INTRODUCTION
Osteoarthritis of the hip is a particularly debilitating and increasingly common affliction. Total hip arthroplasty (THA) is a cost-effective and increasingly popular procedure to treat arthritis of the hip joint. Despite the established effectiveness of THA for treatment of arthritis, it is a very costly procedure. Thus, it is of great interest to find ways of reducing costs while ensuring that patient safety and outcomes are not compromised. The equipment, personnel and facilities needed for THA comprise some of the costs, but the postoperative hospital stay is a significant contributor. Factors contributing to the length of hospital stay after THA include preoperative, intra-operative as well as postoperative variables.

Length of postoperative hospital stay is decreasing for a broad variety of operative procedures. The causes are likely multifactorial, and may include the introduction of minimally invasive procedures, the implementation of rigid peri-operative patient safety protocols, and streamlining of postoperative care by the implementation of evidence-based practices. Concerns have been raised, however that reductions in length of hospital stay may be made at the expense of other postoperative outcomes, possibly causing prolonged stay at rehabilitation units, increases in adverse events after discharge, or the increasing the need for readmission.

In this study we used medical record abstraction and administrative claims data from hospital charts of Medicare beneficiaries who underwent THA from 2002-2007 to investigate the rates and reasons for postoperative readmission as well as the length of postoperative stay (LOS). We hypothesized that a reduction in LOS would lead to an increase in the rate of readmission. We also investigated the causes of readmission in this patient population.

METHODS
The data were collected as a part of the Medicare Patient Safety Monitoring System, and comprise medical record abstraction and administrative claims data representing more than 180,000 hospital stays between January 1, 2002 and December 31, 2007. From within this larger sample, we selected the records of all 1809 patients that had a total hip arthroplasty for degenerative arthritis during their hospitalization. For this study, our primary outcomes of interest were total length of hospital stay in days and all-cause 30-day readmission rate. We divided the sample into two sub-periods, 2002-2004 and 2005-2007, to compare the outcomes of interest.

The Chi-square test was used to compare dichotomous and categorical variables, and the t-test was used to compare continuous variables. The 95% confidence intervals (CI), p-values and odds ratios were generated from these tests. All statistical analyses were conducted with SAS version 9.1.3 (SAS Institute Inc. Cary, NC). Review by our local institutional review board was not required.

RESULTS
There were some changes in characteristics of the study population from 2002-2007. Comparing patients who underwent THA in 2002-2004 and those who had the procedure in 2005-2007, there was a decrease in mean age from 74.1 +/- 9.1 years in 2002-2004 to 73.3 +/- 8.8 years in 2005-2007 (p<0.023). The rate of obesity increased from 10.5% in 2002-2004 to 13.6% in 2005-2007 (p=0.041). There were no statistically significant differences in race, smoking status, use of corticosteroids, or rates of cancer, congestive heart failure, chronic obstructive pulmonary disease, or cerebrovascular disease between the two time periods.

Figure 1 displays rates of 30-day readmission and mean LOS plotted over the time period studied. The overall mean LOS from 2002-2007 was 4.2 ± 2.2 days. There was a significant reduction in LOS from 2002-2004 (4.4 ± 2.5 days) to 2005-2007 (3.8 ± 2.7 days) (OR 1.28, 95% CI 1.25-1.31, p<0.0001). The overall rate of readmission in the 30-days after discharge was 123/1802 (6.8%). There was no difference in the rate of readmission from 2002-2004 (7.1%) to 2005-2007 (6.3%) (OR 0.90, 95% CI 0.63-1.30, p=0.58).

The ten most common reasons for readmission were: congestive heart failure (21%), chronic ischemic heart disease (16%), cardiac dysrhythmias (11%), osteoarthrosis (10%), pneumonia (9%), general symptoms (8%), disorders of fluid, electrolyte, and acid-base balance (7%), chronic bronchitis (7%), diabetes mellitus (6%), and disorders of the urethra and urinary tract (5%).

DISCUSSION
Over the time period studied, we found a decrease in overall postoperative length of hospital stay and no significant change in the 30-day readmission rate, indicating no association with decreasing hospital LOS and increases in readmission rate. To our knowledge, this is the largest study of its kind demonstrating no association between decreasing LOS and increasing readmission rates.

Causes for readmission varied and multiple causes were often listed per admission. The top ten causes accounted for 30.6% of all causes for admission. Notably, venous thromboembolic syndromes and dislocation were not among the top ten causes for readmission. Three of the top ten causes of readmission were cardiac in nature, making up 47.8% of the top ten readmission causes. Cardiac comorbidities are common among candidates for THA and these results may indicate that more caution should be taken during preoperative screening of postoperative follow-up. Our data seem to suggest that preoperative screening and postoperative follow up are inadequate, necessitating a shift to a lower threshold for preoperative screening tests, evidence-based usage of perioperative beta blockade and possibly a scheduled follow-up with a primary care physician in the acute postoperative period after discharge.

This study’s main strengths are the size of the study population, non-physician data abstraction, and our choice to tabulate all-cause readmission as opposed to attempting to associate readmissions with the primary admission. The top ten causes accounted for 30.6% of all causes for admission. Potential limitations of this study include the inherently ambiguous nature of interpreting ICD-9 and CPT codes on discharge summaries as well as our lack of randomized design.

In conclusion, we demonstrated that postoperative length of stay after THA has significantly declined over 2002-2007. We have also shown that 30-day readmission rates have remained relatively stable over the same time period, indicating that the observed decrease in length of stay did not result in an increase in readmission rates. This is encouraging as it indicates improved efficiency and cost-savings accompanied by preserved quality of patient care. We also demonstrated that cardiac complications were the most common readmission diagnoses. Future efforts to improve preoperative cardiac screening and optimize cardiac status prior to and after discharge may lead to lower rates of readmission in the future.