Transcatheter Aortic Valve Replacement with a Repositionable Self-expanding Bioprosthesis in Patients With Severe Aortic Stenosis Suboptimal for Surgery: One-Year Results from the Evolut R US Pivotal Study

Jeffrey J. Popma, MD, For the Evolut R US Clinical Study Investigators
## Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

<table>
<thead>
<tr>
<th>Financial Relationship</th>
<th>Company</th>
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<tbody>
<tr>
<td>Institutional Grants</td>
<td>Medtronic</td>
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<td>Institutional Grants</td>
<td>Boston Scientific</td>
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<tr>
<td>Medical Advisory Board</td>
<td>Direct Flow Medical</td>
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<td>Abbott Vascular</td>
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<tr>
<td>Consultant; Non vested equity</td>
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<td>Medical Advisory Board</td>
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The Evolut R transcatheter aortic valve (TAV) is a self-expanding bioprosthesis that provides a low (14F equivalent) profile delivery system, conformable annular sealing, and the ability to re-sheath and reposition during deployment.
Objective

• To evaluate the one-year safety and efficacy of the Evolut R system for the treatment of severe aortic stenosis in patients deemed high or extreme risk for surgical aortic valve replacement
Evolut R System

Catheter Delivery System
14Fr-equivalent profile

Inline Sheath
Capsule

Loading System

Transcatheter Valve
Supra-annular design, optimized sealing
Evolut R Inclusion Criteria

- Severe aortic stenosis defined as an aortic valve area ≤ 1.0 cm² or aortic valve index ≤ 0.6 cm²/m² and either a mean aortic valve gradient > 40 mm Hg or a peak aortic valve velocity > 4.0 m/sec, at rest or with dobutamine
- NYHA II or greater
- Deemed at high or extreme surgical risk
Evolut R Exclusion Criteria

- Gastrointestinal hemorrhage precluding anticoagulation
- End state renal disease
- Left ventricular ejection fraction < 20%
- Recent percutaneous coronary or peripheral intervention
- Life expectancy < 1 year due to comorbidities
Evolut R Study Methods

- CT imaging for valve sizing and vascular access
- 23 mm, 26 mm and 29 mm Evolut R with perimeter-based diameters between 18 – 26 mm
- Local Heart Team that included cardiac surgery and interventional cardiology determined risk
- National Screening Committee to confirm eligibility
- Independent Echocardiographic Core Laboratory (Mayo Clinic, Rochester, MN)
- CEC adjudicated VARC II definitions
Investigational Sites

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Columbia University Medical Center—New York, NY
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Duke University Medical Center—Durham, NC
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Beth Israel Deaconess Medical Center—Boston, MA
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Yale New Haven Hospital—Haven, CT
J. Forrest, A. Mangi

Aurora St. Luke’s Medical Center—Milwaukee, WI
T. Bajwa, D. O’Hair

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E. Hebeler, R. Stoler

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J. Heiser, W. Merhi

Methodist DeBakey Heart & Vascular—Houston, TX
N. Kleiman, M. Reardon

Riverside Methodist Hospital—Columbus, OH
D. Watson, S. Yakubov

Washington Hospital Center—Washington, DC
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University of Pittsburgh Medical Center—Pittsburgh, PA
T. Gleason, JS Lee

St. Francis Hospital—Roslyn, NY
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Pinnacle Health—Wormleysburg, PA
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University of Kansas Hospital—Kansas City, KS
P. Tadros, G. Zorn

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The Mount Sinai Health System—New York, NY
D. Adams, S. Sharma

Banner Good Samaritan—Phoenix, AZ
T. Byrne, M. Caskey
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M. Williams, New York University-Langone, New York

Screening Committee
J. Conte, G.M. Deeb, T. Gleason, J. Popma, M. Reardon, M. Williams, S. Yakubov

Echo Core Laboratory
Chair: J. Oh, Mayo Clinic, Rochester, MN

Data & Safety Monitoring Board
J. L. Pomar, The Thorax Institut, Barcelona
J. Tijssen, University of Amsterdam
P. De Jaegere, Erasmus MC, Rotterdam

Clinical Events Committee
Chair: I. David, Holy Cross Hospital, Ft. Lauderdale

Sponsor
Medtronic
Patient Disposition

Attempted Evolut R Implant
N=241

30 Days
N=233/233 (100%)

Died-6
Exited-2

1- Year Evolut R
N=198/213 (93.0%)

Died-16
Exited-4
### Evolut R Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N = 241</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>83.3 ± 7.2</td>
</tr>
<tr>
<td>Female, %</td>
<td>68.5</td>
</tr>
<tr>
<td>STS – PROM, %</td>
<td>7.4 ± 3.4</td>
</tr>
<tr>
<td>NYHA Class III or IV, %</td>
<td>83.0</td>
</tr>
<tr>
<td>Previous CABG, %</td>
<td>23.2</td>
</tr>
<tr>
<td>Atrial fibrillation / atrial flutter, %</td>
<td>31.5</td>
</tr>
<tr>
<td>Diabetes mellitus, %</td>
<td>32.4</td>
</tr>
<tr>
<td>Chronic lung disease, %</td>
<td>54.0</td>
</tr>
<tr>
<td>Pre-existing PPI, %</td>
<td>16.6</td>
</tr>
<tr>
<td>Characteristic</td>
<td>N = 241</td>
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<tr>
<td>----------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Severe aortic calcification, %</td>
<td>6.4</td>
</tr>
<tr>
<td>Frailty, %</td>
<td>69.7</td>
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</tbody>
</table>

**Baseline Echocardiographic Findings**

- Mean aortic valve gradient, mm Hg: $48.6 \pm 11.5$
- Maximal AV velocity, m/sec: 4.5
- Aortic valve area, cm$^2$: $0.6 \pm 0.2$
- Left ventricular ejection fraction, %: 59.3
# Evolut R Procedural Outcomes

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N = 241</th>
</tr>
</thead>
<tbody>
<tr>
<td>General anesthesia, %</td>
<td>80.7</td>
</tr>
<tr>
<td>Iliofemoral access approach, %</td>
<td>89.5</td>
</tr>
<tr>
<td>Valve Size Implanted, %</td>
<td></td>
</tr>
<tr>
<td>23 mm</td>
<td>1.3</td>
</tr>
<tr>
<td>26 mm</td>
<td>35.0</td>
</tr>
<tr>
<td>29 mm</td>
<td>63.7</td>
</tr>
<tr>
<td>Pre-TAVR balloon dilation, %</td>
<td>36.8</td>
</tr>
<tr>
<td>Post-implant balloon dilation, %</td>
<td>32.5</td>
</tr>
<tr>
<td>NCS Implant depth, mm</td>
<td>4.0 ± 2.3</td>
</tr>
<tr>
<td>LCS Implant depth, mm</td>
<td>5.2 ± 2.3</td>
</tr>
</tbody>
</table>
## Evolut R 30-Day Outcomes

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N = 241</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary obstruction, %</td>
<td>0.4 (N=1)</td>
</tr>
<tr>
<td>More than 1 valve implanted, %</td>
<td>1.3 (N=3)</td>
</tr>
<tr>
<td>Total Aortic Regurgitation, %</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>26.3</td>
</tr>
<tr>
<td>Trace</td>
<td>35.5</td>
</tr>
<tr>
<td>Mild</td>
<td>32.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>5.7</td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
</tr>
</tbody>
</table>
Evolut R Valve Performance

Effective orifice area compared to mean gradient over time:
- Baseline:
  - EOA: 211 cm²
  - Gradient: 237 mm Hg
- 1-7 Days:
  - EOA: 198 cm²
  - Gradient: 222 mm Hg
- 30 Days:
  - EOA: 205 cm²
  - Gradient: 223 mm Hg
- 1 Year:
  - EOA: 157 cm²
  - Gradient: 183 mm Hg

Graph shows a decrease in effective orifice area (EOA) and an increase in mean gradient over time, indicating a decrease in valve performance.
Hemodynamics by Valve Size*

*Excluding 3 patients implanted with the 23 mm
Left Ventricular Mass Regression

Baseline: N=183
30 Days: N=181
6 Months: N=138
1 Year: N=121

Left Ventricular Mass, gm

Baseline: 180.3
30 Days: 171.3
6 Months: 167.5
1 Year: 169.4
Evolut R New York Heart Association

Percentage of Patients

Baseline  
N=241

NYHA I 75.1%  
NYHA II 17.0%

30 Days  
N=227

NYHA I 53.7%  
NYHA II 37.4%

1 Year  
N=189

NYHA I 64.0%  
NYHA II 31.7%
Evolut R Paravalvular Regurgitation

### 1-7 Days (N=227)
- None/Trace: 70.5%
- Mild: 26.4%
- Moderate: 3.1%
- Severe: 0%

### 30 Days (N=228)
- None/Trace: 62.7%
- Mild: 32.0%
- Moderate: 5.3%
- Severe: 0%

### 1 Year (N=188)
- None/Trace: 76.6%
- Mild: 19.7%
- Moderate: 3.7%
- Severe: 0%
# Evolut R 1-Year Outcomes

<table>
<thead>
<tr>
<th>Outcome (KM rates)</th>
<th>30 Days</th>
<th>1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality, %</td>
<td>2.5</td>
<td>8.6</td>
</tr>
<tr>
<td>Cardiovascular mortality, %</td>
<td>2.5</td>
<td>7.0</td>
</tr>
<tr>
<td>All stroke, %</td>
<td>5.0</td>
<td>7.7</td>
</tr>
<tr>
<td>Disabling stroke, %</td>
<td>3.3</td>
<td>5.1</td>
</tr>
<tr>
<td>Non disabling stroke, %</td>
<td>1.7</td>
<td>3.9</td>
</tr>
<tr>
<td>TIA, %</td>
<td>0.8</td>
<td>1.7</td>
</tr>
<tr>
<td>All-cause mortality or disabling stroke, %</td>
<td>5.4</td>
<td>11.9</td>
</tr>
</tbody>
</table>
## Evolut R 1-Year Outcomes

<table>
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<tr>
<th>Outcome (KM rates)</th>
<th>30 Days</th>
<th>1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major vascular complications, %</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Life-threatening or disabling bleeding, %</td>
<td>7.1</td>
<td>9.3</td>
</tr>
<tr>
<td>Major bleeding, %</td>
<td>5.0</td>
<td>10.1</td>
</tr>
<tr>
<td>Permanent pacemaker implanted, %</td>
<td>16.4</td>
<td>18.2</td>
</tr>
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There were no instances of embolization or migration, valve dysfunction requiring repeat procedure, endocarditis or valve thrombosis.
Evolut R Clinical Summary

• The Evolut R transcatheter aortic valve (TAV) is a self-expanding bioprosthesis that provides a low (14F equivalent) profile delivery system, conformable annular sealing, and the ability to reposition during deployment.

• Early 30-day clinical outcomes are sustained 1 year after the procedure with low all-cause mortality (8.6%) and disabling stroke (5.1%) in patients deemed high or greater risk for surgery.

• FDA approval for the 34 mm Evolut XL