Frailty in Patients Undergoing Transcatheter Aortic Valve Implantation (TAVI): A systematic review and meta-analysis

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Background

- Transcatheter aortic valve implantation (TAVI) has emerged as an alternative, less invasive treatment option for patients with severe symptomatic aortic stenosis who are at high or intermediate risk for poor outcomes with surgical aortic valve replacement (SAVR)
- Frailty is a biological syndrome characterized by an increased vulnerability to stressors, and it has been considered an important risk factor for mortality and morbidity following TAVI

Objectives

This study aims to review the operationalization of frailty instruments for TAVI recipients, and to determine the mortality, clinical outcomes, and change in quality of life in frail patients undergoing TAVI. Review questions included:

I. How is frailty measured in patients undergoing TAVI?
II. What is the frequency of adverse clinical outcomes after TAVI in frail patients with aortic stenosis?
III. How does quality of life change after TAVI in frail patients with aortic stenosis?

Data Sources and Eligibility Criteria

- We conducted a systematic review of the literature, searching PubMed, EMBASE, PsycINFO, Cochrane Library, Web of Science and ClinicalTrials.gov for articles published in 2006 or later
- We searched the abstracts of relevant conferences held in the last 3 years
- We included studies of patients with aortic stenosis, diagnosed with frailty, who underwent a TAVI procedure that reported mortality, clinical outcomes, or health-related quality of life.

Data Synthesis

- Described the frailty instruments and the frailty dimensions measured; reported on the prevalence of frailty in each study
- Summarized the frequency of clinical outcomes of frail patients after TAVI
- Created a single pooled Kaplan-Meier curve for time-to-death by digitizing survival curves from individual studies and combining survival data in a meta-analysis
- Pooled mortality and clinical outcomes from multiple studies
- Explored heterogeneity and performed subgroup analyses, where possible

Results

Assessed frailty using single measures: 15 studies
- Prevalence of frailty: 7.21%-90.07%
- Commonly used measures: Katz Activities of Daily Living, albumin, BMI

Assessed frailty using multi-dimensional measures: 20 studies
- Prevalence of frailty: 15.23%-84.67%
- Commonly used measures: Fried frailty phenotype & modified Fried phenotype

GRADE evidence profile

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Risk of bias</th>
<th>Inconsistency</th>
<th>Indirectness</th>
<th>Imprecision</th>
<th>No. of events</th>
<th>No. of individual</th>
<th>Estimate (95% CI)</th>
<th>Certainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-day mortality (combined all studies)</td>
<td>Strongly serious</td>
<td>Strongly serious</td>
<td>Strongly serious</td>
<td>Not serious</td>
<td>545</td>
<td>8743</td>
<td>7.73% (5.20% - 11.33%)</td>
<td>Very low</td>
</tr>
<tr>
<td>30-day mortality (measured with Fried phenotype or modified Fried phenotype)</td>
<td>Serious</td>
<td>Not serious</td>
<td>Strongly serious</td>
<td>Serious</td>
<td>31</td>
<td>407</td>
<td>7.86% (5.20% - 11.70%)</td>
<td>Very Low</td>
</tr>
<tr>
<td>1-year mortality (combined all studies)</td>
<td>Serious</td>
<td>Not serious</td>
<td>Strongly serious</td>
<td>Serious</td>
<td>217</td>
<td>922</td>
<td>24.13% (20.91% - 27.68%)</td>
<td>Very Low</td>
</tr>
<tr>
<td>1-year mortality (measured with Fried phenotype or modified Fried phenotype)</td>
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<td>Not serious</td>
<td>Strongly serious</td>
<td>Strongly serious</td>
<td>60</td>
<td>223</td>
<td>26.91% (21.50% - 33.12%)</td>
<td>Very Low</td>
</tr>
<tr>
<td>Survival (combined all studies)</td>
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<td>Strongly serious</td>
<td>Strongly serious</td>
<td>Not serious</td>
<td>3296</td>
<td></td>
<td></td>
<td>Very low</td>
</tr>
<tr>
<td>Survival (measured with Fried or modified Fried phenotype)</td>
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<td>Serious</td>
<td>Serious</td>
<td>Serious</td>
<td>484</td>
<td></td>
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<td>Very low</td>
</tr>
</tbody>
</table>

Discussion and Conclusions

- The operationalization of frailty instruments for TAVI recipients varied widely across studies, leading to a wide range of frailty prevalence and substantial heterogeneity
- To the best of our knowledge, this is the first review to investigate the frequency of adverse outcomes and pool estimates of survival after TAVI in frail patients from multiple studies
- We believe the results of this review will inform clinicians, patients, and health care administrators, of the best available evidence about the impact of frailty in patients undergoing TAVI

Limitations

- Unable to perform meta-regression to further investigate the potential sources of clinical heterogeneity
- Unable to perform meta-analysis of secondary outcomes or subgroup analysis by mean age, valve types and procedure approaches
- Did not compare prognosis to other groups of patients or treatments

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