

Transcatheter Versus Surgical Aortic Valve Replacement in Medicare Beneficiaries with Bicuspid Aortic Stenosis

The TREAT-BICUSPID Study

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Disclosure of Relevant Financial Relationships

Within the prior 24 months, I have had a financial relationship with a company producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients:

Nature of Financial Relationship

Grant/Research Support

CEC Member

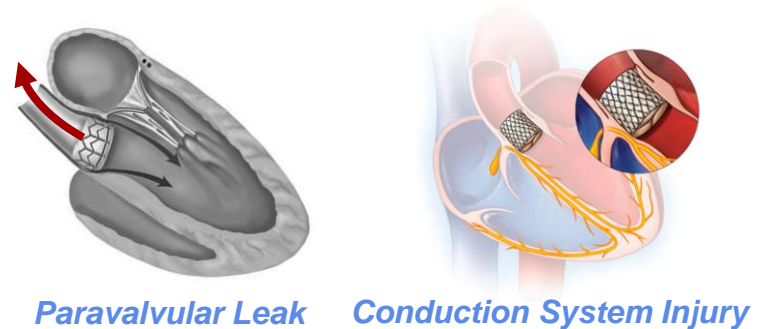
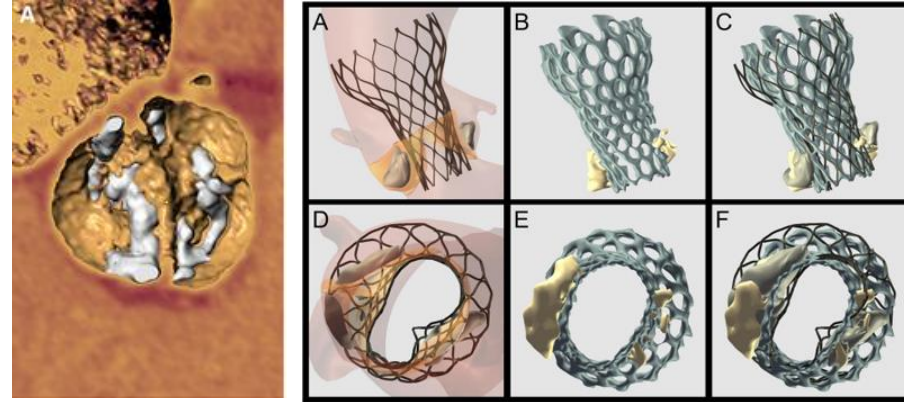
Ineligible Company

Medtronic, Edwards Lifesciences

Tioga Cardiovascular, Inc.

Patients with Bicuspid AS were Excluded from the Pivotal TAVR Trials

- Concerns over anatomic features that could increase peri-procedural risk
 - Non-circular annuli
 - Heavier leaflet calcification
 - Coexisting aortopathy
- Sub-optimal deployment
 - Paravalvular leak
 - Conduction system injury
 - Valve under-sizing
 - Leaflet thrombosis
 - Accelerated valve degeneration



FDA Low-Risk Approval Included Patients with Bicuspid AS

August 2019

FDA NEWS RELEASE

FDA expands indication for several transcatheter heart valves to patients at low risk for death or major complications associated with open-heart surgery

Balloon-Expandable Labeling Change (July 2020)

Device	Sapien 3 and Sapien 3 Ultra Transcatheter Heart Valves
Generic Name	Aortic valve, prosthesis, percutaneously delivered
Applicant	EDWARDS LIFESCIENCES, LLC. One Edwards Way Irvine, CA 92614
Supplement Reason	Labeling Change - Indications/instructions/shelf life/tradename
Approval Order Statement	Approval for modifying the labeling to remove the precaution regarding patients with a congenital bicuspid aortic valve.

Self-Expanding Labeling Change (August 2020)

Device	Medtronic CoreValve Evolut R System, Medtronic CoreValve Evolut PRO System, and Medtronic Evolut PRO+ System
Generic Name	Aortic valve, prosthesis, percutaneously delivered
Applicant	Medtronic, Inc. 710 Medtronic Parkway Minneapolis, MN 55432
Supplement Reason	Labeling Change - Indications/instructions/shelf life/tradename
Approval Order Statement	Approval for modifying a precaution in the labeling regarding patients with a congenital bicuspid aortic valve.

TAVR Utilization in Bicuspid AS is Increasing

All Patients Undergoing TAVR



Tricuspid

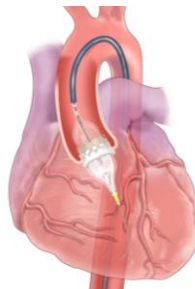
~90%



Bicuspid

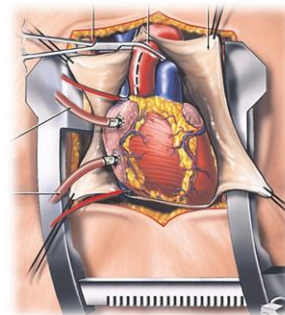
~10%

Bicuspid AS Patients Undergoing AVR



TAVR

???



SAVR

???

Transcatheter Versus Surgical Aortic Valve Replacement in Medicare Beneficiaries with Bicuspid Aortic Stenosis: The TREAT-BICUSPID Study

Aims:

1. To examine **trends** in utilization of TAVR vs. SAVR in patients ≥ 65 years of age with bicuspid AS.
2. To compare **outcomes** of TAVR vs. SAVR in patients with bicuspid AS using **causal inference methods**.

Methods



Data Source

*Center for Medicare and
Medicaid Administrative Data*



Study Population

*Medicare Beneficiaries
Age ≥ 65 Years With Bicuspid AS*



Outcomes

*AVR Use Over Time
Death, Stroke, HF Hosp at 1 Year*



Statistical Analysis

*Instrumental Variable Analysis
2-Stage Least Squares Regression*

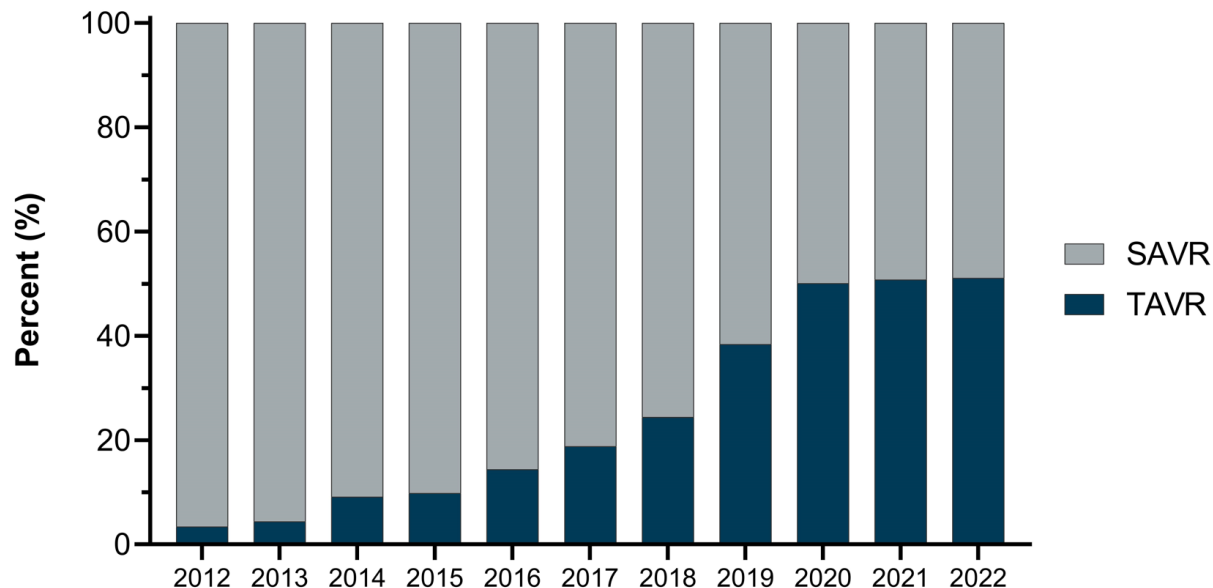
IV: Hospital-Level Preference for TAVR

Trends in TAVR Utilization in Patients ≥ 65 Years of Age With Bicuspid AS

2012: 3.4%

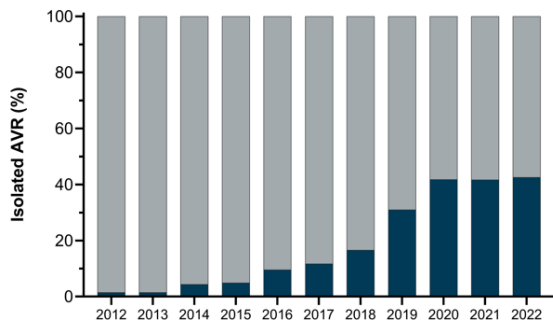
Isolated AVR Only

2022: 51%



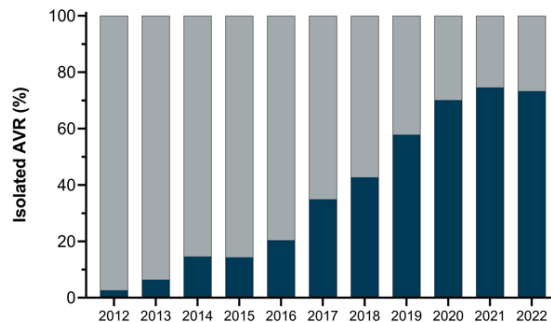
Trends in TAVR Utilization in Bicuspid AS Across Age Ranges

Age 65-74



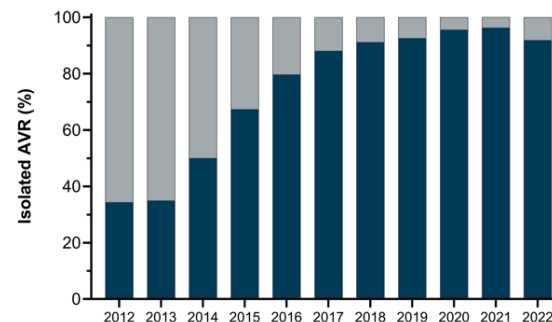
2022: 42.6%

Age 75-84



2022: 73.3%

Age 85+



2022: 91.9%

Baseline Characteristics of Analysis Cohort (Unadjusted)

	Isolated SAVR n = 7797	Isolated TAVR n = 4349	Standardized Mean Difference (%)
Age (yrs)	70.9±4.5	74.9±6.7	-70.1
Gender (female)	38.6%	41.5%	-6.1
Hypertension	57.2%	70.9%	-28.9
Diabetes	19.3%	30.6%	-26.3
Ischemic Heart Disease	51.3%	65.6%	-29.3
Atrial Fibrillation	11.1%	18.8%	-21.9
Stroke / TIA	5.6%	10.6%	-18.2
Peripheral Vascular Disease	10.0%	23.0%	-35.5
Chronic Kidney Disease	11.1%	18.8%	-21.9
COPD	11.5%	23.3%	-31.4

Baseline Characteristics of Analysis Cohort Stratified by Instrumental Variable

(IV: Hospital Preference of TAVR over SAVR in Bicuspid AS Patients over prior 3 years)

	Quintile 1 (Prefers SAVR)	Quintile 5 (Prefers TAVR)	Standardized Mean Difference (%)
Age (yrs)	72.2±5.8	72.5±5.8	-5.5
Gender (female)	41.0%	38.2%	5.7
Hypertension	62.6%	62.9%	-0.5
Diabetes	24.1%	23.8%	0.7
Ischemic Heart Disease	54.9%	57.8%	-5.7
Atrial Fibrillation	14.5%	12.9%	4.6
Stroke / TIA	7.8%	8.1%	-0.9
Peripheral Vascular Disease	13.7%	16.2%	-6.9
Chronic Kidney Disease	20.7%	22.9%	-5.3
COPD	16.7%	16.1%	1.7
Receipt of TAVR	23.5%	61.4%	83.0

Results of Instrumental Variable Analysis

1-Year Clinical Outcomes

Outcome	TAVR (%)	SAVR (%)	Risk Difference (95% CI)		P
Clinical Outcomes – 1 year					
Composite	21.50	11.82	9.63 (-0.35, 19.61)		0.06
Death	6.10	2.05	4.05 (-1.31, 9.41)		0.14
Stroke	7.30	2.65	4.64 (-1.96, 11.25)		0.17
Heart Failure Hospitalization	13.87	9.72	4.15 (-4.71, 13.00)		0.36
Negative Control Outcome – 1 year					
Pneumonia	4.50	3.54	0.96 (-4.58, 6.51)		0.73
Urinary Tract Infection	4.47	3.92	0.54 (-4.33, 5.52)		0.83

*Partial F-Statistic for Instrumental Variable: 568.05



Conclusions

- TAVR utilization in patients ≥ 65 years of age with bicuspid AS is increasing.
- In this analysis applying causal inference methods to real-world observational data, we found a trend towards worse clinical outcomes with TAVR vs. SAVR at 1 year in patients with bicuspid AS, although confidence intervals were wide.
- These findings support the urgent need for randomized controlled trials comparing TAVR vs. SAVR in patients with bicuspid AS.