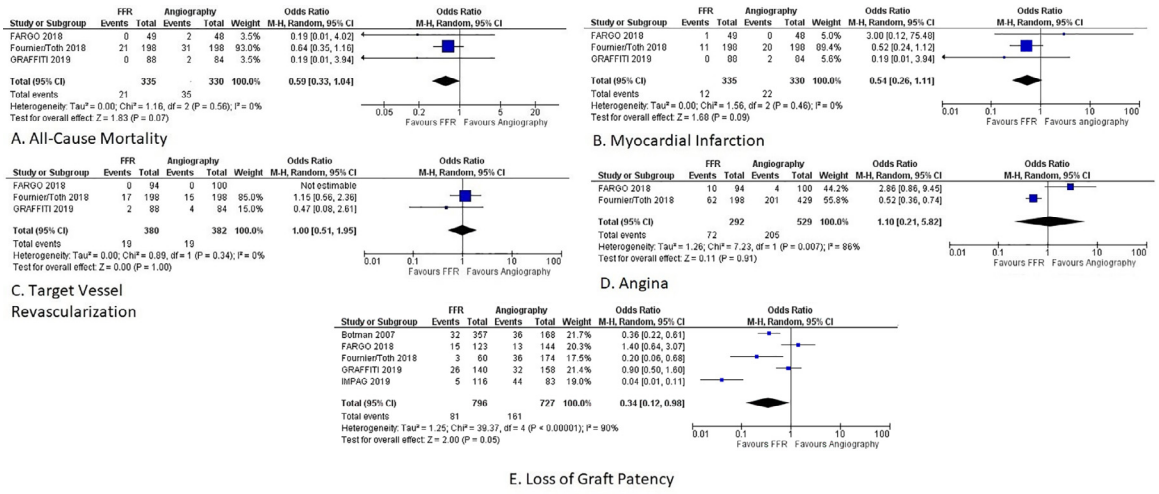

Figure 1. Forrest plots for comparison of different clinical outcomes between FFR-guided CABG compared with angiography alone. Horizontal lines represent 95% confidence intervals (CI). The rectangles represent the point estimate, and the size of the rectangle is proportional to the weight given to each study in the meta-analysis. The diamond represents the summary estimate (size of the diamond = 95% CI). The vertical line represents the reference of no increased risk. [Wherever possible propensity matched data were used for Fournier/Toth. For IMPAG, vessels that were grafted and had FFR≥0.78 were considered angiogram-guided and those that had FFR<0.78 were considered FFR guided].

alone may result in better graft patency but clinical outcomes are similar.

Disclosures

The authors have no conflicts of interest to disclose.

Khalid Changal, MD[a]
Mitra Patel, MD[b]
FNU Salman, MD[c]
Salik Nazir, MD[a]
Rajesh Gupta, MD[a]*

[a] Department of Cardiovascular Medicine, University of Toledo, Ohio
[b] Department of Medicine, University of Toledo, Ohio
[c] Department of Medicine, Mercy Health St. Vincent Medical Center, Toledo, Ohio

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1. Tonino PA, De Bruyne B, Pijls NH, Siebert U, Ikeno F, vant Veer M, Klauss V, Manoharan G, Engstrøm T, Oldroyd KG, Ver Lee PN. Fractional flow reserve versus angiography for guiding percutaneous coronary intervention. N Engl J Med.. 360213–224.
2. Botman CJ, Schonberger J, Koolen S, Penn O, Botman H, Dib N, Eeckhout E, Pijls N. Does stenosis severity of native vessels influence bypass graft patency? A prospective fractional flow reserve−guided study. Ann Thorac Surg. 832093–2097.
3. Thuesen AL, Riber LP, Veien KT, Christiansen EH, Jensen SE, Modrau I, Andreasen JJ, Junker A, Mortensen PE, Jensen LO. Fractional flow reserve versus angiographically-guided coronary artery bypass grafting. J Am Coll Cardiol. 722732–2743.
4. Fournier S, Toth GG, De Bruyne B, Johnson NP, Ciccarelli G, Xaplanteris P, Milkas A, Strisciuglio T, Bartunek J, Vanderheyden M, Wyffels E. Six-year follow-up of fractional flow reserve-guided versus angiography-guided coronary artery bypass graft surgery. Circ Cardiovasc Interv. 11:e006368.
5. Glineur D, Grau JB, Etienne PY, Benedetto U, Fortier JH, Papadatos S, Laruelle C, Pieters D, El Khoury E, Blouard P, Timmermans P. Impact of preoperative fractional flow reserve on arterial bypass graft anastomotic function: the IMPAG trial. Eur Heart J. 402421–2428.
6. Toth GG, De Bruyne B, Kala P, Ribichini FL, Casselman F, Ramos R, Piroth Z, Fournier S, Piccoli A, Van Mieghem C, Penicka M. Graft patency after FFR-guided versus angiography-guided coronary artery bypass grafting: the GRAFFITI trial. J Europcr Collabor Working Group Int Cardiol Eur Soc Cardiol. 15e999–e1005.

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Effect of Acute Pulmonary Embolism on the Hospitalization Rates in Patients With Heart Failure (From a Nationwide Cohort Sample)

Patients with heart failure (HF) experience high rates of hospitalization, account for over 1 million admissions annually, and place a large economic burden on the US health system.[1] HF complicated by acute pulmonary embolism (PE) is associated with even worse outcomes.[2] Previous studies demonstrated a bidirectional relation whereby both conditions increase the risk of hospitalization and mortality for the other.[3,4] Further understanding the inter-relationship between PE and HF, particularly across types of HF (HF with reduced (HFrEF) and preserved (HFpEF) ejection fraction), may help guide more tailored treatment strategies. Accordingly, we sought to explore the change in 30-day hospitalization rates before and after a diagnosis of PE in HF patients.

We used the Nationwide Readmission Database (NRD),[5] which is a de-identified publicly available all-payer database from 28 states accounting for 58.2% of U.S. hospitalizations, to identify patients hospitalized with a primary diagnosis of PE between 2010 and 2017. Patients were then stratified by presence of HF, and further subdivided into HFpEF and HFrEF by using relevant ICD-9/10-CM codes. We excluded patients < 18 years old, who died during index admission and who were hospitalized during January or December to ensure 30-day follow-up for all patients before and after index admission, as the NRD resets annually. The primary outcome was change in the 30-day all-cause hospitalization rates before and after PE diagnosis in patients with and without HF. The secondary outcomes included the change in 30-day hospitalization rates in

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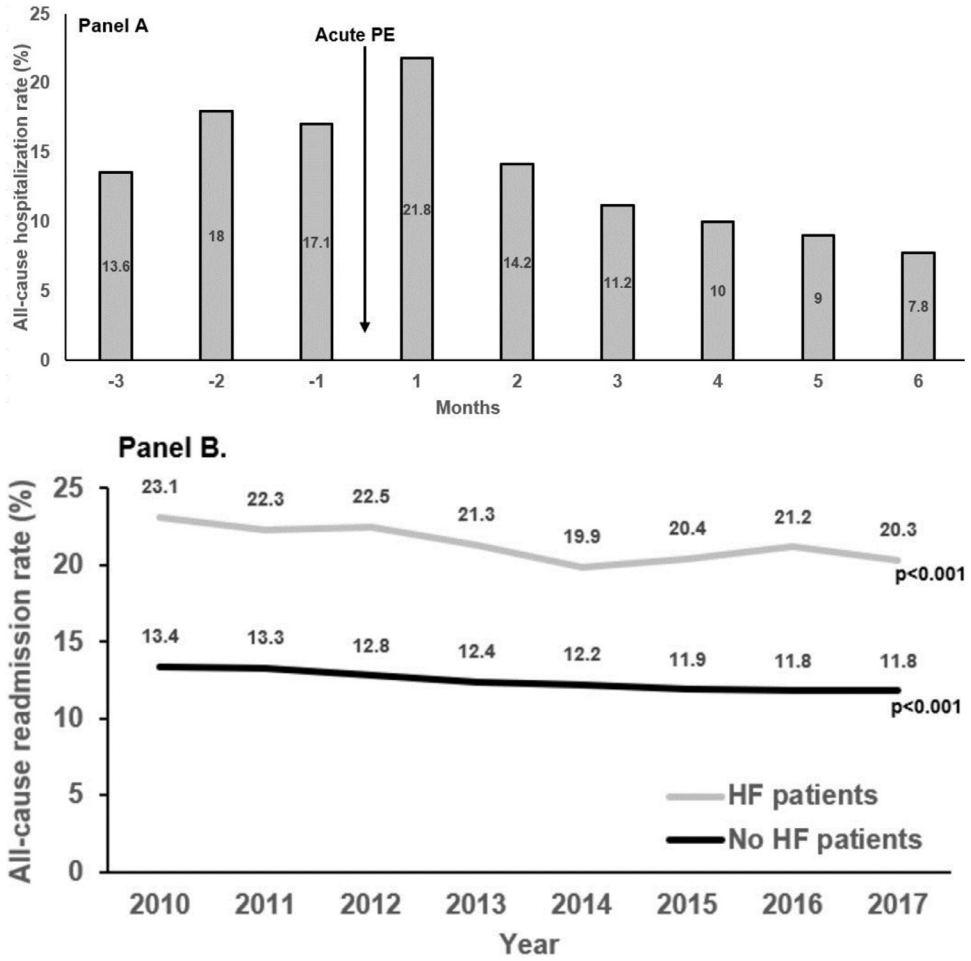

Figure. **Panel A:** Monthly all-cause hospitalization rates for HF patients over six months post-PE. **Panel B:** Trends of all-cause 30-day hospitalization rates after PE in patients with and without HF over years from 2010 to 2017. HF = heart failure; PE = pulmonary embolism.

HFrEF and HFpEF, the annual trends of 30-day readmission rates post-PE in patients with and without HF, and the monthly hospitalization rate for 6 months post-PE in patients with HF (cohort was limited for hospitalizations during April-June to allow 3-month before and 6-month after the index admission). We used McNemar's test to compare the hospitalization rates pre- and post-PE, and linear trend test for the post-PE readmission trend analysis. Propensity score matching for HF status was conducted for the primary outcome by using age, sex, atrial fibrillation, hypertension, diabetes mellitus, pulmonary hypertension, chronic lung disease, and chronic kidney disease. Patients with and without HF were matched 1:1. A p value <0.05 was considered statistically significant. This study was exempted by the institutional review board due to the de-identified nature of the database.

We identified 512,367 patients who were hospitalized with a primary diagnosis of acute PE, of whom 61,963 (12.1%) had concomitant HF (64.6% HFrEF). The 30-day all-cause hospitalization rate pre- and post-PE in patients with HF increased from 16.9% to 21.2% (relative increase 20.1%, $p < 0.001$), whereas in patients without HF hospitalization decreased marginally from 12.7% to 12.4% ($p < 0.001$). After propensity matching 61,963 patients with HF with 61,963 patients without HF, the 30-day all-cause hospitalization rate in HF patients increased from 16.9% before to 21.2% after PE ($p < 0.001$), whereas in patients without HF rate remained similar (14.1% vs 14.4%, $p = 0.155$). In patients with HFrEF hospitalization rate increased from 16.7% to 21.7% (relative increase 23.0%, $p < 0.001$) as compared with HFpEF, where the rate increased from 17.4% to 20.4% (relative increase 14.7%, $p < 0.001$). The landmark analysis with 30-day interval for hospitalization rates post-PE in patients with HF (18,941 patients) showed a gradual decline over 6-month follow-up, with the highest rate during the first 30-day post-PE (Panel A). The post-PE annual trends for 30-day readmission rates in patients with and without HF showed small reduction over years (Panel B).

There are several major findings in our study. First, patients with HF suffer from increased 30-day all-cause hospitalization rate after acute PE whereas patients without HF do not follow the same trajectory of repeat hospitalizations. Second, in the HF cohort, patients with HFrEF have more pronounced increase in the 30-day all-cause hospitalization rate as compared with patients having HFpEF. Third, over 6-month follow-up period for HF patients, the first 30-day has the highest rate of readmission and gradually trends down which

highlights the possible need for standardized postdischarge outpatient follow-up to decrease the risk of early readmission. Fourth, there was a small reduction of 30-day readmission rate after PE in the recent years.

We recognize several limitations which are inherent to an administrative database. The NRD lacks clinical data to assess risk severity and poses a risk of miscoding and under-coding. In particular, we are not able to differentiate between patients with low and intermediate-risk of PE and cannot quantify PE burden. Additionally, we cannot account for out-of-hospital mortality through NRD which may lead to possible under-estimation for post-PE readmission rates.

In conclusion, in patients who were hospitalized for PE with a history of HF, 30-day all-cause hospitalization rate increased after the index PE hospitalization versus before. This finding is more pronounced in patients with HFrEF as compared to HFpEF.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relations that could have appeared to influence the work reported in this study.

Ahmed Elkaryoni, MD[a]
Karim R. Merchant, MD[b]
Yevgeniy Brailovsky, MD, MSc[c]
Matthew C. Bunte, MD, MS[d]
Brett W. Sperry, MD[d]
Amir Darki, MD, MSc[ab]*

[a] Division of Cardiovascular Disease, Loyola University Medical Center, Loyola Stritch School of Medicine, Maywood, IL
[b] Department of Internal Medicine, Loyola University Medical Center, Loyola Stritch School of Medicine, Maywood, IL
[c] Division of Cardiovascular Disease, Jefferson Heart Institute, Sidney Kimmel School of Medicine, Thomas Jefferson University, PA
[d] Divsion of Cardiovascular Disease, Saint Luke's Mid America Heart Institute, Kansas City, MO

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1. Virani SS, Alonso A, Benjamin EJ, Bittencourt MS, Callaway CW, Carson AP, Chamberlain AM, Chang AR, Cheng S, Delling FN, Djousse L, Elkind MSV, Ferguson JF, Fornage M, Khan SS, Kissela BM, Knutson KL, Kwan TW, Lackland DT, Lewis TT, Lichtman JH, Longenecker CT, Loop MS, Lutsey PL, Martin SS, Matsushita K, Moran AE, Mussolino ME, Perak AM, Rosamond WD, Roth GA, Sampson UKA, Satou GM, Schroeder EB, Shah SH, Shay CM, Spartano NL, Stokes A, Tirschwell DL, VanWagner LB, Tsao CW, Wong SS, Heard DG. Heart disease and stroke statistics—2020 update: a report from the American Heart Association. Circulation. 141e139–e596. https://doi.org/10.1161/CIR.0000000000000757.
2. Darze ES, Latado AL, Guimarães AG, Guedes RAV, Santos AB, De Moura SS, Passos LCS. Acute pulmonary embolism is an independent predictor of adverse events in severe decompensated heart failure patients. Chest. 1311838–1843. https://doi.org/10.1378/chest.06-2077.
3. Ne JYA, Chow V, Kritharides L, Ng ACC. Predictors for congestive heart failure hospitalization or death following acute pulmonary embolism: a population-linkage study. Int J Cardiol. 278162–166. Available from: https://doi.org/10.1016/j.ijcard.2018.12.063.
4. Secemsky EA, Rosenfield K, Kennedy KF, Jaff M, Yeh RW. High burden of 30-day readmissions after acute venous thromboembolism in the United States. J Am Heart Assoc. 7: e009047. https://doi.org/10.1161/JAHA.118.009047.
5. Nationwide Readmission Database (NRD). *Healthcare Cost and Utilization Project (HCUP)*. Rockville, MD: Agency for Healthcare Research and QualityRockville, MD; 2012 https://www.hcup-us.ahrq.gov/nrdoverview.jsp.

https://doi.org/10.1016/j.amjcard.2020.09.005

Meta-Analysis of Aspirin Monotherapy Versus Dual Antiplatelet Therapy After Transcatheter Aortic Valve Implantation

Transcatheter Aortic Valve Implantation (TAVI) is increasingly being performed in patients with severe aortic stenosis.[1] The current American guidelines recommend dual antiplatelet therapy (DAPT) for the first 3 to 6 months after TAVI in patients who are not on anticoagulation.[1] These recommendations have been established based on experts' opinions due to the lack of clinical trials investigating the optimal antithrombotic therapy in this population. More recently, multiple studies have questioned the benefit of DAPT in reducing thromboembolic outcomes and revealed high bleeding events in patients who received DAPT after TAVI compared with aspirin monotherapy.[2–5] Therefore, we conducted a meta-analysis of all randomized controlled trials (RCTs) to assess the safety and efficacy of DAPT versus aspirin monotherapy after TAVI.

We performed a comprehensive electronic databases search for RCTs. Two authors extracted and analyzed the data using STATA v15.1 software. The outcomes of interest were all-cause mortality, stroke, and clinically significant bleeding (defined as valve academic research consortium major, life-threatening or disabling bleeding). We calculated hazard ratios (HRs) and 95% confidence intervals (CIs) to account for differences in follow-up duration using a random-effect model. We also calculated the number need to treat for the clinically significant outcomes.

We identified 4 RCTs[2-5] with 1,086 patients, mean duration of follow up (7 ± 4 months) (age 80 ± 1 years; females 44%), randomizing 9,845 patient-months of follow-up. Compared with DAPT, aspirin monotherapy was associated with a significant reduction of clinically significant bleeding (HR 0.49, 95% CI 0.32 to 0.75, p = 0.001, number need to treat = 19) (Figure). There was no difference between aspirin monotherapy and DAPT in terms of all-cause mortality (HR 1.00, 95% CI 0.62 to 1.62, p = 1.00) and stroke (HR 1.05, 95% CI 0.58 to 1.90, p = 0.87) (Figure).

In conclusion, in patients with severe aortic stenosis who underwent TAVI, an antithrombotic strategy using aspirin monotherapy has reduced the risk of clinically significant bleeding by 50% with no difference in all-cause mortality and stroke compared with DAPT.

Disclosure

None.

Mohammed Osman, MD[a#]*
Moinuddin Syed, MD[a#]
Sudarshan Balla, MD[a]
Babikir Kheiri, MD[b]
Harsh Golwala, MD[b]
Firas Zahr, MD[b]

[a] Division of Cardiology, West Virginia University School of Medicine, Morgantown, West Virginia
[b] Knight Cardiovascular Institute, Oregon Health and Science University, Portland, Oregon
[#] Both authors have equal contribution

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