Does Transcatheter Aortic Valve Replacement Overcome the Negative Impact of Distressed Socioeconomic Status?

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PURPOSE

Patients of low socioeconomic status have increased risk of complications following cardiac surgery. Recent analysis demonstrated worse outcomes following coronary artery bypass grafting in this cohort. We aimed to identify similar disparities in patients undergoing aortic valve replacement using the Distressed Communities Index (DCI), a comparative measure of community well-being.

METHODS

The Healthcare Cost and Utilization Project State Inpatient Database (HCUP-SID) for Florida and Washington was queried to identify patients undergoing surgical and transcatheter aortic valve replacement (SAVR, TAVR) between 2012 and 2015. Patient records were linked to the Distressed Communities Index. Patients undergoing TAVR and SAVR were propensity matched and stratified based on quintile of Economic Innovation Group DCI score. A distressed community was defined as those in quintiles 4 (Q4) and 5 (Q5), a non-distressed community was defined as those in quintiles 1 (Q1) and 2 (Q2). Outcomes following aortic valve replacement were compared across groups in distressed communities.

FUNDING

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RESULTS

A total of 27,591 patients underwent aortic valve replacement. After propensity matching, 5,331 patients were identified in each TAVR and SAVR group, of which 1,347 SAVR and 1,355 TAVR patients were in Q4/Q5. Overall, TAVR patients had a shorter length of stay (7.7 vs 12.02 days, $p < 0.001$), and fewer cases of post-operative sepsis (96 vs 214 patients, $p < 0.001$), pneumonia (209 vs 435 patients, $p < 0.001$), and cardiac complications (442 vs 775 patients, $p < 0.001$) than overall SAVR. Distressed Q4/Q5 TAVR vs SAVR patients mimicked these findings (Table 2). When comparing distressed Q4/Q5 SAVR and TAVR and low distressed Q1/Q2 SAVR and TAVR groups, no significant difference was found in post-operative outcomes, except distressed Q4/Q5 TAVR experienced more cases of UTI (78 vs 55 patients, $p < 0.05$).

Unmatched Data			
Distressed Quintiles	SAVR n (%)	TAVR n (%)	Total n (%)
1	5,326 (23.9)	1,278 (23.97)	6,604 (23.9)
2	6,179 (27.8)	1,516 (28.4)	7,695 (27.9)
3	4,989 (22.4)	1,182 (22.2)	6,171 (22.4)
4	3,761 (16.9)	874 (16.4)	4,635 (16.8)
5	2,005 (9.01)	481 (9.02)	2,486 (9.01)
1:1 Propensity Matched Data			
Distressed Quintiles	SAVR n (%)	TAVR n (%)	Total n (%)
1	1,200 (22.5)	1,278 (23.97)	2,478 (23.2)
2	1,563 (29.3)	1,516 (28.4)	3,079 (28.9)
3	1,221 (22.9)	1,182 (22.2)	2,403 (22.5)
4	883 (16.6)	874 (16.4)	1,757 (16.5)
5	464 (8.7)	481 (9.02)	945 (8.9)

Table 1: Distribution of SAVR and TAVR patients with respect to distressed communities index quintiles (unmatched and propensity matched data)

Patient Characteristics	SAVR Q4Q5 n = 1,347	TAVR Q4Q5 n = 1,355	p-value†
Age	78.58 (8.19)	80.97 (8.52)	<0.001
Number of Chronic Conditions	9.8 (3.10)	10.30 (3.34)	<0.001
Length of Stay	12.2 (8.99)	8.2 (7.35)	<0.001
Distressed Communities Index Score	75.7 (10.01)	76.4 (10.35)	0.09
Mortality			
Deaths	67 (4.97)	64 (4.72)	0.762
Charlson Comorbidity Index			0.224
Low Sickness	138 (10.2)	122 (9.00)	
Moderate Sickness	226 (16.8)	205 (15.1)	
Severe Sickness	983 (72.98)	1028 (75.9)	
Post-Operative Complications			
Pulmonary Embolism	<11	<11	0.177
Myocardial Infraction	<11	<11	0.991
Sepsis	49 (3.6)	26 (1.9)	0.007
Urinary Tract Infection	62 (4.6)	78 (5.8)	0.176
Pneumonia	103 (7.7)	52 (3.8)	<0.001
Deep Vein Thrombosis	<11	<11	0.161
Surgical Site Infection	11 (0.8)	<11	0.129
Cardiac Complications	208 (15.4)	101 (7.5)	<0.001
Surgery Complications	<11	26 (1.9)	<0.001
Statistics are presented as: mean (standard deviation), n (%)			
†Statistical tests performed: Students T-Test, Chi-square test of independence			
In compliance with the HCUP DUA, cells with fewer than 10 observations are marked "<11"			

Table 2: Comparison of SAVR and TAVR propensity matched data for Distressed Communities Index quintiles 4 and 5

Patient Characteristics	SAVR Q1Q2 n = 5,766	SAVR Q4Q5 n = 5,766	p-value†
Age	69 (12.8)	68.7 (12.7)	0.239
Number of Chronic Conditions	8.46 (3.2)	8.4 (3.2)	0.69
Length of Stay	9.97 (8.3)	10.6 (9.03)	<0.001
Distressed Communities Index Score	21.01 (10.8)	75.8 (10.1)	<0.001
Mortality			
Deaths	184 (3.2)	199 (3.5)	0.436
Charlson Comorbidity Index			0.958
Low Sickness	1,411 (24.5)	1,402 (24.3)	
Moderate Sickness	1,557 (27)	1,570 (27.2)	
Severe Sickness	2,798 (48.5)	2,794 (48.5)	
Post-Operative Complications			
Pulmonary Embolism	15 (0.3)	13 (0.23)	0.705
Myocardial Infraction	20 (0.4)	25 (0.4)	0.455
Sepsis	159 (2.8)	181 (3.1)	0.226
Urinary Tract Infection	149 (2.6)	163 (2.8)	0.422
Pneumonia	303 (5.3)	333 (5.8)	0.221
Deep Vein Thrombosis	48 (0.8)	37 (0.6)	0.231
Surgical Site Infection	29 (0.5)	37 (0.6)	0.323
Cardiac Complications	717 (12.4)	712 (12.4)	.888
Surgery Complications	54 (0.9)	54 (0.9)	1
Statistics are presented as: mean (standard deviation), n (%)			
†Statistical tests performed: Students T-Test, Chi-square test of independence			

Patient Characteristics	TAVR Q1Q2 n = 1,355	TAVR Q4Q5 n = 1,355	p-value†
Age	80.60 (9.5)	80.97 (8.5)	0.289
Number of Chronic Conditions	10.2 (3.4)	10.3 (3.3)	0.235
Length of Stay	7.7 (6.7)	8.2 (7.4)	0.10
Distressed Communities Index Score	20.7 (10.7)	76.4 (10.4)	<0.001
Mortality			
Deaths	53 (3.9)	64 (4.7)	0.299
Charlson Comorbidity Index			0.366
Low Sickness	143 (10.6)	122 (9)	
Moderate Sickness	209 (15.4)	205 (15.1)	
Severe Sickness	1,003 (74.02)	1,028 (75.9)	
Post-Operative Complications			
Pulmonary Embolism	<11	<11	0.563
Myocardial Infraction	<11	<11	0.636
Sepsis	20 (1.5)	26 (1.92)	0.372
Urinary Tract Infection	55 (4.06)	78 (5.8)	0.041
Pneumonia	48 (3.5)	52 (3.8)	0.684
Deep Vein Thrombosis	<11	<11	0.365
Surgical Site Infection	<11	<11	1
Cardiac Complications	118 (8.7)	101 (7.5)	0.231
Surgery Complications	24 (1.8)	26 (1.9)	0.775
Statistics are presented as: mean (standard deviation), n (%)			
†Statistical tests performed: Students T-Test, Chi-square test of independence			

Tables 3 & 4: Comparison of SAVR low distressed (Q1Q2) versus high distressed (Q4Q5) propensity matched SAVR & TAVR data

CONCLUSIONS

- Socioeconomic distress is an important contributing factor in patient care outcomes.
- Overall, TAVR patients had fewer episodes of post-operative sepsis, pneumonia, and cardiac complications as compared to SAVR. Highly distressed TAVR patients had lower incidences of post-operative sepsis, pneumonia, and cardiac complications when compared to the highly distressed SAVR cohort. Patients undergoing TAVR in highly distressed communities had an increased incidence of post-operative urinary tract infection.
- Patients from highly distressed communities may have worse outcomes when compared between surgical and transcatheter aortic valve replacement groups and have an increased incidence of urinary tract infection when compared between low and highly distressed TAVR groups.
- DCI, a composite score consisting of seven distinct socioeconomic contributors, may be an important addition to existing surgical risk scores for surgical and transcatheter aortic valve replacement to better predict post-operative outcomes.

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