Health-Related Quality of Life and Functional Capacity Outcomes Post Transcatheter Aortic Valve Replacement (TAVR): A Systematic Review and Meta-Analysis

Presented by
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Background

Aortic stenosis (AS) is one of the most common heart valve diseases globally

- AS is the narrowing of the aortic valve opening, impeding delivery of blood from the heart to the body.

- Prevalence of AS increases with age (almost 10% in 80-89 year olds).

- Symptoms of AS include angina, syncope, and those of heart failure (primarily dyspnoea).

- AS will eventually lead to death if treatment not provided.

  The PARTNER trial – Cohort B, reported a mortality rate of 50.7% within one year.

Background

Traditional treatment for severe AS is surgical valve replacement (SAVR), or medical treatment alone in high-risk patients

• With SAVR, patients >80yrs old mortality increases sharply.

• Older, higher-risk surgical patients can often be predisposed to a delayed recovery period, increased complications and cognitive decline post operatively (SAVR).

• Conservative management associated with a poor prognosis amongst high-risk, severe AS patients.

• A new approach to Aortic Valve Replacement was required.

Background

An effective contemporary treatment alternative to SAVR for high-risk patients is TAVR (Transcatheter Aortic Valve Replacement)

• Minimally invasive, percutaneous insertion of a bio-prosthetic valve directly in position of the native stenosed aortic valve (femoral approach common)

• Reduced procedural time – usually 1-2 hours, less anaesthetic, smaller wounds, less pain and shorter recovery time

• Compared to SAVR, TAVR patients have lower mortality in the short term (1 yr 14.2% TAVR vs 19.1% SAVR) and equivalent mortality at 5 years(4,5).


Background

Knowledge Gaps in Cardiovascular Care of the Older Adult Population

• Recent TAVR vs SAVR studies focused on mortality rate and post operative complication outcomes.

• Older patients may place greater value on functional capacity and quality of life outcomes, than longevity.

• Since initial TAVR in 2002 >150,000 cases worldwide.

• Limited comprehensive evidence in TAVR, for key patient outcomes such as quality of life, physical function, and maintenance of independence.


Health-Related Quality of Life (HRQoL) and Functional Capacity Outcomes Post Transcatheter Aortic Valve Replacement (TAVR): A Systematic Review and Meta-Analysis
Methods

Aim: to perform a systematic search and meta-analysis to describe changes in functional capacity and HRQoL outcomes for TAVR patients.

Keywords: Transcatheter * Aortic Valve * Quality of Life * Functional Assessment * ADL

Inclusion Criteria:

1) included **TAVR patients**
2) reported at least one measure of functional capacity (objective or self-reported) and/or quality of life
3) reported the measure(s) both pre and post TAVR (minimum 1m and up to 12m post)
4) used **validated and reliable tools** for assessing functional capacity and/or quality of life, in patients with **cardiovascular disease**
Bibliographic databases (CINAHL, EMB Review, EMBASE, MEDLINE, PreMEDLINE, COCHRANE)

Reference lists of eligible papers, bibliographies of related trials and conference abstracts
Google scholar

n = 519

Studies excluded based on screening for discipline and duplication

n = 302

Studies screened for title and abstract review

n = 217

Studies excluded as titles or abstracts indicate they would not meet inclusion criteria

n = 176

Studies retrieved for full text analysis

n = 41

Excluded studies

1. Incomplete data (n=9)
2. Duplicate sample (n=6)
3. No post TAVR Measure (n=5)
4. No validated measure of functional capacity or HRQoL (n=2)

n = 22

Studies meeting inclusion and exclusion criteria included for analysis

n = 19
Results

Study Characteristics (n=19)

- **6 were multi-centre** and **13 were single site**
- **13 were observational, 5 RCT’s** and **1 registry**
- Europe (n=13), the Middle East (n=1), North America (n=5) and Australasia (n=1).
- Total sample was **2645 patients**, with study sample size ranging from n=36 to n=484.
- Participants had a **mean age of 81.7±2.1 years** (78–86 years) and **52%±8.8 were females**
- A **range of measures of functional capacity and HRQoL** were used. 5 studies used 6MWT and 3 used DASI, 9 used SF12/36, 6 used EQ5D, and lastly 3 used MLHFQ and 4 KCCQ.
### Results

#### Study Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Range/Values</th>
<th>Clinically Meaningful Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF36/SF12</td>
<td>36-Item/12-Item Short Form Health Survey</td>
<td>The Mental Component Summary (MCS) and the Physical Component Summary (PCS). The score ranges 0-100, increasing values represent better HRQoL</td>
<td>±2.5 points</td>
</tr>
<tr>
<td>EQ5D-Index (Utilities)</td>
<td>EuroQoL-5D, generic HRQoL index instrument</td>
<td>A single index value obtained by combining and weighting these various dimensions of HRQoL. The score ranges from 0.0-1.0, higher value represents increased HRQoL</td>
<td>±0.074 points</td>
</tr>
<tr>
<td>EQ5D-VAS</td>
<td>EuroQoL Visual Analogue Scale, rating health state</td>
<td>Respondents rate their present health status using a scale from 0-100, increasing values represent better HRQoL</td>
<td>±28 points</td>
</tr>
<tr>
<td>MLHFQ</td>
<td>Minnesota Living With Heart Failure Questionnaire</td>
<td>Scoring system works inversely to the other tools, with a range 0-105, decreasing values represent better HRQoL</td>
<td>±5 points</td>
</tr>
<tr>
<td>KCCQ-OS</td>
<td>The Kansas City Cardiomyopathy Questionnaire, Overall Summary</td>
<td>Scores for each subscale and overall score, range from 0 to 100, increasing values represent better HRQoL</td>
<td>±20 points</td>
</tr>
<tr>
<td>6MWT</td>
<td>Six-minute Walk Test, Objective measure of physical capacity</td>
<td>Distance measured in total metres achieved over six-minutes. Increasing distance represents better physical walking capacity</td>
<td>±50 metres</td>
</tr>
<tr>
<td>DASI</td>
<td>Duke Activity Status Index, functional capacity of patients with cardiovascular disease</td>
<td>Each item is weighted by its known metabolic cost and weights of positive terms, which are combined to provide a single score. The score ranges 0-68.2, increasing values represent better HRQoL</td>
<td>±4 points</td>
</tr>
</tbody>
</table>
### Results

**Functional Capacity** improved significantly as measured by the 6-minute walk test (6MWT) and a clinically meaningful increase in ability to perform daily physical-based tasks (Duke Activity Status Index (DASI)).

A mean increase of **41.48m in 6MWT** (CI 9.69-73.28, p=0.01) and a **5.42 points** mean increase was reported with **DASI** (CI 3.16-7.68) p=<0.01).

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Baseline Mean</th>
<th>Baseline SD</th>
<th>Baseline Total</th>
<th>Follow-Up Mean</th>
<th>Follow-Up SD</th>
<th>Follow-Up Total</th>
<th>Weight</th>
<th>Mean Difference IV, Random, 95% CI</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagur et al. (2011)</td>
<td>165.9</td>
<td>77.6</td>
<td>48</td>
<td>211.8</td>
<td>78.7</td>
<td>46</td>
<td>16.5%</td>
<td>-45.90 [-77.84, -13.96]</td>
<td></td>
</tr>
<tr>
<td>Delarochellière et al. (2015) (anemia)</td>
<td>167.8</td>
<td>120.5</td>
<td>242</td>
<td>234.5</td>
<td>122.1</td>
<td>148</td>
<td>17.6%</td>
<td>-66.70 [-91.55, -41.85]</td>
<td></td>
</tr>
<tr>
<td>Delarochellière et al. (2015) (no anemia)</td>
<td>220.5</td>
<td>116.3</td>
<td>137</td>
<td>265.4</td>
<td>122.2</td>
<td>98</td>
<td>16.9%</td>
<td>-64.90 [-94.46, -35.34]</td>
<td></td>
</tr>
<tr>
<td>Gotzmann et al. (2012)</td>
<td>213</td>
<td>131</td>
<td>112</td>
<td>267</td>
<td>165</td>
<td>112</td>
<td>15.2%</td>
<td>-54.00 [-93.02, -14.98]</td>
<td></td>
</tr>
<tr>
<td>Green et al. (2013) (fast walkers)</td>
<td>240</td>
<td>96</td>
<td>133</td>
<td>196</td>
<td>148</td>
<td>103</td>
<td>16.3%</td>
<td>44.00 [11.09, 76.91]</td>
<td></td>
</tr>
<tr>
<td>Green et al. (2013) (slow walkers)</td>
<td>72</td>
<td>34</td>
<td>133</td>
<td>130</td>
<td>126</td>
<td>103</td>
<td>17.6%</td>
<td>-58.00 [-83.01, -32.99]</td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td></td>
<td></td>
<td>803</td>
<td>610</td>
<td></td>
<td></td>
<td>100.0%</td>
<td>-41.48 [-73.28, -9.69]</td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 1333.58; Chi² = 34.00, df = 5 (p < 0.000001); I² = 85%

Test for overall effect: Z = 2.56 (p = 0.01)
Results

HRQoL improved significantly and demonstrated a clinically meaningful difference post TAVR.

Short Form Health Surveys had similar increases in both for the Physical Component Summary Score (PCS), a mean increase of 12.98 points, (SF36) (CI 5.48-20.49, p=<0.01) and by10.14 points (SF12) (CI 4.20-16.09, p=<0.01) at follow-up. Mental Component Summary Score (MCS) improved slightly less but still significantly (SF36 a mean increase of 5.43 points (CI 0.88-9.99, p=<0.01) and SF12 by 5.95 points (CI 2.80-9.09, p=<0.01).
**Results**

**HRQoL** improvements were seen irrespective of the measure used and whether it was general or cardiac specific.

Cardiac-specific HRQoL as measured by the **MLFHQ improved with a decrease of 21.30 points** (CI 27.13-15.46), *p*=<0.01, which was clinically meaningful and the **KCCQ with a mean increase of 15.97 points** (CI 7.64-24.30), *p*=<0.01 post TAVR. In the more general **EQ5D questionnaire** statistically significant increases were seen in both elements, the **utilities score with a mean difference increase of 0.05 points**, (CI 0.01-0.10), *p*=0.03 and the **VAS a 13.81 point increase** (CI 9.28-18.34), *p*=<0.01, the latter being clinically meaningful.
## Results Interpretation

<table>
<thead>
<tr>
<th>Measure</th>
<th>Change</th>
<th>Post TAVR</th>
</tr>
</thead>
<tbody>
<tr>
<td>6MWT</td>
<td>↑</td>
<td>&gt;40m exercise capacity</td>
</tr>
<tr>
<td>DASI</td>
<td>↑</td>
<td>Personal Care, Walking, Housework, Recreational Activities</td>
</tr>
<tr>
<td>SF PCS</td>
<td>↑</td>
<td>Walking, Physical Capability, Accomplish More Activities</td>
</tr>
<tr>
<td>SF MCS</td>
<td>↑</td>
<td>Calmer, Desire to Engage in Activities, Less Worn Out, Decreased Anxiety</td>
</tr>
<tr>
<td>MLHFQ &amp; KCCQ</td>
<td>↑</td>
<td>Improved HF symptoms, Exercise Capacity, More Control, Personal Care,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less Fatigue, Improved Social Interaction</td>
</tr>
<tr>
<td>EQ5D</td>
<td>↑</td>
<td>Walking, Personal Care, Overall General Health</td>
</tr>
</tbody>
</table>
Results

A high level of cross study heterogeneity was present.

For functional capacity analysis this ranged from $I^2 = 59\%$ (DASI) to $I^2 = 85\%$ (6MWT). Similar heterogeneity ranges were found in HRQoL outcome measures, with the lowest $I^2 = 55\%$ (EQ5D utilities) to $I^2 = 98\%$ (SF36 PCS component). The high levels of heterogeneity may reflect the range of studies included, with the majority being single centre studies observational studies (68%) compared with multi-site trials.
Discussion

• Post TAVR, patients had significant improvement in functional capacity of the 6-minute walk test and a meaningful increase in ability to perform daily physical-based tasks.

• HRQoL improved consistently following TAVR regardless of measure used.

• TAVR resulted in clinically meaningful increases in both the physical and mental HRQoL composite scores, however, physical scores overall had greater improvements.

Conclusion

• TAVR represents not only an increasingly viable but directly beneficial option for high-risk, severe AS patients.