



Transcatheter Aortic Valve Implantation in Patients Under Seventy: Durability, Reintervention and Lifetime Management

Vittorio Maragliano^{1*}, Britt Sondergaard-Holt², Ruxandra Ionita-Neagu³

¹Department of Cardiac Surgery, Campanian Heart Centre, Naples, Italy

²Department of Interventional Cardiology, Midtjylland Institute of Cardiovascular Research, Herning, Denmark

³Centre for Cardiovascular Outcomes, Somes Heart Centre, Baia Mare, Romania

*Correspondence to: Vittorio Maragliano, Department of Cardiac Surgery, Campanian Heart Centre, Naples, Italy

E-mail: v.maragliano@chc-naples.it

Received: 14 January 2022; Accepted: 15 May 2022; Published: 24 October 2022

Copyright: © 2022 Maragliano V, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Transcatheter aortic valve implantation (TAVI) has moved from prohibitive-risk to low-risk patients on the strength of randomised trials showing outcomes comparable to, or in some measures better than, surgical aortic valve replacement (SAVR) through five to ten years: PARTNER 3 found similar clinical event rates and valve durability at seven years, Evolut Low Risk found numerically fewer deaths with TAVI at four years, and NOTION found significantly less severe structural valve deterioration with TAVI at ten years. This evidence has encouraged extending TAVI to patients well under 70, but the trials underpinning it enrolled patients with a mean age of 73 to 74 years -- older, on average, than the population now increasingly being treated. NOTION-2, the first randomised trial built specifically around patients aged 70 or younger, tells a less reassuring story: at one year its composite endpoint numerically favoured surgery (10.2% TAVI versus 7.1% SAVR), driven substantially by a stroke signal and, at three years, by a widening gap in patients with bicuspid aortic valves (20.4% versus 7.8%) -- a valve morphology disproportionately common in exactly the younger population this review addresses. Beyond individual trial results, the lifetime management literature estimates that roughly 20% of TAVI recipients will need at least one reintervention within their lifetime, and a dedicated imaging study found that redo TAVI leaves over half of patients with some degree of impaired future coronary access -- rising to an odds ratio of 19.8 with supra-annular valve designs -- a consideration that matters far more for a 60-year-old with several decades of remaining life than for the 80-year-old such valves were originally designed to treat. This review sets out the evidence for TAVI's expansion into younger patients and closes with the complication that evidence has not yet fully resolved: choosing a valve and an implantation strategy today that will not foreclose safe options decades from now.

Keywords: Transcatheter aortic valve implantation; Valve durability; Lifetime management; Reintervention; Coronary access

Introduction

Transcatheter aortic valve implantation (TAVI) began as an option for patients too frail for open-heart surgery, and has since expanded, trial by trial, into intermediate- and low-risk populations who are, on average, younger and healthier than the original prohibitive-risk cohorts [1-3]. That expansion has now reached patients well under 70 -- an age group with

several decades of remaining life expectancy, for whom a single procedural comparison at five years is a much smaller fraction of the relevant time horizon than it is for the original TAVI population [8].

This review sets out the trial evidence that has driven TAVI's expansion into younger, lower-risk patients, and closes with a complication that follows directly from success itself: having proven durable enough for a 60- or 65-year-old to

consider, TAVI must now be evaluated against a lifetime-management horizon its founding trials were never designed to answer.

Material and Methods

This is a narrative review of the randomised-trial evidence for TAVI in low-risk and younger populations, the specific trial literature addressing patients aged 70 or younger, and the subsequent literature on valve durability, lifetime reintervention, and coronary re-access after redo TAVI, identified through the sources cited above and citation tracking between them, without a pre-registered protocol or systematic search string. Because different trials report outcomes at different follow-up durations and use different composite endpoints, this review presents each trial's own reported figures rather than pooling them, and no numerical value in this review has been invented, estimated, or extrapolated beyond what the cited source itself reports.

Results

The low-risk trials that established TAVI's evidence base look genuinely reassuring through seven to ten years

Three major randomised trials underpin TAVI's use in low surgical-risk patients. At seven years, PARTNER 3 found similar clinical event rates between TAVR and SAVR -- all-cause mortality 19.5% versus 16.8%, reintervention 6.7% versus 6% -- with the authors describing valve function and durability as "excellent and similar" between arms [1]. Evolut Low Risk found the opposite mortality direction: at four years, TAVR showed numerically fewer deaths than surgery (9.0% versus 12.1%), with the gap widening rather than narrowing over time, and lower reintervention (1.3% versus 1.7%) [2]. At ten years -- the longest follow-up of any randomised TAVI trial -- NOTION found no difference in all-cause mortality (62.7% TAVI versus 64.0% SAVR) but significantly less severe structural valve deterioration with TAVI (1.5% versus 10%, hazard ratio 0.2) [3]. Figure 1 sets these three trials' mortality findings out side by side, and illustrates a point often lost in headline summaries: which arm looks better depends on which trial, which follow-up duration, and which specific valve generation is being discussed.

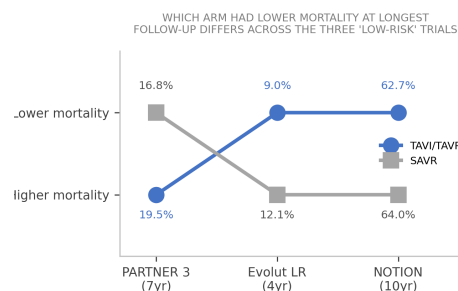


Figure 1: All-cause mortality at each trial's longest published follow-up, TAVI/TAVR versus SAVR: which arm ranks lower differs across the three trials [1-3].

But the trials establishing this evidence enrolled patients older, on average, than the population now being treated

A detail easily missed when this evidence is cited to support TAVI in patients under 70 is that none of these three pivotal trials actually targeted that population specifically: mean enrollment age was 73 years in PARTNER 3 and 74 years in Evolut Low Risk [1,2]. Figure 2 sets this gap out directly. The first randomised trial built specifically around patients aged 70 or younger, NOTION-2, only reported its first results in 2024: 370 patients with a mean age of 71.1 years, of whom 42.7% were aged 70 or younger [4]. Even this dedicated younger-patient trial could only get its average participant to just above the threshold this review addresses -- underscoring how thin the direct evidence base still is for the population under discussion.

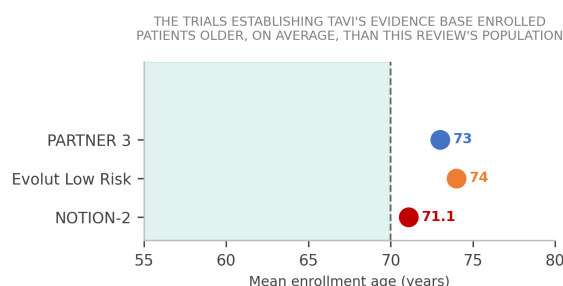


Figure 2: Mean enrollment age in the three trials most often cited to support TAVI in younger patients, against the sub-70 population this review addresses [1,2,4].

NOTION-2's results for this specific population are less reassuring than the broader low-risk evidence

At one year, NOTION-2's primary composite endpoint (death, stroke, or rehospitalisation) numerically favoured surgery: 10.2% with TAVI versus 7.1% with SAVR (hazard ratio 1.4), driven in part by a higher rate of stroke, including non-disabling stroke, with TAVI [4]. By three years the gap had widened rather than narrowed -- 16.1% versus 12.6% (hazard ratio 1.3) -- and the widening was concentrated almost entirely in patients with bicuspid aortic valves, where the endpoint occurred in 20.4% of TAVI patients versus 7.8% of surgery patients, compared with near-identical rates in patients with tricuspid anatomy (14.5% versus 14.4%) [5]. Bicuspid aortic valve disease is disproportionately common in younger patients with severe aortic stenosis, which means this specific complication falls hardest on exactly the population this review is about [4,5]. Reassuringly, valve durability itself looked comparable between arms at three years -- moderate-or-greater structural valve deterioration 4.5% (TAVI) versus 5.2% (SAVR), and bioprosthetic valve failure 1.6% versus 2.9% [5] -- so the concern NOTION-2 raises is specifically about early clinical events, not about how the valve itself is ageing. Figure 3 sets the primary-endpoint data out across both time points and both valve subtypes.

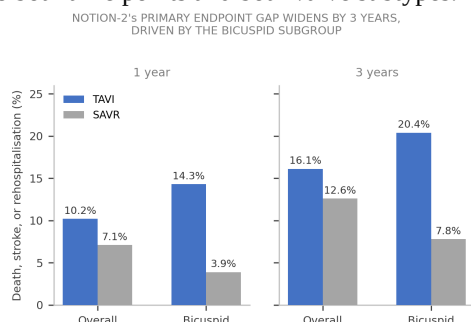


Figure 3: NOTION-2 primary composite endpoint (death, stroke, or rehospitalisation), TAVI versus SAVR, at 1 and 3 years, overall and in the bicuspid-valve subgroup [4,5].

A separate commentary specific to patients under 65 describes a broadly similar pattern using different metrics: reintervention at five years reported at 6-7% with TAVI versus 2-3% with SAVR, permanent pacemaker implantation at roughly three times the surgical rate (20% versus 7%), and moderate-or-greater paravalvular regurgitation at roughly five times the surgical rate (around 10% versus under 2%) [6]. Figure 4 sets these figures out together; taken alongside NOTION-2, they suggest that whatever conclusions the broader low-risk trials support, the specific evidence for patients well under 70 currently paints a less uniformly favourable picture.

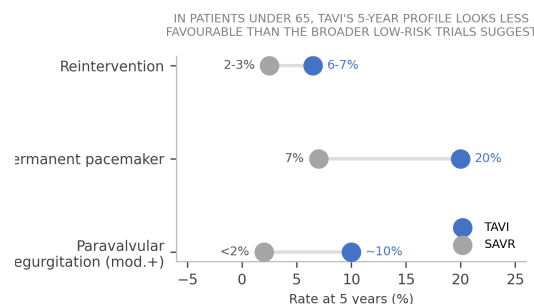


Figure 4: Five-year reintervention, permanent pacemaker, and paravalvular regurgitation rates reported specifically for patients under 65, TAVI versus SAVR [6].

Lifetime management means planning for a reintervention this population is likely to eventually need

Beyond individual trial endpoints, the broader lifetime-management literature estimates that approximately 20% of TAVI recipients will require at least one reintervention within their lifetime -- a figure that matters more, not less, for a population with decades of remaining life expectancy [8]. Figure 5 illustrates this estimate directly. When that reintervention is needed, a dedicated computed tomography study of 221 patients after redo TAVI found that 55.6% showed increased risk of impaired future coronary access, with 85% of those impaired-access cases occurring specifically in patients with supra-annular valve designs -- an odds ratio of 19.8 compared with intra-annular devices -- and 14.9% to 42.1% of patients (depending on the threshold used) at increased risk of direct coronary obstruction during a redo procedure [7]. Figure 6 sets these coronary re-access findings out together. The authors of the lifetime management literature accordingly recommend that index-procedure planning in younger patients explicitly weigh valve type, implantation depth, and future coronary access alongside immediate procedural risk -- a materially different calculus than optimising only for the patient in front of the operator today [8].

OF PATIENTS RECEIVING TAVR TODAY...

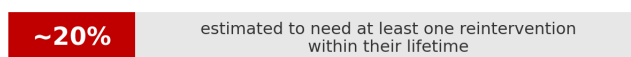


Figure 5: Estimated proportion of TAVI recipients who will require at least one reintervention within their lifetime [8].

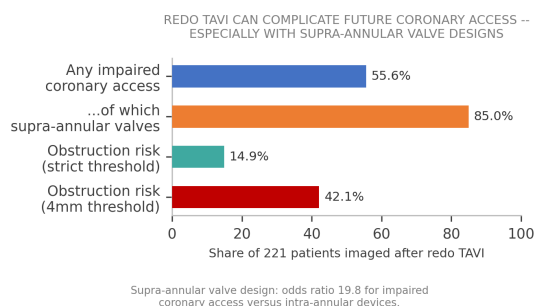


Figure 6: Impaired coronary access and coronary obstruction risk after redo TAVI, overall and by valve design, among 221 patients imaged by computed tomography [7].

Metric	TAVI/TAVR	SAVR
PARTNER 3, 7yr mortality	19.5%	16.8%
NOTION, 10yr severe SVD	1.5%	10%
NOTION-2, 3yr primary endpoint	16.1%	12.6%
Under-65, 5yr reintervention	6-7%	2-3%

Table 1: Selected outcomes across the trials and analyses reviewed, presented as each source's own reported figures rather than a pooled estimate [1,3,5,6].

Discussion

The evidence reviewed here supports two conclusions that sit in tension with one another, in much the same way the CIED remote-monitoring evidence in this issue does. TAVI's broader low-risk trial base is genuinely strong through seven to ten years, with valve durability now looking at least as good as, and on some measures better than, surgical bioprostheses [1-3]. But the trials that generated that evidence enrolled patients averaging 73 to 74 years old, and the one trial purpose-built for a sub-70 population found a less reassuring picture, concentrated specifically in patients with bicuspid anatomy -- precisely the anatomical variant that is over-represented in younger aortic stenosis patients to begin with [4,5]. This is not a reason to abandon TAVI in younger patients; it is a reason to treat the broader low-risk trial evidence and the sub-70-specific evidence as answering related but distinct questions, and to weight bicuspid anatomy heavily in the decision for any individual younger patient.

The reintervention and coronary-access findings reviewed here point toward the same conclusion from a different direction: a population expected to live decades past their index procedure needs that procedure planned with the eventual reintervention in mind, not treated as a one-time decision. An estimated one in five TAVI recipients will need a reintervention, and the valve design choice made at the index procedure measurably affects how difficult that future intervention -- or future coronary access more generally -- will be [7,8]. For an 80-year-old patient, a valve design that modestly complicates a hypothetical procedure 10 years hence may reasonably be a secondary consideration; for a

60-year-old, it is a primary one. The odds ratio of 19.8 for impaired coronary access with supra-annular valve designs is, in this sense, the single most actionable number in this review: it identifies a specific, modifiable choice at the index procedure -- valve type -- that materially changes the difficulty of a future intervention that roughly one in five patients in this population will eventually need [7,8]. A decision framework that treats valve selection purely as a function of today's anatomy and today's procedural risk, without reference to the patient's expected remaining lifespan, will systematically under-weight this consideration precisely for the youngest and lowest-risk patients for whom it matters most.

Study limitations

This is a narrative review, not a systematic review with a pre-registered protocol, and the trials and analyses it draws on differ substantially in follow-up duration, composite endpoint definition, and population: PARTNER 3, Evolut Low Risk, and NOTION are broader low-risk trials not restricted to patients under 70, while NOTION-2 is restricted to that population but has published only one- and three-year data so far, far short of the multi-decade horizon relevant to a 60-year-old patient [1-5]. The under-65 reintervention and pacemaker figures come from a single commentary rather than a primary trial publication, and the coronary-access findings are derived from computed tomography simulation in 221 patients rather than from actual redo procedures, so they describe theoretical anatomical risk rather than observed clinical outcomes [6,7]. The three broader low-risk trials also used different valve platforms and different trial generations of the same device family, so a reader should not treat the cross-trial mortality comparison in Figure 1 as evidence that one specific valve outperforms another; it illustrates trial-level heterogeneity, not a head-to-head device comparison [1-3].

Conclusion

TAVI's expansion into low-risk, younger patients rests on a genuinely strong trial evidence base through seven to ten years of follow-up, but that evidence base was built in patients averaging 73 to 74 years old. The one trial designed specifically around patients aged 70 or younger tells a more qualified story, with a stroke signal at one year and a widening gap at three years concentrated in bicuspid anatomy -- the anatomical variant most common in exactly this population. Combined with an estimated one-in-five lifetime reintervention rate and documented coronary re-access complications after redo TAVI, particularly with supra-annular valve designs, the evidence supports TAVI as a reasonable option for many patients under 70, but not as a decision that can be made on the broader low-risk trial evidence alone, without separately weighing valve morphology, valve design, and the decades of lifetime management the original trials were never built to address.

1. Mack MJ, Leon MB, et al. "Transcatheter or Surgical Aortic-Valve Replacement in Low-Risk Patients at 7 Years". *N Engl J Med* (2025).
2. Forrest JK, et al. "5-Year Outcomes After Transcatheter or Surgical Aortic Valve Replacement in Low-Risk Patients With Aortic Stenosis". *J Am Coll Cardiol* 85(2025):15.
3. Thyregod HGH, et al. "Transcatheter or surgical aortic valve implantation: 10-year outcomes of the NOTION trial". *Eur Heart J* 45(2024):1116-1124.
4. Jorgensen TH, Thyregod HGH, Savontaus M, et al. "Transcatheter aortic valve implantation in low-risk tricuspid or bicuspid aortic stenosis: the NOTION-2 trial". *Eur Heart J* 45(2024):3804-3814.
5. De Backer O, et al. "Three-Year Follow-Up of the NOTION-2 Trial: TAVR Versus SAVR to Treat Younger Low-Risk Patients With Tricuspid or Bicuspid Aortic Stenosis". *Circulation* (2025).
6. Martinez Comendador JM. "TAVI in patients younger than 65 years: when evidence has not yet reached the age of the patients". *Sociedad Espanola de Cirugia Cardiovascular y Endovascular*, 27 October 2025.
7. Buzzatti N, Montorfano M, Romano V, et al. "A computed tomography study of coronary access and coronary obstruction after redo transcatheter aortic valve implantation". *EuroIntervention* 16(2020):983-992.
8. Lankaputhra M, Stub D, Batchelor RJ, Goel V, Htun NM. "Lifetime management of transcatheter aortic valve replacement: a guide to decision-making and future reinterventions". *J Clin Med* 15(2026):1917.

Cite this article: Maragliano V, Sondergaard-Holt B, Ionita-Neagu R. Transcatheter Aortic Valve Implantation in Patients Under Seventy: Durability, Reintervention and Lifetime Management. *J Heart Cardiovasc Sci.* 2022; 3: 025-030.