INTRODUCTION:
Compared to primary total joint arthroplasty (TJA), revision TJA is more technically challenging and involves more extensive tissue damage and bone resection. Institution-based studies have concluded that revision procedures involve greater costs, longer operative time, longer hospital stay, and higher in-hospital complication rates [1]. Though previous studies have focused on complications following revision TJA [2,3], little is known about the risk of subsequent revision following revision TJA. The objective of this study was to evaluate the relative risk of subsequent revision following a first revision total hip arthroplasty (THA) or total knee arthroplasty (TKA) and to assess their associated risk factors.

METHODS:
Primary THA and TKA patients were identified from the 5% national sample of the Medicare claims data between 1997 and 2006, using relevant ICD-9-CM (International Classification of Diseases, 9th rev., Clinical Modification) and CPT-4 (Current Procedural Terminology) codes. We excluded patients younger than 65 years old, not enrolled in both Parts A and B, enrolled in a HMO, or diagnosed with bone cancer, metastatic cancer, fractures, or joint infection. The patients (“primary” cohort) were tracked longitudinally following their primary procedure to identify subsequent admissions for revision surgery. This subset of revision patients (“revision” cohort) was then followed again to identify subsequent admissions for re-revision surgery. Patients who died without encountering revision or re-revision surgery were considered censored and the longevity of their respective TJA was calculated up to the date of death. Each beneficiary’s enrollment status and date of death were identified in the annual Medicare denominator files. Kaplan-Meier method was used to determine overall revision and re-revision rates at up to 5 years follow-up. Cox regression was used to evaluate the effects of age, gender, race, comorbidity (Charlson index), and year of procedure on revision and re-revision risk.

RESULTS:
A total of 35,746 primary THA and 72,913 primary TKA patients were identified between 1997-2006 for our study. During this period, 1,205 of these primary THA and 1,599 of these primary TKA underwent revision surgery, providing the baseline patients for the revision cohort. At five-year follow-up, the revision rates were 95.9% and 97.2% for primary THA and TKA patients, respectively (Figures 1 and 2). The corresponding re-revision rates were 81.0% and 87.4% for revision THA and TKA patients, respectively. Revision patients were approximately 5 to 6 times more likely of undergoing re-revision (odds ratio, OR=4.89 for THA, OR=5.71 for TKA) compared to primary patients undergoing their first revision (p<0.0001). Knee patients were 37% and 27% less likely to undergo revision (p=0.0001) or re-revision (p=0.007), respectively, compared to hip patients.

Age (p<0.002) and comorbidities (p=0.027) were significantly associated with the risk of revision for the primary cohort. In general, younger patients and patients with more comorbidities (Figure 3) had a higher risk of revision. Black patients (p=0.029) and male patients (p=0.013) were also found to be associated with higher revision risk following primary TKA. The risk of re-revision was 49% greater for males following revision TKA (p=0.023). No other demographic factors were found to be significantly associated with re-revision risk for revision hip or knee patients.

DISCUSSION:
These data provide an understanding of the risk of revision following primary and revision TJA in the Medicare population. The greater risk of revision following a previous revision procedure could be the consequence of the technically demanding nature of revision surgeries and of the suboptimal results from the initial primary procedure. The latter is supported by the higher risk of revision for primary patients with more comorbidities, but the lack of association between comorbidities and re-revision risk for the revision cohort. The need for re-revision surgery may place the patient at greater risk of complications due to the technical challenges associated with each additional surgery. This will likely have substantial impact on healthcare resource utilization and patient morbidity.