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Association between social vulnerability index and admission urgency for transcatheter aortic valve replacement

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Abstract

Background: Transcatheter aortic valve replacement (TAVR) are not offered equitably to vulnerable population groups. Adequate levels of insurance may narrow gaps among patients

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Ethical statement
The study was conducted using ethical standards and was deemed exempt from review by the Indiana University Institutional Review Board. The study was conducted using deidentified Optum CDM data.

CRediT authorship contribution statement
Ikeoluwapo Kendra Bolakale-Rufai: Conceptualization, Methodology, Writing – original draft. **Alexander Shinnerl:** Conceptualization, Methodology, Writing – original draft. **Shannon M. Knapp:** Data curation, Formal analysis, Methodology, Software, Validation, Visualization. **Amber E. Johnson:** Writing – review & editing. **Selma Mohammed:** Writing – review & editing. **LaPrincess Brewer:** Writing – review & editing. **Asad Torabi:** Writing – review & editing. **Daniel Addison:** Writing – review & editing. **Sula Mazimba:** Writing – review & editing. **Khadijah Breathett:** Conceptualization, Funding acquisition, Methodology, Project administration, Resources, Supervision, Writing – review & editing.

Declaration of competing interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
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Appendix A. Supplementary data
Supplementary data to this article can be found online at https://doi.org/10.1016/j.ahjo.2024.100370.

with higher social vulnerability index (SVI). Among a national population of individuals with commercial or Medicare insurance, we sought to determine whether SVI was associated with urgency of receipt of TAVR for aortic stenosis.

Methods and results: Using Optum's de-identified Clinformatics Data Mart Database (CDM), we identified admissions for TAVR with aortic stenosis between January 2018 and March 2022. Admission urgency was identified by CDM claims codes. SVI was cross-referenced to patient zip codes and grouped into quintiles. Generalized linear mixed effects models were used to predict the probability of a TAVR admission being urgent based on SVI quintiles, adjusting for patient and hospital-level covariates.

Results: Among 6680 admissions for TAVR [median age 80 years (interquartile range 75–85), 43.9 % female], 8.5 % ($n = 567$) were classified as urgent. After adjusting for patient and hospital-level variables, there were no significant differences in the odds of urgent admission for TAVR according to SVI quintiles [OR 5th (greatest social vulnerability) vs 1st quintile (least social vulnerability): 1.29 (95 % CI: 0.90–1.85)].

Conclusions: Among commercial or Medicare beneficiaries with aortic stenosis, SVI was not associated with admission urgency for TAVR. To clarify whether cardiovascular care delivery is improved across SVI with higher paying beneficiaries, future investigation should identify whether relationships between SVI and TAVR urgency vary for Medicaid beneficiaries compared to commercial beneficiaries.

Keywords

Social determinants of health; Social vulnerability index; Valve surgery; Emergency; Valve replacement; Aortic stenosis; Healthcare delivery

1. Introduction

Aortic stenosis (AS) is the most common valvular heart disease worldwide, and if left untreated results in an average life expectancy of five years following the development of symptoms [1]. Historically, the only curative intervention for symptomatic AS was surgical aortic valve replacement (SAVR), which was associated with peri-operative and post-operative risks [2]. However, the introduction of transcatheter aortic valve replacement (TAVR) in the last decade has continued to offer exceptional outcomes for many populations, particularly those with high surgical risk [3].

Although a promising intervention, TAVR is associated with higher complication rates and mortality when performed as an urgent/emergent procedure as compared to when performed non-urgently/electively [4]. Patients with AS can potentially be treated with TAVR in an elective setting; however, variable socioeconomic and environmental factors, along with limited access to care may contribute to a disparity in receiving appropriate timely care and contribute to urgent procedures. One of such measures of social factors that could play a role in clinical outcomes is the Social Vulnerability Index (SVI).

While TAVR has been proven to improve clinical outcomes for AS patients, little is known about whether SVI is associated with the urgency of receiving TAVR. With increasing adoption of TAVR, especially in urgent settings, understanding the relationship between SVI and the urgency of TAVR in AS is important in identifying and addressing possible health disparities. Adequate health insurance may compensate for some of the barriers to cardiovascular care across rising levels of SVI. Therefore, using a national database of commercial and Medicare beneficiaries, which isolates patients with adequate insurance, we sought to determine whether high versus low SVI was associated with the urgency of TAVR admissions for AS.

2. Methods

2.1. Data source

The Optum's de-identified Clinformatics® Data Mart Database (CDM), is a de-identified, HIPAA-compliant, closed system of administrative health claims that includes claims for approximately 67 million commercial and Medicare beneficiaries from all 50 U.S. states. This database includes information on patient demographics including zip code, race and ethnicity captured administratively, medical claims, pharmacy claims, and inpatient confinement claims [5–8]. This study was deemed exempt from Indiana University institutional review board.

2.2. Study population

We searched for hospital admission records in the CDM using the International Classification of Diseases-9th Revision-Clinical Modification (ICD-9-CM) and 10th Revision (ICD-10) procedural codes for TAVR (ICD 9 codes: 3505, 3506 and ICD-10 codes: 02RF37H, 02RF37Z, 02RF38H, 02RF38Z, 02RF3JH, 02RF3JZ, 02RF3KH, 02RF3KZ) between January 2018 and March 2022 and found 26,252 total admissions for TAVR listed among the first five procedures. These admissions were used to calculate the number of TAVR admissions per hospital over the study period.

Our study cohort was selected using the following criteria: exclusion of admissions for which TAVR was not the first procedure listed ($n = 622$), those without the concurrent diagnosis of AS ($n = 4090$), <12 months of prior enrollment in database ($n = 3920$), and/or admissions in hospitals that performed <10 TAVR procedures in a year ($n = 5801$). In total, we excluded 11,811 admissions for one or more of these reasons and 14,441 admissions were found eligible for our study. We further excluded patients with >1 admission on the same date (n = 58 admissions) and took only the first admission per patient, thus we had 14,379 admissions (which were all unique patients; Fig. 1).

2.3. Outcome of interest

The primary outcome of interest was the urgency for hospital admission for TAVR which was classified as urgent versus non-urgent. To determine urgency for TAVR, we examined all medical claims associated with the admission. In particular, we looked at variables for the type of admission and the channel of admission. Among the possible values for admission type were codes for "emergency", "urgent", and "elective" and among the possible codes for the admission channel were "emergency room" and multiple codes for transfer (from another hospital, from a skilled nursing facility, etc.). Patients with any code for "transfer" were excluded from the study as were patients with missing admission type and channel (blank). Patients were also excluded if they had at least one code for "elective", and also had at least one code for "emergency", "urgent", and/or "emergency room". For the remaining patients, if there was at least one code for "emergency", "urgent", or "emergency room" they were coded as "urgent," otherwise they were coded as non-urgent. After excluding 1655 patients, we had 1094 urgent and 11,630 non-urgent admissions (Fig. 1).

2.4. Primary predictor and covariates

We were primarily interested in the effect of a patient's SVI on whether their TAVR was urgent or not. SVI is a composite metric developed by the Centers for Disease Control from United States census data which is used to identify communities that may be disproportionately impacted by disasters, public health emergencies and recently clinical outcomes [9]. SVI is a graded score from 0 (least vulnerable) to 1 (highest vulnerability) that accounts for interrelated sociodemographic factors such as education, unemployment, household composition, housing and transportation, racial and ethnic composition, and other factors across U.S. census tracts and has been linked to and predictive of poorer cardiovascular outcomes (Table 1) [10–12]. Worse indices have also been linked to the higher likelihood of having an emergent medical procedure posed by these sociodemographic barriers to healthcare [13].

SVI data for 2018 was obtained from the Center for Disease Control and is given at the level of the census tract [14]. We looked at the overall tract summary ranking for SVI and then the four-summary theme ranking for SVI which includes the socioeconomic, household composition and disability, minoritized status and language, and housing type and transportation. Because we only had patient location by ZIP code, we aggregated SVI to the ZIP-code level using a weighted average of the SVIs of census tracts in each ZIP code. The weights used were the residential ratios from the HUD Zip-to-Tract Cross Walk data for Q1 2018 [15]. We excluded patients with >1 zip code, those with missing or ambiguous zip codes, and those without an SVI for their zip code ($n = 6044$). The weighted average for the overall tract summary SVI was grouped into quintiles (Quintile 1 demonstrated least social vulnerability and Quintile 5 demonstrated the greatest social vulnerability). The minimum SVI weighted average for our patients was 0.006 and the maximum index was 0.997. The cut-off values for quintile groups are illustrated in Supplemental Fig. 1. For diagnoses used as covariates and to calculate the Charlson Comorbidity Index (CCI) [16], we looked at all ICD-9 and ICD-10 diagnosis codes in the 12 months preceding the TAVR admission.

2.5. Statistical analyses

Patient characteristics were summarized using count and percentage for categorical variables and median and interquartile range for quantitative variables. To predict whether an admission would be urgent or not, we used generalized linear mixed effects models including effects of SVI quintile; gender; age; Charlson comorbidity index; clinical diagnosis of COPD, diabetes, heart failure, obesity and peripheral vascular disease in the year preceding TAVR admission; hospital bed size (small, medium, large) and region (Midwest, Northeast, South and West); and a random hospital intercept. Bed size was missing for 66 of the 470 hospitals (14.0 %, which included 642 patients (9.6 %)), so multiple imputation was used. Bed size is an ordinal variable (small, medium, large), so we used proportional odds to model this variable. Moreover, because bed size is a hospital-level variable, imputations accounted for clustering by hospital so all values for bed size within a hospital were the same for any given imputation. All analyses were completed using R version 4.1.1 [17]. Statistical significance was defined as a p-value of <0.05.

3. Results

3.1. Patient demographics and characteristics

From January 2018 to March 2022, a total of 26,252 admissions for TAVR as first five procedures were obtained and 6680 were included in our final analysis. The median age of patients admitted was 80 years (IQR: 75–85 years). The majority of patients (56.1 %) were male and 78.6 % were admitted to hospitals with large bed size range. The median Charlson Comorbidity Index (CCI) was 4.0(IQR: 2–6). In our cohort, 23.8 % of the patients had chronic obstructive pulmonary disease, 45.4 % had diabetes mellitus, 50.1 % had a diagnosis of heart failure, 35.2 % had a diagnosis of obesity, and 20.4 % had peripheral vascular disease (Table 2).

3.2. Outcome

Of the 6680 patients included in the final analysis, 567 (8.5 %) were classified as urgent while 6113 (91.5 %) were non-urgent admissions (Table 3). The proportion of urgent admissions were similar across SVI quintiles (ranging from 7.0 % in the lowest SVI quintile, to 9.7 % in the highest quintile).

After adjusting for patient and hospital-level variables, there was no statistically significant difference in the overall effect of SVI groups on the hospital admission urgency for TAVR in patients with AS ($p = 0.54$). Point estimates for adjusted odds ratios show odds of urgent admission between 7 % and 29 % higher for the upper 4 quintiles compared to the first (reference level) quintile (Fig. 2). The distribution of SVI weighted averages along all four dimensions of SVI were similar for urgent and non-urgent admissions.

(Supplemental Fig. 2). Among patients with dual Medicaid and Medicare insurance or Low-Income Subsidies, 9.1 % (55/603) received TAVR urgently versus 6.8 % (19/280) of patients with commercial insurance (Supplemental Table 1); statistical analyses were not isolated for these groups due to too few observations.

4. Discussion

Our study was motivated by contemporary data demonstrating that TAVR is not offered equitably to vulnerable population groups, and those with greater sociodemographic disadvantages have lower rates of TAVR [18]. Furthermore, when performed urgently, TAVR has been associated with higher mortality and increased complication risks [19]. Given the substantially elevated risks associated with urgently conducted TAVR, our study investigated the association between SVI and the urgency of TAVR admissions. In our cohort of patients with commercial or Medicare insurance, SVI was not significantly associated with the urgency to receive TAVR in AS. In addition, the proportion of TAVR admissions that were urgent was similar among SVI quintiles (7.0 % in lowest, 9.7 % in highest SVI quintile). Thus, this study highlights how adequate insurance may mitigate disparities across SVI.

This is promising data when considering the risks associated with urgent TAVR. A large study of 42,154 hospitalizations for TAVR found that non-urgent TAVR was associated with lower mortality when compared to urgent TAVR. Non-urgent TAVR was also associated with lower incidence of complications such as cardiogenic shock, acute kidney injury, hemodialysis, and major bleeding [20]. Although higher SVIs have been associated with increased risk of urgent/emergency procedures as compared to elective procedures such as cholecystectomy [13], our data demonstrated that SVI had no significant association with receiving TAVR urgently or electively. This may result in similar clinical outcomes for patients with AS across SVI levels. Our findings are likely related to access to adequate insurance. Patients with AS usually present with chronic symptoms which progressively worsen over time. It is possible that this population has better access to healthcare and more selective access to healthcare to receive the appropriate treatment as symptoms progress. In addition, healthcare teams may have less bias towards these populations, which have higher reimbursement rates for their procedures. Scheduling for these procedures electively may occur more timely since ability to pay is often required prior to proceeding with non-urgent procedures.

Despite no difference in urgency status of TAVR based on SVI, other studies have shown that patients with lower SVI face other difficulties with receiving the procedure. Patients with lower socioeconomic status had to travel farther for their TAVR, which has been associated with higher mortality rates following TAVR [21,22]. Neighborhood disadvantage is also associated with all-cause mortality at 18 months post-TAVR [23,24]. This may be related to redlining, where communities are intentionally designed to prioritize community resources to one population over another (typically minoritized racial and ethnic groups). Under resourced social environments systemically lack nearby access to healthy food, aesthetic and safe park systems and recreational activities, quality public education, and often quality healthcare [25–27]. When considering other risk factors, patients with worse SVI experience higher mortality rates for cardiovascular disease, ischemic heart disease, stroke, hypertension and heart failure [11].

While other studies have been able to assess clinical outcomes in TAVR, these have not been linked to the SVI and are often limited to a single center. Several limitations of our study should be noted. First, our population is composed of commercial and Medicare Advantage beneficiaries, and this could limit generalizability. However, this population was specifically selected to determine whether SVI contributed to disparities in the setting of adequate insurance coverage. Also, SVIs are measured at the level of the census tract but our closest estimate of this was using the zip codes, which might be an imperfect measure. Second, our date selection period includes the COVID-19 pandemic, which may have altered hospital-specific algorithms for when to perform the TAVR procedure given the risk of the pandemic [28,29]. However, it would be expected to have more emergent procedures since elective procedures were delayed at different times. Finally, as a study using insurance claims, there is an inability to control for errors from inappropriate coding.

5. Conclusions

Among commercial and Medicare beneficiaries with AS, SVI was not associated with urgent admissions for TAVR. This study demonstrates how adequate insurance may mitigate issues with higher SVI. However, future investigation is needed to identify whether relationships between SVI and TAVR urgency vary for Medicaid beneficiaries and individuals lacking insurance. Furthermore, Medicaid reimbursement levels vary by state. There may be additional geographical disparities linked to access to timely TAVR for AS.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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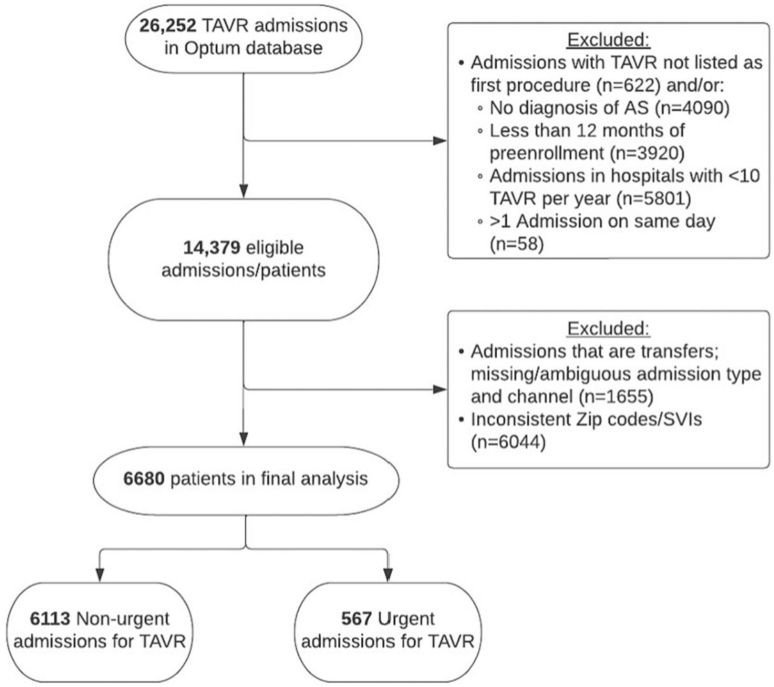

Fig. 1.
Flow chart for patient selection.

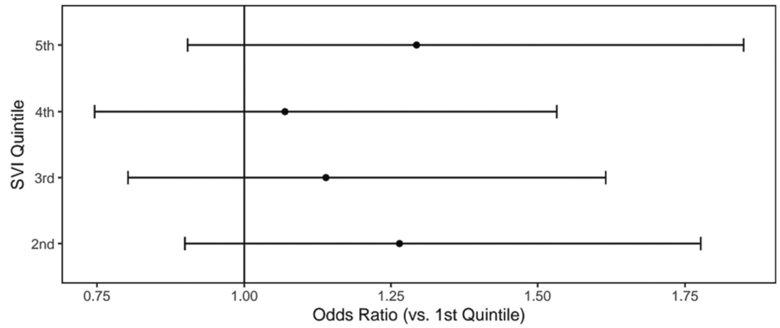

Fig. 2.

Odds of receiving an urgent TAVR in AS based on SVI.

The SVI Quintile group is along the Y axis (Quintile 1 is the referent SVI with lowest social vulnerability; Quintile 5 has the greatest social vulnerability). The odds of receiving an urgent TAVR in AS is on the X axis. AS indicates Aortic Stenosis; SVI, Social Vulnerability Index; TAVR, Transcatheter aortic valve replacement.

Table 1

Components of social vulnerability index.

Socioeconomic status	• Below 150 % Poverty • Unemployment • Housing cost burden • No High School Diploma • No Health Insurance
Household composition and disability	• Age 65 & older • Age 17 & younger • Civilian with a Disability • Single-Parent Households
Minority status and language	• Race and ethnicity minoritized status • Speaks English “less than well”
Housing, and transportation	• Multi-unit Structures • Mobile Homes • Crowding • No Vehicle • Group Quarters

*For each component of the SVI, the proportion of the population in that census tract with the characteristics listed contributes to worse indices [10].

Table 2

Patient characteristics by SVI quintil.

	Q1 (*n* = 1336)	Q2 (*n* = 1333)	Q3 (*n* = 1339)	Q4 (n = 1336)	Q5 (n = 1336)	Total (*n* = 6680)
Age, median (IQR)	81 (76–86)	81 (75–85)	81 (75–86)	80 (74–85)	79 (73–84)	80 (75–85)
Urgent admission	93 (7.0 %)	122 (9.2 %)	121 (9.0 %)	102 (7.6 %)	129 (9.7 %)	567 (8.5 %)
Female	555 (41.5 %)	527 (39.5 %)	593 (44.3 %)	602 (45.1 %)	657 (49.2 %)	2934 (43.9 %)
Insurance type						
Commercial	74 (5.5 %)	62 (4.7 %)	52 (3.9 %)	52 (3.9 %)	40 (3.0 %)	280 (4.2 %)
Medicare	1192 (89.2 %)	1197 (89.8 %)	1199 (89.5 %)	1145 (85.7 %)	1060 (79.3 %)	5793 (86.7 %)
Medicare Dual	30 (2.2 %)	32 (2.4 %)	28 (2.1 %)	35 (2.6 %)	82 (6.1 %)	207 (3.1 %)
Medicare LIS	39 (2.9 %)	41 (3.1 %)	59 (4.4 %)	104 (7.8 %)	153 (11.5 %)	396 (5.9 %)
Unknown	1 (0.1 %)	1 (0.1 %)	1 (0.1 %)	0 (0.0 %)	1 (0.1 %)	4 (0.1 %)
Region						
Midwest	587 (43.9 %)	408 (30.6 %)	380 (28.4 %)	338 (25.3 %)	248 (18.6 %)	1961 (29.4 %)
Northeast	306 (22.9 %)	395 (29.6 %)	332 (24.8 %)	221 (16.5 %)	217 (16.2 %)	1471 (22.0 %)
South	226 (16.9 %)	340 (25.5 %)	349 (26.1 %)	506 (37.9 %)	615 (46.0 %)	2036 (30.5 %)
West	217 (16.2 %)	190 (14.3 %)	278 (20.8 %)	271 (20.3 %)	256 (19.2 %)	1212 (18.1 %)
Bed size						
Small	22 (1.6 %)	38 (2.9 %)	36 (2.7 %)	31 (2.3 %)	26 (1.9 %)	153 (2.3 %)
Medium	97 (7.3 %)	125 (9.4 %)	133 (9.9 %)	138 (10.3 %)	140 (10.5 %)	633 (9.5 %)
Large	1076 (80.5 %)	1057 (79.3 %)	1032 (77.1 %)	1040 (77.8 %)	1047 (78.4 %)	5252 (78.6 %)
Unknown	141 (10.6 %)	113 (8.5 %)	138 (10.3 %)	127 (9.5 %)	123 (9.2 %)	642 (9.6 %)
Atrial fibrillation	476 (35.6 %)	515 (38.6 %)	496 (37.0 %)	513 (38.4 %)	466 (34.9 %)	2466 (36.9 %)
Bicuspid Aortic valve	42 (3.1 %)	25 (1.9 %)	42 (3.1 %)	29 (2.2 %)	31 (2.3 %)	169 (2.5 %)
CABG	654 (49.0 %)	640 (48.0 %)	675 (50.4 %)	645 (48.3 %)	674 (50.4 %)	3288 (49.2 %)
CKD4	73 (5.5 %)	65 (4.9 %)	86 (6.4 %)	95 (7.1 %)	96 (7.2 %)	415 (6.2 %)
CKD5	13 (1.0 %)	19 (1.4 %)	22 (1.6 %)	21 (1.6 %)	21 (1.6 %)	96 (1.4 %)
COPD	247 (18.5 %)	279 (20.9 %)	313 (23.4 %)	359 (26.9 %)	394 (29.5 %)	1592 (23.8 %)
Coronary artery disease	1178 (88.2 %)	1160 (87.0 %)	1149 (85.8 %)	1163 (87.1 %)	1145 (85.7 %)	5795 (86.8 %)
Diabetes	524 (39.2 %)	589 (44.2 %)	612 (45.7 %)	605 (45.3 %)	703 (52.6 %)	3033 (45.4 %)
Dyslipidemia	1044 (78.1 %)	1049 (78.7 %)	1063 (79.4 %)	1058 (79.2 %)	1064 (79.6 %)	5278 (79.0 %)

	Q1 (*n* = 1336)	Q2 (*n* = 1333)	Q3 (*n* = 1339)	Q4 (n = 1336)	Q5 (n = 1336)	Total (*n* = 6680)
ESRD	24 (1.8 %)	33 (2.5 %)	31 (2.3 %)	46 (3.4 %)	53 (4.0 %)	187 (2.8 %)
Heart failure	640 (47.9 %)	636 (47.7 %)	663 (49.5 %)	692 (51.8 %)	718 (53.7 %)	3349 (50.1 %)
Hypertension	1216 (91.0 %)	1217 (91.3 %)	1241 (92.7 %)	1231 (92.1 %)	1250 (93.6 %)	6155 (92.1 %)
Obese	410 (30.7 %)	433 (32.5 %)	475 (35.5 %)	488 (36.5 %)	546 (40.9 %)	2352 (35.2 %)
PCI	73 (5.5 %)	75 (5.6 %)	75 (5.6 %)	87 (6.5 %)	97 (7.3 %)	407 (6.1 %)
PVD	220 (16.5 %)	265 (19.9 %)	254 (19.0 %)	311 (23.3 %)	316 (23.7 %)	1366 (20.4 %)
Radiation exposure	54 (4.0 %)	46 (3.5 %)	47 (3.5 %)	47 (3.5 %)	45 (3.4 %)	239 (3.6 %)
Stroke	127 (9.5 %)	142 (10.7 %)	134 (10.0 %)	144 (10.8 %)	131 (9.8 %)	678 (10.1 %)
Tobacco use	28 (2.1 %)	35 (2.6 %)	40 (3.0 %)	51 (3.8 %)	58 (4.3 %)	212 (3.2 %)
Charlson comorbidity index, median (IQR)	4 (2–5)	4 (2–6)	4 (2–6)	4 (3–6)	4 (3–6)	4 (2–6)

*Quantitative data are presented in median and Interquartile range (IQR) while categorical data are presented with counts and percentages.

CABG indicates Coronary artery bypass grafting; CKD4, Chronic Kidney Disease Stage IV; CKD5, Chronic Kidney Disease Stage V; COPD, Chronic Obstructive Pulmonary Disease; ESRD, End Stage Renal Disease; IQR, Interquartile Range; LIS, Low Income Subsidy; PCI, Percutaneous Coronary Intervention; PVD, Peripheral Vascular Disease; SVI, Social Vulnerability Index.

Table 3

Urgent vs. non-urgent TAVR patient characteristics.

	Urgent (n = 567)	Not-urgent (*n* = 6113)	Total (n = 6680)
Age, median (IQR)	81 (75–86)	80 (75–85)	80 (75–85)
SVI quintile			
Q1	93 (16.4 %)	1243 (20.3 %)	1336 (20.0 %)
Q2	122 (21.5 %)	1211 (19.8 %)	1333 (20.0 %)
Q3	121 (21.3 %)	1218 (19.9 %)	1339 (20.0 %)
Q4	102 (18.0 %)	1234 (20.2 %)	1336 (20.0 %)
Q5	129 (22.8 %)	1207 (19.7 %)	1336 (20.0 %)
Female	253 (44.6 %)	2681 (43.9 %)	2934 (43.9 %)
Insurance			
Commercial	19 (3.4 %)	261 (4.3 %)	280 (4.2 %)
Medicare	493 (86.9 %)	5300 (86.7 %)	5793 (86.7 %)
Medicare dual	26 (4.6 %)	181 (3.0 %)	207 (3.1 %)
Medicare LIS	29 (5.1 %)	367 (6.0 %)	396 (5.9 %)
Unknown	0 (0.0 %)	4 (0.1 %)	4 (0.1 %)
Region			
Midwest	110 (19.4 %)	1851 (30.3 %)	1961 (29.4 %)
Northeast	156 (27.5 %)	1315 (21.5 %)	1471 (22.0 %)
South	169 (29.8 %)	1867 (30.5 %)	2036 (30.5 %)
West	132 (23.3 %)	1080 (17.7 %)	1212 (18.1 %)
Hospital bed size			
Small	36 (6.3 %)	117 (1.9 %)	153 (2.3 %)
Medium	76 (13.4 %)	557 (9.1 %)	633 (9.5 %)
Large	400 (70.5 %)	4852 (79.4 %)	5252 (78.6 %)
Unknown	55 (9.7 %)	587 (9.6 %)	642 (9.6 %)
Atrial fibrillation	234 (41.3 %)	2232 (36.5 %)	2466 (36.9 %)
Bicuspid aortic valve	10 (1.8 %)	159 (2.6 %)	169 (2.5 %)
CABG	282 (49.7 %)	3006 (49.2 %)	3288 (49.2 %)
CKD4	54 (9.5 %)	361 (5.9 %)	415 (6.2 %)
CKD5	12 (2.1 %)	84 (1.4 %)	96 (1.4 %)
COPD	137 (24.2 %)	1455 (23.8 %)	1592 (23.8 %)
Coronary artery disease	465 (82.0 %)	5330 (87.2 %)	5795 (86.8 %)
Diabetes	275 (48.5 %)	2758 (45.1 %)	3033 (45.4 %)
Dyslipidemia	433 (76.4 %)	4845 (79.3 %)	5278 (79.0 %)
ESRD	19 (3.4 %)	168 (2.7 %)	187 (2.8 %)
Heart failure	294 (51.9 %)	3055 (50.0 %)	3349 (50.1 %)
Hypertension	510 (89.9 %)	5645 (92.3 %)	6155 (92.1 %)
Obese	193 (34.0 %)	2159 (35.3 %)	2352 (35.2 %)
PCI	38 (6.7 %)	369 (6.0 %)	407 (6.1 %)
PVD	129 (22.8 %)	1237 (20.2 %)	1366 (20.4 %)

	Urgent (n = 567)	**Not-urgent (*n* = 6113)**	**Total (n = 6680)**
Radiation exposure	27 (4.8 %)	212 (3.5 %)	239 (3.6 %)
Stroke	67 (11.8 %)	611 (10.0 %)	678 (10.1 %)
Tobacco use	15 (2.6 %)	197 (3.2 %)	212 (3.2 %)
Charleston comorbidity	4 (2–6)	4 (2–6)	4 (2–6)

* Quantitative data are presented in median and Interquartile range (IQR) while categorical data are presented with counts and percentages.

CABG indicates coronary artery bypass grafting; CKD, Chronic Kidney Disease Stage; COPD, Chronic Obstructive Pulmonary Disease; ESRD, End Stage Renal Disease; IQR, Interquartile Range; LIS, Low Income Subsidy; PCI, Percutaneous Coronary Intervention; PVD, Peripheral Vascular Disease; SVI, Social Vulnerability Index.