Percutaneous Treatment of Valve Disease in The Frail Elderly Patient

Mauricio G. Cohen, MD, FACC, FSCAI
Director, Cardiac Catheterization Lab
Associate Professor of Medicine
Aortic Stenosis
Pathology

Normal

Degenerative calcified
Bicuspid
Rheumatic
Aortic Stenosis: Natural History

“Survival after onset of symptoms is 50% at two years and 20% at five years.”¹

“Surgical intervention [for severe AS] should be performed promptly once even … minor symptoms occur.”²

Sources:
¹ S.J. Lester et al., “The Natural History and Rate of Progression of Aortic Stenosis,” Chest 1998
Indications for AVR in Patients With AS

Abnormal Aortic Valve With Reduced Systolic Opening

Severe AS
\( V_{\text{max}} \geq 4 \text{ m/s} \)
\( \Delta P_{\text{mean}} \geq 40 \text{ mm Hg} \)

Symptomatic (stage D1)
- LVEF <50% (stage C2)
- Other cardiac surgery
- \( V_{\text{max}} \geq 5 \text{ m/s} \)
  - \( \Delta P_{\text{mean}} \geq 60 \text{ mm Hg} \)
  - Low surgical risk
- Abnormal ETT
  - \( \Delta V_{\text{max}} > 0.3 \text{ m/s/y} \)
  - Low surgical risk

Asymptomatic (stage C)

AVR (I)
AVR (IIa)
AVR (IIb)

AVR (IIa)
AVR (IIa)
AVR (IIb)

\( V_{\text{max}} = 3 \text{ m/s} - 3.9 \text{ m/s} \)
\( \Delta P_{\text{mean}} = 20 - 39 \text{ mm Hg} \)

Symptomatic
- LVEF <50%

YES
- DSE with
  - \( \text{AVA} \leq 1 \text{ cm}^2 \)
  - \( V_{\text{max}} \geq 4 \text{ m/s} \)
    (stage D2)

NO
- AVR (IIa)

AVR (IIa)

Asymptomatic (stage B)
- Other cardiac surgery
- AVA \( \leq 1 \text{ cm}^2 \)
  - LVEF \( \geq 50\% \)
    (stage D3*)

AS likely cause of symptoms
At Least 30% of Patients with Severe Symptomatic AS are “Untreated”!

Severe Symptomatic Aortic Stenosis
Percent of Cardiology Patients Treated

Under-treatment especially prevalent among patients managed by Primary Care physicians

2. Iung B et al. A prospective survey of patients with valvular heart disease in Europe: The Euro Heart Survey on Valvular Heart Disease. European Heart Journal 2003;24:1231-1243 (includes both Aortic Stenosis and Mitral Regurgitation patients)
Euro Heart Survey

Factors Associated with Decision Not-To-Operate

<table>
<thead>
<tr>
<th>Factor</th>
<th>p</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV EF</td>
<td>0.004</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>30–50%</td>
<td></td>
<td>2.66</td>
<td>1.57–4.64</td>
</tr>
<tr>
<td>30%</td>
<td></td>
<td>7.09</td>
<td>2.42–20.82</td>
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<tr>
<td>Age (years)</td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75–80</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>80–85</td>
<td></td>
<td>1.90</td>
<td>1.22–2.99</td>
</tr>
<tr>
<td>85</td>
<td></td>
<td>3.60</td>
<td>1.47–8.82</td>
</tr>
<tr>
<td>Neurological dysfunction</td>
<td>0.02</td>
<td>3.82</td>
<td>1.23–12.27</td>
</tr>
</tbody>
</table>

n = 216
Transcatheter Aortic-Valve Implantation for Aortic Stenosis in Patients Who Cannot Undergo Surgery

Martin B. Leon, M.D., Craig R. Smith, M.D., Michael Mack, M.D., D. Craig Miller, M.D., Jeffrey W. Moses, M.D., Lars G. Svensson, M.D., Ph.D., E. Murat Tuzcu, M.D., John G. Webb, M.D., Gregory P. Fontana, M.D., Raj R. Makkar, M.D., David L. Brown, M.D., Peter C. Block, M.D., Robert A. Guyton, M.D., Augusto D. Pichard, M.D., Joseph E. Bavaria, M.D., Howard C. Herrmann, M.D., Pamela S. Douglas, M.D., John L. Petersen, M.D., Jodi J. Akin, M.S., William N. Anderson, Ph.D., Duolao Wang, Ph.D., and Stuart Pocock, Ph.D., for the PARTNER Trial Investigators*
PARTNER Study Design

Symptomatic Severe Aortic Stenosis

ASSESSMENT: High-Risk AVR Candidate
3,105 Total Patients Screened

High Risk

Total = 1,057 patients

Inoperable

ASSESSMENT: Transfemoral Access

Yes

1:1 Randomization

TF TAVR

VS

Standard Therapy

No

Not In Study

Primary Endpoint: All-Cause Mortality
Over Length of Trial (Superiority)
Co-Primary Endpoint: Composite of All-Cause Mortality
and Repeat Hospitalization (Superiority)
Inoperable PARTNER Cohort
Primary Endpoint: All-Cause Mortality


Hazard ratio, 0.55 (95% CI, 0.40–0.74)
P<0.001
△ at 1 yr = 20.0%
NNT = 5.0 pts

Death from Any Cause (%)

<table>
<thead>
<tr>
<th>Months</th>
<th>TAVI</th>
<th>Standard therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>179</td>
<td>179</td>
</tr>
<tr>
<td>6</td>
<td>138</td>
<td>121</td>
</tr>
<tr>
<td>12</td>
<td>122</td>
<td>83</td>
</tr>
<tr>
<td>18</td>
<td>67</td>
<td>41</td>
</tr>
<tr>
<td>24</td>
<td>26</td>
<td>12</td>
</tr>
</tbody>
</table>

No. at Risk
Hybrid OR
Hybrid OR

A unique collaborative experience!
Hybrid OR
Transfemoral TAVI
Current Approved Technologies in the US

Sapien S3

CoreValve Evolut R
SAPIEN 3 Transcatheter Heart Valve

PET inner and outer sealing Skirt
• Designed to minimize paravalvular (PV) leak
• Inner skirt 1/2 valve – Outer skirt 1/3 valve

Frame Design
• Enhanced frame geometry for low delivery profile
  • Cobalt-chromium

Bovine Pericardial Tissue
Deployment and Positioning

Initial Positioning
Use Center Marker and fine positioning feature

Deployment
Slow, controlled initial inflation using nominal volume

Final Placement
Precise placement
NYHA Class Over Time

Survivors

<table>
<thead>
<tr>
<th>Percent</th>
<th>Baseline</th>
<th>1 Year</th>
<th>2 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>92.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>93.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.9%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Treatment Visit

- Baseline
- 1 Year
- 2 Year

TAVR vs Standard Rx

- p = 0.61
- p < 0.0001
- p < 0.0001

NYHA Classes:
- IV
- III
- II
- I
CoreValve Evolut R System

- Outflow shortened and redesigned to provide improved alignment with the native sinus and less stress on the LVOT
- Optimized oversizing designed to reduce PVL
- More consistent radial force (inflow) across the operating range
- Extended skirt at inflow (26 & 29 mm) designed to improve annular seal and reduce PVL
Evolut-R Delivery System Design

CoreValve® System
with 18Fr Cook Sheath
22 Fr (OD)

Evolut® R System
with 14Fr-Equivalent InLine™ Sheath
True 18Fr (OD)

Catheter Delivery System
14Fr-equivalent profile

Gray Front Grip
Blue Actuator
Blue Hand Rest
Tip Retrieval Mechanism
Stability Layer
Flush Port
Actuator Trigger
Capsule
Flush Port
Wire Lumen
Flush Port
EvolutPerformance Design Focus: Improve Annular Sealing

• Modified cell geometry
  – Improves conformability in non-circular and calcified annulus while preserving anchoring

• Consistent radial force curve across operating zone
  – Contributes to improved sealing across indicated annulus range
Transcatheter Aortic-Valve Replacement with a Self-Expanding Prosthesis

David H. Adams, M.D., Jeffrey J. Popma, M.D., Michael J. Reardon, M.D., Steven J. Yakubov, M.D., Joseph S. Coselli, M.D., G. Michael Deeb, M.D., Thomas G. Gleason, M.D., Maurice Buchbinder, M.D., James Hermiller, Jr., M.D., Neal S. Kleiman, M.D., Stan Chetcuti, M.D., John Heiser, M.D., William Merhi, D.O., George Zorn, M.D., Peter Tadros, M.D., Newell Robinson, M.D., George Petrossian, M.D., G. Chad Hughes, M.D., J. Kevin Harrison, M.D., John Conte, M.D., Brijeshwar Maini, M.D., Mubashir Mumtaz, M.D., Sharla Chenoweth, M.S., and Jae K. Oh, M.D., for the U.S. CoreValve Clinical Investigators*
CoreValve US Pivotal Trial Design (HR)

As-Treated Population
N=750

Underwent Attempted TAVR
N=391

1-Year TAVR
N=323/328 (98.5%)

Died-28
Exited-3
Pending follow-up-2

2-Year TAVR
N=278/295 (94.2%)

Underwent Attempted SAVR
N=359

1-Year SAVR
N=265/281 (94.3%)

Died-31
Exited-13

2-Year SAVR
N=221/237 (93.2%)

All-Cause Mortality

Δ = 6.5

Δ = 4.8

28.6%

22.2%

Log-rank P=0.04

No. at Risk

Transcatheter | 391 | 378 | 354 | 334 | 219
Surgical | 359 | 343 | 304 | 282 | 191
All Stroke

Log-rank $P=0.05$

<table>
<thead>
<tr>
<th>Months Post-Procedure</th>
<th>Transcatheter</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>391</td>
<td>359</td>
</tr>
<tr>
<td>6</td>
<td>364</td>
<td>324</td>
</tr>
<tr>
<td>12</td>
<td>335</td>
<td>281</td>
</tr>
<tr>
<td>18</td>
<td>318</td>
<td>256</td>
</tr>
<tr>
<td>24</td>
<td>205</td>
<td>169</td>
</tr>
</tbody>
</table>

$\Delta = 3.8$

$\Delta = 5.7$

$12.5\%$

$8.7\%$

$16.6\%$

$10.9\%$
Major Stroke

Log-rank $P=0.25$

No. at Risk

<table>
<thead>
<tr>
<th>Transcatheter</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>391</td>
<td>359</td>
</tr>
<tr>
<td>368</td>
<td>335</td>
</tr>
<tr>
<td>345</td>
<td>296</td>
</tr>
<tr>
<td>326</td>
<td>271</td>
</tr>
<tr>
<td>214</td>
<td>184</td>
</tr>
</tbody>
</table>

Graph showing the percentage of major stroke over months post-procedure for Transcatheter and Surgical procedures. The graph indicates a comparison of stroke incidence over time with a log-rank significance of 0.25.
Sometimes Tranfemoral Access is not an Option
Careful Evaluation of Iliofemoral Arteries

12.67 mm
12.64 mm

9.61 mm

9.02 mm
10.03 mm

9.15 mm
8.08 mm

8.96 mm

9.00 mm

8.26 mm

11.00 mm

9.95 mm

7.21 mm
Severe tortuosity in the access route
Patient Assessment
The “Eyeball” Test

Patient A vs. Patient B

Same age and predicted risk
One passes the “eyeball test” – one does not

Photos courtesy of Michael J. Mack, MD
Medical City Dallas
TAVR: Vascular Access

Transfemoral

Transapical

Transaortic

Subclavian

Axillary

Rodés-Cabau, J. Nat Rev Cardiol 2011
Transapical TAVR
Valve (mm)
Diameter: 28
Impl. height: 4.0

Prototype. Not for diagnostic use.
TAO TAVR TECHNIQUE

“Mini-Sternotomy”

- 2” midline incision
- limited sternotomy to 2\textsuperscript{nd} ICS
TAO TAVR TECHNIQUE

the left innominate vein is mobilized
the ascending aorta is exposed
• a suitable access site in the ascending aorta is identified
• a double purse-string suture is placed at the aortotomy site
• the aortotomy site is punctured with an 18-gauge needle

• a 7-French sheath is inserted over the wire

• The aortic valve is crossed with a 6-French pigtail catheter over the wire
0.035” Amplatz Extra-Stiff® wire is advanced across the aortic valve into the LV to serve as a rail for subsequent interventions
• the large Retroflex introducer sheath is inserted through the aortotomy

• the distal tip is advanced into the vessel lumen, ~1-2 cm from the puncture site
• balloon aortic valvuloplasty is performed through the Retroflex sheath
The Retroflex delivery catheter is advanced & the SAPIEN valve is positioned across the aortic valve.
• The prosthetic valve is deployed under rapid pacing ➔ the delivery catheter is retrieved after
• After the procedure, the Retroflex sheath is removed under rapid pacing, immediately followed by closure of the double purse-string sutures ➔ results in near-perfect seal of the aortotomy in every case
A cardiac surgeon secures the aortic sheath throughout the procedure.

An interventional cardiologist performs catheter injections, balloon inflations, and valve deployment.

A second interventional cardiologist controls the wire and catheter exchanges throughout the procedure.
How do we Select Patients for TAVR?
How do we Select Patients for TAVR?
The Society of Thoracic Surgery Predicted Risk Outcomes Model for Aortic Valve Replacement Surgery

- Risk model derived from data set of 67,292 patients with isolated AVR from 2002 to 2006 (updated in 2007)
- 29 variables (demographics, risk factors, previous interventions, cardiac status, hemodynamics) used to calculate operative risk
- Estimates 30 day mortality risk

http://riskcalc.sts.org/stswebriskcalc/
## CoreValve Trial Risk Assessment

### Risk Assessment Continued

**Incremental Risks**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNP &gt; 550 pg/mL, proBNP &gt; 3200 pg/mL</td>
<td>3%</td>
</tr>
<tr>
<td>Prohibitive Chest Wall (deformity)</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Severe LV Diastolic Dysfunction</strong></td>
<td>4%</td>
</tr>
<tr>
<td>Prior Stroke / TIA</td>
<td>3%</td>
</tr>
<tr>
<td>FEV1: &lt; 750cc</td>
<td>20%</td>
</tr>
<tr>
<td>FEV1: 750cc - 1000cc</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Home (Supplemental) Oxygen</strong></td>
<td>5%</td>
</tr>
<tr>
<td>Nocturnal Bipap</td>
<td>2%</td>
</tr>
<tr>
<td>Liver Disease - Childs A</td>
<td>5%</td>
</tr>
<tr>
<td>Liver Disease - Childs B</td>
<td>7%</td>
</tr>
<tr>
<td>Liver Disease - Childs C</td>
<td>25%</td>
</tr>
<tr>
<td>Hostile Mediastinum</td>
<td>15%</td>
</tr>
<tr>
<td>Pulmonary Systolic HTN: 60-80mmHg</td>
<td>5%</td>
</tr>
<tr>
<td>&gt;80mmHg</td>
<td>15%</td>
</tr>
<tr>
<td>Aorta Calcification: Porcelain</td>
<td>20%</td>
</tr>
<tr>
<td>Aorta Calcification: Severe</td>
<td>3%</td>
</tr>
</tbody>
</table>

### Items in Red and Bold are present

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>&lt; 80</th>
<th>80-90</th>
<th>&gt; 90</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt; 21</td>
<td>4%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Albumin &lt; 3.3</td>
<td>4%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Wheelchair Bound</strong></td>
<td>7%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Does Not Live</td>
<td>5%</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>Independently</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Total incremental Risk: 37%*

*If present, Low Flow, Low Output
Charlson score, Poor nutrition, extreme frailty & Incomplete revascularization were not considered*
Society of Thoracic Surgeons (STS) Score

- The STS score was not developed for TAVR, and does not include the components of an individual frailty analysis.
STS Score and Mortality in TAVR

- Group 1 (STS<5)
- Group 2 (STS 5-14.9)
- Group 3 (STS≥15)

Number at risk:
- Group 1: 74, 68, 57, 46, 33
- Group 2: 222, 170, 143, 116, 95
- Group 3: 73, 51, 40, 34, 24

P = 0.0002
A Firm Diagnosis of Frailty

By KAREN PENNAR  JUNE 25, 2012

Quick, define frailty. Infirmity? Disability? Weakness? Shakiness?

For years, frailty was like pornography, says Dr. John W. Rowe, professor of health policy and management at the Mailman School of Public Health at Columbia University — it was hard to define, but you knew it when you saw it. For many people, even many doctors, frailty was a catchall description of the state of being old.

Linda P. Fried’s work changed all that. After years of observing and working with older patients, Dr. Fried recognized objective hallmarks of frailty, and in the 1990s developed a definition of frailty in people 65 and
Frailty

Minor illness (e.g., urinary tract infection)
Frailty is considered highly prevalent in old age and to confer high risk for falls, disability, hospitalization, and mortality.

Frailty has been considered synonymous with disability, comorbidity, and other characteristics.

Frailty may have a biologic basis and appears to be a distinct clinical syndrome.
Frailty in Older Adults: Evidence for a Phenotype

Linda P. Fried,1 Catherine M. Tangen,2 Jeremy Walston,1 Anne B. Newman,3 Calvin Hirsch,4 John Gottdiener,5 Teresa Seeman,6 Russell Tracy,7 Willem J. Kop,8 Gregory Burke,9 and Mary Ann McBurnie2 for the Cardiovascular Health Study Collaborative Research Group

[Diagram showing the relationship between disease, aging, and frailty indicators such as anorexia, weight loss, sarcopenia, and decreased metabolic rate.]
Trajectories of Health and Functioning with Ageing

Frailty is defined as a clinical syndrome in which three or more of the following criteria:

- Unintentional weight loss (10 lbs in past year)
- Self-reported exhaustion,
- Weakness (grip strength)
- Slow walking speed
- Low physical activity.
Objective Assessment of Frailty

• Decreased reserve and resistance to stressors, resulting from cumulative declines across multiple physiologic systems, and causing vulnerability to adverse outcomes
  – Katz ADL < 4
    • Activities, Bathing, Dressing, Toileting, Transferring, Continence, Feeding
  – Serum Albumin < 3.5 g/dL
  – Grip strength < 18 Kg
  – 15-foot Walk > 7 sec

<table>
<thead>
<tr>
<th>Frailty Domain</th>
<th>Measure</th>
<th>Frailty Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slowness</td>
<td>15-ft walk gait speed (m/s)</td>
<td>Quartiles (0–3)</td>
</tr>
<tr>
<td>Weakness</td>
<td>Grip strength (kg)</td>
<td>Sex-based quartiles (0–3)</td>
</tr>
<tr>
<td>Wasting and malnutrition</td>
<td>Serum albumin (g/dl)</td>
<td>Quartiles (0–3)</td>
</tr>
<tr>
<td>Inactivity</td>
<td>Katz activities of daily living</td>
<td>Any dependence = 3, Independent = 0</td>
</tr>
</tbody>
</table>
The Impact of Frailty Status on Survival After Transcatheter Aortic Valve Replacement in Older Adults With Severe Aortic Stenosis

A Single-Center Experience

159 subjects who underwent TAVR
Relation of Frailty to Outcomes After Transcatheter Aortic Valve Replacement (from the PARTNER Trial)

Philip Green, MD\textsuperscript{a,b,\ast}, Suzanne V. Arnold, MD, MHA\textsuperscript{c}, David J. Cohen, MD, MSc\textsuperscript{c}, Ajay J. Kirtane, MD, SM\textsuperscript{a,b}, Susheel K. Kodali, MD\textsuperscript{a,b}, David L. Brown, MD\textsuperscript{d}, Charanjit S. Rihal, MD\textsuperscript{c}, Ke Xu, PhD\textsuperscript{a,b}, Yang Lei, PhD\textsuperscript{c}, Marian C. Hawkey, RN\textsuperscript{a,b}, Rebeca J. Kim, BA\textsuperscript{f}, Maria C. Alu, MM\textsuperscript{a,b}, Martin B. Leon, MD\textsuperscript{a,b}, and Michael J. Mack, MD\textsuperscript{f,g}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{chart}
\caption{Death rates by frailty score and time in months.}
\end{figure}

\begin{table}
\centering
\begin{tabular}{|c|c|c|c|c|c|}
\hline
 & Number at risk: & & & & \\
\hline
 & Frailty score < 6 & Frailty score \geq 6 & Frailty score < 6 & Frailty score \geq 6 & \\
\hline
Death at 12 months & 32.7\% & 15.9\% & \\
\hline
\end{tabular}
\caption{Number at risk for death by frailty score.}
\end{table}
Psoas Muscle Area and All-Cause Mortality After Transcatheter Aortic Valve Replacement: The Montreal-Munich Study

Samuel Mamane, MD,a,* Louis Mullie, MD,a,* Nicolo Piazza, MD, PhD,a,b Giuseppe Martucci, MD,a,b José Morais, MD,a,c Antonio Vigano, MD,d Mark Levental, MD,e Kristoff Nelson, MD,a Ruediger Lange, MD,f and Jonathan Afilalo, MD, MSca,b,g
## Aortic Stenosis: Choice of Surgical or Transcatheter Intervention

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical AVR is recommended in patients who meet an indication for AVR (listed in Section 3.4) with low or intermediate surgical risk</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>For patients in whom TAVR or high-risk surgical AVR is being considered, members of a Heart Valve Team should collaborate closely to provide optimal patient care</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>TAVR is recommended in patients who meet an indication for AVR for AS who have a prohibitive surgical risk and a predicted post-TAVR survival &gt;12 months</td>
<td>I</td>
<td>B</td>
</tr>
</tbody>
</table>

Helping Cardiovascular Professionals
### Recommendations

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAVR is a reasonable alternative to surgical AVR for AS in patients who meet an indication for AVR and who have high surgical risk</td>
<td>IIa</td>
<td>B</td>
</tr>
<tr>
<td>Percutaneous aortic balloon dilation may be considered as a bridge to surgical or transcatheter AVR in severely symptomatic patients with severe AS</td>
<td>IIb</td>
<td>C</td>
</tr>
<tr>
<td>TAVR is not recommended in patients in whom the existing comorbidities would preclude the expected benefit from correction of AS</td>
<td>III: No Benefit</td>
<td>B</td>
</tr>
</tbody>
</table>
Conclusions

• TAVR is now an established treatment for aortic stenosis
• Patient selection is key for procedure and program success
• Identification of frailty is crucial to predict outcomes
• Rehabilitation services play a crucial role in the management of the patients before and after the procedure.