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Reasons for Readmission After Placement of Cardiac Implantable Electronic Devices—Is It the Patient, Implanter, or the Traffic?

Rehospitalization is a frequently used quality metric in the realm of cardiovascular diseases and procedures. Escalating costs of care have prompted the health care delivery systems to track outcomes and expenditures, primarily for procedures. It especially holds true in the present-day health care environment where substantial focus and effort are directed to the judicious use of health care resources and restraining health care costs.[1] Pasupula et al[2] queried the largest nationally available readmission database in the United States to report trends in *de novo* cardiac implantable electronic device (CIED) implantation during hospitalization and subsequent readmission rates. They report an overall steady decline in in-hospital CIED implantations and only a modest decline in readmission rates.

IS THERE A SURPRISE IN WHO IS GETTING HOSPITALIZED AND REHOSPITALIZED?

The authors note that the majority of hospitalizations in their analyzed data were in the older age group (>75 year), men, and patients with diabetes, hypertension, chronic obstructive lung disease, anemia, electrolyte abnormalities, renal failure, and overall higher comorbidities. It is apparent that this is the same group who is at risk for overall hospitalization and rehospitalization, with and without CIED implantation. This group is also more likely to have an indication for CIED predominantly influenced by age. The authors report heart failure as the most frequent cause for readmission followed by septicemia, atrial fibrillation, acute kidney failure, and pneumonia. Heart failure is one of the leading reasons for both hospitalization and rehospitalization with approximately one-quarter of patients being hospitalized again within 30 days.[3] The duration of hospital stay is a factor that could affect rehospitalization risk both as a system-based practice and as a surrogate of underlying comorbidity burden leading to higher risk.[4]

It is also noteworthy that during the initial hospitalization approximately one-third of patients were discharged to a nursing facility; they likely remain the most vulnerable group to be readmitted. For example, in 2006, nearly one-quarter of new nursing home residents (23.5%) were rehospitalized within 30 days.[1] Hence, the patient characteristics associated with rehospitalization is not surprising.

CAN WE BLAME THE CIED IMPLANTATION?

According to the Medicare data, the 30-day readmission rate for 6 surgical procedures (coronary artery bypass graft surgery, pulmonary lobectomy, endovascular abdominal aortic aneurysm repair, open repair of abdominal aortic aneurysm, colectomy, and hip replacement) was 13.1%.[5] The authors noted a similar 30-day hospitalization rate after CIED implantation. Elective surgeries are generally performed when the patient is in an optimally compensated state, and thus, purely operation-related rehospitalizations are more likely to result from an adverse outcome of the operation. One would surmise that the hospitals with stellar operative outcomes generally to have fewer readmissions. However, for CIED implantation, the techniques are typically anticipated to be very refined, and most of the operators perform them using "muscle memory." Hence, high readmissions rates need to be examined particularly from a complication standpoint. The overall complication rate for device implantation was between 1.8% and 2.7%. Therefore, the presence of complications

alone may not translate into unusually high rates of readmissions. The mean length of stay for the initial hospitalization was 5.5 days, which is unusual for a specific CIED-related admission. It could be inferred that rehospitalization is occurring irrespective of the CIED implantation and any complication.

CLAIMS DATA: THE GOOD, THE BAD AND THE UGLY

The authors highlight the unique advantages and limitations of an administrative database for research endeavors. The datasets typically contain limited, de-identified information regarding the patient and the hospital such as demographics, discharge diagnosis, procedures performed, type of hospital, and location, among other information. These data, in turn, can help answer questions that would be otherwise impractical or impossible to study.[6] This is probably the only feasible way to investigate health care utilization, quality, disparities, and cost of care. There is often legitimate criticism regarding the cogency of claims data for clinical investigations.[7] The most common criticism pertains to the diagnostic accuracy and validation of ICD-9 codes. that are selected. In general, procedural codes are likely to be more accurate as the procedures will be coded only if they are billed as thus performed. The National Readmissions Database is an administrative dataset, and thus specific information pertaining to CIED implantation such as challenges with access, bleeding, pacing, and sensing characteristics of the leads, time per procedure, echocardiographic variables for heart failure, medication and diet adherence rates, and overall individual patient risk scores are not available. Residual measured and unmeasured confounders are likely to be present in the adjusted analyses. For example, recurrent hospitalizations of a patient with chronic kidney disease may be driven by heart failure, to which patients with chronic kidney disease are prone, and not by the need or result of an intervention. The database is unlikely to differentiate class of heart failure symptoms, overall frailty, and potential reason for rehospitalization (eg, the patient couldn't get a timely outpatient follow up).

Similarly, a patient being admitted for syncope in the setting of complete heart block is unlikely to be readmitted within 30 days if the CIED implantation was uneventful. The authors highlight the importance of claims data by noting a steady and significant decline in the number of de novo total inpatient CIED implantations driven primarily by a lower number of defibrillators. This is a real strength of the data, as the majority of the ICDs implanted are for primary prevention, and the majority of these procedures are done as an outpatient, suggesting a more compensated clinical condition.

REHOSPITALIZATION—BIG DATA AND BIG PICTURE

There are clinical, administrative, and financial implications for rehospitalization following hospital discharge within 30 days. The Hospital Readmission Reduction Program was launched in 2012 to motivate hospitals to have a structured approach to reduce costly readmissions and improve quality of care.[8]

The additive impact of underlying patient comorbidity and health care delivery systems can also be some of the major unseen factors which can lead to readmissions, specifically following a CIED implant.

Big data and smart data can shed some light on how postdischarge events may impact readmission. It will help us identify the "whys" rather than the "whens" and the "ifs" of readmissions. Beyond actual granular patient level data, predictions about rehospitalizations are fraught with many unknowns. We thus suggest caution in defining it as an ideal and optimal indicator of CIED implant quality.

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