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Complications - Other

History of Breast Cancer Increases 90-Day Pulmonary Embolism Rates and Reimbursements After Total Hip Arthroplasty: A National Matched-Pair Analysis

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ABSTRACT

Background: Rates of total hip arthroplasty (THA) are projected to increase in the coming decades. Multiple studies have focused on identifying risk factors for adverse events after joint arthroplasty, and recent attention has been directed toward cancer. Very limited data have been published examining the effects of history of malignancy on outcomes after THA. With a concomitant increase in breast cancer diagnosis and treatments in recent years, it is expected that orthopedic surgeons will likely see more breast cancer survivors in clinic. The purpose of this study is to examine the effects of a personal history of breast cancer on 90-day outcomes after THA.
Methods: We conducted a retrospective case-control study of the entire Medicare records. The endpoints of this study included length of stay, medical complications, surgical complications, and costs (examined here as reimbursements). Patients were matched by age and gender in order to decrease confounding. A 1:1 matching was performed.
Results: After age and demographics matching, our findings demonstrated that patients with a history of breast cancer have increased rates of pulmonary embolism (0.59% vs 0.45%, $P = .003$), increased use of chest computed tomography (1.72% vs 1.18%, $P < .001$), and higher mean 90-day reimbursements (mean $15,432 vs mean $14,701, $P = .011$) in the 90 days following surgery. Other medical and surgical complications were equally distributed in both cohorts.
Conclusion: Surgeons should be aware of the increased rate of pulmonary embolism and have a more aggressive thromboprophylaxis protocol in these patients.

Total hip arthroplasty (THA) [1] rates are projected to grow in the United States in the coming years [2]. Unfortunately, with increasing utilization of these procedures, more complications are also expected, thus pre-operative risk stratification has received a great deal of attention as research has proven that risk-stratifying patients are cost-effective [3,4]. Modifiable risk factors have been a source of great attention as pre-operative interventions decrease post-operative complications, but non-modifiable risk factors continue to be a source of great concern [5–7]. Some of these non-modifiable risk factors include a history of cancer, rheumatic disease, and/or red cell dysplasia, and thus further research on these topics is required [8,9]. Epidemiological studies of the US patient population have demonstrated that the incidence of breast cancer is increasing, but the mortality is decreasing due to earlier diagnosis and advancements in treatment. Thus it is common to encounter patients in clinic with a history of cancer such as breast, prostate, or colon.

In a recent study, Karam et al [10] evaluated the outcomes of patients treated with lower extremity arthroplasty with a history of cancer at their institution. This study demonstrated that greater attention should be given to these patients, but due to sample size limitations, outcomes of each type of cancer were not described. Nonetheless, the general outcomes of patients with a history of cancer

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Table 1
Codes Utilized for the Query.

Code Description	ICD 9th Revision Code
Total hip arthroplasty	81.51
Osteoarthritis	715.00-715.99
Pulmonary embolism	415.1
Acute post-operative anemia	285.1
Acute myocardial infarction	410
Deep venous thrombosis	453.4
Pneumonia	480-486
Pulmonary insufficiency	518.5
Post-operative bleeding	998.11, 998.12
Cardiac complication	997.1
Peripheral vascular complication	997.2
Urinary complication	997.5
Osteomyelitis	730
Mechanical complication of orthopedic device	996.4
Unspecified mechanical complication of internal orthopedic device	996.40
Mechanical loosening of prosthetic joint	996.41
Dislocation of prosthetic joint	996.42
Broken prosthetic joint implant	996.43
Peri-prosthetic fracture around prosthetic joint	996.44
Other mechanical complication of prosthetic joint implant	996.47
Other mechanical complication of other internal orthopedic device implant and graft	996.49
Infection of orthopedic device	996.66
Other complications due to other internal prosthetic device	996.79
Intubation	Procedure code: 96.xx
Transfusion of blood	Procedure code: 99.x
Diagnostic ultrasound of peripheral vascular system	Procedure code: 8877
Chest computed tomography	CPT codes: 71250, 71260, 71270, 71275

CPT, Current Procedural Terminology; ICD-9, International Classification of Disease 9th revision.

demonstrated that these patients had a greater in-hospital risk of ischemic cardiac events and deep vein thrombosis compared to patients without cancer. Thus, the purpose of this study is to examine the effects of a personal history of breast cancer on patient outcomes and costs following THA at the national level.

Materials and Methods

A population health study was conducted examining the entire Medicare files. The Medicare Standard Analytical Files provide the ability to examine all the records of the Medicare database through a standardized search. The search was conducted with International Classification of Disease 9th revision codes and Current Procedural Terminology codes as has been done in previous studies [9,11,12]. The PearlDiver server (Warsaw, IN) was used for the query. The codes utilized to identify patients are shown in Table 1. A query for all THAs performed within the Medicare Standard Analytical Files was performed from 2005 to 2014. Two cohorts of patients were then identified based on the presence of a history of breast cancer or no history of breast cancer. Once the cohort of patients with a history of breast cancer was created, an age and demographics matched cohort was selected at random from the total number of patients without a history of cancer to match at a 1:1 ratio to patients with a history of breast cancer.

Ninety-day outcomes were tracked and analyzed, as this is the time period used in the comprehensive Care for Joint Replacement program, which is the most commonly used bundled payment program used by Medicare [3,13]. This methodology has been used before extensively to track outcomes within the 90-day interval. Patients with incomplete data were excluded from analysis.

Cost, as depicted by Medicare reimbursements, was tracked and analyzed for the day of surgery and entire 90-day global period. These cost data represent the amount of dollars spent for the entire care provided to patients. Length of stay was also analyzed.

Statistical analysis was conducted with odds ratios (OR) with 95% confidence interval [8], Student's t-tests, and chi-squared tests. Statistical significance was set at $P < .05$. All tests were performed with SPSS Version 20 (IBM, Armonk, NY).

Results

After inclusion and exclusion criteria were applied, there were a total of 46,618 patients in the breast cancer history cohort. There were 1,162,973 THAs performed on patients without a history of breast cancer. After randomized 1:1 matching, each cohort comprised 43,902 patients. Table 2 presents the demographics of the patient cohorts. As expected, women comprised over 98% of the patient population.

Length of stay was similar in both cohorts ($P = .432$) with a mean of 3.50 days (standard deviation [SD] 0.33) for those with a history of breast cancer vs 3.64 days (SD 0.40) in those without a history of breast cancer.

Medical Outcomes

Ninety-day post-operative complication rates were similar between cohorts except for pulmonary embolism (PE) rates (0.59% in those with a history of cancer vs. 0.45% in those without; OR 1.323, 95% CI 1.09-1.59, $P = .003$). There was also an increased use of chest computed tomography (CT) imaging in the cancer history cohort (1.72% vs 1.18%, $P < .001$) and extremity ultrasound, but this was not statistically significant (OR 1.32, 95% CI 0.96-1.80, $P = .082$). Table 3 demonstrates the 90-day medical complication rates of the 2 cohorts.

Surgical Outcomes

The rates of surgical complications were similar in both cohorts as evidenced by 90-day osteomyelitis, mechanical complications, dislocation, prosthetic joint infection, prosthetic joint fracture, and peri-prosthetic joint fractures ($P > .05$ for all). Table 4 demonstrates the rates of these complications and the statistical comparisons of both groups of patients.

Reimbursement Comparison

Mean day of surgery reimbursement analysis demonstrated that there was no difference in costs between both cohorts: mean

Table 2
Demographic Characteristics of the Matched Cohorts.

	Percent of Cohort
Age	
64 and under	3.7%
65-69	20.9%
70-74	22.3%
75-79	23.0%
80-84	18.0%
85 and over	11.2%
Unknown	0.9%
Gender	
Female	98.38%
Male	0.69%
Unknown	0.93%
Total sample size	43,902