Incidence, Causes, and Predictors of Early (≤30 Days) and Late Unplanned Hospital Readmissions After Transcatheter Aortic Valve Replacement

Luis Nombela-Franco, MD,* María del Trigo, MD,† Guillermo Morrison-Polo, MD,* Gabriela Veiga, MD,†
Pilar Jimenez-Quevedo, MD, PHD,* Omar Abdul-Jawad Altisent, MD,† Francisco Campelo-Parada, MD,†
Corina Biagioni, MD,* Rishi Puri, MBBS, PHD,† Robert DeLarochellière, MD,† Eric Dumont, MD,† Daniel Doyle, MD,†
Jean-Michel Paradis, MD,† Alicia Quirós, PhD,* Carlos Almeria, MD,* Nieves Gonzalo, MD, PHD,*
Ivan Nuñez-Gil, MD, PHD,* Pablo Salinas, MD, PHD,* Siamak Mohammadi, MD,† Javier Escaned, MD, PHD,*
Antonio Fernández-Ortiz, MD, PHD,* Carlos Macaya, MD, PHD,* Josep Rodés-Cabau, MD†

ABSTRACT

OBJECTIVES The aim of this study was to determine the incidence, causes, and predictors of unplanned hospital readmissions after transcatheter aortic valve replacement (TAVR).

BACKGROUND Data regarding unplanned hospital readmissions after TAVR in a real-world all-comers population are scarce.

METHODS A total of 720 consecutive patients undergoing TAVR at 2 centers who survived the procedure, were included. Median follow-up was 23 months (interquartile range [IQR]: 12 to 39 months), available in 99.9% of the initial population. The occurrence, timing, and causes of hospital readmission within the first year post-TAVR were obtained in all cases. Early and late readmissions were defined as those occurring ≤30 days and >30 days to 1 year post-TAVR, respectively.

RESULTS There were 506 unplanned readmissions in 316 patients (43.9%) within the first year post-TAVR (median time: 63 days; IQR: 19 to 158 days post-discharge). Of these, early readmission occurred in 105 patients (14.6%), and 118 patients (16.4%) had multiple (≥2) readmissions. Readmissions were due to noncardiac and cardiac causes in 59% and 41% of cases, respectively. Noncardiac readmissions included, in order of decreasing frequency, respiratory, infection, and bleeding events as the main causes, whereas heart failure and arrhythmias accounted for most cardiac readmissions. The predictors of early readmission were peri-procedural major bleeding complications (p = 0.001), anemia (p = 0.019), lower left ventricular ejection fraction (p = 0.042), and the combined presence of antiplatelet and anticoagulation therapy at hospital discharge (p = 0.014). The predictors of late readmission were chronic obstructive pulmonary disease (p = 0.001), peripheral vascular disease (p = 0.023), chronic renal failure (p = 0.013), and atrial fibrillation (p = 0.012). Early readmission was an independent predictor of mortality during the follow-up period (hazard ratio: 1.56, 95% confidence interval: 1.02 to 2.39, p = 0.043).

CONCLUSIONS The readmission burden after TAVR in an all-comers population was high. Nearly one-fifth of the patients were readmitted early after hospital discharge, increasing the risk of mortality at follow-up. Reasons for readmission were split between noncardiac and cardiac causes, with respiratory causes and heart failure as the main diagnoses in each group, respectively. Whereas early readmissions were mainly related to periprocedural bleeding events, most late readmissions were secondary to baseline patient comorbidities. These results underscore the importance of and provide the basis for implementing specific preventive measures to reduce readmission rates after TAVR. (J Am Coll Cardiol Intv 2015;8:1748–57) © 2015 by the American College of Cardiology Foundation.

Unplanned readmissions after initial hospitalization are frequent, significantly affecting clinical outcomes, patient quality of life, and health care costs (1,2). Early (within 30 days of discharge) readmissions have generated significant debate. As many as 20% of Medicare beneficiaries are readmitted within 30 days after an index hospitalization, and this has been associated with additional health care costs exceeding $15 billion (1). Of note, the rate of early unplanned readmissions has been considered a marker of quality of care and hospital performance (3,4), and the subject of provider payment restrictions in the United States. Identifying the timing, causes, and predictors of unplanned readmissions is thus fundamental for implementing appropriate preventive measures.

Transcatheter aortic valve replacement (TAVR) is currently the standard treatment for severe aortic stenosis in symptomatic patients with prohibitive or high surgical risk (5). The significant burden of comorbidities in patients currently undergoing TAVR, as well as the relatively high rate of periprocedural complications, engenders a high likelihood of hospital readmissions in such patients. However, data on unplanned readmissions after TAVR are scarce, particularly regarding the timing, specific causes, and predictors of readmission. More importantly, no data exist on 30-day readmissions after TAVR apart from reporting its incidence (6-8). The objectives of this study were to determine the incidence, causes, and predictive factors of unplanned hospital readmissions after TAVR, with a specific focus on readmissions within the 30-day and 1-year periods.

METHODS

STUDY POPULATION. A total of 893 consecutive patients with symptomatic severe aortic stenosis who underwent TAVR at 2 centers were evaluated for the study. Of these, patients who died before hospital discharge (n = 65) or those with follow-up of less than 1 year (n = 108) were excluded, leading to a final population of 720 patients. The indications for TAVR and procedural approach were assessed by each center's heart team composed of interventional cardiologists and cardiac surgeons. The TAVR procedures were performed using balloon- and self-expanding valves, as previously described (5). In-hospital and follow-up data were prospectively entered in a dedicated database. Clinical outcomes were defined according to Valve Academic Research Consortium-2 criteria (9). All patients signed informed consent

forms before the procedure, and all studies were performed in accordance with the local ethics committee of each center.

FOLLOW-UP. Clinical follow-up was carried out during pre-scheduled outpatient clinic visits or by telephone contact at 1, 6, and 12 months post-TAVR and yearly thereafter. Records from referring cardiologists, general practitioners, and other hospitals were consulted whenever necessary for further information. Complete information about readmissions within the last follow-up was obtained in 99.9% of patients (1 patient was lost to follow-up). The median length of follow-up of the study population was 23 months (interquartile range [IQR]: 12 to 39 months).

HOSPITAL READMISSION. Readmissions were defined as a patient being admitted to a hospital ward or an intensive care unit. Visits to the emergency department or admission to a day-stay hospital were excluded from the current analysis. Readmission date, duration of hospital stay, primary and secondary reasons for hospitalization, and in-hospital death were recorded after a detailed medical records review. The primary diagnosis on the discharge report was used to determine the main cause of readmission. Causes of readmission were grouped as being of cardiac or noncardiac origin. Cardiac causes included the following: heart failure, acute coronary syndrome (unstable angina or myocardial infarction), arrhythmia, and prosthesis related (endocarditis, valve thrombosis, structural failure of the valve requiring intervention). Noncardiac causes were classified as follows: respiratory (including pneumonia), bleeding, cerebrovascular event (ischemic or hemorrhagic stroke, transient ischemic attack), peripheral vascular events, infections, trauma, and other.

Time to readmission was calculated as the time between the date of hospital discharge after the index TAVR procedure (time 0) and the first hospital readmission day. Readmissions were also classified according to the timing as early (≤30 days) or late (between 30 days and 12 months). Multiple readmissions were defined as ≥2 readmissions.

STATISTICAL ANALYSIS. Categorical variables were expressed as number (percentage) and continuous variables as mean ± SD or median (IQR: 25th to 75th percentiles) according to their distribution. Assessment of normality for continuous data was performed using the Shapiro-Wilks test. Comparison of numerical variables was performed with the 2-sided Student *t* test or Wilcoxon rank sum test, and the chi-square