The common practice of relying on total shoulder arthroplasty ICD procedural codes for administrative database studies identifies a skewed set of cases that affects study results

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INTRODUCTION: There has been growing utilization of large, administrative databases to characterize postoperative outcomes of total shoulder arthroplasty (TSA) at a national level. While many TSA studies identify cohorts with Current Procedural Terminology (CPT), others use International Classification of Diseases Procedural Coding System (ICD-10-PCS) codes due to their increased granularity of identifying laterality and anatomic versus reverse procedures. However, ICD-10-PCS codes were implemented to define inpatient services, and thus may introduce inherent biases when used to identify TSA cases. The differences between cohorts identified using these two methods have been poorly characterized. This study thus aimed to clarify the relationship between coding choice and population or outcome characteristics.

METHODS: This study was exempt from Institutional Review Board approval. From the national M170Ortho PearlDiver Mariner Patient Claims Database, patients of both sexes who underwent TSA between 2021-2022 were identified in one of two ways: using CPT codes or using ICD-10-PCS codes. Exclusion criteria included: age < 18 years, and those with concomitant trauma, neoplasm, or infection diagnosed within three months prior to surgery. Patient demographics, as well as the incidence and univariate odds ratios (OR) of 90-day postoperative adverse events after TSA, were compared between cohorts with Bonferroni correction of p<0.002 applied.

RESULTS SECTION: A total of 70,535 TSA cases were identified based on CPT codes while 18,112 TSA cases were identified with ICD-10-PCS codes. Compared to the CPT cohort, the ICD-10-PCS cohort was older, slightly more female, had a higher comorbidity burden (Elixhauser Comorbidity Index), and a higher rate of obesity (p<0.001 for each).

Relative to the CPT cohort, patients identified by ICD-10-PCS codes demonstrated greater odds of nearly all 90-day postoperative adverse events (Figure 1). These included (in order of decreasing OR): revision (OR 2.85), hospital readmission (OR 2.56), transfusion (OR 2.53), hematoma (OR 1.88), wound dehiscence (OR 1.86), sepsis (OR 1.85), surgical site infection (OR 1.78), pneumonia (OR 1.71), myocardial infarction (OR 1.68), acute kidney injury (OR 1.59), emergency department visit (OR 1.53), urinary tract infection (UTI) (OR 1.49), pulmonary embolism (PE) (OR 1.47), and deep vein thrombosis (DVT) (OR 1.46) (p<0.001 for all).

DISCUSSION: While many administrative database TSA studies utilize ICD-10-PCS codes due to the information they define, it is clear that only a subset of CPT-coded TSA cases are identified in this manner. Selection of cases based on different code classifications can significantly affect population characteristics and outcome results. It is thus important to consider these factors when designing and interpreting studies, and future investigation is needed to elucidate if other procedures display a similar effect. If ICD-10-PCS codes are utilized, controlling and matching may help mitigate this effect.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): This has important implications for minimizing selection bias when conducting and interpreting clinical studies which use administrative coding. This is particularly relevant as TSA cases are increasingly performed in an outpatient setting[1].

REFERENCES: 1. Smolev, E. T., Ling, K., Wang, E., Kim, J., & Wang, E. D. (2025). A national shift to outpatient total shoulder arthroplasty in the United States after regulatory changes: a 10-year analysis of current trends in procedure volume, complications, and health-care utilization. *Seminars in Arthroplasty: JSES, 35*(2), 246–253. doi:10.1053/j.sart.2024.12.011

IMAGES AND TABLES:

Figure 1. Odds of 90-Day Adverse Events Following TSA for ICD-PCS Coded Patients, Relative to CPT Coded Patients