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Letter to the Editor

# Psychiatric disorders' paradoxical protective effect on cardiovascular procedures and mortality

The recent publication titled "Clinical depression and anxiety among ST-elevation myocardial infarction hospitalizations: Results from Nationwide Inpatient Sample 2004–2013" is a thought-provoking study examining psychiatric comorbidity among patients with acute coronary artery disease (Pino et al., 2018). The authors demonstrated an interesting paradox where patients with a depression and/or anxiety diagnosis at the time of ST-elevation myocardial infarction (STEMI) have lower odds of revascularization (the primary treatment for STEMI) and in-hospital mortality. As the authors have noted, this is in direct contrast to majority of the previous literature which have shown that these comorbidities are risk factors for cardiovascular disease and mortality. Few additional analyses may be helpful in disentangling this interesting finding.

First, as noted in Table 4 of the article, increased length of stay (LOS) in the hospital is associated with depression and/or anxiety, and LOS varied by the type of revascularization therapy performed. Given these associations for LOS with both the exposure and outcome, the multivariate regression models for revascularization and mortality should include the LOS to control for its effect.

Second, percutaneous coronary intervention (PCI) is the recommended therapy for majority of STEMI, so patients receiving coronary artery bypass grafting (CABG) are usually those with contraindications for PCI, with failed PCI, or with a fundamentally different medical history and/or anatomical findings (O'Gara et al., 2013). Therefore, models on revascularization should be stratified into clinically relevant categories: patients who received PCI and those who received CABG.

Third, the dataset used in this study, the Nationwide Inpatient Sample, includes a variable which indicates the urban/rural status of a patient's residence. The distance to the nearest hospital with PCI/CABG capabilities is an important factor to consider prior to the administration of mortality-reducing fibrinolytic agents and for post-STEMI outcome (O'Gara et al., 2013). While the distance to the nearest PCI/CABG capable hospital cannot be calculated from this dataset, the urban/rural designation of the patient's residence may approximate the closeness to such hospital, likely located in densely populated urban areas. Moreover, literature has shown that urban and rural residents differ in their behavioral risk factors as it relates to cardiovascular health as well as their cardiovascular mortality (Bhuyan et al., 2013; Teo et al., 2013).

These additional analyses may elucidate reasons behind the surprising findings of this study. If LOS is found to push the results of revascularization and mortality models toward null, then the results can be used to hypothesize its relationship to depression, anxiety, and the outcomes. Perhaps the increased length of stay indicates the likelihood of diagnosis with these mental health conditions, via greater interaction with hospital staff, rather than the prevalence of the diagnoses. If true, this finding is most likely to have a greater effect among patients undergoing CABG, since the LOS is usually longer in this population. Additionally, patient's urban or rural residence may indicate behavioral and environmental factors as it relates to heart health and access to care that can be informative in the two models. The understudied burden of psychiatric disorder among this population and the paradoxical effect seen in this study necessitate further analyses.

Although it is not possible with the nationwide data used here, other data from the same Healthcare Cost and Utilization Project (HCUP) may provide further evidence of the comorbidity's effect (Healthcare Cost and Utilization Project (HCUP), 2018). Many of the state-level databases in the HCUP provide anonymized patient identifiers to link across visits and across the three databases (State Inpatient Database, State Ambulatory Surgery and Services Database, and State Emergency Department Database). With patients' longitudinal medical histories, including outpatient procedures and psychiatric hospital admissions, the effect of psychiatric comorbidity on STEMI, its treatment, and mortality may be assessed without the cross-sectional limitation of this paper.

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