



ALL YOU NEED TO KNOW ABOUT TRANSCATHETER AORTIC VALVE IMPLANTATION

Specific focus on the role of the geriatrician

J.F. Argacha MD, PhD

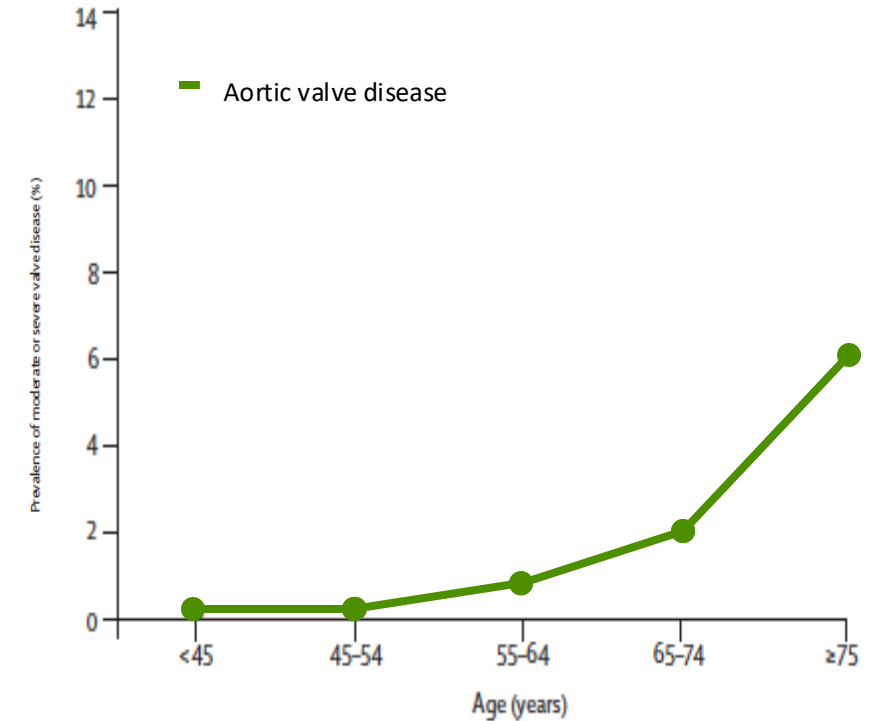


Universitair
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Brussel



●●● WHY YOU SHOULD KNOW ABOUT TAVI ?

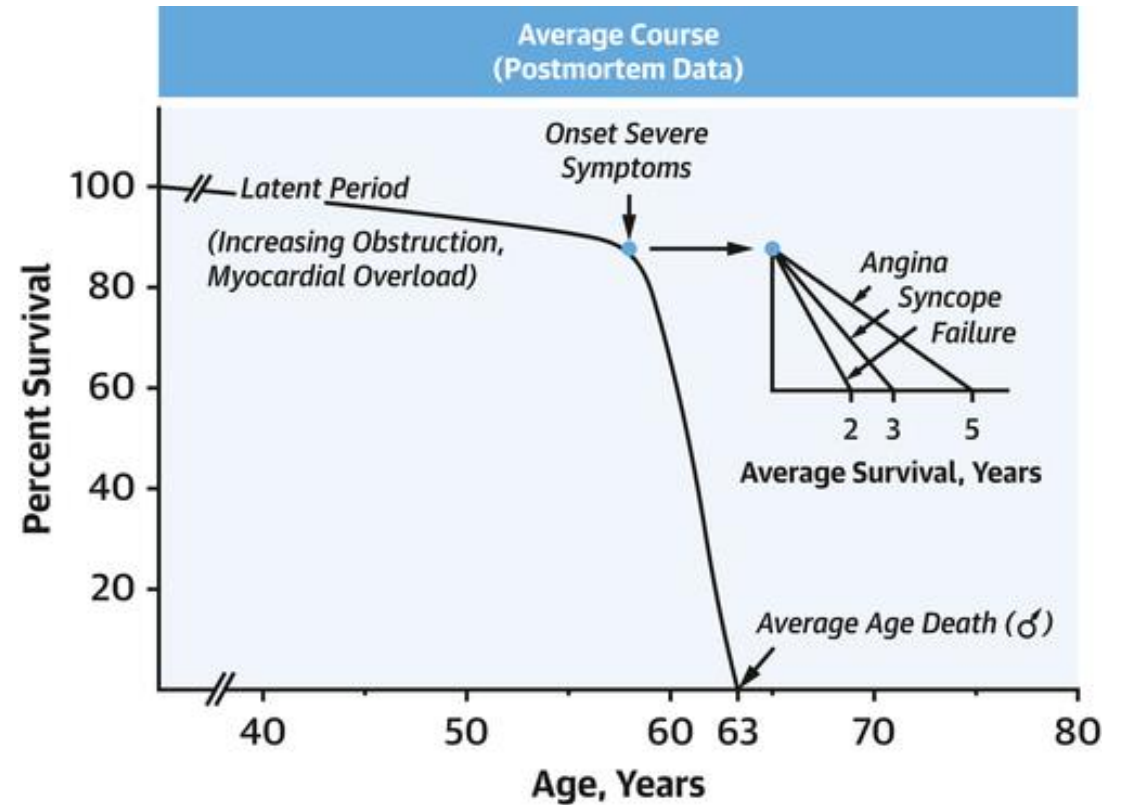
- Aortic valve disease prevalence increases with age



VT Nkomo, et al. Lancet 2006; 368: 1005-11.

WHY YOU SHOULD KNOW ABOUT TAVI ?

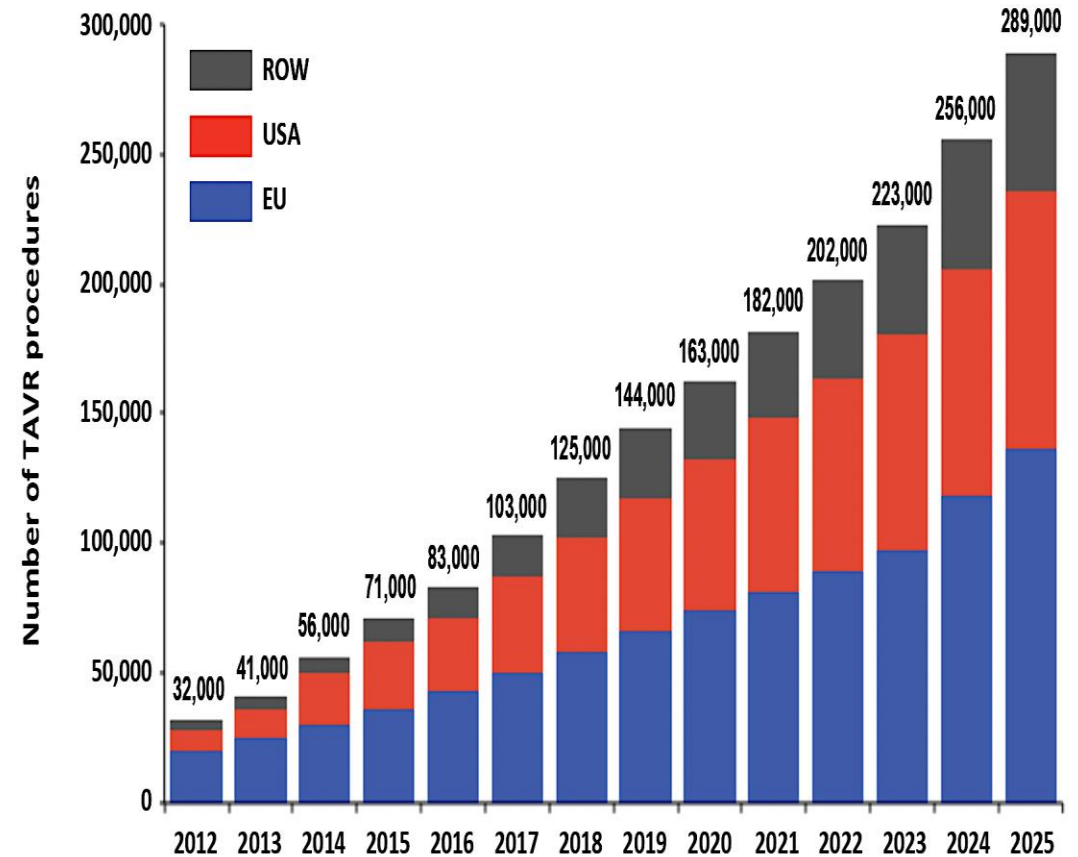
- Aortic valve disease prevalence increases with age
- **Conservative management for severe symptomatic AS: 50% mortality within 2 years**



Eugene Braunwald et al. JACC 2023; 82:2110-2112.

WHY YOU SHOULD KNOW ABOUT TAVI ?

- Aortic valve disease prevalence increases with age
- Conservative management for severe symptomatic AS: 50% mortality within 2 years
- **Structural Heart Interventions, as TAVI, are coming up in a big way**



●●● WHY YOU SHOULD KNOW ABOUT TAVI ?

- Geriatricians take part to the Heart Team decision to select the good candidates

AND...

- Geriatricians have a role to play in post TAVI cares.

●●● WHAT YOU SHOULD KNOW ABOUT TAVI

- Etiologies, risk factors and staging of AS
- Indication according to guidelines
- Contra-indications
- Main procedural steps
- Potential complications
- Place and missions of the geriatrician in TAVI clinical pathways
- Specificities of Belgian situation
- Perspectives in a close future

ETIOLOGY AND RISK FACTORS

HISTORICAL PERSPECTIVE

INDICATION OF TAVI in 2025: EBM vs Belgium

BASICS OF TAVI

POSSIBLE COMPLICATIONS

ROLE OF THE GERIATRICIAN IN TAVI PATHWAY:

UZB experience.

AS ETIOLOGIES

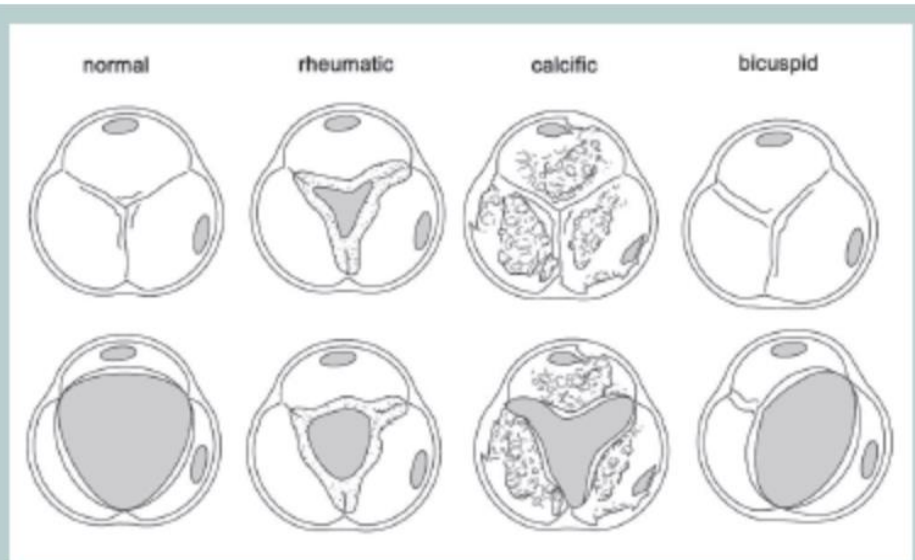


Figure. Schematic of Aortic Stenosis Etiology and Corresponding Morphology.

Reprinted from Journal of the American Society of Echocardiography, volume 22, number 1, Baumgartner H, Hung J, Bermejo J, et al. Echocardiographic assessment of valve stenosis: EAE/ASE recommendations for clinical practice. Pages 1-23. Copyright 2009. Reprinted with permission from Elsevier.

Table 4. Causes of aortic stenosis

Common	Rheumatic
	Calcific
	Bicuspid valve
Uncommon	Radiation
	Drugs
	Congenital e.g. subaortic membrane
Rare	Ochronosis
	Hypercholesterolaemia in children
	Paget's disease
	Other congenital - Unicuspid or quadricuspid valve - Supravalvar stenosis

AS RISK FACTORS

Advance age
Male gender
Genetics
Arterial hypertension
Cigarette smoking
Familiar
hypercholesterolaemia
High levels of LDL and
lipoprotein(a)
Hypertriglyceridaemia
Diabetes mellitus
Metabolic syndrome

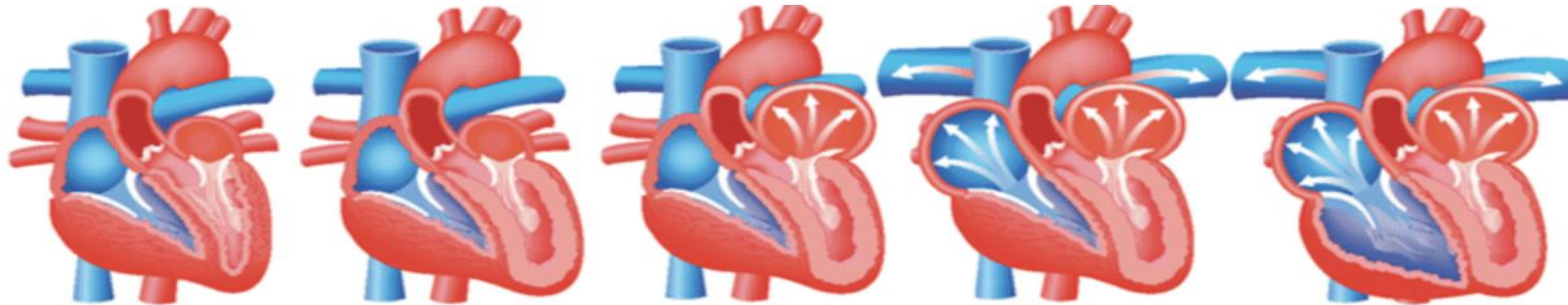
Obesity
Abdominal obesity
CRP and interleukin-6
High homocysteine
Vitamin K deficiency
Renal insufficiency

High serum calcium

High serum phosphates
Osteoporosis
Mediastinal radiation history

Risk factors for aortic valve stenosis

AS STAGES: HOW IS THE LV ? HOW IS THE PAP ?



Stages/Criteria	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4
	No Cardiac Damage	LV Damage	LA or Mitral Damage	Pulmonary Vasculature or Tricuspid Damage	RV Damage
Echocardiogram		Increased LV Mass Index >115 g/m ² (Male) >95 g/m ² (Female)	Indexed left atrial volume >34 mL/m ²	Systolic Pulmonary hypertension ≥60 mmHg	Moderate-Severe right ventricular dysfunction
		E/e' >14	Moderate-Severe mitral regurgitation	Moderate-Severe tricuspid regurgitation	
		LV Ejection Fraction <50%	Atrial Fibrillation		

Staging classification of aortic stenosis based on the extent of cardiac damage. Adapted from Genereux P et al. Staging classification of aortic stenosis based on the extent of cardiac damage. Eur Heart J. 2017

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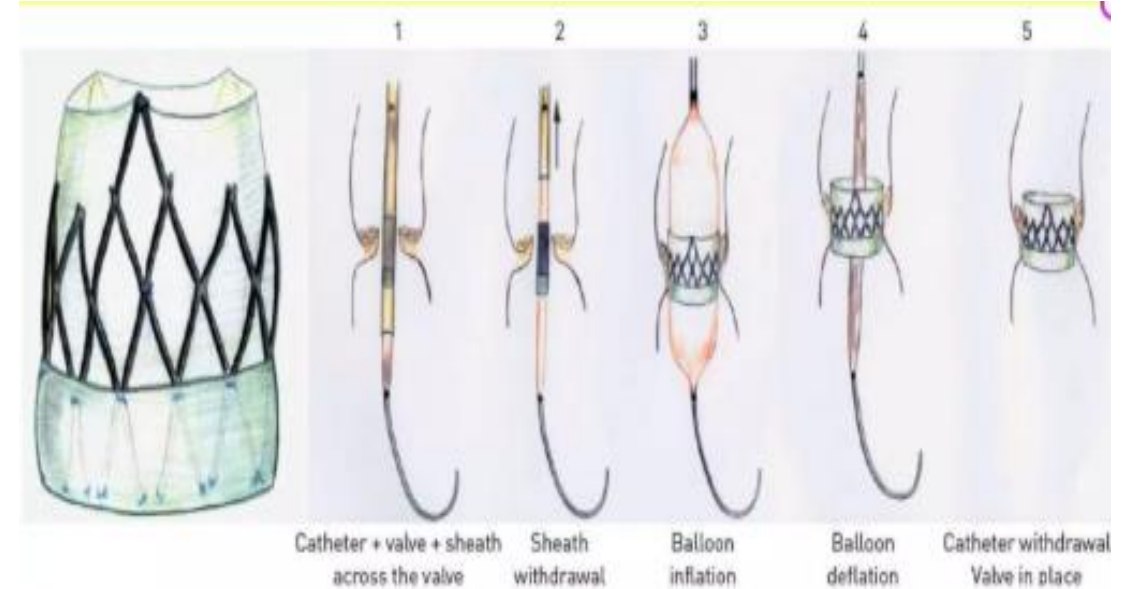
POSSIBLE COMPLICATIONS

ROLE OF THE GERIATRICIAN IN TAVI PATHWAY:

UZB experience.

●●● HISTORICAL PERSPECTIVE

- First balloon aortic valvotomy (BAV) done in 1988 by Dr Alain Cribier
- Recurrence of symptoms due to restenosis in 6-8 months
- 1993: Alain Cribier demonstrated in cadaveric hearts that a stent across the aortic valve was well anchored within the aortic annulus, there was no recoil and the coronary ostia were unobstructed



First human implantation – 2002

Special Report

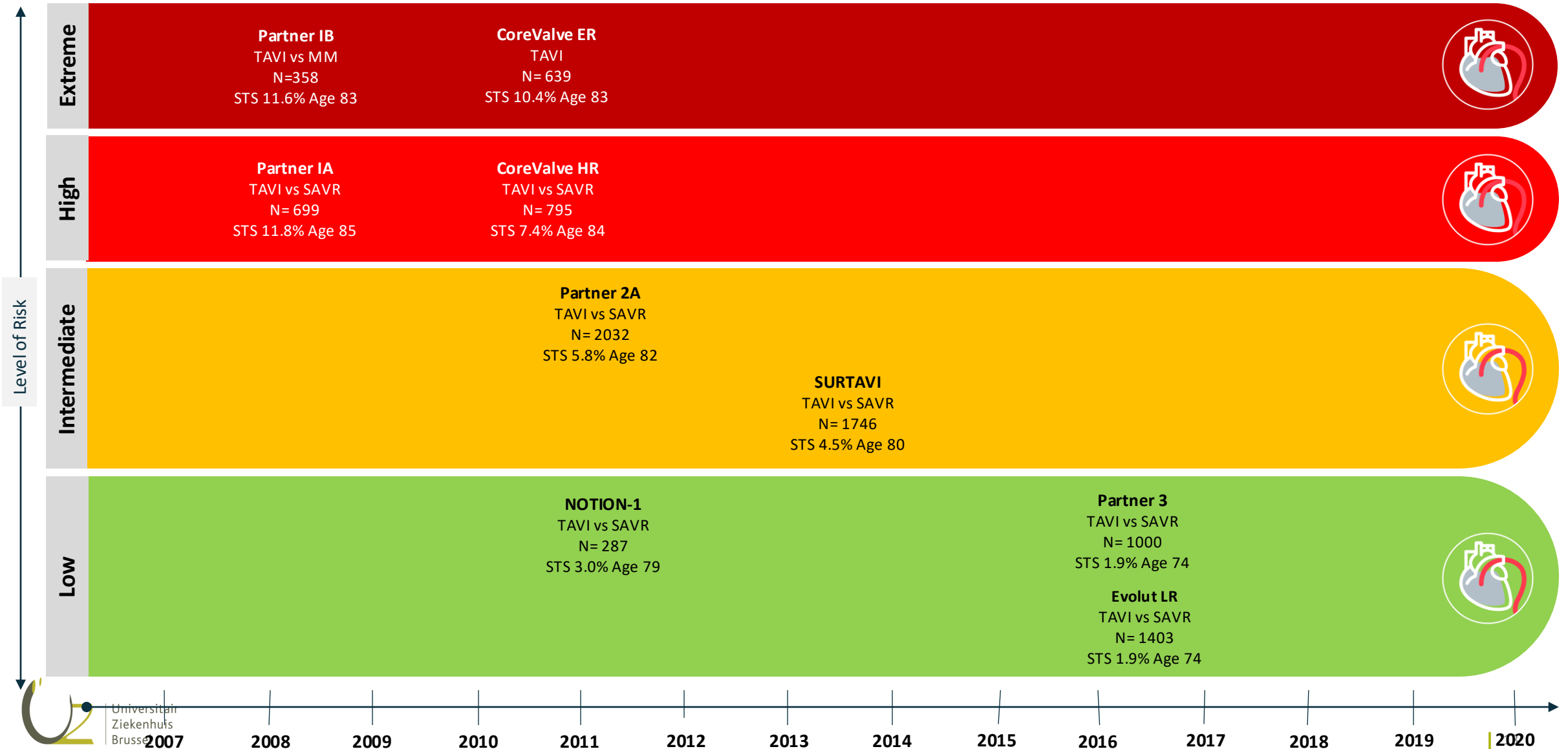
Percutaneous Transcatheter Implantation of an Aortic Valve Prosthesis for Calcific Aortic Stenosis First Human Case Description

Alain Cribier, MD; Helene Elchami, MD; Assaf Bash, PhD; Nicolas Baronstein, MD; Christophe Tron, MD; Fabrice Bauer, MD; Genevieve Derumeaux, MD; Frederic Anselme, MD; François Laborde, MD; Martin B. Leon, MD

On **April 16, 2002**, at the Charles Nicolle University Hospital in Rouen, France, the Interventional Cardiologist, Professor **Alain Cribier** performed the first transcatheter aortic valve implantation procedure in the world. He used a **Percutaneous Valve Technology (PVT)** percutaneous heart valve.

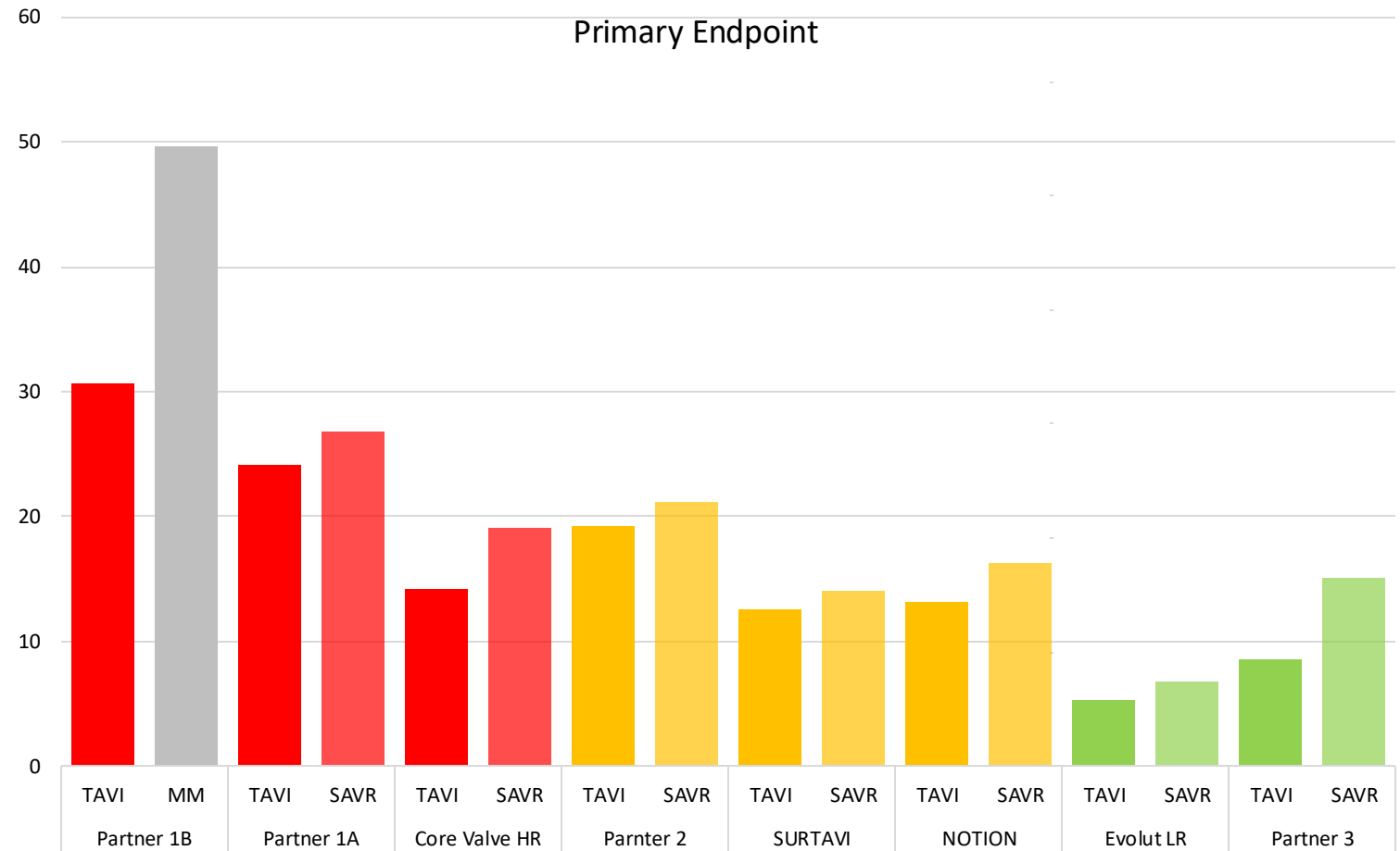


●●● TAVI LANDMARK TRIALS



●●● TAVI IS EQUAL OR SUPERIOR TO SAVR

	Time	All cause mortality	Stroke	Rehospitalize	Myocardial Infarction
Partner 1 (A and B)	1 year	x			
Evolut ER/HR	1 year	x			
Partner 2	2 year	x	x		
SURTAVI	2 year	x	x		
NOTION	1 year	x	x		x
Evolut LR	2 year	x	x		
Partner 3	1 year	x	x	x	



Leon MB, et al. NEJM 2010; 363:1597-607. , Smith CE, et al. NEJM 2011; 354: 2187-98. , Mack MJ, et al. Lancet 2015; 385:2477-84., Popma JJ et al. JACC; 2014; 63: 1972-81., Adams DH, et al. NEJM 2014; 370: 1790-8., Leon MB, et al. NEJM 2017; 376: 1321-31., Mack MJ, et al. NEJM 2019; 380: 1695-705., Popma JJ, et al. NEJM 2019; 380: 1706-15.

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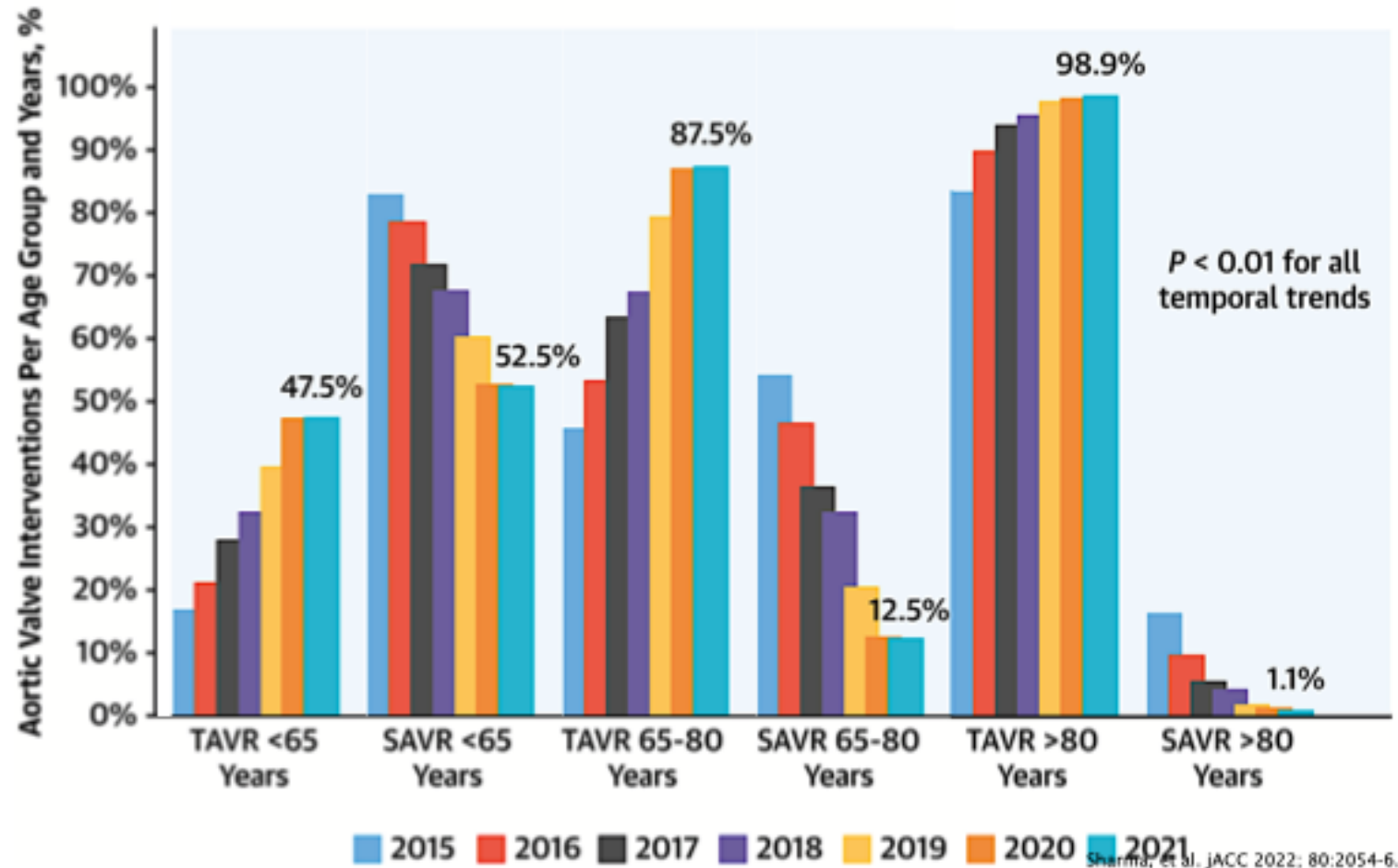
UZB experience.

Previous AS Guidelines (ESC, 2021)

SAVR is recommended in younger patients who are low risk for surgery (<75 years ^e and STS- PROM/Euro SCORE II<4%) ^{e,f} , or in patients who are operable and unsuitable for transfe-moral TAVI. ²⁴⁴	I	B
TAVI is recommended in older patients (≥75 years) or in those that are high risk STS- PROM/EuroSCORE II ^f >8%) or unsuitable for surgery. ^{197-206,245}	I	A

A Vahanian, et al. EHJ 2021; 00, 1-72.

●●● PUSHING THE BOUNDARIES TOWARDS YOUNGER PATIENTS



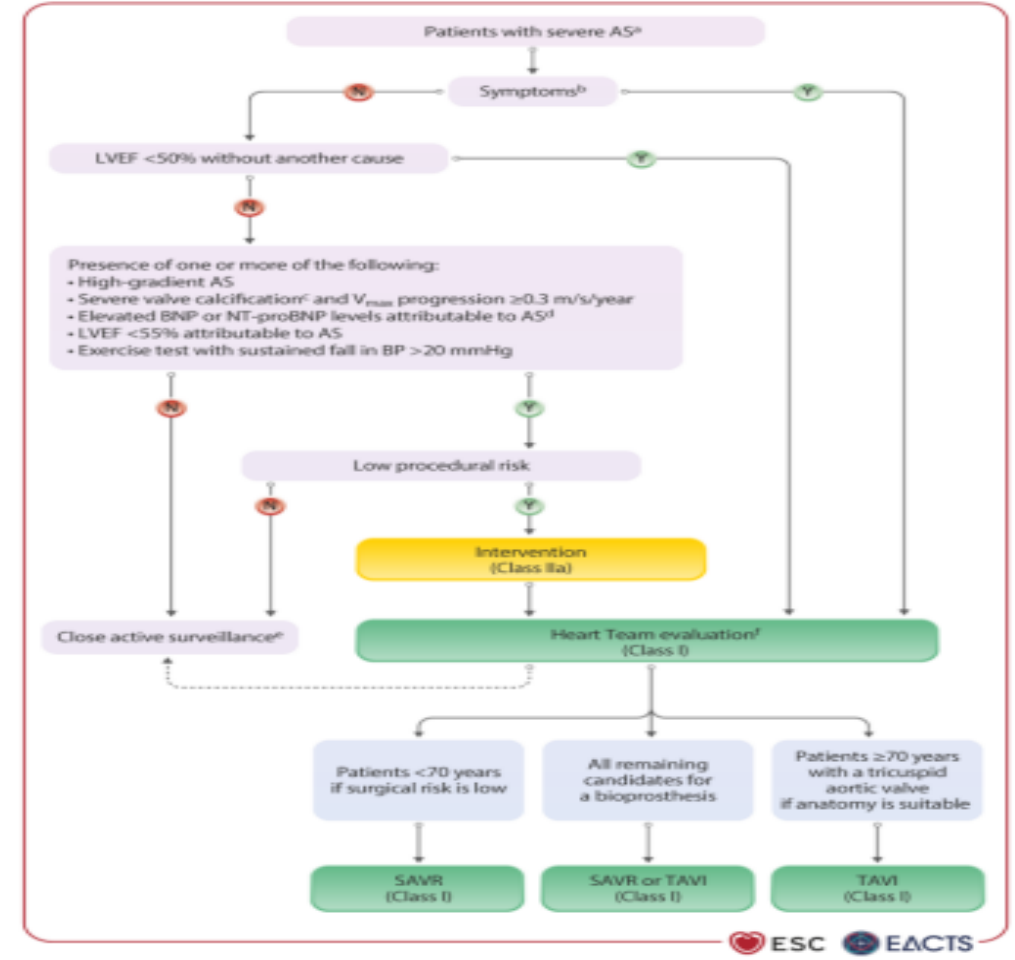
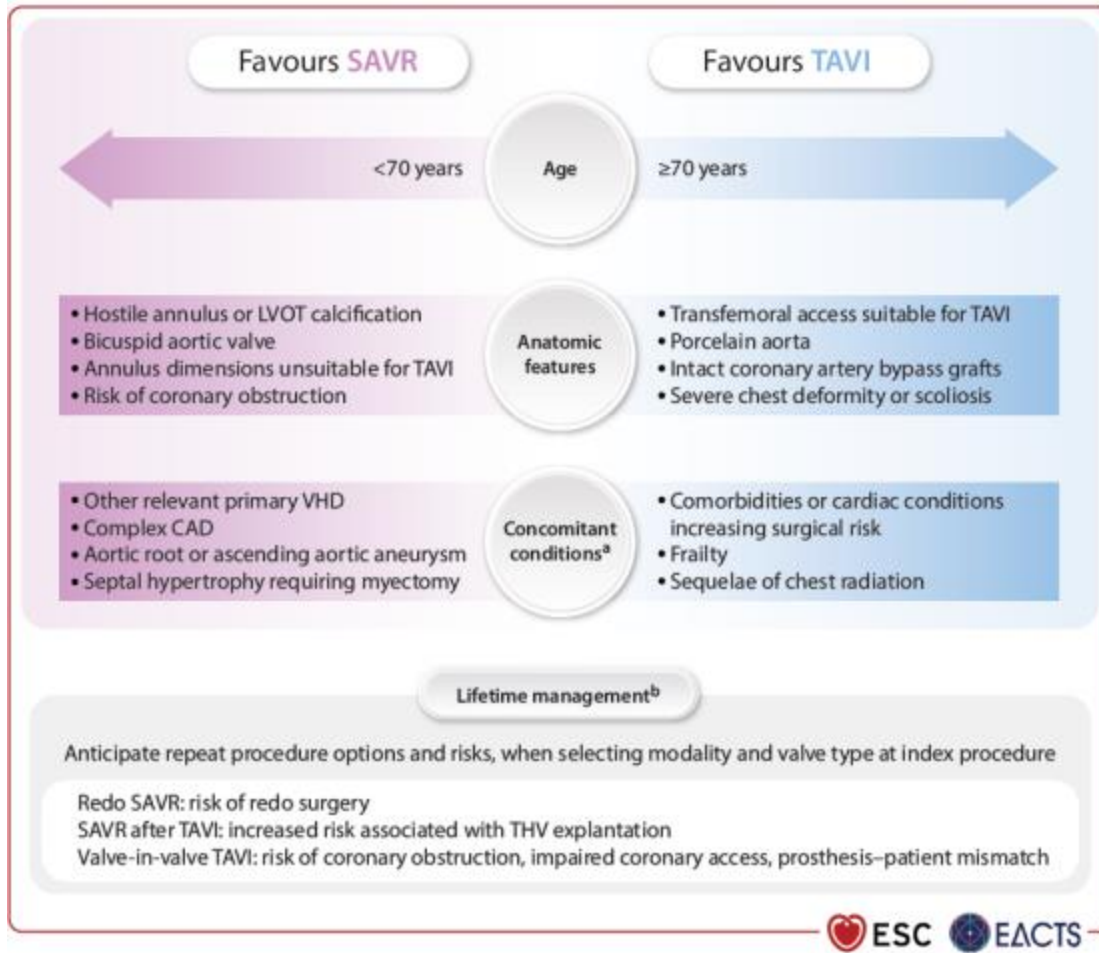
●●● HOT OFF THE PRESS: AS GUIDELINES (ESC, AUGUST 2025)

Recommendations in 2021 version	Class	Level	Recommendations in 2025 version	Class	Level
<i>Mode of intervention in aortic stenosis</i>					
TAVI is recommended in older patients (≥75 years), or in those who are high risk (STS-PROM/EuroSCORE II >8%) or unsuitable for surgery.	I	A	TAVI is recommended in patients ≥70 years of age with tricuspid AV stenosis, if the anatomy is suitable.	I	A
SAVR is recommended in younger patients who are low risk for surgery (<75 years and STS-PROM/EuroSCORE II <4%), or in patients who are operable and unsuitable for transfemoral TAVI.	I	B	SAVR is recommended in patients <70 years of age, if the surgical risk is low.	I	B
SAVR or TAVI are recommended for remaining patients according to individual clinical, anatomical, and procedural characteristics.	I	B	SAVR or TAVI are recommended for all remaining candidates for an aortic BHV according to Heart Team assessment	I	B
Non-transfemoral TAVI may be considered in patients who are inoperable and unsuitable for transfemoral TAVI.	IIb	C	Non-transfemoral TAVI should be considered in patients who are unsuitable for surgery and transfemoral access.	IIa	B

●●● HOT OFF THE PRESS: AS GUIDELINES (ESC, AUGUST 2025)

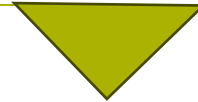
Recommendations in 2021 version	Class	Level	Recommendations in 2025 version	Class	Level
Indications for intervention in asymptomatic severe aortic stenosis					
Intervention should be considered in asymptomatic patients with severe AS and LV dysfunction (LVEF <55%) without another cause. Intervention should be considered in asymptomatic patients with LVEF >55% and a normal exercise test if the procedural risk is low and one of the following parameters is present: • Very severe AS (mean gradient ≥60 mmHg or Vmax >5 m/s). • Severe valve calcification (ideally assessed by CCT) and Vmax progression ≥.3 m/s/year. • Markedly elevated BNP levels (more than three times age- and sex-corrected normal range) confirmed by repeated measurements and without other explanation.	IIa	B	Intervention should be considered in asymptomatic patients with severe AS and LVEF ≥50%, if the procedural risk is low and one of the following parameters is present: • Very severe AS (mean gradient ≥60 mmHg or Vmax >5.0 m/s). • Severe valve calcification (ideally assessed by CCT) and Vmax progression ≥.3 m/s/year. • Markedly elevated BNP/NT-proBNP levels (more than three times age- and sex-corrected normal range, confirmed on repeated measurement without other explanation). • LVEF <55% without another cause.	IIa	B

●●● TAVI DECISION MAKING



000 TAVI DECISION MAKING

- SURGICAL RISK CRITERIA: Based on Euroscore 2
- ANATOMICAL CRITERIA: Based on CT TAVI
- PATIENT CRITERIA: Co-morbidities, Frailty Index



HEART TEAM DECISION:

Multidisciplinary assessment of the patient in the light of surgical, anatomical and patient criteria i

Essential for the appropriate selection and safe conduct of a TAVI program

000 SURGICAL RISK CRITERIA: EUROSCORE 2



All Calculators

Calculator

About

References

1. Age?

2. Gender?

3. Creatinine Clearance?

4. Extracardiac Arteriopathy?

5. Poor mobility?

6. Previous Cardiac Surgery?

7. Chronic Lung Disease?

8. Active Endocarditis?

9. Critical Preoperative State?

10. Diabetes on Insulin?

11. NYHA Class?

12. CCS Class 4 Angina?

13. LV function?

14. Recent MI?

15. Pulmonary Hypertension?

16. Urgency?

17. Weight of the Intervention?

18. Surgery on Thoracic Aorta?

5. Poor mobility?

No
Yes

More Information

Severe impairment of mobility secondary to musculoskeletal or neurological dysfunction

ANATOMICAL CRITERIA

**'Skin to valve'
analysis using MDCT
for TAVI planning**



000 PATIENT CRITERIA

- **Frailty index** - The appearance of frailty can be perceived by experienced clinicians. Objectively defining this physiological state, however, remains challenging. In practice a combination of subjective evaluation and objective parameters such as the Katz score or Charlson comorbidity index, grip strength (assessed with a dynamometer), validated walking test and albumin are used.
- **Futility index** - Patients at extreme risk who have a limited life expectancy (arbitrarily considered to be <1 year) or who are unlikely to gain any meaningful symptomatic relief due to significant comorbidity, should not undergo this procedure due to futility.

CGA-FI

Medical History (20 deficit items)

Angina	☐	Atrial fibrillation/flutter	☐	Coronary artery disease	☐
Diabetes	☐	Heart failure	☐	Hypertension	☐
Myocardial infarction	☐	Peripheral vascular disease	☐	Stroke/TIA	☐
Anxiety disorder	☐	Arthritis	☐	Asthma	☐
Cancer within 5 years	☐	Chronic kidney disease (eGFR<60)	☐	COPD	☐
Degenerative spine disease	☐	Depression	☐	Fall within the past year	☐
Sensory impairment	☐	Use of ≥5 prescription drugs	☐		

Functional Status (22 deficit items)

Unable to perform or need personal help with:

Activities of Daily Living	Instrumental Activities of Daily Living		Nagi & Rosow-Breslau Activities		
Feeding	☐	Using telephone	☐	Pulling or pushing a large object	☐
Dressing/undressing	☐	Using transportation	☐	Stooping, crouching or kneeling	☐
Grooming	☐	Shopping	☐	Lifting or carrying 10 lbs	☐
Walking (or use of a walker)	☐	Preparing own meals	☐	Reaching arms above shoulder	☐
Getting in and out of bed	☐	Housework	☐	Writing or handling small objects	☐
Toileting	☐	Taking own medications	☐	Walking up/dn a flight of stairs	☐
Bathing or shower	☐	Managing money	☐	Walking half a mile	☐
				Heavy work around house	☐

Performance Tests (3 deficit items)

Mini-Mental State Examination	Gait Speed	Dominant Handgrip Strength
27-30 points (0 points)	☐ ≥ 1 m/sec (0 points)	☐ M: ≥ 32 kg; F: ≥ 20 kg (0 points) ☐
24-26 points (0.3 points)	☐ 0.80-0.99 m/sec (0.3 points)	☐ M: 26-31 kg; F: 16-19 kg (0.5 points) ☐
21-23 points (0.7 points)	☐ 0.60-0.79 m/sec (0.7 points)	☐ M: < 26 kg; F: < 16 kg (1 point) ☐
<21 points (1 point)	☐ < 0.60 m/sec (1 point)	☐

Nutritional Status (3 deficit items)

Weight loss > 10 lbs in past year	☐	Body mass index < 21 kg/m²	☐	Serum albumin < 3.5 g/L	☐
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Number of positive items: _____ Number of items assessed: _____ CGA-FI (range: 0.0-1.0): _____

●●● TAVI CONTRAINDICATIONS

Absolute contraindications

Absolute contraindications include the absence of a Heart Team and no cardiac surgery on-site, appropriateness of TAVI not confirmed by the Heart Team, estimated life expectancy <1 year, comorbidity suggesting lack of improvement of quality of life, inadequate annulus size (<18 mm, >29 mm), active endocarditis, symmetric valve calcification, short distance between the annulus and the coronary ostium, and plaques with mobile thrombi in the ascending aorta.

Relative contraindications

Relative contraindications include inadequate vascular access for transfemoral or subclavian approach (such patients could be treated from the transapical approach), bicuspid valve (no longer applicable), haemodynamic instability, and severe LV dysfunction.

ESC 2025 GUIDELINES VS. RIZIV/INAMI

Federale Overheidsdienst Sociale Zekerheid

11 APRIL 2025. - Ministerieel besluit tot wijziging van hoofdstuk "F. Heelkunde op de thorax en cardiologie" van de lijst en van de nominatieve lijsten, gevoegd als bijlagen 1 en 2 bij het koninklijk besluit van 25 juni 2014 tot vaststelling van de procedures, termijnen en voorwaarden inzake de tegemoetkoming van de verplichte verzekering voor geneeskundige verzorging en uitkeringen in de kosten van implantaten en invasieve medische hulpmiddelen

1.2.5.

Het multidisciplinair overleg betreffende de indicatiestelling en de ingreep voor een specifieke rechthebbende wordt uitgevoerd door een multidisciplinair team dat bestaat uit minstens de volgende zes of, indien van toepassing, zeven artsen-specialisten die allen verbonden zijn aan de campus waar de ingreep wordt uitgevoerd:

- 2 interventionele cardiologen

EN

- 2 cardiochirurgen

EN

- 1 cardioloog met ervaring in transoesophageale echocardiografie

EN

- 1 cardioloog met ervaring in hartfalen

EN

- 1 geriater indien de rechthebbende 75 jaar of ouder is

Artsen-specialisten verbonden aan een verplegingsinrichting van de samenwerking mogen hier aan deelnemen

ESC 2025 GUIDELINES VS. RIZIV/INAMI

2.1. Inclusiecriteria voor de verstrekkingen 172734-172745, 172756-172760, 185776-185780, 185791-185802, 185813-185824 en 172771-172782:

a) Ernstige, symptomatische aortaklepstenose, gedefinieerd door de meest recente ESC richtlijnen;

EN
b) Technische haalbaarheid van de implantatie van een percutaan implanteerbare klepstent in aortapositie ;

EN
c) De geschatte levensverwachting na de implantatie bedraagt minstens twaalf maanden ;

EN
d) De rechthebbende werd voorafgaandelijk aan de ingreep op basis van alle van toepassing zijnde inclusiecriteria geselecteerd tijdens een multidisciplinair overleg beschreven in punt 1.2.5. Het multidisciplinair team stelt een rapport op met daarin de klinische karakteristieken, relevante historiek en comorbiditeiten van de rechthebbende en hun gemotiveerde beslissing. Dit rapport vermeldt de artsen-specialisten die aanwezig waren tijdens het multidisciplinair overleg.

2.2. Bovenop de inclusiecriteria vermeld onder punt 2.1, moet de rechthebbende voldoen aan minstens één van de volgende inclusiecriteria voor verstrekkingen 172734-172745 en 172756-172760:

a) De rechthebbende is inoperabel via chirurgie

OF

b) De rechthebbende heeft een EuroSCORE II > 8%.

Exclusiecriteria:

- primaire hypertrofische cardiomyopathie met of zonder obstructie,
- ernstige ventriculaire dysfunctie met een Linker Ventrikel Ejectie Fractie (LVEF) < 20%,
- cerebrovasculair accident of TIA (*transient ischemic attack*), binnen de 6 maanden vóór de geplande ingreep,
- nierinsufficiëntie (chronisch of acuut) met een creatininespiegel > 3 mg/dL of waarvoor dialyse,
- een ernstige toestand van seniele dementie of andere invaliderende neurologische ziekten, in zoverre deze de normale activiteiten van het dagelijks leven verhinderen,
- een levensverwachting van minder dan één jaar omwille van andere comorbiditeiten van niet-cardiale oorsprong,
- een myocardinfarct binnen de 30 dagen vóór de geplande ingreep,
- onbehandelde en klinisch significante coronaire aandoening waarvoor revascularisatie vereist is,
- hemodynamische instabiliteit waarvoor inotrope medicatie of mechanische ondersteuning vereist is,
- niet-gecalcificeerde aortaklep of congenitale afwijking van de aortaklep: uni- of bicuspidale klep,
- gemengde aortaklepziekte (aortastenose en aortainsufficiëntie) met predominantie van de insufficiëntie > 3+,
- ernstige mitralisklepcalcificatie, of ernstige mitralisklepinsufficiëntie (> 3+),
- echocardiografische evidentie van een intracardiale massa, thrombus of vegetaties,
- afmeting van de natieve annulus aortae (gemeten op echocardiografie) die incompatibel is met de afmeting van de voorziene klep,
- andere anatomische afwijkingen die het succes van de behandeling in de weg kunnen staan,
- acuut peptisch ulcus of hoge gastro-intestinale bloeding binnen de drie maanden vóór de geplande ingreep,
- bloeddyscrasie gedefiniëerd als volgt: leukopenie ($WBC < 3000/mm^3$), acute anemie ($Hb < 9 \text{ mg\%}$), thrombocytopenie ($< 50.000 \text{ cellen}/mm^3$), voorgeschiedenis van bloedingsdiathese of coagulopathie,
- gekende overgevoeligheid of contra-indicatie voor acetylsalicylzuur, heparine, ticlopidine (Ticlid®), clopidogrel (Plavix®) of andere anti-aggregantia; gekende overgevoeligheid voor contraststoffen (en waarvoor geen adequate premedicatie mogelijk is),
- nood tot dringende heekkunde voor welke reden dan ook.

000 LET'S PLAY WITH THE EUROSCORE 2

90 yo female, moderate CKD, NYHA 3

Patient-related factors

age ⁱ 90

biological sex Female ^v

chronic lung disease ⁱ ☐ no

extracardiac arteriopathy ⁱ ☐ no

poor mobility ⁱ ☐ no

previous cardiac surgery ⁱ ☐ no

active endocarditis ⁱ ☐ no

critical preoperative state ⁱ ☐ no

renal impairment ⁱ ☐ creatinine clearance moderate (CC 50-85 l ^v)

diabetes on insulin ☐ no

Cardiac-related factors

CCS angina class 4 ⁱ ☐ no

LV function good (LVEF > 50%) ^v

recent MI ⁱ ☐ no

pulmonary hypertension ⁱ No ^v

NYHA class III ^v

Operation-related factors

surgery on thoracic aorta ⁱ ☐ no

urgency of operation ⁱ elective ^v

weight of operation ⁱ single non CABG ^v

EuroSCORE II

2.62 %

Based on the information you have provided... if 100 people with a similar condition had a similar operation, 2 to 3 may be expect to die, whereas 97 to 98 would be expected to survive. Your EuroSCORE is 2.62.

reset

000 LET'S PLAY WITH THE EUROSCORE 2

90 yo female, moderate CKD, NYHA 3

Patient-related factors

age ⁱ 90

biological sex Female ^v

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CCS angina class 4 ⁱ ☐ no

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EuroSCORE II

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reset

000 LET'S PLAY WITH THE EUROSCORE 2

78 yo male, moderate CKD, NYHA 3 + COPD+ PAD + poor mobility

Patient-related factors	Cardiac-related factors	EuroSCORE II	
age <i>i</i>	CCS angina class 4 <i>i</i>	6.43 % Based on the information you have provided... if 100 people with a similar condition had a similar operation, 6 to 7 may be expect to die, whereas 93 to 94 would be expected to survive. Your EuroSCORE is 6.43. reset	
biological sex	LV function		
chronic lung disease <i>i</i>	recent MI <i>i</i>		
extracardiac arteriopathy <i>i</i>	pulmonary hypertension <i>i</i>		
poor mobility <i>i</i>	NYHA class		
previous cardiac surgery <i>i</i>	Operation-related factors		
active endocarditis <i>i</i>			surgery on thoracic aorta <i>i</i>
critical preoperative state <i>i</i>			urgency of operation <i>i</i>
renal impairment <i>i</i>			weight of operation <i>i</i>
<i>creatinine clearance</i>			
diabetes on insulin			

000 LET'S PLAY WITH THE EUROSCORE 2

78 yo male, moderate CKD, NYHA 3 + COPD+ PAD + poor mobility + bad LV function

Patient-related factors	Cardiac-related factors	EuroSCORE II
age ⁱ 78	CCS angina class 4 ⁱ ☐ no	8.60 %
biological sex Male ^v	LV function moderate (LVEF 31% ^v)	
chronic lung disease ⁱ ☒ yes	recent MI ⁱ ☐ no	Based on the information you have provided... if 100 people with a similar condition had a similar operation, 8 to 9 may be expected to die, whereas 91 to 92 would be expected to survive. Your EuroSCORE is 8.60.
extracardiac arteriopathy ⁱ ☒ yes	pulmonary hypertension ⁱ moderate (PA systolic ^v)	
poor mobility ⁱ ☒ yes	NYHA class III ^v	
previous cardiac surgery ⁱ ☐ no		
active endocarditis ⁱ ☐ no		reset
critical preoperative state ⁱ ☐ no		
renal impairment ⁱ moderate (CC 50-85 l ^v) <input checked="" type="button" value="creatinine clearance"/>		
diabetes on insulin ☒ yes		
	Operation-related factors	
	surgery on thoracic aorta ⁱ ☐ no	
	urgency of operation ⁱ elective ^v	
	weight of operation ⁱ single non CABG ^v	



ESC 2025 GUIDELINES VS. RIZIV/INAMI

71003901-167 CHU UCL Namur Mont-Godinne	71003901 CHU UCL Namur	01.05.2023	18	26	39	3
71067049-167 UZ Gent Gent	71067049 UZ Gent	01.05.2023	53	78	123	10
		01.05.2023				

Voor drie andere bestaande verstrekkingen is de omschrijving aangepast:

- 172734 - 172745 wordt "Percutaan implanteerbare klepstent in aortapositie inclusief het plaatsingssysteem, bij inoperabele patiënten of patiënten met een EuroSCORE II >8%", waarvan het jaarlijkse nationale aantal is verhoogd tot 2.200 (tegenover 1.500).

71001723-167 AZ Maria Middelaes Gent	71001723 AZ Maria Middelaes	01.05.2023	42	61	99	8
71017658-167 Algemeen Stedelijk Ziekenhuis Aalst	71017658 Algemeen Stedelijk Ziekenhuis	01.05.2023	28	46	72	6
71012611-167 OLV ziekenhuis Aalst	71012611 OLV ziekenhuis - Campus Aalst	01.05.2023	52	75	111	9
71000931-167 ZNA - AZ Middelheim Antwerpen	71000931 ZNA Middelheim	01.05.2023	45	65	107	9
71032209-167 UZ Leuven Leuven	71032209 UZ Leuven Leuven	01.05.2023	158	230	244	19

NB: Was 500 in 2023, 1500 in 2024 !

ETIOLOGY AND RISK FACTORS

HISTORICAL PERSPECTIVE

INDICATION OF TAVI in 2025: EBM vs Belgium

BASICS OF TAVI

POSSIBLE COMPLICATIONS

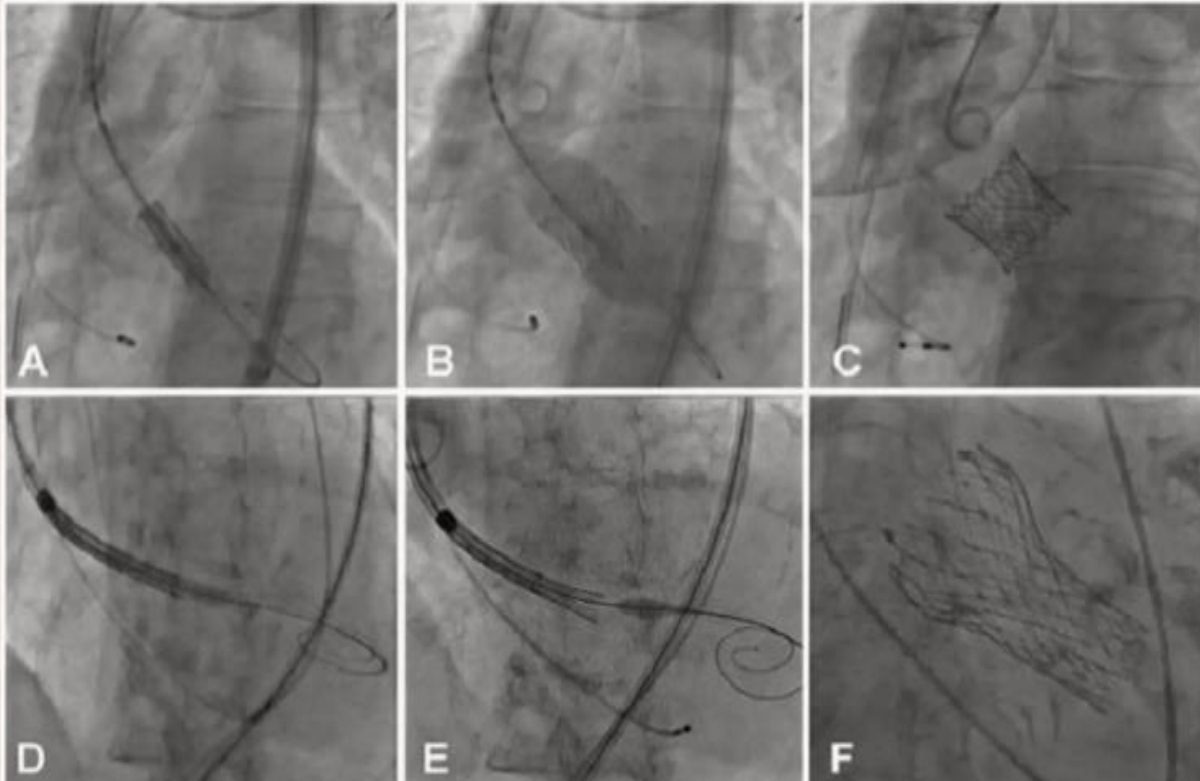
ROLE OF THE GERIATRICIAN IN TAVI PATHWAY:

UZB experience.

●●● TAVI: VALVES ON THE BELGIAN MARKET

Balloon Vs self-expandable valves

Figure 2. Mechanisms of deployment of commonly used TAVI devices.



EDWARDS SAPIEN 3

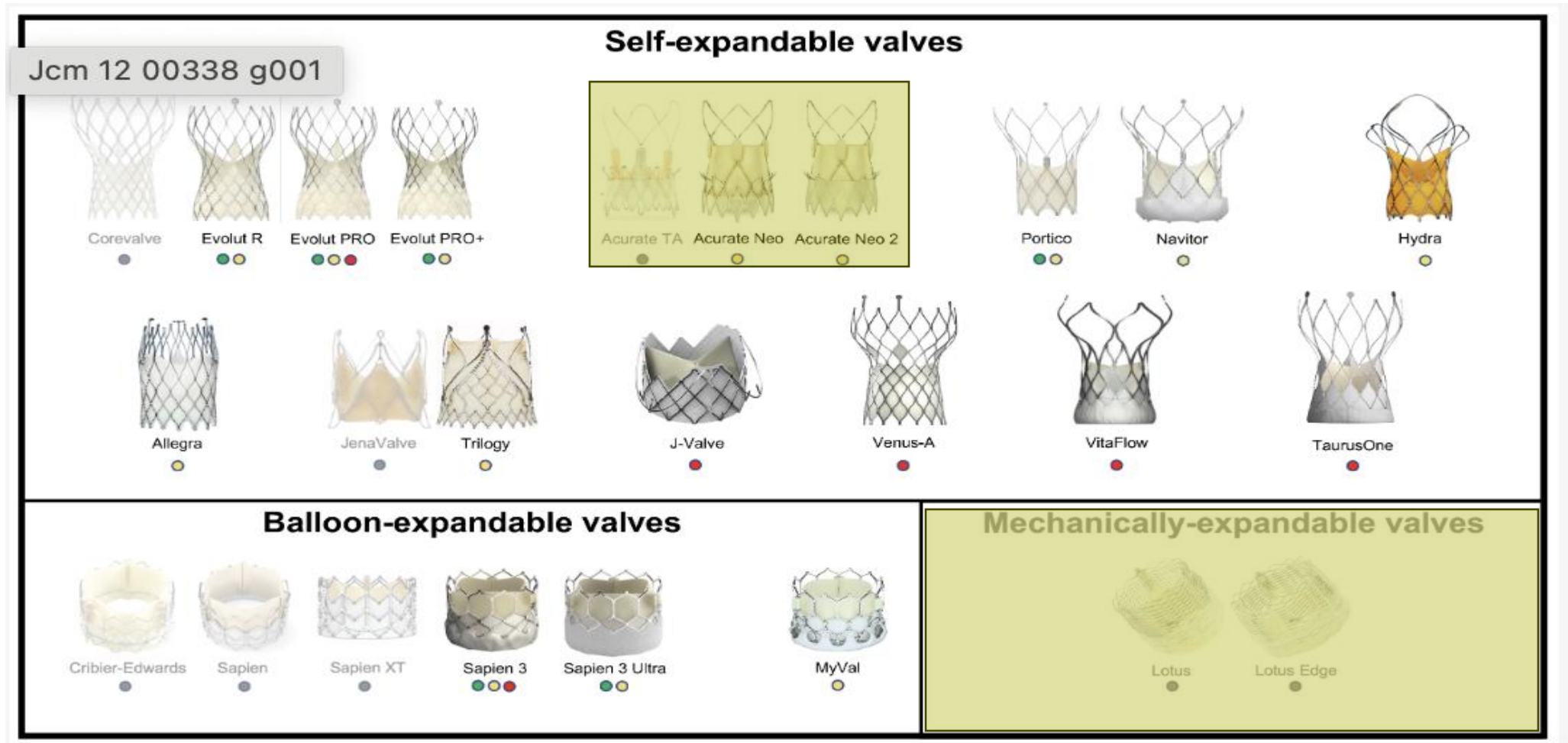


MEDTRONIC EVOLUTE PRO/FX



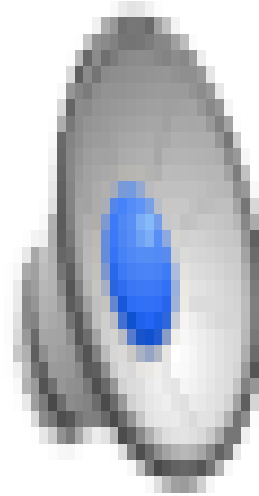
ABBOTT NAVITOR

OTHER TAVI VALVES



●●● TAVI PROCEDURE OVERVIEW

- 1) Local anesthesia femoral TAVI access site
- 2) Pre closing femoral TAVI access site
- 3) Radial or contralateral femoral secondary access
- 4) 14 Fr sheath femoral to abdominal aorta. HNF for ACT 250 sec
- 5) Wiring LV with stiff wire
- 6) Predilatation with semi or non-compliant balloon under very rapid pacing (160-180 bpm)
- 7) TAVI commissural alignment check
- 8) TAVI valve implantation (with or without rapid pacing)
- 9) TAVI post dilatation (if residual gradient or PVL)
- 10) Closure of access site with pre-closing system
- 11) Angiography of access site to check hemostasis
- 12) Protamine



000 MINIMALISTIC TAVI IN 2025

CONCEPT: DOING LESS TO ACHIEVE MORE AND BETTER

AIM: EARLY AMBULATION AND SHORT HOSPITAL STAY (NEXT DAY DISCHARGE)

HOW ?

Evolution in the **devices:** use of resheathtable devices if suboptimal position

Evolution in **approach:** full percutaneous access with pre closure techniques, no more surgery, exceptional TOE guidance

Evolution of **anesthesiology:** conscious sedation

Downgrading the **number of invasive lines** : Contralateral access via radial, pacing on the LV wire.

ETIOLOGY AND RISK FACTORS

HISTORICAL PERSPECTIVE

INDICATION OF TAVI in 2025: EBM vs Belgium

BASICS OF TAVI

POSSIBLE COMPLICATIONS

ROLE OF THE GERIATRICIAN IN TAVI PATHWAY:

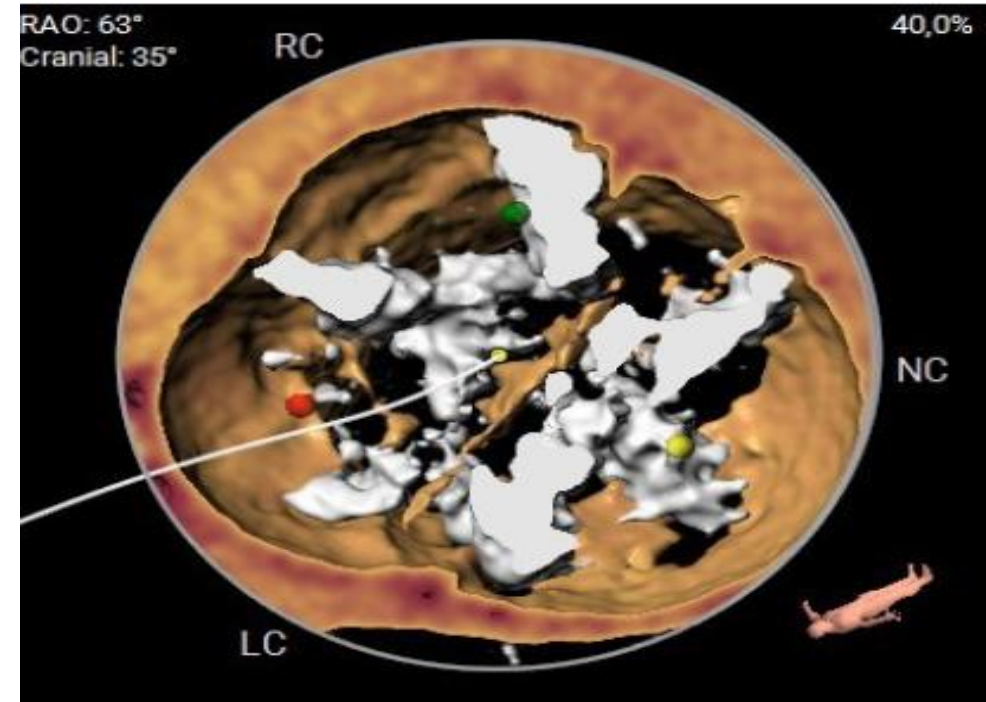
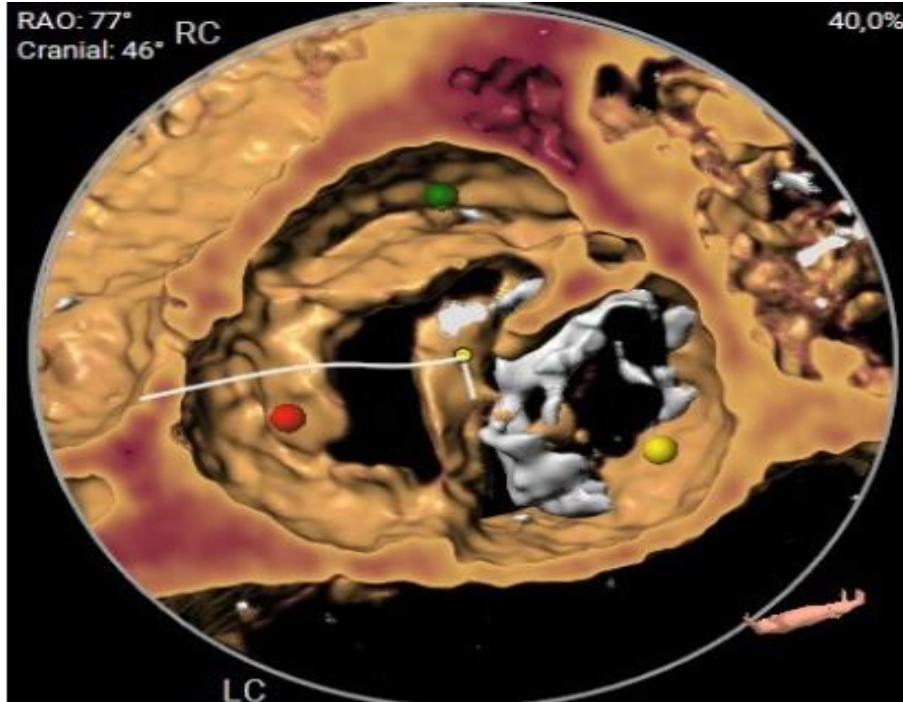
UZB experience.

●●● COMPLICATIONS

1. Moderate to severe paravalvular leak: 4-5%
2. Residual mean gradient > 20 mmHg: Rare but 20-30% in BAV and VIV
3. Stroke : 2-5%
4. De novo LBBB/PM need: 10-15%
5. Coronary obstruction: 1% (2.5% in Valve in Valve procedures)
6. Vascular complication: 6 to 8%
7. LV annulus rupture < 1%
8. Tamponade (RV pace perforation): < 1%
9. Device embolization (aortic or ventricular implantation): < 1%

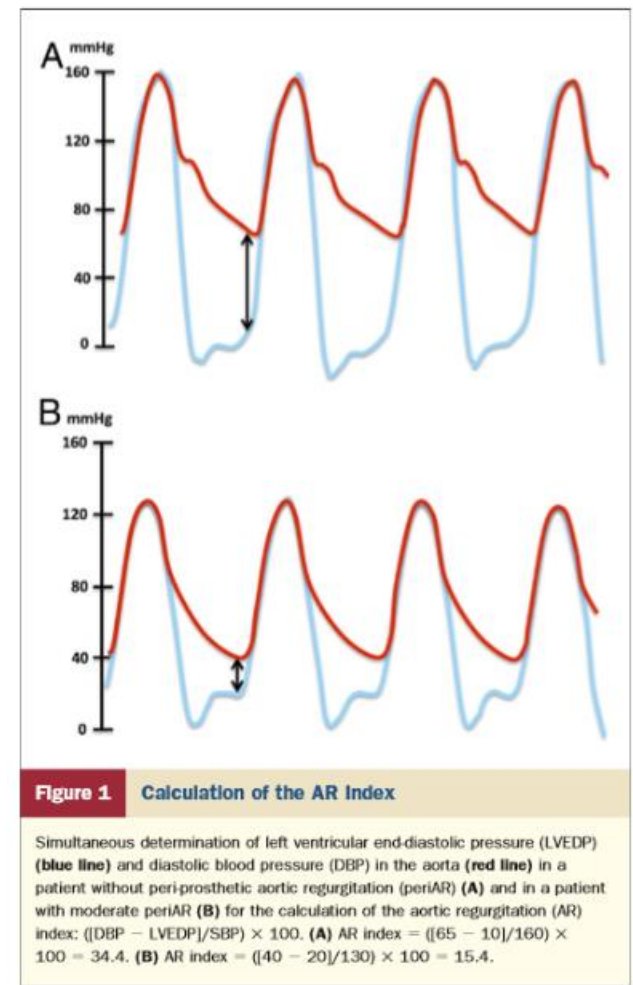
●●● CALCIUM IS OUR FIRST ENEMY

Calcium at the level of the leaflets, at the level of the annulus and also at the level of femoral/iliacal arteries

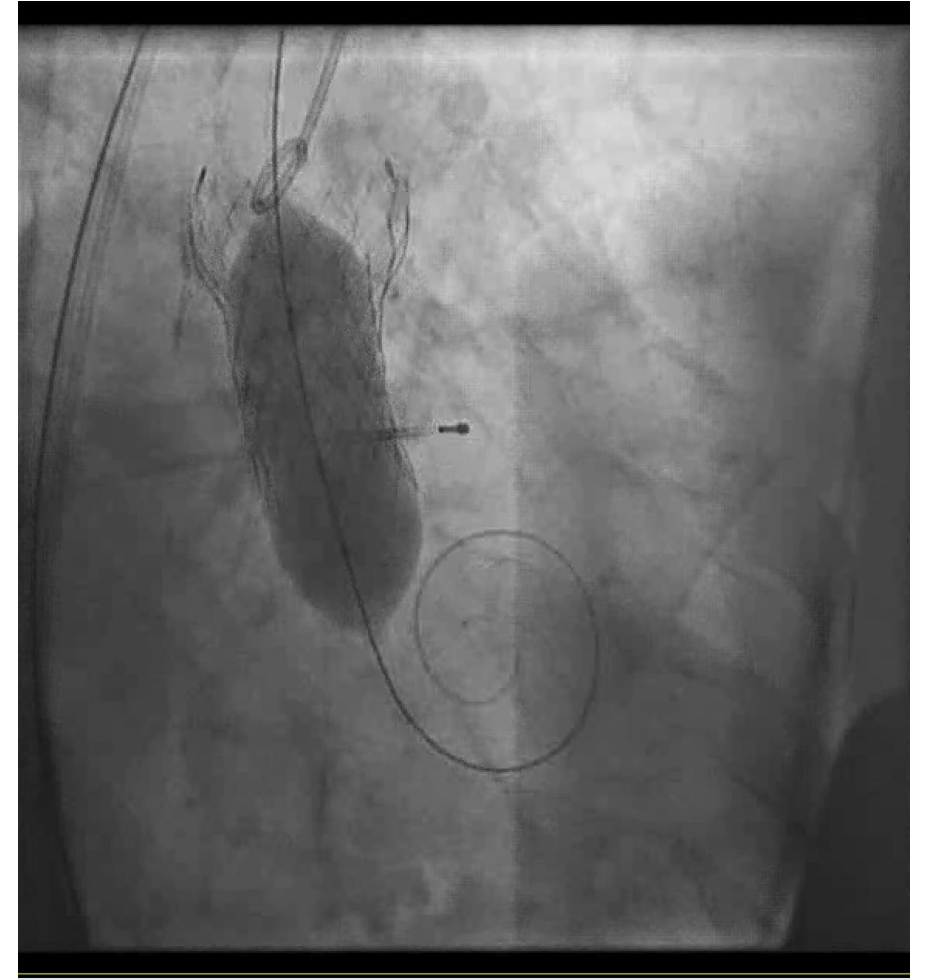
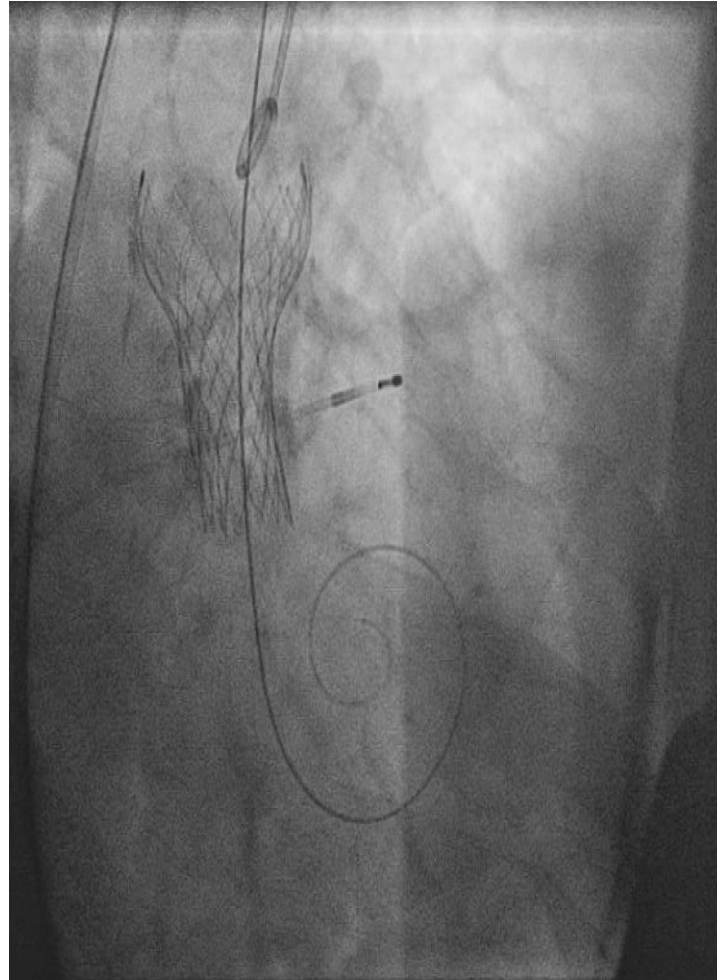
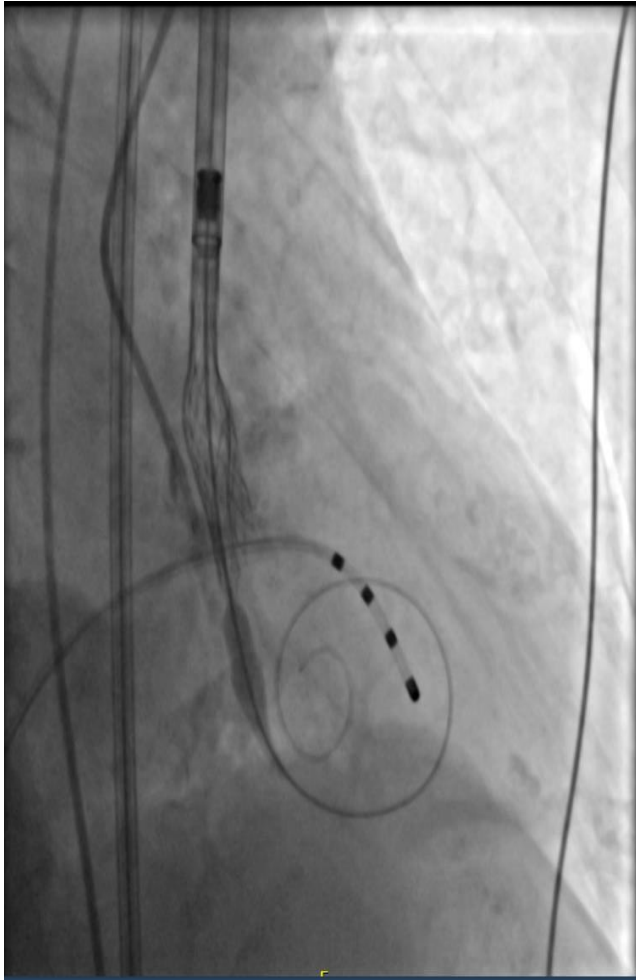


Affect stent expansion, stent apposition >> Risk of paravalvular leak and/or residual gradient
Will require more steps of pre and post dilatation >> Risk of stroke

PARAVALVULAR REGURGITATION

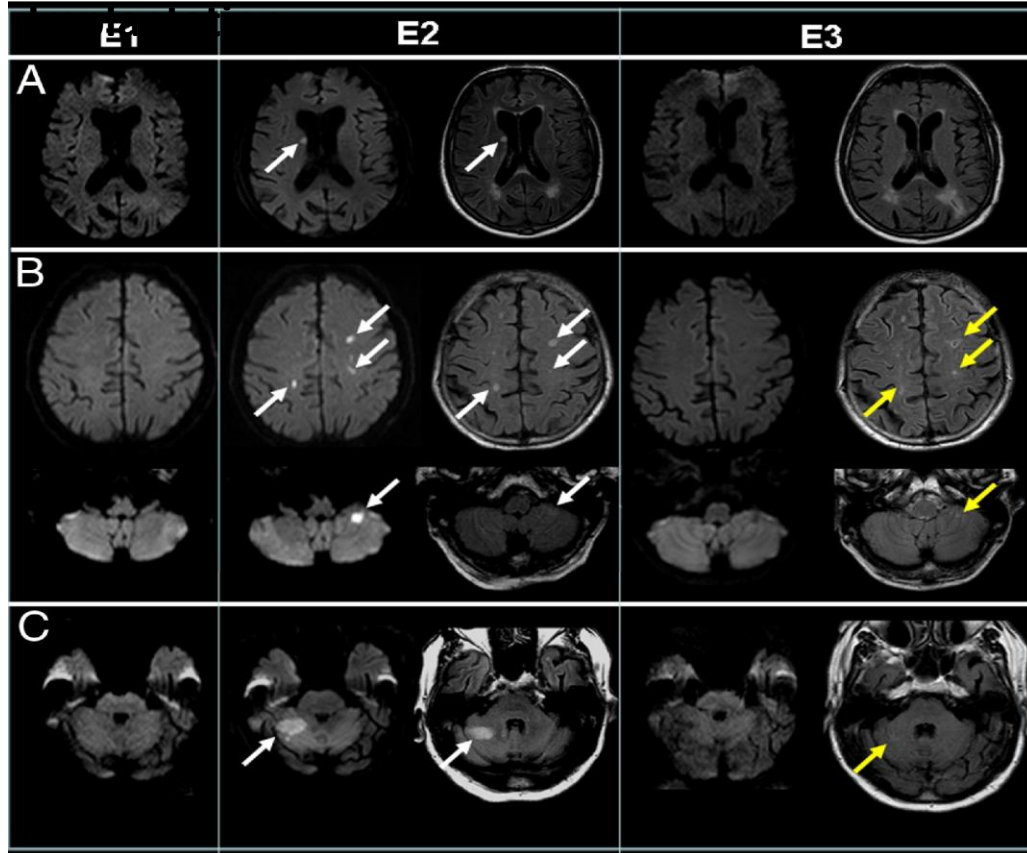


RESIDUAL GRADIENT DUE TO TAVI UNDEREXPANSION

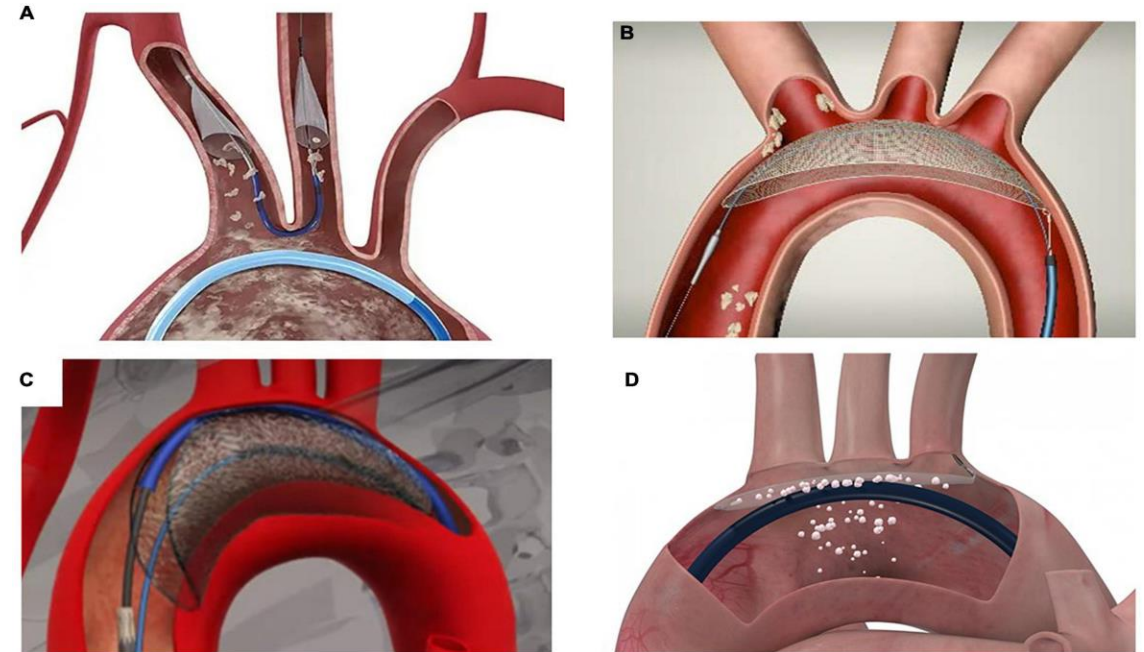


STROKE

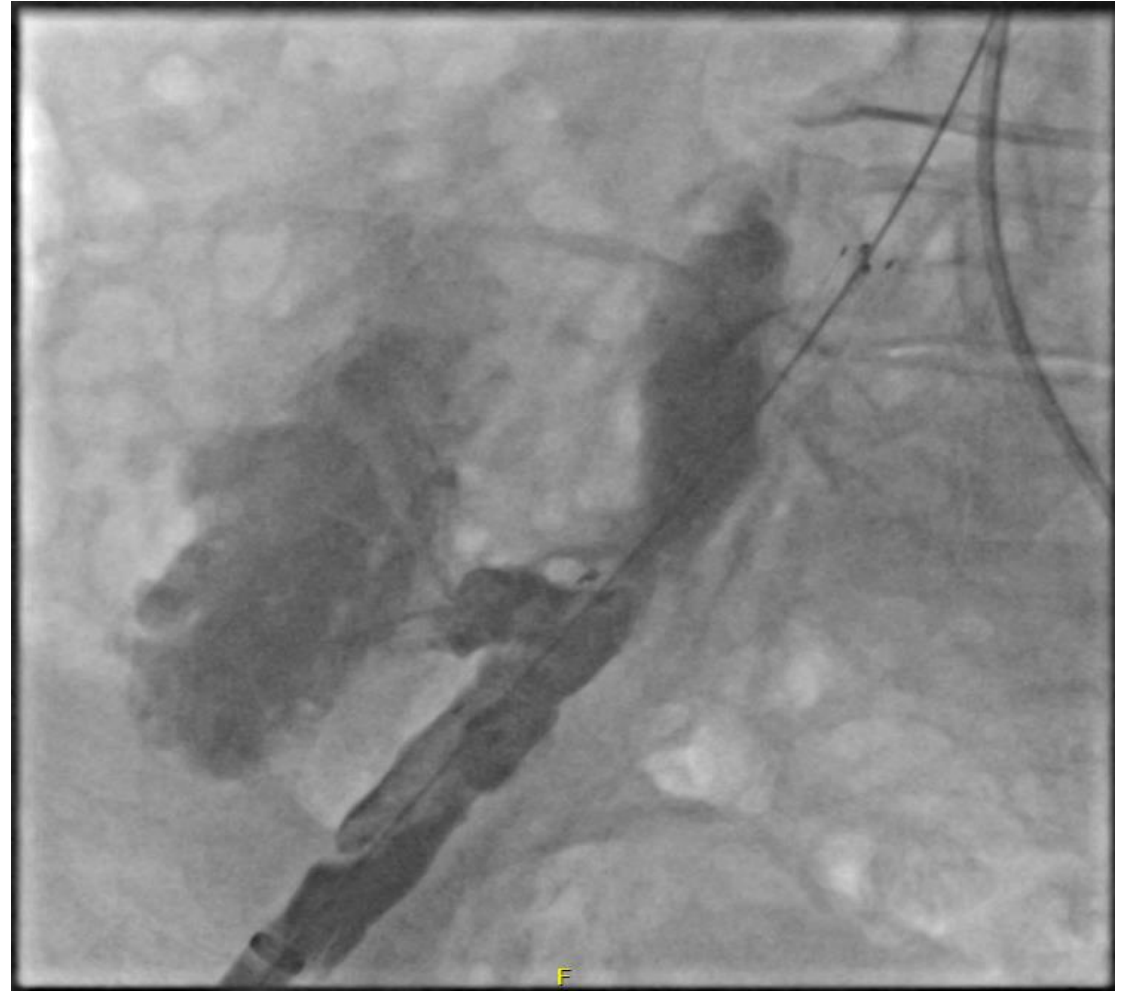
Silent and Apparent Cerebral Ischemia After Percutaneous Transfemoral Aortic Valve



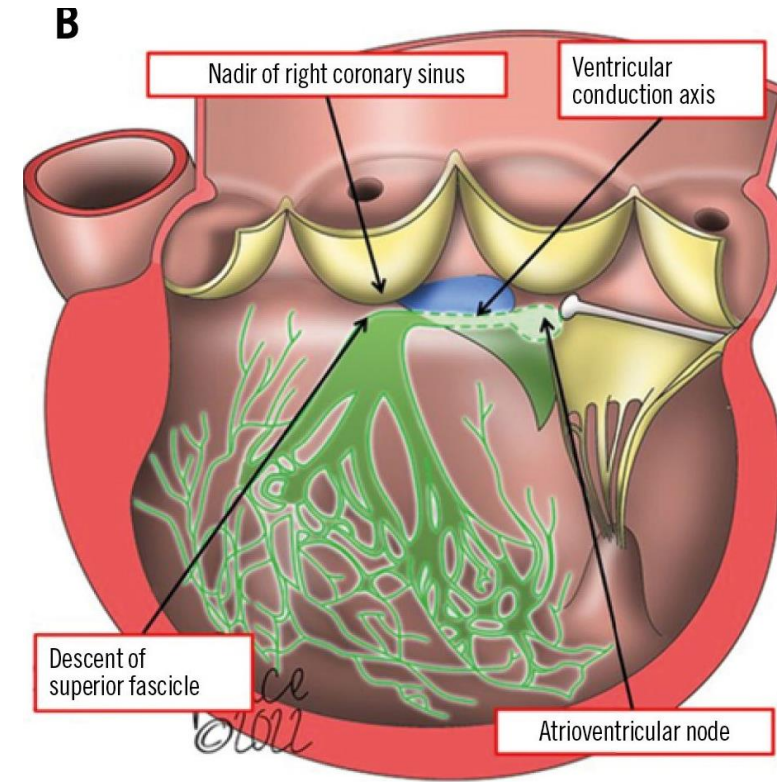
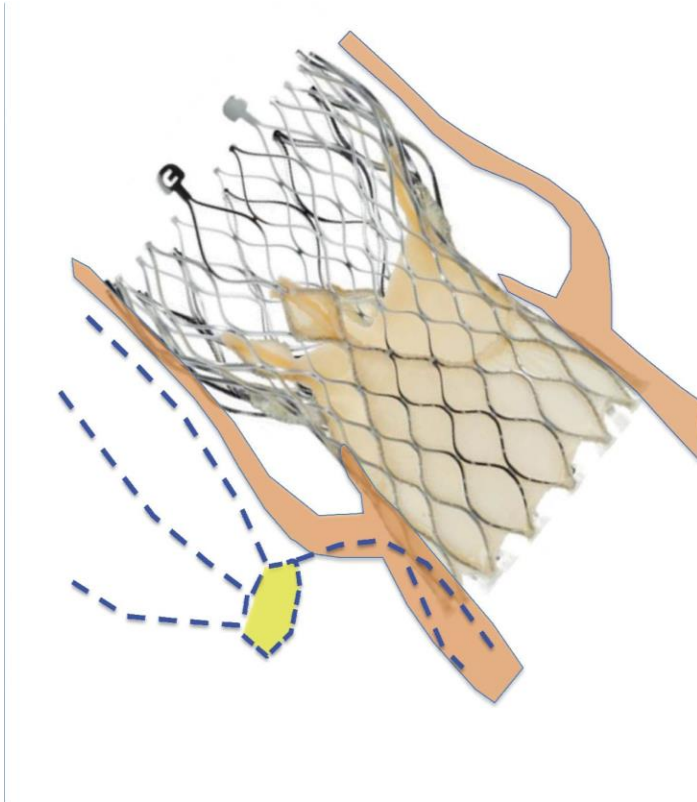
The PROTECTED TAVR trial showed negative results, failing to demonstrate that the Sentinel Cerebral Embolic Protection (CEP) system significantly reduced stroke within 72 hours of a transcatheter aortic valve implantation (TAVI) compared to no device



000 SEVERE ILIACAL PERFORATION



LOW IMPLANTATION IS OUR SECOND ENEMY

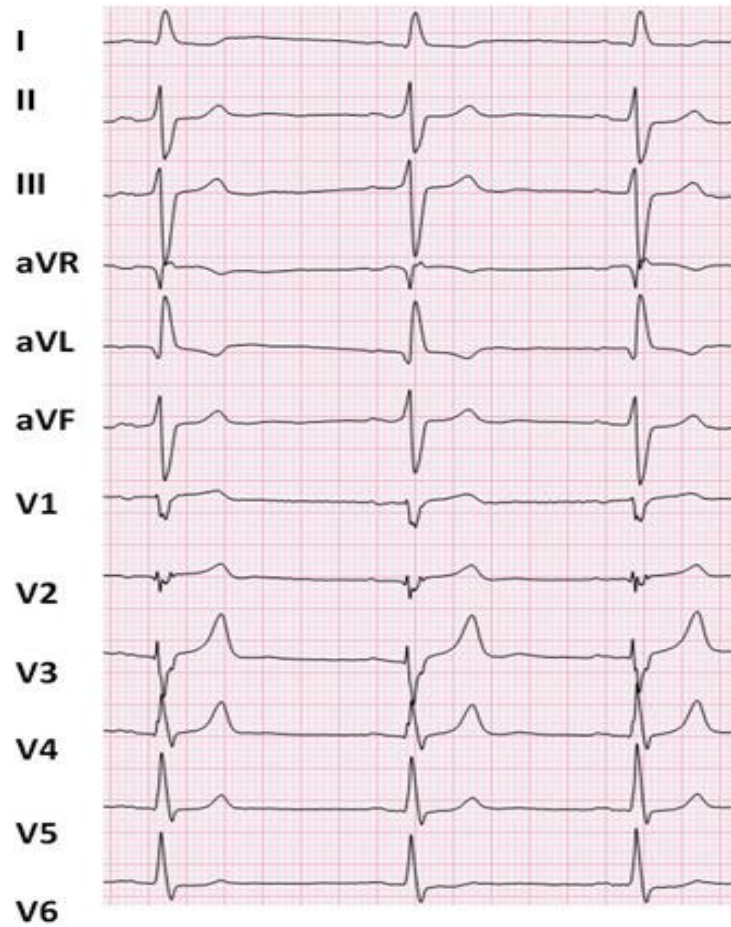


➤ Importance of post TAVI ECG evaluation: change in PR, QRS duration, LBTB



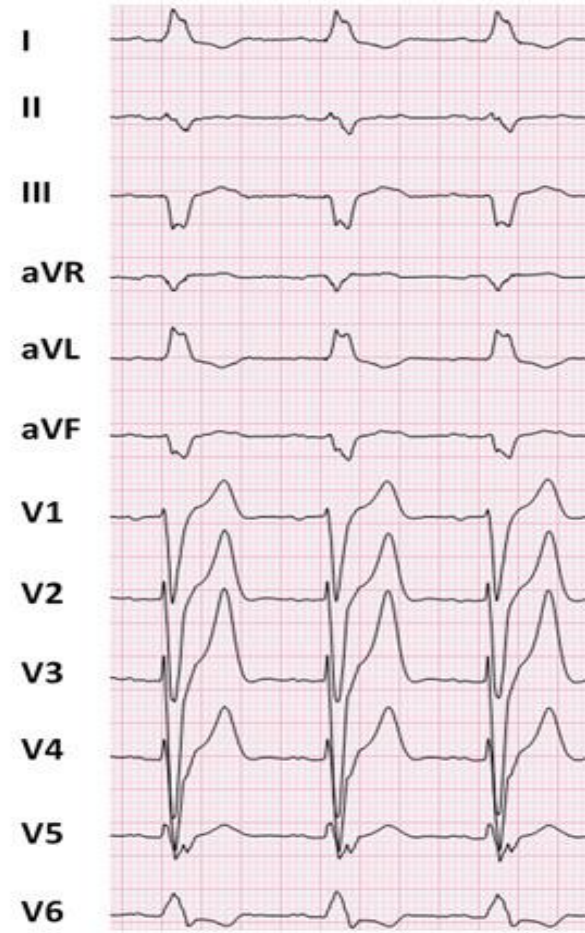
NEW CONDUCTION ABNORMALITIES

Pre TAVR ECG



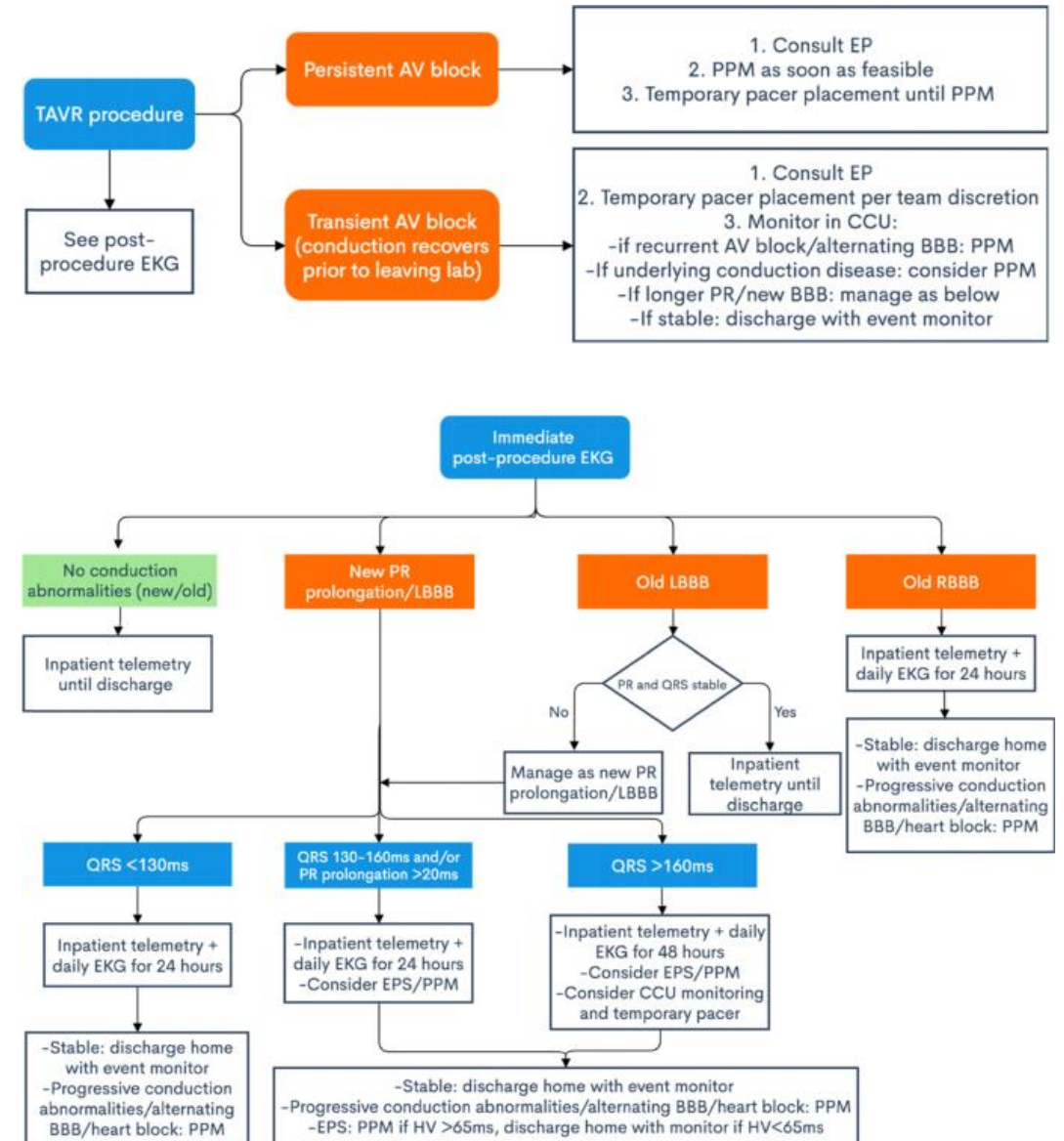
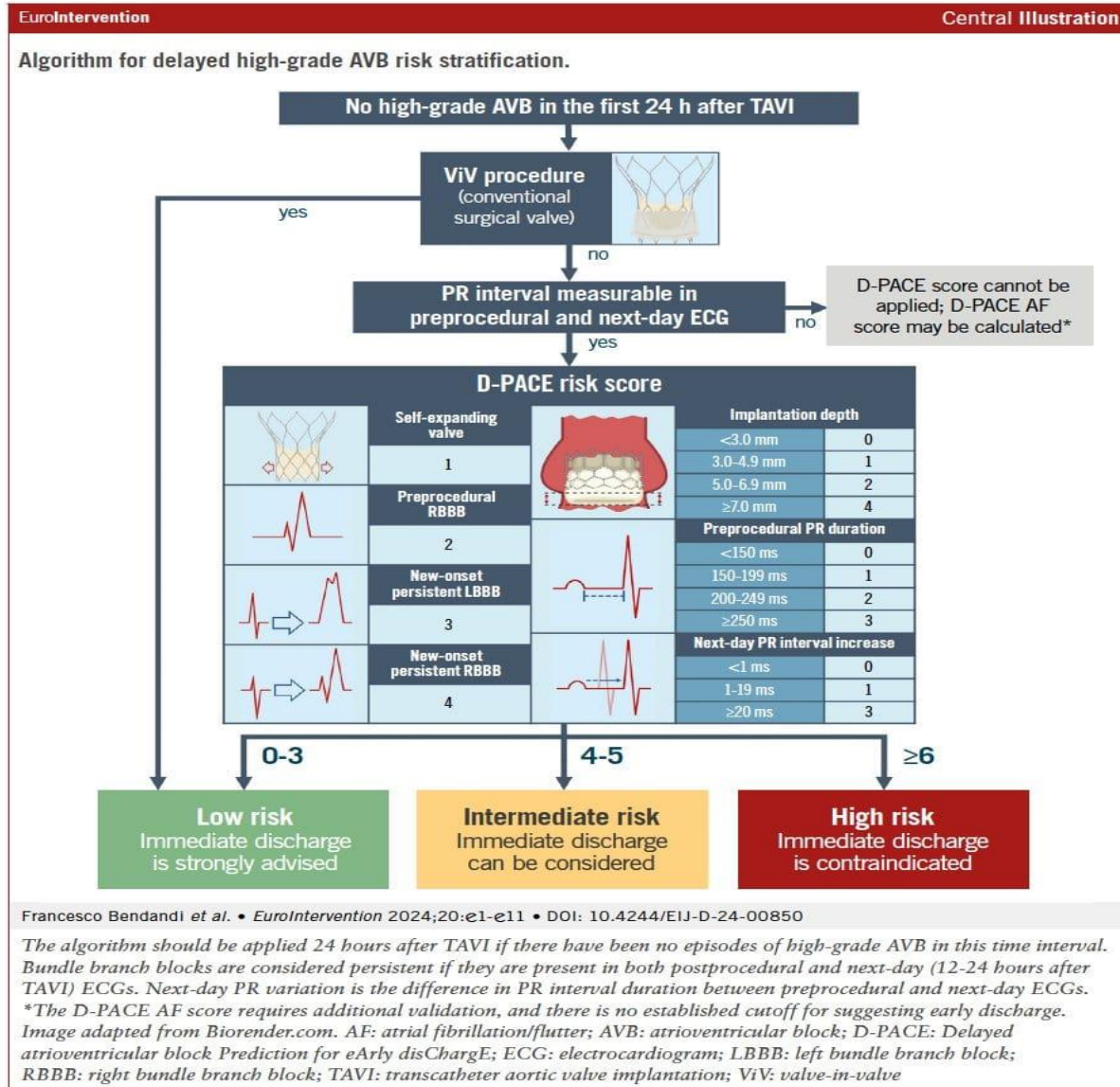
QRS duration 136ms

Post TAVR ECG



QRS duration 180ms

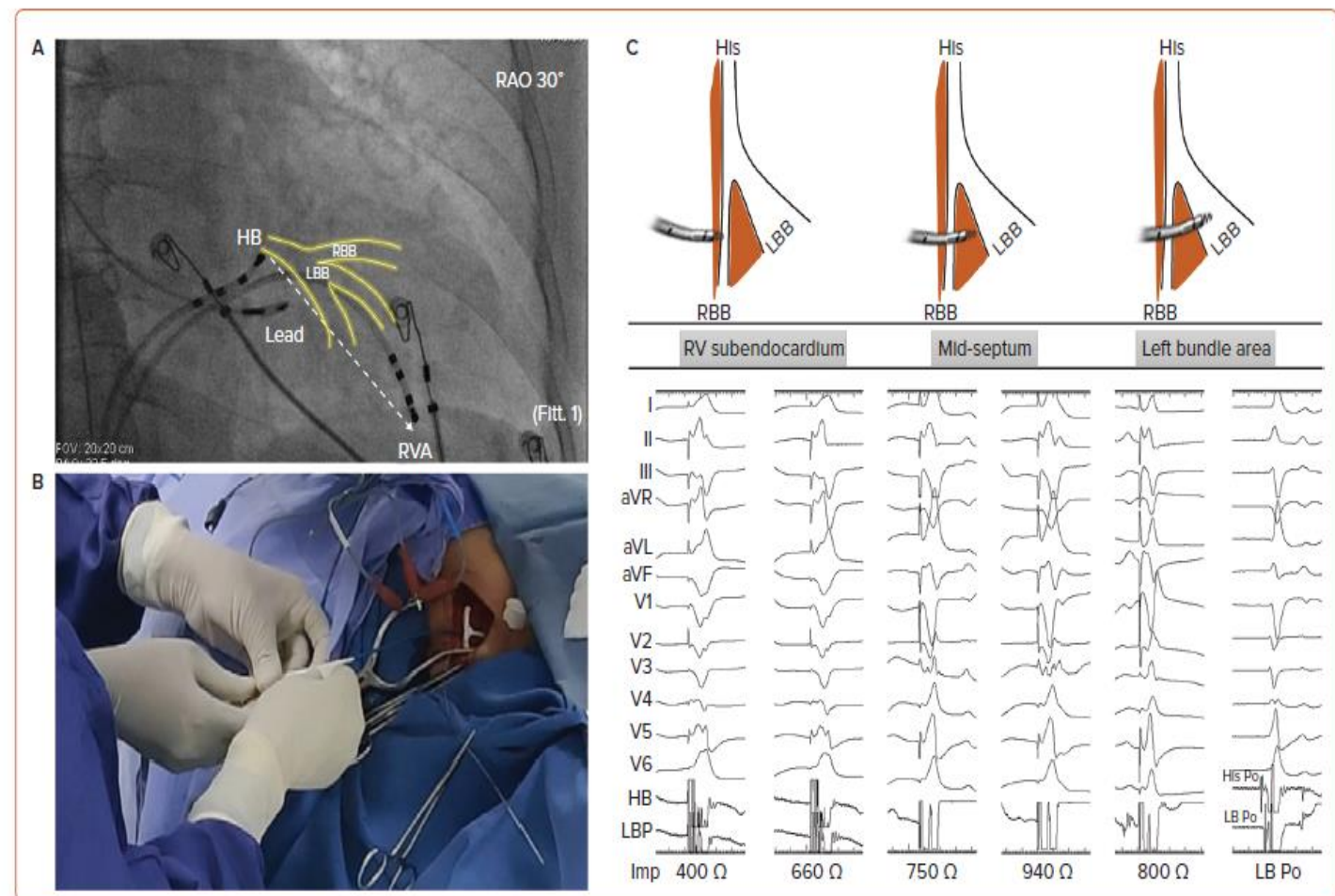
NEW CONDUCTION ABNORMALITIES





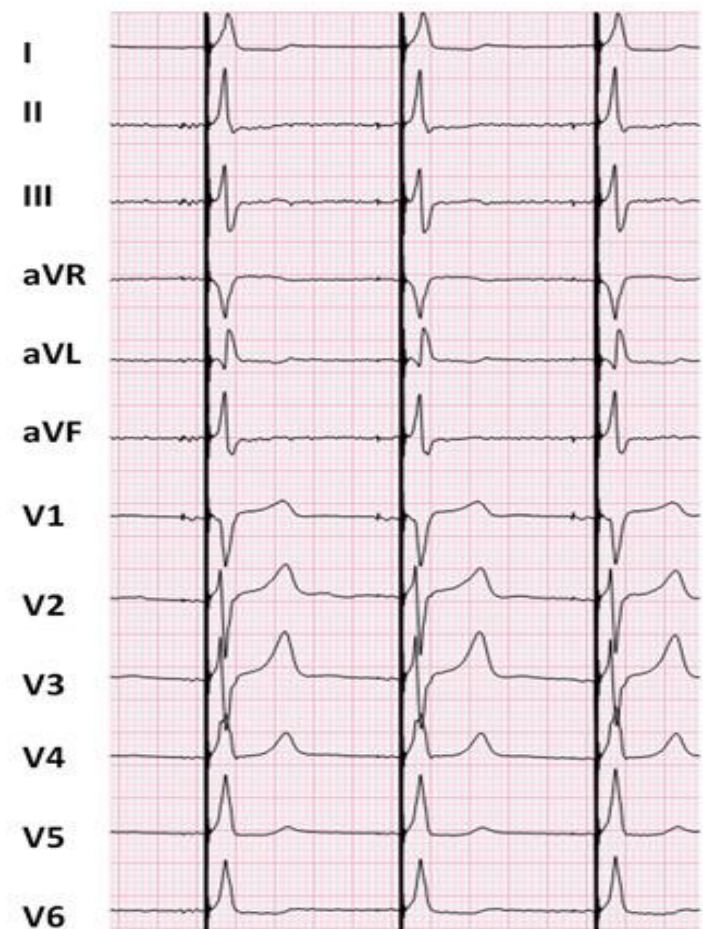
PM IMPLANTATION: MORE PHYSIOLOGICAL PACING

Figure 4: Left Bundle Branch Pacing Implantation Technique



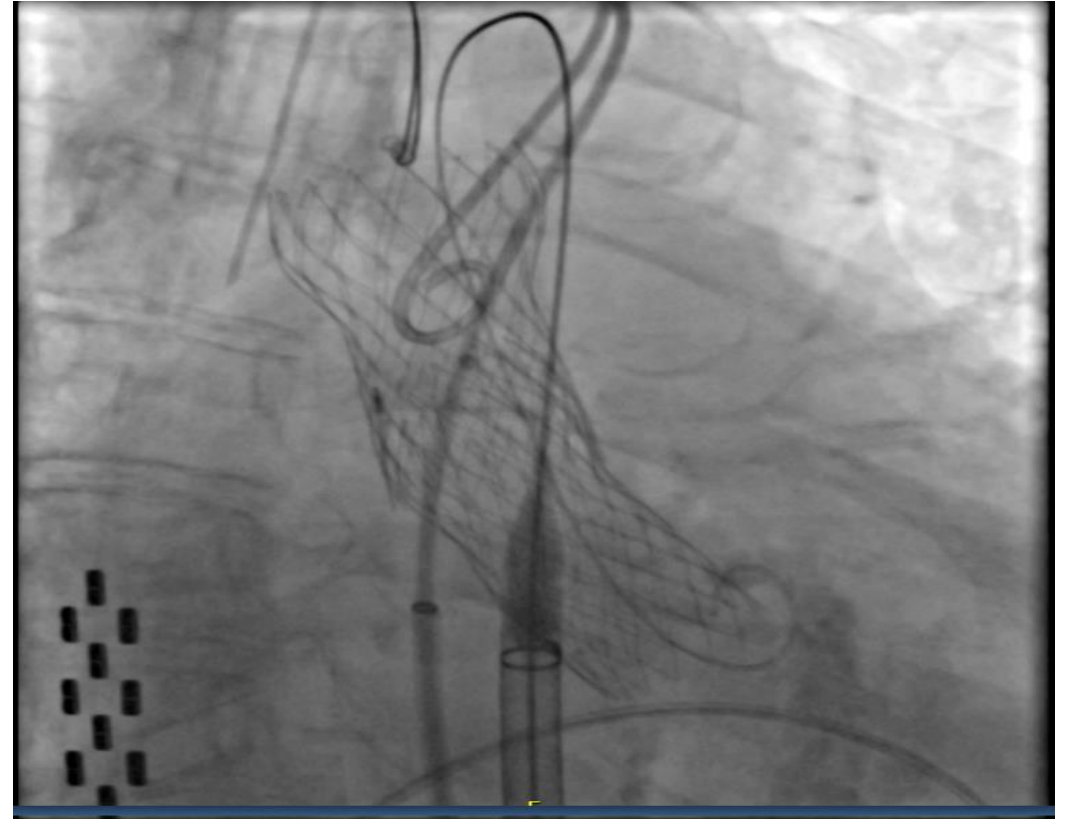
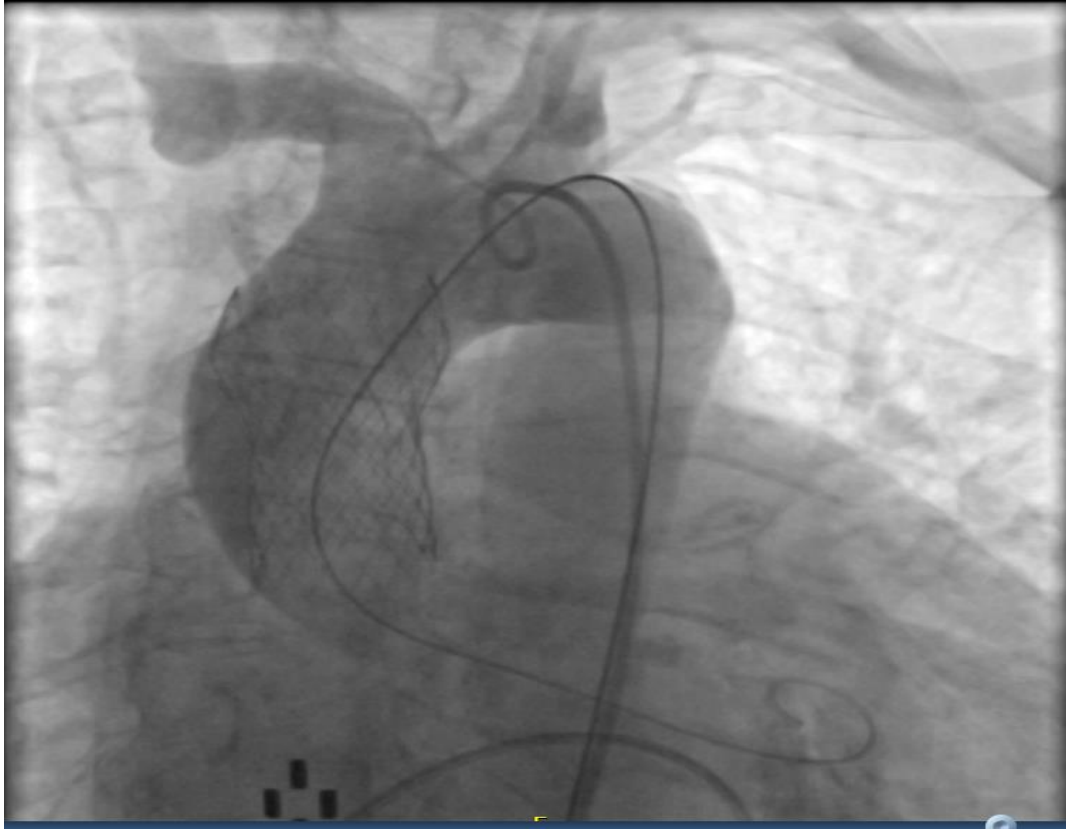
A: RAO fluoroscopic view showing the course of the HB and LBB. The ideal target site is 1–1.5 cm below the HB along an imaginary line connecting the distal HB to the RVA. B: Rapid rotation of the lead must be performed with the hub of the sheath pointing towards the 3- to 4-o'clock position, with preferably dry gloves closer to the sheath. C: Pacing the target site at the right side of the septum will show the "W" pattern in lead V1, tall R in lead II and discordant QRS complexes in aVR and aVL. As the lead reaches the LBB area, paced QRS will show a qR pattern in lead V1 along with LB Po preceding the local ventricular electrogram. HB = His bundle; LBB = left bundle branch; LB Po = left bundle potential; RAO = Right anterior oblique; RBB = right bundle branch; RV = right ventricle; RVA = right ventricle apex.

Non-selective HBP with TAVR induced LBBB corection



QRS duration 130ms

000 SUPRA-ANNULUS VALVE EMBOLISATION



ETIOLOGY AND RISK FACTORS

HISTORICAL PERSPECTIVE

INDICATION OF TAVI in 2025: EBM vs Belgium

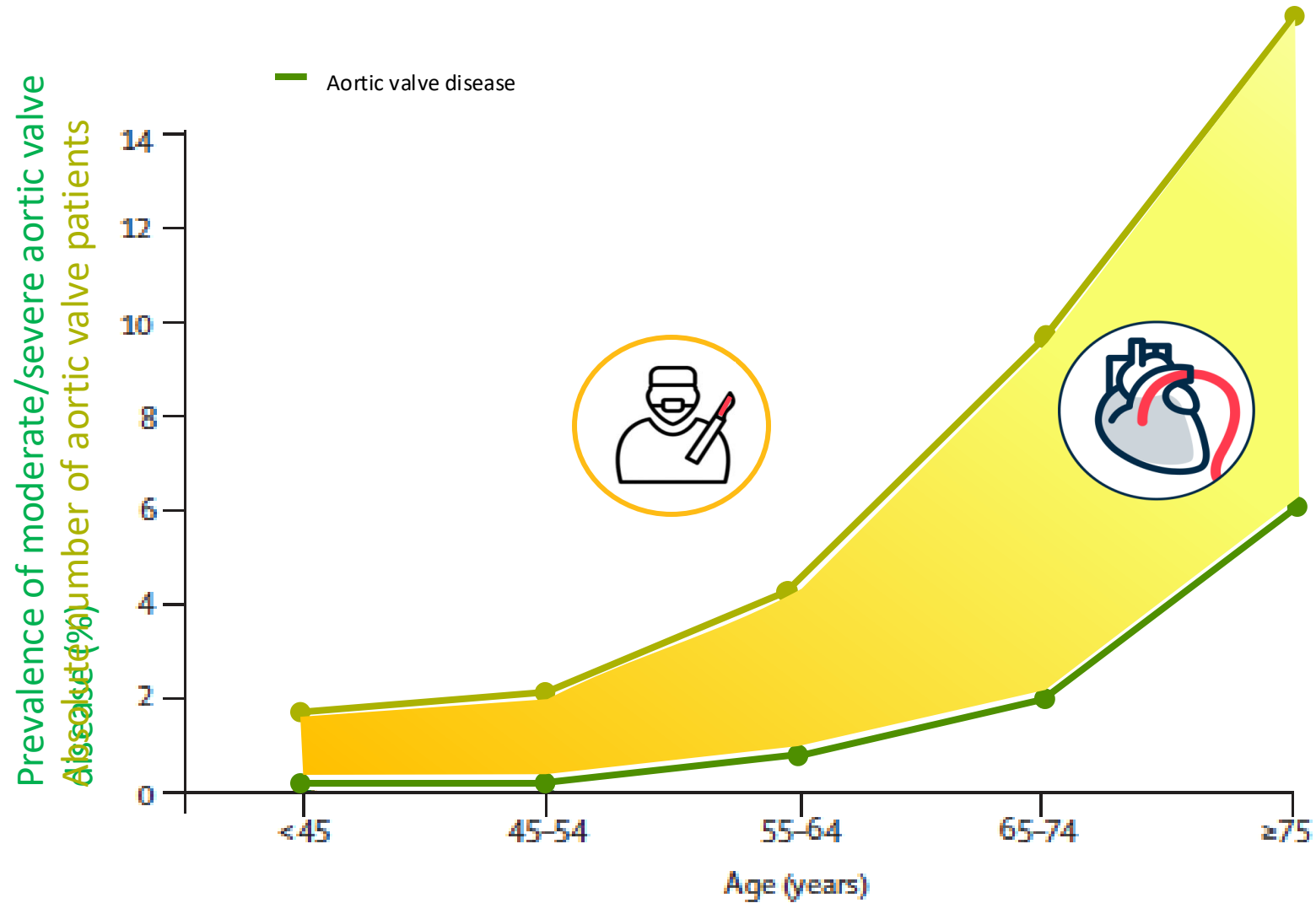
BASICS OF TAVI

POSSIBLE COMPLICATIONS

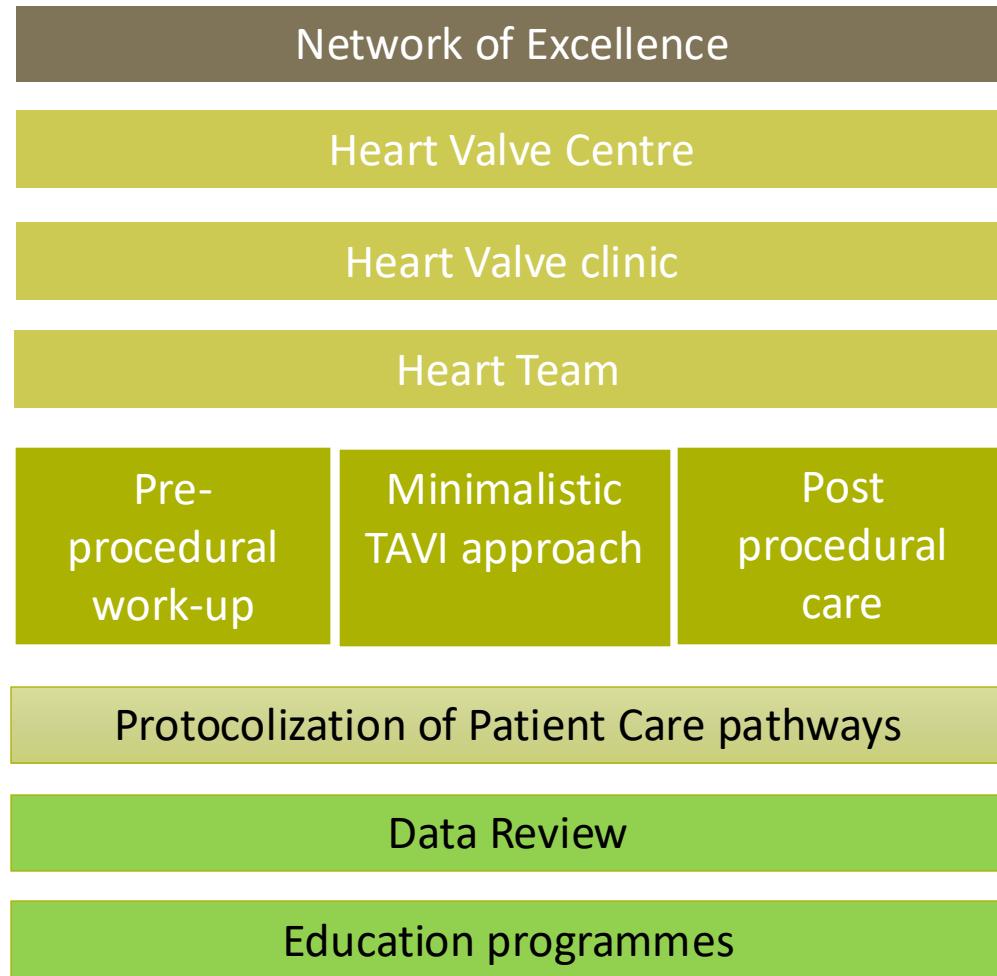
ROLE OF THE GERIATRICIAN IN TAVI PATHWAY:

UZB experience.

NEED OF DEDICATED TAVI PATHWAY



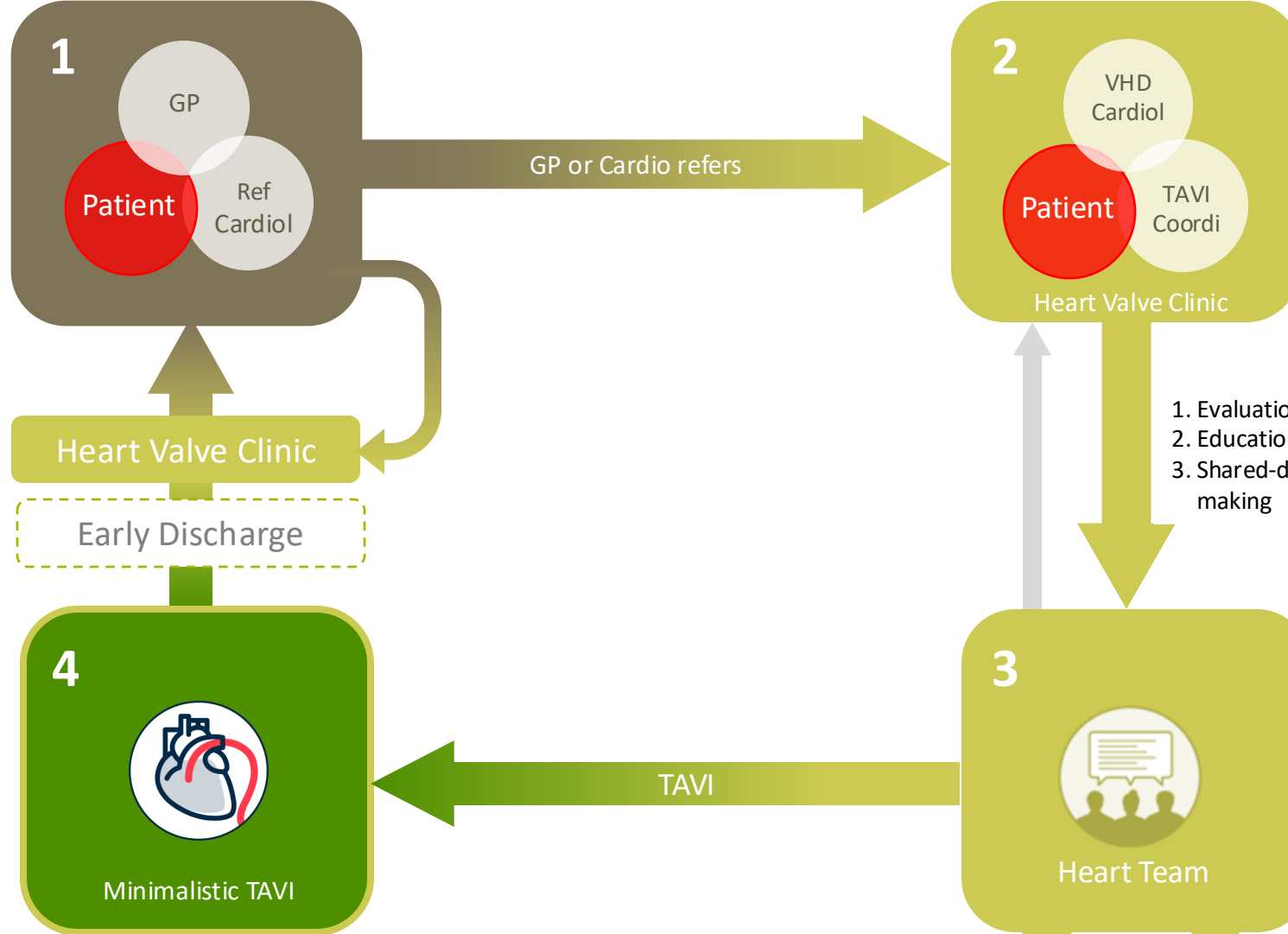
KEY POINTS OF DEDICATED TAVI PATHWAY



- TAVI coordinator
- Dedicated nursing personnel
- Clinical cardiologist
- Interventional cardiologist
- Cardiac surgeon
- Imaging specialist
- Heart failure specialist
- Electrophysiologist
- **Geriatrician**
- Anesthesiologist

Courtesy Dr. Rosseel Liesbeth

... SETTING UP A DEDICATED TAVI PATHWAY



- ✓ TTE
- ✓ ECG
- ✓ MSCT
- ✓ Lab
- ✓ Comorbidity assessment

- ± Coronary angiogram
- ± DSE
- ± TOE
- ± NT(pro)BNP
- ± Exercise test

- ✓ MSCT pre planning
- ✓ Cathlab
- ✓ 2 interventionalists
- ✓ 2 nurses
- ✓ Local anaesthesia
- ✓ Ultrasound guided access
- ✓ Secondary radial access
- ✓ Fast ambulation protocol
- ✓ Short stay protocol

- ✓ VHD cardiologist
- ✓ Imaging specialist
- ✓ Interventional cardiologist
- ✓ Cardiac surgeon
- ✓ Geriatrician

- ± Heart failure specialist
- ± Electrophysiologist
- ± Cardiac anaesthesiologist

DATA REVIEW FROM UZB TAVI PATHWAY



diagnostics

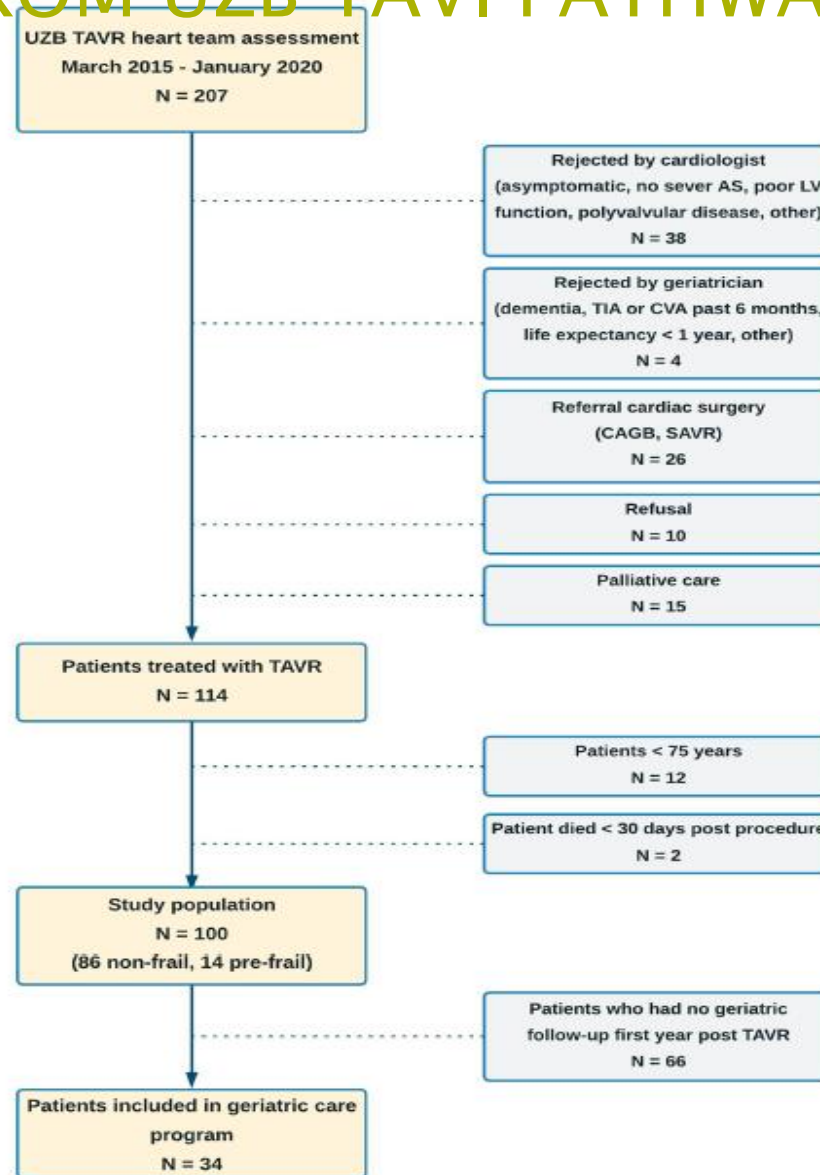


Article

Depression and Malnutrition for Prediction of Mortality after Transcatheter Aortic Valve Replacement: A Registry Study of a Tertiary Referral Hospital

Jolien Geers ^{1,*} , Karen Van den Bussche ¹, Bert Vandeloo ¹, Dorien M. Kimenai ², Ines Van Loo ³, Vincent Michiels ¹, Daniele Plein ¹, Stefan Beckers ⁴, Teun Muylle ⁵, Siddhartha Lieten ⁶, Bernard Cosyns ¹, Nathalie Compté ⁷ and Jean-François Argacha ¹

DATA REVIEW FROM UZB TAVI PATHWAY



DATA REVIEW FROM UZB TAVI PATHWAY

- Geriatric parameters
 - Functional status
 - Cognitive functions
 - Polypharmacy
 - Malnutrition
 - Depression
 - Grip strength
 - Mobility and balance
- 2 groups based on CGA-FI
 - non-frail ≤ 0.10
 - Pre frail > 0.10

CGA-FI

Medical History (20 deficit items)

Angina	☐ Atrial fibrillation/flutter	☐ Coronary artery disease	☐
Diabetes	☐ Heart failure	☐ Hypertension	☐
Myocardial infarction	☐ Peripheral vascular disease	☐ Stroke/TIA	☐
Anxiety disorder	☐ Arthritis	☐ Asthma	☐
Cancer within 5 years	☐ Chronic kidney disease (eGFR<60)	☐ COPD	☐
Degenerative spine disease	☐ Depression	☐ Fall within the past year	☐
Sensory impairment	☐ Use of ≥ 5 prescription drugs	☐	☐

Functional Status (22 deficit items)

Unable to perform or need personal help with:

Activities of Daily Living

Feeding
Dressing/undressing
Grooming
Walking (or use of a walker)
Getting in and out of bed
Toileting
Bathing or shower

Instrumental Activities of Daily Living

☐ Using telephone
☐ Using transportation
☐ Shopping
☐ Preparing own meals
☐ Housework
☐ Taking own medications
☐ Managing money

Nagi & Rosow-Breslau Activities

☐ Pulling or pushing a large object
☐ Stooping, crouching or kneeling
☐ Lifting or carrying 10 lbs
☐ Reaching arms above shoulder
☐ Writing or handling small objects
☐ Walking up/dn a flight of stairs
☐ Walking half a mile
☐ Heavy work around house

Performance Tests (3 deficit items)

Mini-Mental State Examination

27-30 points (0 points)
24-26 points (0.3 points)
21-23 points (0.7 points)
<21 points (1 point)

Gait Speed

☐ ≥ 1 m/sec (0 points)
☐ 0.80-0.99 m/sec (0.3 points)
☐ 0.60-0.79 m/sec (0.7 points)
☐ < 0.60 m/sec (1 point)

Dominant Handgrip Strength

☐ M: ≥ 32 kg; F: ≥ 20 kg (0 points)
☐ M: 26-31 kg; F: 16-19 kg (0.5 points)
☐ M: < 26 kg; F: < 16 kg (1 point)
☐

Nutritional Status (3 deficit items)

Weight loss > 10 lbs in past year	☐ Body mass index < 21 kg/m ²	☐ Serum albumin < 3.5 g/L	☐
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Number of positive items: _____ Number of items assessed: _____ CGA-FI (range: 0.0-1.0): _____

DATA REVIEW FROM UZB TAVI PATHWAY

Table 1. Baseline clinical, hemodynamic, laboratory, and procedural characteristics of the overall study population and the primary endpoint groups.

	Overall Population (n = 100)	Primary Endpoint (n = 28)	No Primary Endpoint (n = 72)	p-Value
<i>Clinical</i>				
Male, n (%)	39 (39)	14 (50)	25 (35)	0.160
Age (years)	84 ± 4	84 ± 4	84 ± 4	0.979
Body mass index (kg/m ²)	27.5 ± 4.9	27.3 ± 4.8	27.6 ± 5.0	0.793
Hypertension, n (%)	78 (78)	22 (79)	56 (78)	0.931
Diabetes mellitus, n (%)	24 (24)	8 (29)	16 (22)	0.504
Atrial fibrillation, n (%)	33 (33)	8 (29)	25 (35)	0.557
Prior MI, n (%)	15 (15)	4 (14)	11 (15)	0.901
CAD, n (%)	42 (42)	12 (43)	30 (42)	0.914
Prior stroke or TIA, n (%)	9 (9)	4 (14)	5 (7)	0.249
Sternotomy, n (%)	24 (24)	7 (25)	17 (24)	0.884
COPD, n (%)	19 (19)	5 (18)	14 (19)	0.856
EuroSCORE II	4.6 [2.8–7.7]	6.1 [3.7–10.4]	4.0 [2.7–6.0]	0.025
STS-PROM	3.9 [2.6–5.0]	3.6 [2.5–5.0]	4.1 [2.7–5.0]	0.539
<i>Medication, n (%)</i>				
ADP inhibitor	7 (7)	2 (7)	5 (7)	0.972
ACE/ARB inhibitor	57 (57)	18 (64)	39 (54)	0.359
Antidepressants	8 (8)	2 (7)	6 (8)	0.844
<i>Hemodynamic and laboratory</i>				
AVA (cm ²)	0.76 ± 0.22	0.74 ± 0.16	0.76 ± 0.24	0.654
PG (mmHg)	71.3 ± 27.8	68.9 ± 19.4	72.2 ± 30.5	0.593
LVEF (%)	55 [50–60]	50 [50–59]	55 [50–60]	0.326
TAPSE (mm)	19.7 ± 5.3	19.1 ± 5.9	19.9 ± 5.1	0.604
SPAP (mmHg)	42.0 ± 15.3	45.4 ± 21.1	40.5 ± 11.8	0.279
LAVI (mL/m ²)	50.9 ± 15.6	57.5 ± 17.2	48.7 ± 14.5	0.042
eGFR (mL/min/1.73 m ²)	53.2 ± 14.3	49.4 ± 14.6	54.6 ± 13.9	0.100
Hematocrit (%)	34.5 ± 11.5	33.3 ± 11.8	35.0 ± 11.5	0.509
WBC (×10 ³ /mm ³)	7.0 [5.6–8.1]	7.1 [5.2–8.0]	7.0 [5.7–8.2]	0.514
Albumin (g/L)	39.6 ± 5.5	37.8 ± 4.4	40.4 ± 5.8	0.046
<i>Procedural and hospitalization</i>				
Full anesthesia, n (%)	75 (75)	22 (79)	53 (74)	0.607
TF approach, n (%)	97 (97)	27 (96)	70 (97)	0.835
Length of stay (days)	8 [6–12]	10 [6–23]	8 [6–12]	0.263
Pacemaker, n (%)	18 (18)	6 (21)	12 (17)	0.578
MR ≥ 2/4, n (%)	29 (29)	10 (36)	19 (26)	0.356
AR ≥ 2/4, n (%)	10 (10)	2 (8)	8 (12)	0.581
Geriatric follow-up, n (%)	34 (34)	6 (21)	28 (39)	0.098

DATA REVIEW FROM UZB TAVI PATHWAY

Table 2. Baseline geriatric characteristics of the overall study population and the primary endpoint groups.

	Overall Population	Primary Endpoint	No Primary Endpoint	<i>p</i> -Value
Katz (<i>n</i> = 97)	7 [6–8]	7 [6–8]	7 [6–8]	0.818
MMSE (<i>n</i> = 97)	27 [25–29]	27 [25–29]	27 [24–29]	0.420
Polypharmacy (<i>n</i> = 98)				
≥5 medicines	90 (92)	24 (89)	66 (93)	0.511
Timed up and go (<i>n</i> = 93)	15.4 ± 9.8	13.7 ± 6.9	16.1 ± 10.6	0.305
≥20 s	18 (19)	5 (20)	13 (19)	0.924
Chair stand test (<i>n</i> = 90)	15.9 ± 9.6	14.2 ± 8.7	16.4 ± 9.9	0.347
≥14 s	66 (73)	16 (70)	50 (75)	0.636
Gait speed (<i>n</i> = 75)	0.83 ± 0.26	0.80 ± 0.33	0.84 ± 0.24	0.393
≤0.8 m/s	30 (40)	7 (39)	23 (40)	0.912
Tinetti (<i>n</i> = 81)	25 [21–27]	24 [20–27]	26 [21–27]	0.711
<20	16 (20)	5 (23)	11 (19)	0.681
SPPB (<i>n</i> = 80)	7.7 ± 2.8	8.2 ± 2.4	7.6 ± 3.0	0.393
<10	54 (68)	14 (70)	40 (67)	0.784
Grip strength (<i>n</i> = 68)	42.5 ± 16.4	46.8 ± 14.8	41.2 ± 16.8	0.235
GDS-15 (<i>n</i> = 91)	1 [1–4]	3.5 [1–5]	1 [0–3]	0.045
≥5	18 (20)	9 (38)	9 (13)	0.011
Malnutrition (<i>n</i> = 80)				
BMI < 22 or albumin < 3.5 g/L	11 (14)	7 (28)	4 (7)	0.013
BMI < 22	3 (3)	2 (7)	1 (1)	0.063
Albumin < 3.5 g/L	11 (14)	7 (28)	4 (6)	0.002
CCI (<i>n</i> = 100)	5.0 ± 1.1	5.1 ± 1.2	4.9 ± 1.1	0.399
CGA-FI (<i>n</i> = 100)	0.14 ± 0.05	0.15 ± 0.06	0.14 ± 0.05	0.200
>0.2	14 (14)	5 (18)	9 (12)	0.488

Data are presented as number (percent), mean ± standard deviation if normally distributed or median (interquartile range) if not normally distributed. MMSE: mini mental state examination; SPPB: short physical performance battery; kPa: kilopascal; GDS-15: geriatric depression scale 15; BMI: body mass index; CCI: Charlson comorbidity index; CGA-FI: comprehensive geriatric assessment frailty index.

DATA REVIEW FROM UZB TAVI PATHWAY

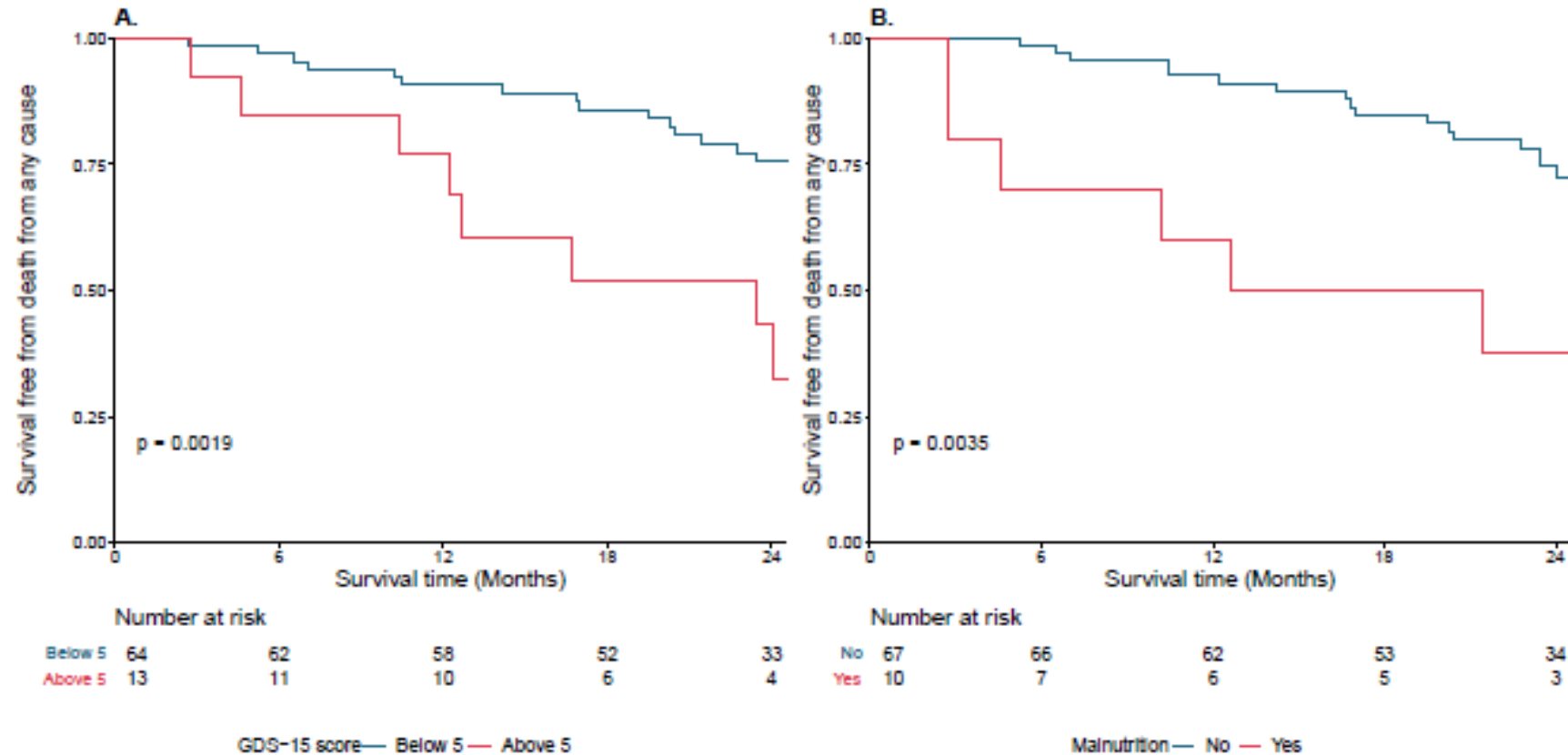


Figure 1. Kaplan-Meier curves with log-rank for overall survival of patients treated with TAVR according to (A) geriatric depression scale 15 and (B) malnutrition status.

DATA REVIEW FROM UZB TAVI PATHWAY

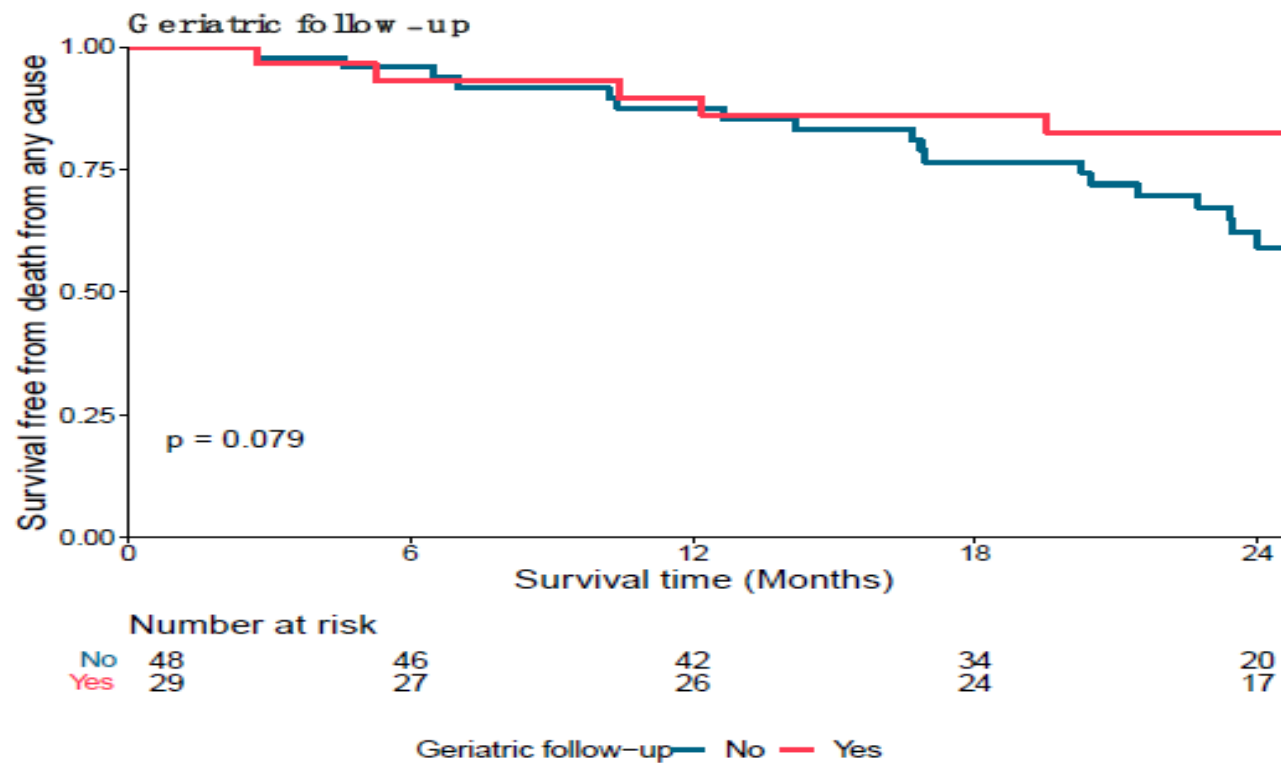
Table 3. Univariable and multivariable Cox regression analysis of GDS-15 and malnutrition for the prediction of all-cause mortality.

	HR	95% CI	<i>p</i>-Value
Unadjusted			
GDS-15 ≥ 5	3.60	1.52–8.52	0.004
Malnutrition	3.67	1.44–9.34	0.006
Adjusted for age and sex			
GDS-15 ≥ 5	5.07	2.00–12.87	<0.001
Malnutrition	3.83	1.45–10.12	0.007
Adjusted for EuroSCORE II			
GDS-15 ≥ 5	4.15	1.72–10.01	0.002
Malnutrition	2.89	1.09–7.67	0.033
Combined model with EuroSCORE II			
GDS-15 ≥ 5	4.38	1.79–10.74	0.001
Malnutrition	3.08	1.15–8.22	0.025

HR: hazard ratio; CI: confidence interval; GDS-15: geriatric depression scale 15.

DATA REVIEW FROM UZB TAVI PATHWAY

Supplemental figure S2. Kaplan-Meier curves with log-rank test for overall survival of patients treated with TAVR according to inclusion in post TAVR geriatric care program.



DATA REVIEW FROM RIGA HOSPITAL TAVI PATHWAY

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> Clin Cardiol. 2019 Apr;42(4):444-451. doi: 10.1002/clc.23166. Epub 2019 Mar 14.

Patients and informal caregivers' experience of surgical and transcatheter aortic valve replacement: Real-world data contributing to establish value-based medicine in Denmark

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Affiliations + expand

PMID: 30816559 PMCID: [PMC6712343](#) DOI: [10.1002/clc.23166](#)

Abstract

Background: The concept of value-based medicine (VBM) is increasingly implemented in therapeutic decision-making processes, but only few data on patient-perceived values are available in the field of aortic stenosis treatment.

Hypothesis: This study aimed to deliver data on patient-perceived values and health-related

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Questionnaire

Wellbeing Perspective



Physical



Mental



Social

Patient

Social status

Health 0-100 scale

before AVR

today, after AVR

Symptoms

before AVR

today - after AVR

Physical health: physical stress?

Procedure AVR

Post procedure

How long to recover physically

Mental health: mental stress?

Procedure AVR

Post procedure

How long to recover mentally

Would you do it again?

Informal Caregiver

IC assessment of patient

How physically stressfull

How mentally stressfull

How long to recover

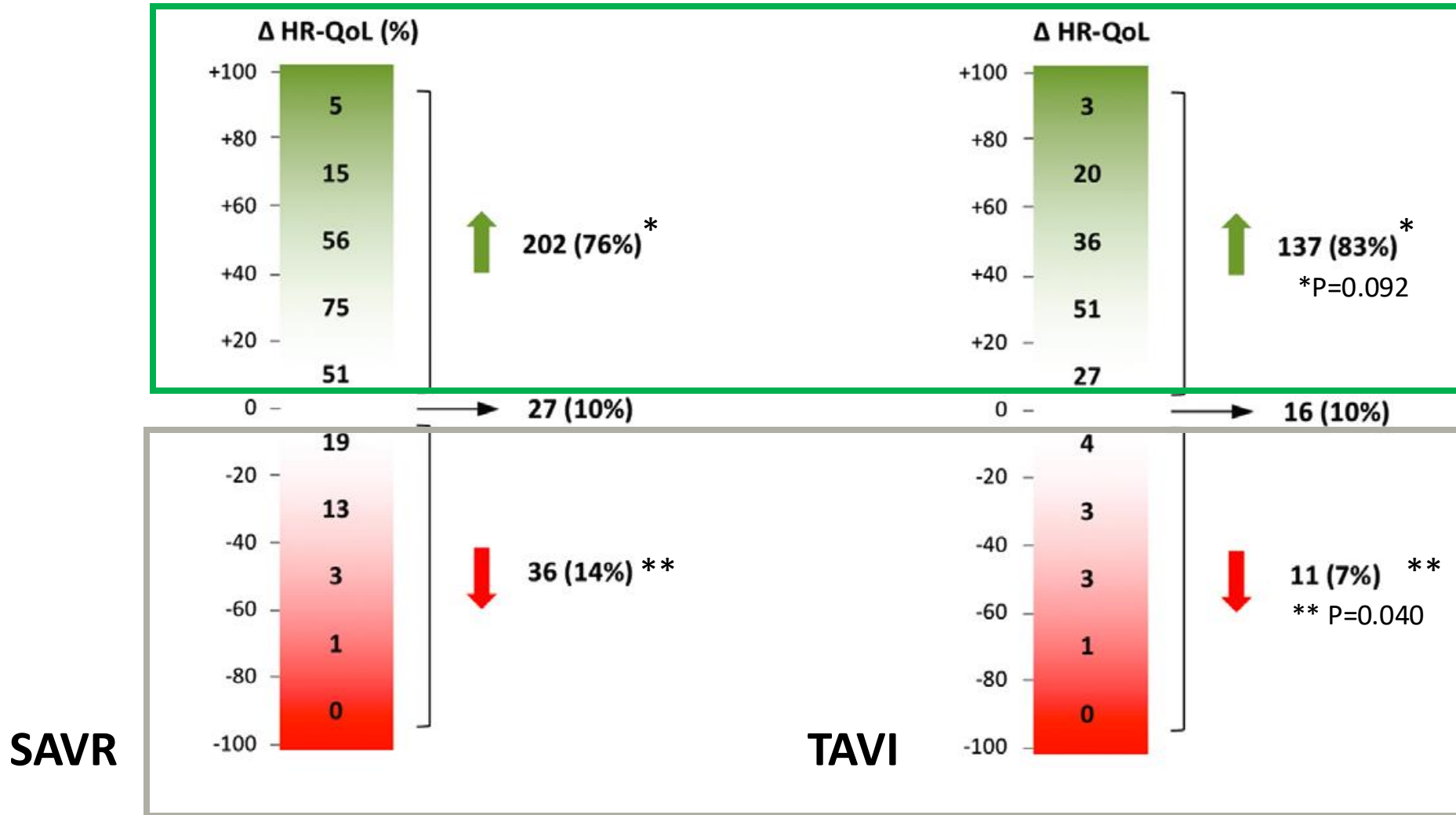
IC assessment of yourself

How physically stressfull

How mentally stressfull

How long to recover

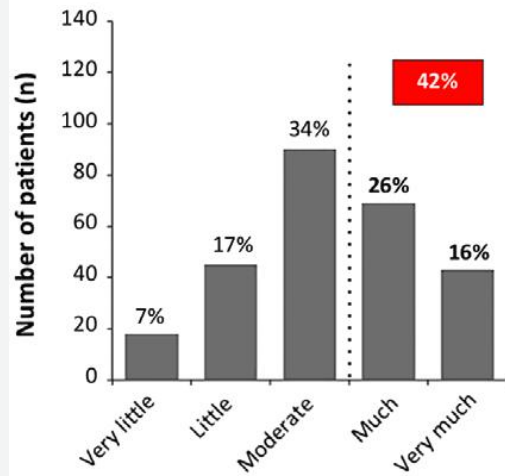
Health-Related Quality of Life (SAVR; N=265, TAVR; N=164)



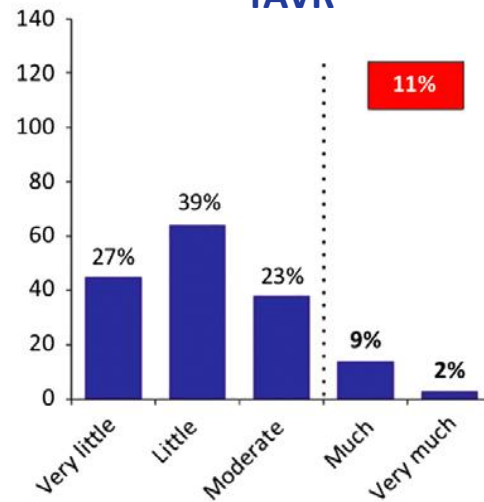
How stressful was the procedure?



SAVR



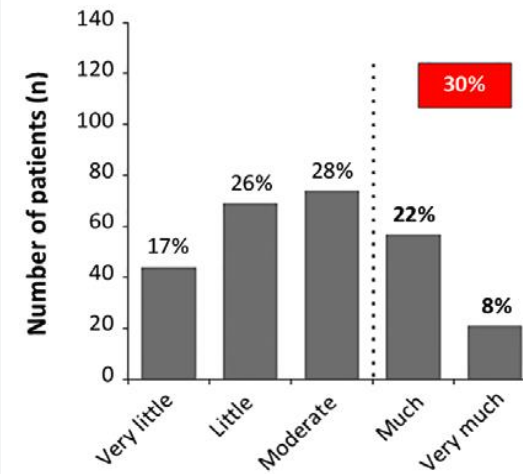
TAVR



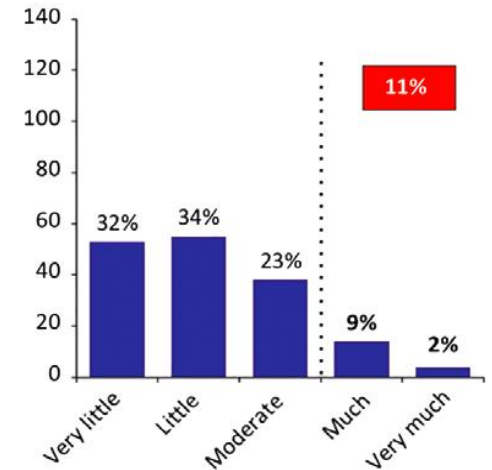
P < 0.001



SAVR

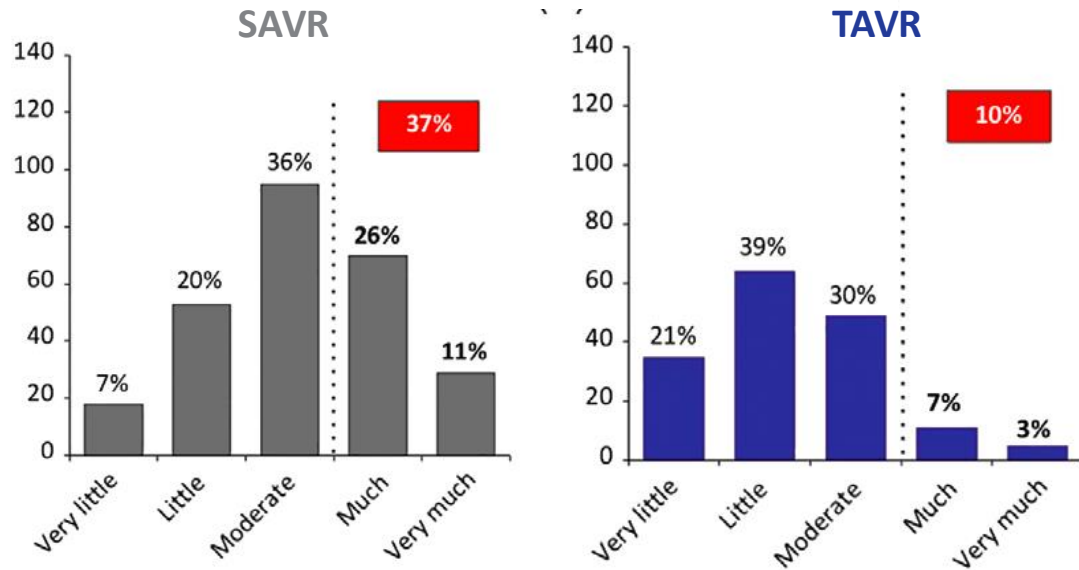


TAVR

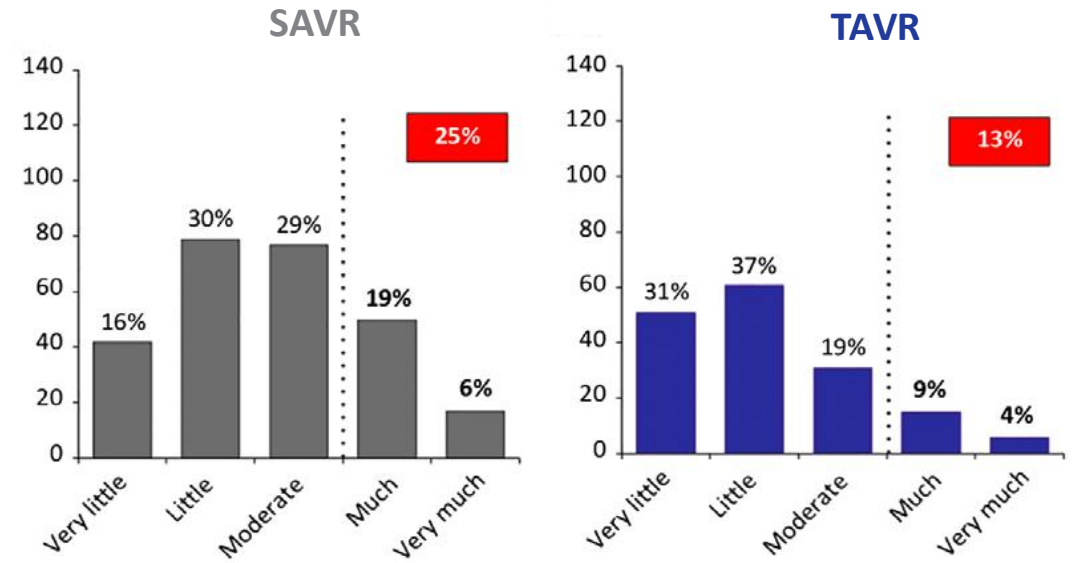


P<0.001

How stressful was the recovery period?



$P < 0.01$



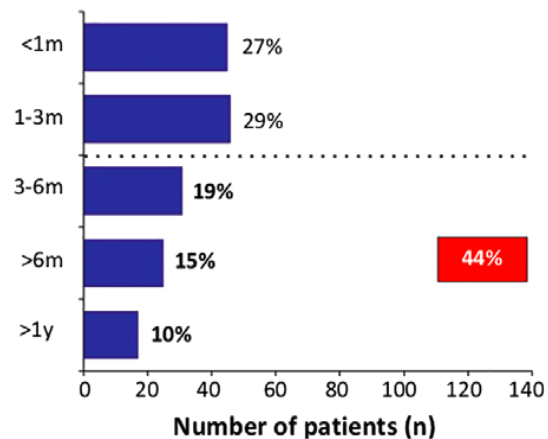
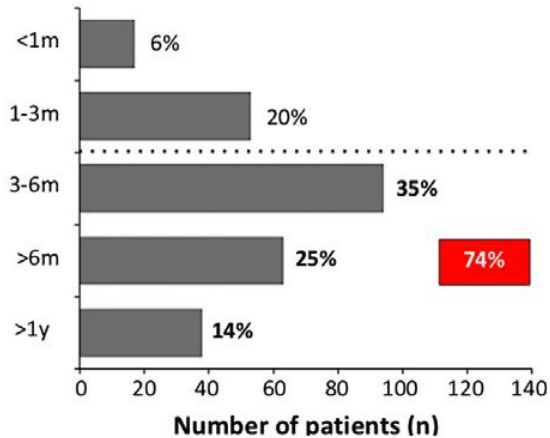
$P < 0.01$

How long did it take to recover from the procedure?



SAVR

TAVR

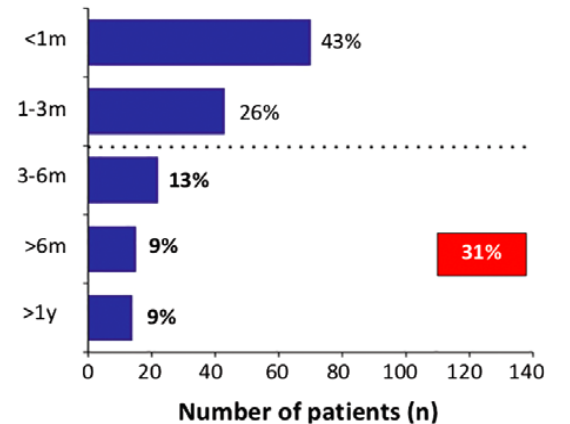
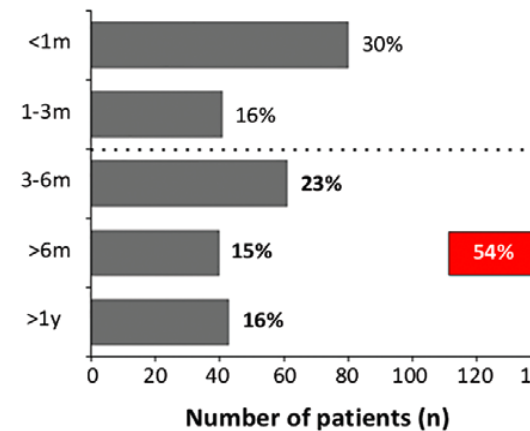


P < 0.001



SAVR

TAVR



P<0.001

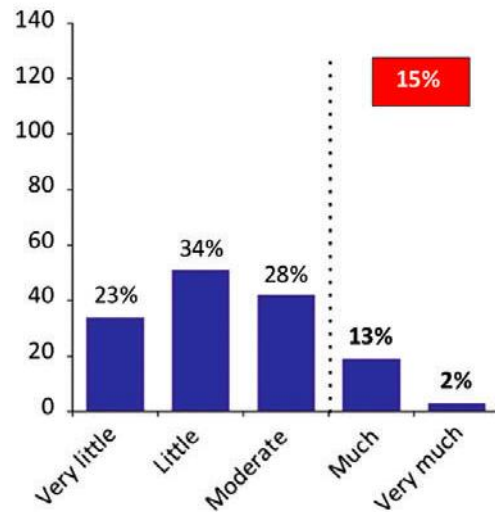
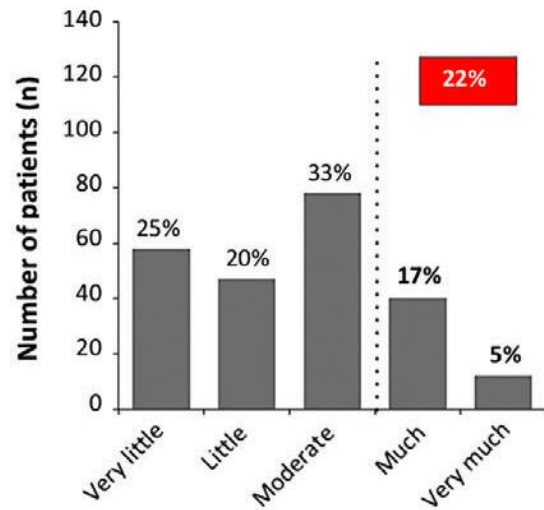
The Carer's perspective

How stressful was the process as a relative?



SAVR

TAVR

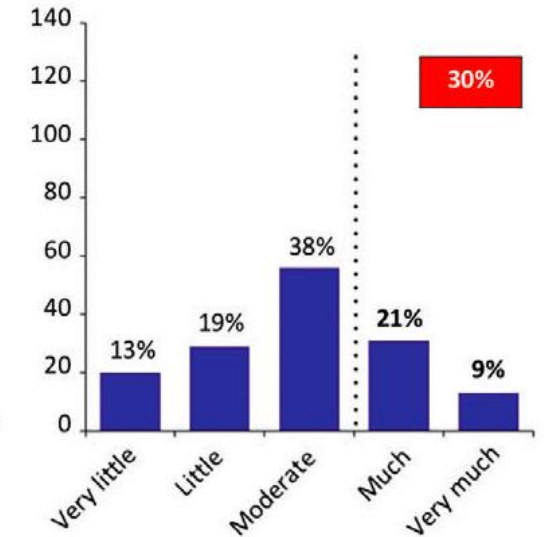
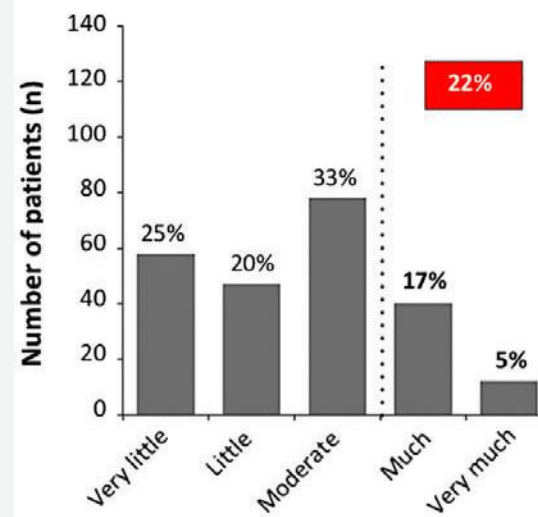


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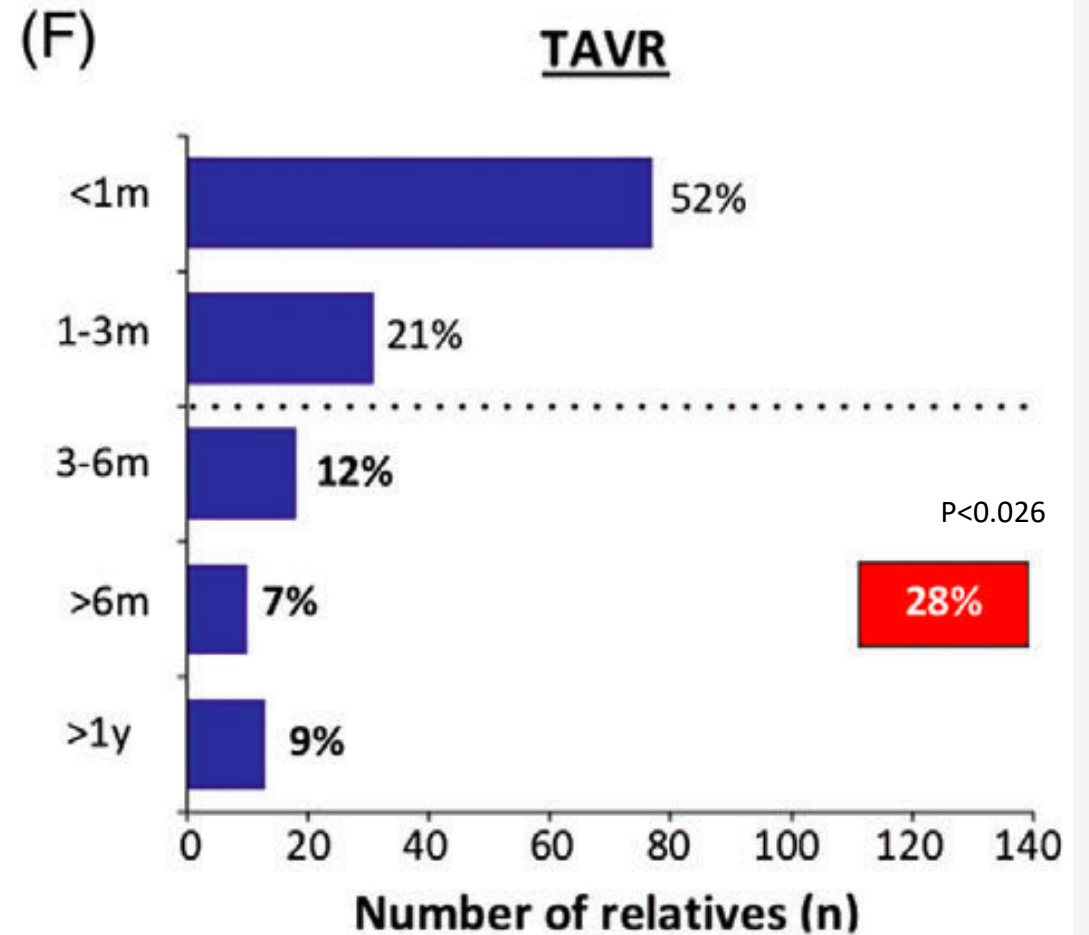
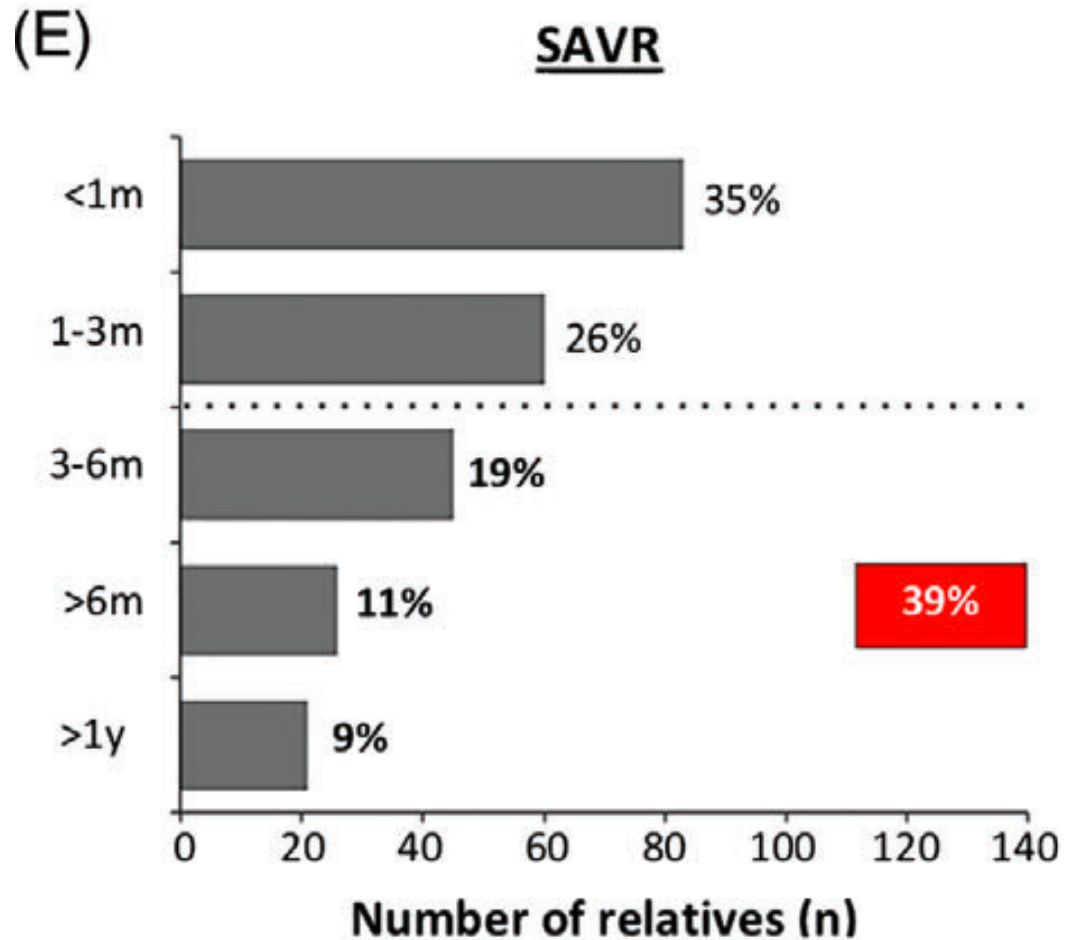
SAVR

TAVR



P<0.001

How long did it take to you, as a relative, to get back to a normal situation?



ETIOLOGY AND RISK FACTORS

HISTORICAL PERSPECTIVE

INDICATION OF TAVI in 2025: EBM vs Belgium

BASICS OF TAVI

POSSIBLE COMPLICATIONS

ROLE OF THE GERIATRICIAN IN TAVI PATHWAY:

UZB experience.

●●● NEXT FRONTIERS: 65 ? THE END OF EUROSCORE 2 ?

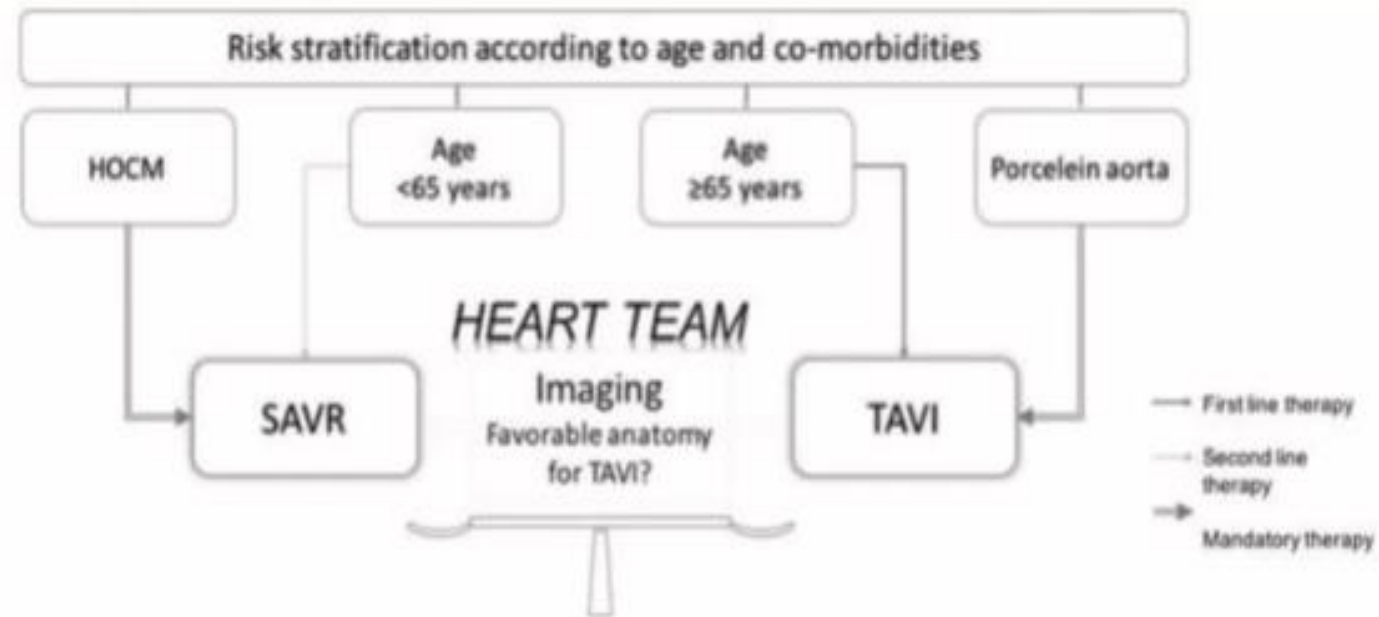


Figure 4 Indication for TAVI in 2025. A possible scenario in the near future may be that recommendations for TAVI are no longer based on classical risk stratification but are made according to age and some specific co-morbidities. This is provided that TAVI in forthcoming trials of low-risk patients will have positive results, and that long-term data will confirm similar durability between transcatheter heart valves and surgical bioprostheses. TAVI, transcatheter aortic valve implantation.

... TAVI AND VALUE BASED MEDICINE



Outcome

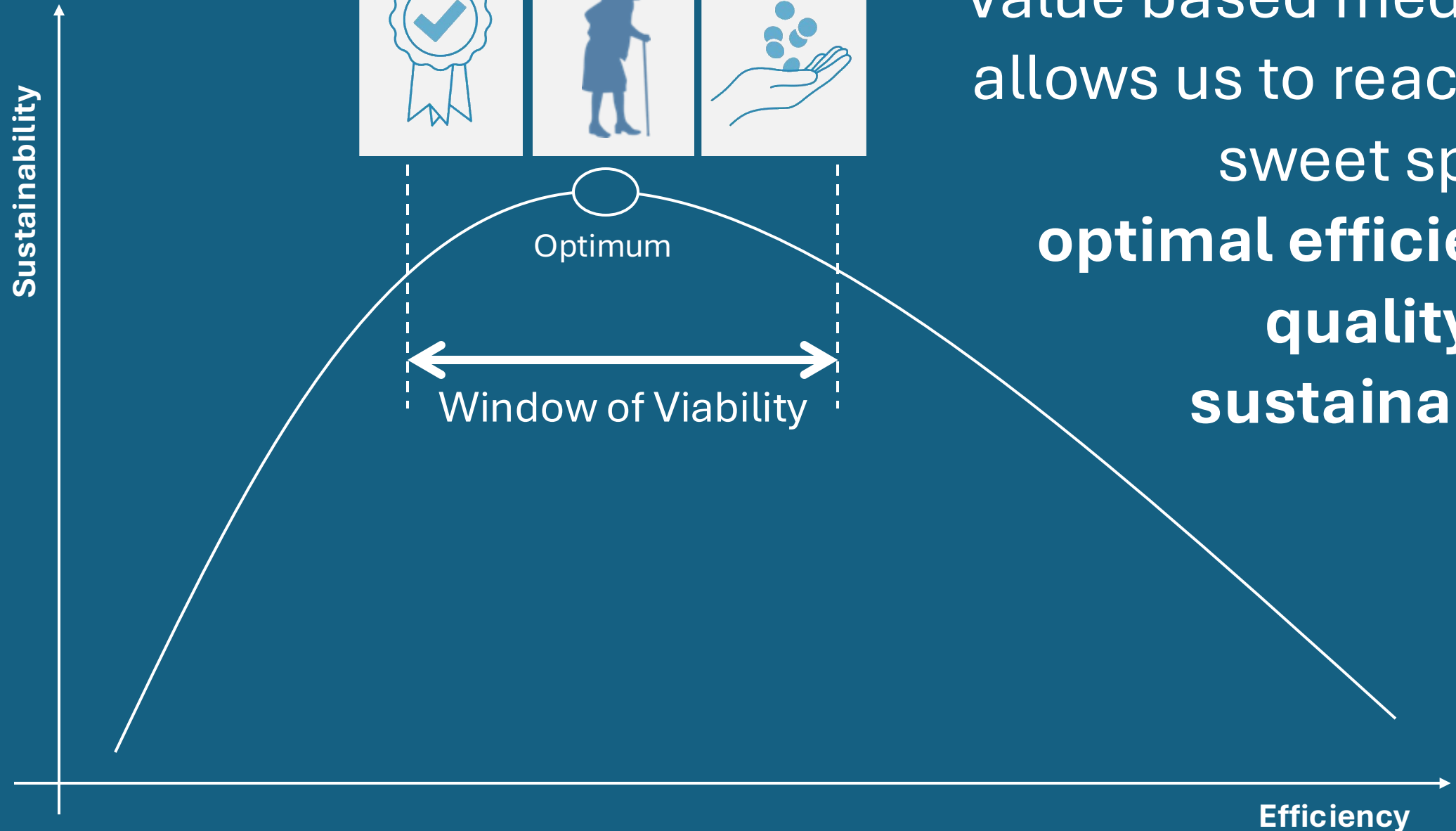


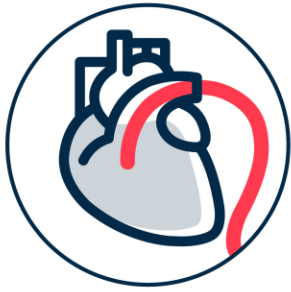
Patient Values



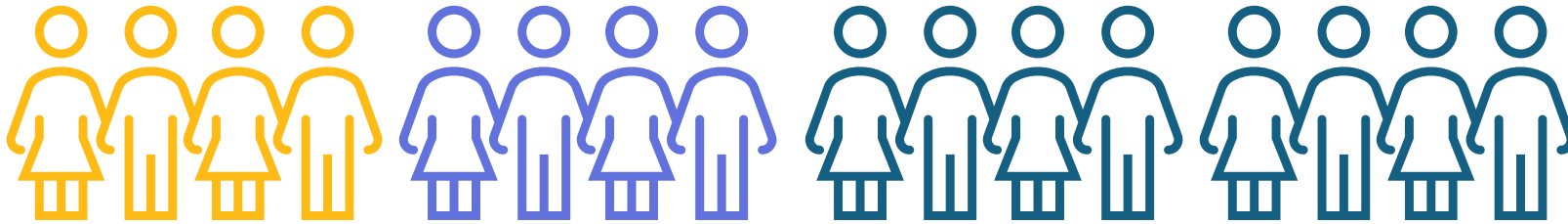
Cost Effectiveness

Value Based Medicine





Identify which treatment is best
for which patient
acute and long-term outcome

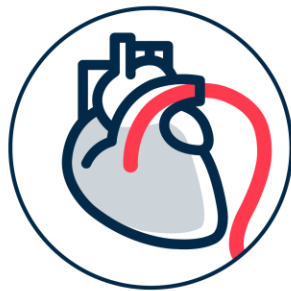


Machine
Learning - AI -
Big data

Anatomy?

Disease stage?

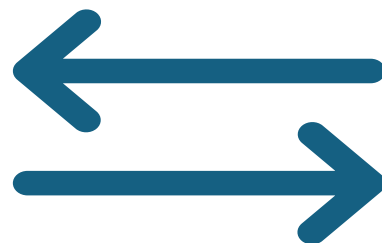
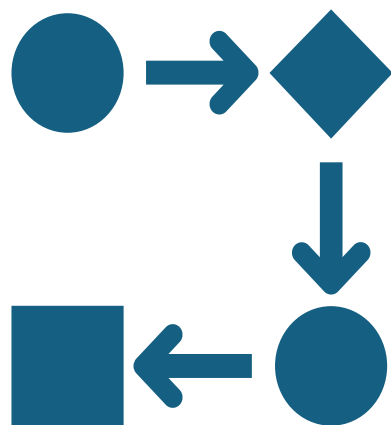
Multi-modality
decisions



Insert Protocols / Pathways

Test Protocols / Pathways

Adjust - Finetune



Relevant QOL
questionnaire

Waiting list quota

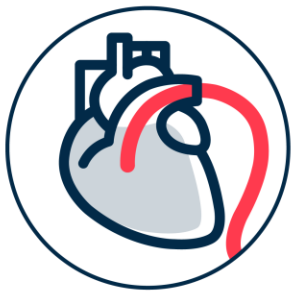
Hard and soft
endpoints

Early discharge
protocol

Procedural steps -
technique

Pre-procedure
frailttests?

Protocolized Pathway



Cost-effectiveness

Reliable data



TAVI

- Higher valve cost
- Shorter Hospital stay
- Less post-procedural rehabilitation
- Fewer short/long-term complications

Investigator
initiated
studies

European TAVI
Registry

Benchmark

TAKE HOME MESSAGES

TAVI = game changer in management of severe AS

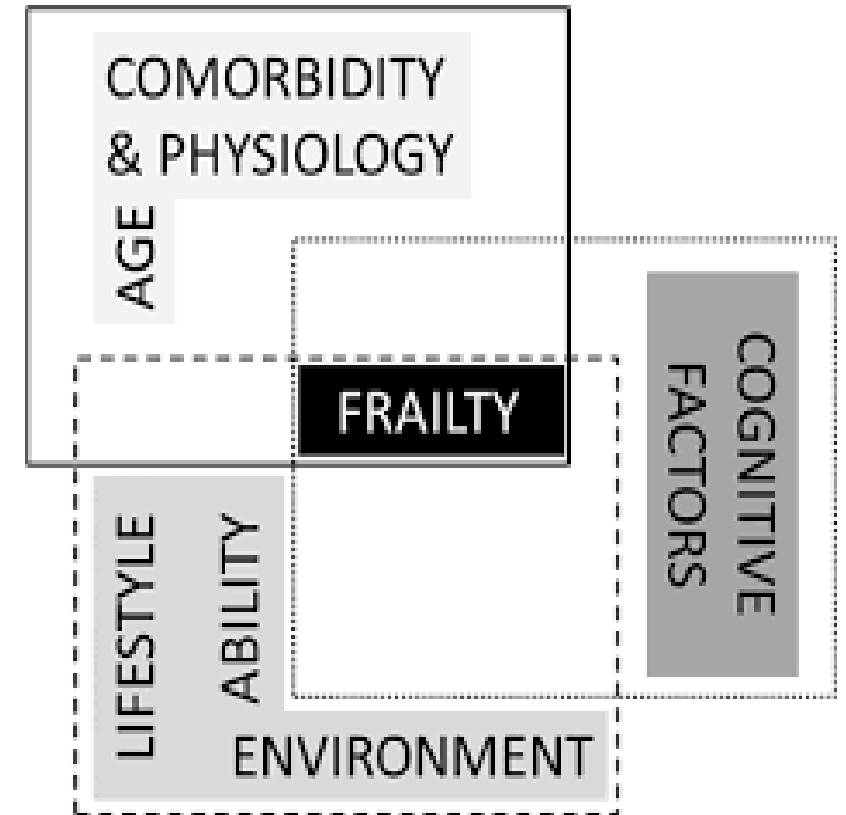
Progressive move towards low surgical risk and younger population

Discrepancies between ESC guidelines and Belgian real life

TAVI decision making will rely more and more only on co-morbidities and frailty assessment.

Central role of geriatricians in Heart Team for decision making

Value based medicine applied to TAVI would require specific post TAVI care pathways to improve outcome and decrease health cost





THANK YOU!



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