: focus on diversity (M/F, SES race, age..)



- Women vs men:
  - Different presentation
  - Undergo different treatment
  - QOL and coping mechanisms differ



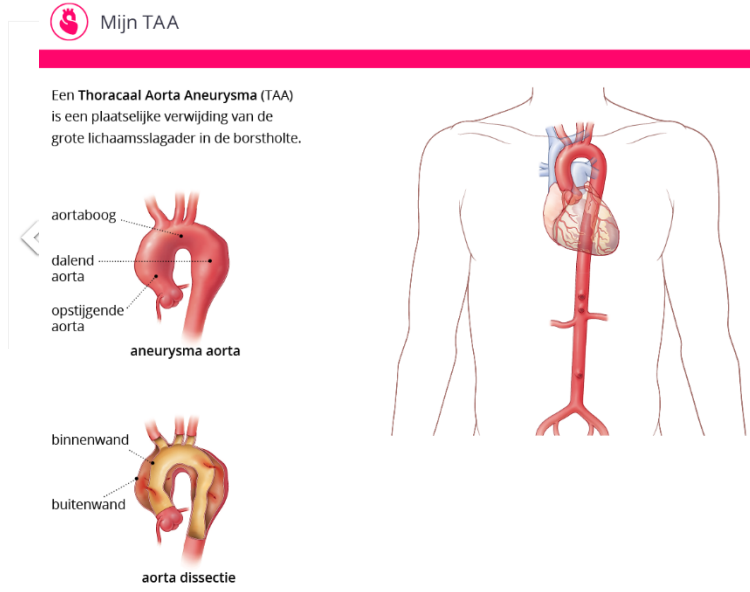
1. Over TAA

- Informatie over mijnTAA en behandelingen ✓
- Wat is een Thoracaal Aorta Aneurysma (TAA)?** ✓
- Wat is een acute dissectie en wat is een ruptuur? ✓
- Hoe ontstaat een TAA? ✓
- Is mijn TAA erfelijk? ✓
- Hoe wordt een TAA ontdekt? ✓
- Hoe wordt een TAA behandeld? ✓
- Wanneer is een operatie nodig? ✓

Wat is een Thoracaal Aorta Aneurysma (TAA)? Print

Een Thoracaal Aorta Aneurysma (TAA) is een plaatselijke verwijding van de grote lichaamsslagader in de borstholte.

In de grote lichaamsslagader (aorta) stroomt het bloed van het hart naar de rest van het lichaam. De aorta in de borstkas heet de thoracale aorta. Deze bestaat uit de aortawortel, de opstijgende aorta, de aortaboog en de dalende aorta.



**Uw situatie**

Uw aorta diameter nu ..... mm

Hoge bloeddruk  Ja  Nee

Aortaklep lekt  Ja  Nee

Aortaklep is vernauwd  Ja  Nee

Diameter waarbij operatie mogelijk wordt aangeraden ..... mm

**Uw behandelplan**

Naar huisarts

Medicijnen

Monitoring

Operatie

Naar thoraxchirurg

[logo ziekenhuis]

**Uw cardioloog**

naam

naam

naam

.....

**Poli naam**

contact@mail.nl

012 - 456 78 90

maandag t/m vrijdag: 8:30 - 16:30 uur

- Waarom MijnTAA?**
- In MijnTAA:
    - ✓ leest u over de diagnose, leven met een TAA en de mogelijke behandelingen
    - ✓ geeft u aan wat voor u belangrijk is
  - Samen met uw zorgverlener:
    - ✓ bespreekt u de samenvatting uit MijnTAA
    - ✓ bespreekt u de vervolgstappen

**MijnTAA gebruiken**

Ga naar

< invoegen URL >

Gebruikersnaam Wachtwoord

<<naam>> <<ww>>

- Focus on patients
- ↓ Treatment variation



## Future directions

- Move away from the quest for the perfect valve, there is no perfect valve for all
- Focus on tailoring optimal treatment to the individual patient:
  - Evidence
  - Clinical considerations
  - Informed patient preferences
- Collaborative audit:
  - Big databases with real-life data (allowing for nested RCTs)
  - Standardized patient-centered outcome measures
- Research
  - Focus on diversity, patients (not procedures), treatment variation
  - Involving patients

Thank you!

