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Predictors of Home Health Care Utilization and Its Relationship With Early Outcomes in Patients Undergoing Transcatheter Mitral Valve Repair



Transcatheter mitral valve repair (TMVR) has become an important treatment option for patients with moderate-to-severe or severe primary or secondary mitral regurgitation who are at prohibitive or high surgical risk.¹ Although TMVR has been shown to reduce rehospitalization and mortality, there remains few studies identifying risk factors for increased rehospitalization or mortality after repair.²⁻⁴ As early rehospitalization has a significant impact on health care systems and patient level outcomes, patients who are homebound or need nursing care are discharged with home health care (HHC) services to assist with the transition of management to their home environment and possibly reduce rehospitalization and other adverse events. Although this has been the goal of HHC utilization, there have been mixed results in recent studies focusing on heart failure (HF) readmissions and HHC referral.⁵ Patients discharged with

HHC after acute HF exacerbation have higher 30-day all-cause readmissions and mortality compared with their matched routine home discharge counterparts.⁶ Similar to other patients with HF, patients discharged after TMVR who meet requirements for HHC are discharged with this service. However, it remains unknown if HHC utilization influences the 30-day outcomes in this high-risk group of patients. Hence, we conducted this study on post-TMVR patients to identify the predictors of HHC referral at discharge, and its impact on 30-day outcomes utilizing a large national database.

The Nationwide Readmission Database (NRD) from 2014 to 2017 was used to identify patients hospitalized for TMVR using International Classification of Diseases-9th (35.97) and-10th (02UG3JZ) procedure codes.⁷ NRD provides variables that have information regarding discharge disposition of every hospitalized patient. For this study, we included all patients with a HHC referral upon discharge and compared this group with patients with routine home discharge. Patients discharged to a skilled nursing facility and those who died during hospitalization were excluded from the analysis. We analyzed outcomes (30-day all-cause readmission, 30-day HF-related readmission, and 30-day mortality) after propensity score matching (PSM) to reduce selection bias and heterogeneity between the groups. PSM was conditioned on baseline demographics, comorbidities, hospital characteristics, and in-hospital complications. Additionally, predictors of HHC utilization on discharge were identified using multivariate logistic regression analysis. All statistical analyses were performed using RStudio software (RStudio, Boston, MA) and IBM SPSS version 26 (IBM Corporation, Armonk, NY).

A total of 11,005 (weighted national estimate) patients underwent TMVR during the study period. Of those patients included in the analysis, 2,512 (22.8%) were discharged with HHC. In the overall cohort, patients discharged with HHC were more likely to be elderly, of female gender, and had a higher prevalence of diabetes mellitus, heart failure, atrial fibrillation, peripheral vascular disease, chronic kidney disease, and anemia (p for all <0.05). Additionally, patients discharged with

HHC had increased in-hospital complications including stroke, acute kidney injury, cardiogenic shock, transfusion requirement, bleeding, and need for circulatory support (p for all <0.05). On multivariate analysis, weight loss, peripheral vascular disease, anemia, diabetes mellitus, female gender, atrial fibrillation, hypothyroidism, prior percutaneous coronary intervention, and age were all significant baseline characteristics independently predicting HHC referral at discharge. In-hospital events including stroke, need for circulatory support, need for mitral valve surgery, acute kidney injury, nonelective admission, blood transfusion, bleeding, week-end admission, and cardiogenic shock were identified as independent predictors of HHC discharge (Figure 1). In the PSM cohort, 30-day readmission and mortality outcomes remained significantly increased within the HHC group. Those discharged with HHC had higher incidence of 30-day all-cause readmission (18.8% vs 13.3%; adjusted odds ratio [aOR] 1.50; 95% confidence interval [CI] 1.28 to 1.77), 30-day HF readmission (3.7% vs 2.4%; aOR 1.44; 95% CI 1.02 to 2.05), and 30-day mortality (1.3% vs 0.4%; aOR 3.18; 95% CI 1.49 to 6.78; p for all <0.05; Figure 1).

In this study, patients who were discharged with HHC after TMVR had higher 30-day all-cause readmission, 30-day HF-related readmission, and 30-day mortality compared with those discharged without HHC, likely related to increased prevalence of co-morbidities. As seen in the baseline characteristics of the 2 groups, patients receiving a HHC referral at discharge were more likely to have other cardiovascular and systemic diseases. Furthermore, significant hospital events such as stroke, need for circulatory support, AKI, and others predicted the need for HHC referral at discharge. Interestingly, after propensity matching between the 2 cohorts to correct for the underlying baseline comorbidities, 30-day all-cause readmission, 30-day HF-specific readmission, and 30-day mortality all remained significantly higher in the HHC population, although with propensity matching the differences in the outcomes were slightly mitigated. One possible explanation is that there may be additional patient characteristics that portend worse outcomes that

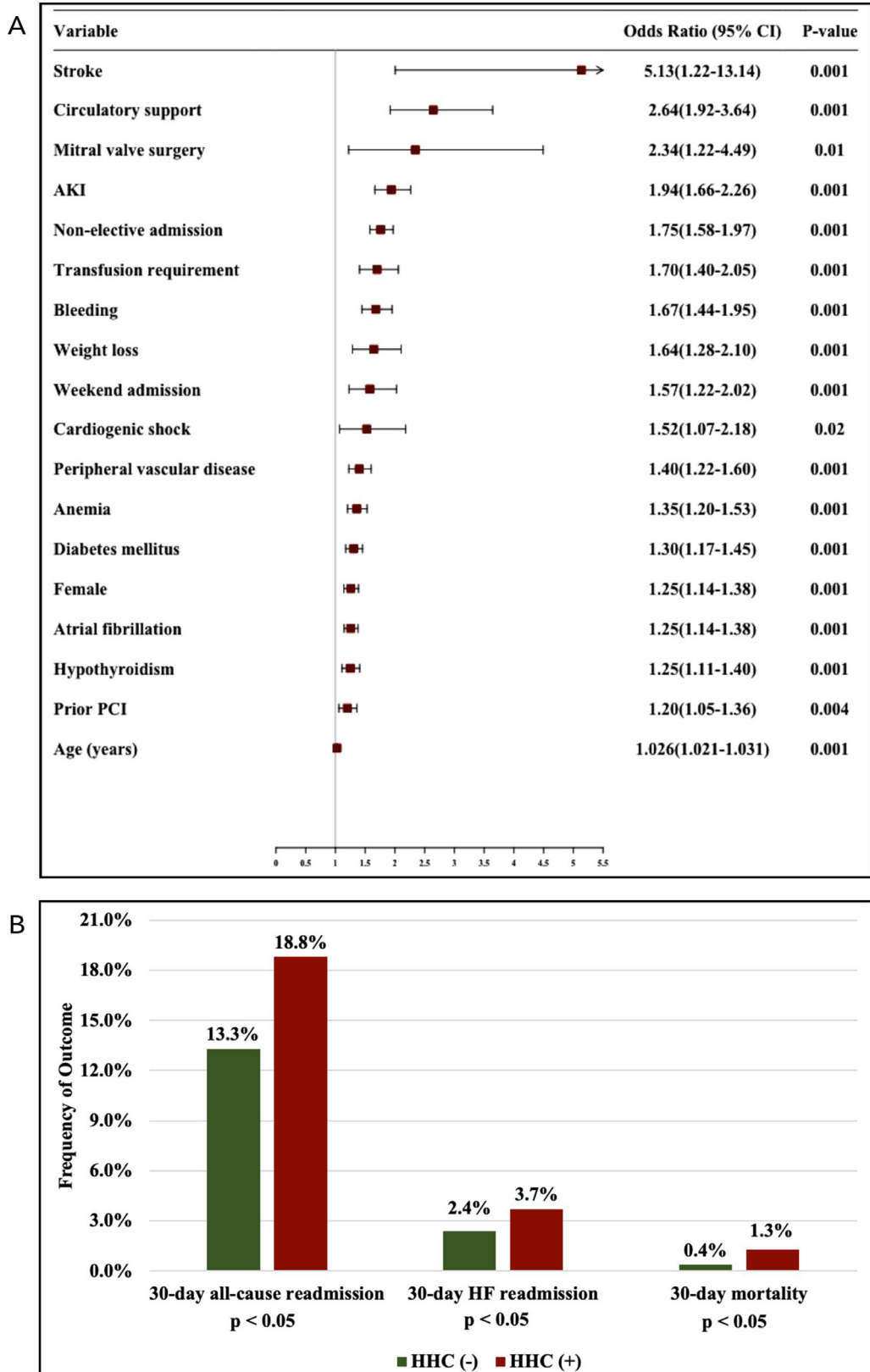


Figure 1. Predictors of home health care utilization after transcatheter mitral valve repair (TMVR) and 30-day outcomes. (A) Independent predictors of home health care referral at discharge in patients who underwent TMVR. (B) Thirty-day readmission and mortality rates in patients who underwent TMVR in the propensity score-matched cohort.

were not fully captured in the current database.

Although HHC services are usually utilized to improve outcomes in high-risk patient groups, similar findings have been reported following decompensated HF.⁵ Patients discharged with HHC after hospitalization for decompensated HF were found to have increased 30-day all-cause readmission rates and 30-day mortality.⁶ In another study, HF patients receiving any home health aide visit had a greater likelihood of readmission and shorter time until readmission than those who did not.⁸ Similar to our findings of increased comorbidities and in-hospital events within the HHC group, patients who were discharged with HHC within the National Inpatient Sample were more likely to be of older age, female gender, have higher illness severity scores, and have HF.⁹

As such, understanding the predictors for a HHC referral following TMVR and identifying this high rehospitalization and mortality risk subgroup of TMVR patients will assist in decision-making for heart teams. Patients recommended HHC on discharge due to their underlying co-morbidities and in-hospital events may require a targeted approach with transition of care and additional resources to prevent rehospitalization beyond what traditional home care provides. For example, combining home health care services with early physician follow-up has been shown to potentially reduce HF readmissions compared with either intervention alone.¹⁰

This study is limited by the database used, which lacks information on risk scores, laboratory/imaging parameters, and mid/long term outcomes. Although we attempted to reduce the effect of baseline co-morbidities through propensity-matched scoring, it is likely that patients within the HHC group had worse overall health compared with their matched counterparts. This has been identified as a source of bias showing worse outcomes in a propensity-matched cohort after HHC discharge following decompensated HF.⁶ Regarding the 30-day mortality outcomes, the NRD does not record patients who may have died within the emergency department or outside the hospital; however, it is anticipated that

an equal number of patients from both groups would fall into this category resulting in a neutral effect on the results. Finally, frailty is a common indication for HHC discharge and would result in poorer outcomes within that group but is not captured within the NRD. Our analysis indicated that weight loss was a significant predictor for HHC discharge, but it remains unclear how many frail patients within the HHC group exist and their respective outcomes.

Despite these limitations, our study encompasses a large nationwide sample of patients reflecting current practices and identifies a group of TMVR patients at higher risk of worse outcome. Additional studies are needed to further assess the impact of HHC utilization at discharge and to determine other targeted interventions that can be used to improve outcomes in these patients.

Disclosures

The authors declare no conflict of interest.

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The Added Benefit of the CHADS2 Score



We read with interest the original article “Baseline CHADS2 score and risk of cardiovascular events in the population without atrial fibrillation” by Chunpeng Ji et al.¹ The study concludes “The baseline CHADS2 score is an independent risk factor for cardiovascular events and all-cause death in the population without atrial fibrillation.” This is an excellent prospective Chinese long-term study with meticulous follow-up once every 2 years from 2006/2007 to December 2016 (Kailuan