Indication and Healthcare Resource Utilization Trends for Revision Total Hip Arthroplasty in the United States
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INTRODUCTION:
As the number of primary total hip arthroplasty procedures being performed in the United States continues to increase, so will the number of revision total hip arthroplasty (rTHA) procedures. These complex cases represent a significant clinical and financial burden to the healthcare system. To better understand the evolving landscape of rTHA, it is important to evaluate surgical indication trends as well as patient and hospital factors associated with rTHA.

METHODS:
This was a retrospective review from January 1, 2012 to December 31, 2017 using the National Inpatient Sample (NIS), a national database containing inpatient hospitalization information. ICD-9 and ICD-10 codes were used to identify patients who underwent rTHA (femoral component only, acetabular component only, or both components) and to create cohorts based on indications for rTHA, including instability, loosening, infection, periprosthetic fracture, osteolysis, polyethylene wear, and implant breakage. Associated patient demographics including age, payer, and US census region (Northeast, Midwest, South, and West) were identified. National and regional trends for hospital length of stay (LOS), inflation-adjusted cost (2017 US dollars), and discharge location (skilled nursing facility [SNF] vs. home) were evaluated based on indication for rTHA. Trends in these outcomes were also evaluated by US census region. Survey-weighted mean and 95% confidence intervals were estimated annually.

RESULTS:
A total of 245,305 rTHA procedures were identified during our study period. From 2012 to 2017, the number of annual rTHA increased from 37,325 to 51,490. The top three indications for rTHA were instability (24.3%), loosening (19.8%), and infection (10.4%) (Figure 1A). Both component revisions were the most common type of rTHA (64.8%), followed by femoral component only (22.0%) and acetabular component only (13.2%). Hospital LOS decreased over the study period from 4.8 to 4.5 days. Infections had the highest mean LOS (7.5 days) followed by periprosthetic fractures (6.6 days) (Figure 1C). Overall, the proportion of patients discharged to SNF decreased from over 44.2% in 2012 to 38.5% in 2017, and patients treated for periprosthetic fractures were most likely to be discharged to SNF (Figure 1B). Hospital costs associated with rTHA increased over the study period, from $87,843 to $94,543. Periprosthetic fractures had the highest mean cost ($125,563), followed by infections ($121,946) (Figure 1D). Regional analysis demonstrated that rTHA procedures performed in the Western region of the US were associated with the lowest mean LOS of 4.1 days, but the highest mean cost of $117,044 (Figure 2).

DISCUSSION AND CONCLUSION:
Instability, loosening, and infection were the top three indications for rTHA during the study period. Despite a decrease in overall hospital LOS, there has been an increase in overall costs associated with rTHA. Furthermore, there exists significant regional variability with respect to healthcare resource utilization for rTHA. Further investigation is warranted to better understand the driver of this variation.

Figure 1: Trends by rTHA indication for (A) overall proportion of patients undergoing rTHA, for most common indications, (B) proportion of patients discharged to facility by indication, (C) mean length of stay by indication, (D) total hospital cost by indication. All cost estimates adjusted for inflation. Error bars represent 95% confidence interval.

Figure 2: Trends by census region for (A) mean total hospital charges and (B) mean length of stay. All cost estimates adjusted for inflation. Error bars represent 95% confidence intervals.