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The Knee



Patient-related risk factors for infection following knee arthroscopy: An analysis of over 700,000 patients from two large databases☆

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ABSTRACT

Background: To determine patient-related risk factors for infection following knee arthroscopy using two large databases.

Methods: A private-payer (PP) and Medicare national insurance database were queried for patients undergoing simple knee arthroscopy procedures from 2005 to 2015. Patients undergoing concomitant open or complex procedures with grafts were excluded. Postoperative infection within 90 days was assessed using ICD-9 and CPT codes. A multivariate logistic regression analysis was utilized to evaluate patient-related risk factors for postoperative infection. Adjusted odds ratios (OR) and 95% confidence intervals were calculated for each risk factor, with $P < 0.05$ considered statistically significant.

Results: One hundred thousand three hundred ninety nine patients from the PP database and 629,842 patients from the Medicare database met all inclusion and exclusion criteria. In the PP database, there were 250 patients with documented infections (0.25%); the incidence of infection was similar in the Medicare database (1755 patients, 0.28%). There were numerous patient-related comorbidities and demographics independently associated with a significantly increased risk of postoperative infection that were similar across the PP and Medicare patient populations, respectively, including younger age (OR = 1.27, 1.43), morbid obesity (OR = 1.26, 1.74), tobacco use (OR = 1.34, 1.48), inflammatory arthritis (OR = 1.61, 1.60), chronic kidney disease (OR = 1.65, 1.14), hemodialysis (OR = 1.93, 1.36), depression (OR = 2.02, 1.73), and a hypercoagulable disorder (OR = 2.76, 1.58).

Conclusion: The present study identified numerous patient-related risk factors independently associated with an increased risk of infection following knee arthroscopy in PP and Medicare-aged patients.

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1. Introduction

Knee arthroscopy is one of the most common orthopaedic procedures worldwide, and represents three of the six most common orthopaedic procedures performed in the United States [1–3]. While exceedingly uncommon, infection following arthroscopic knee procedures has been reported. Prior literature has estimated rates of infection following knee arthroscopy to range from 0.04% to 0.42% [4–9]. Given the infrequency of this complication it has been difficult to adequately power an analysis of patient

☆ This investigation was performed at the University of Virginia Health System.

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related risk factors for infection following knee arthroscopy. Recently, a study utilized a national database to overcome this limitation and reported deep and superficial infection rates of 0.22% and 0.29% respectively, following a variety of arthroscopic knee procedures [10]. Furthermore, the study was able to identify several patient related risk factors associated with higher rates of post-operative infectious complications. Although this study added novel data to the topic, there was a substantial amount of heterogeneity among the complexity of knee procedures which has been shown to affect post-operative infection risk [11]. In addition, the lack of a regression analysis prevented the identification of independent patient specific risk factors which are critical when stratifying an individual patient's risk of complications preoperatively. In a similar study, Brophy et al. utilized the Multicenter Orthopaedic Outcomes Network (MOON) cohort to determine patient related risk factors for infection following anterior cruciate ligament reconstruction (ACLR) [12]. The group reported an overall infection rate of 0.8%, and identified diabetes as the only significant independent risk factor after evaluating patient age, body mass index (BMI), smoking status, and graft choice as risk factors for infection [12].

With the arrival of bundled payments and cost containment policies for common procedures such as arthroscopic meniscectomy, it is of high clinical significance to identify patient related risk factors independently associated with postoperative infection that would require readmission, surgical treatment, long term antibiotic use, and overall increased cost for the episode of care. Therefore, the goal of the present study was to identify patient-related risk factors independently associated with post-operative infection and septic arthritis of the knee following arthroscopy by utilizing and comparing both a Medicare and private payer insurance database.

2. Materials and methods

The PearlDiver Patient Records Database (www.pearldiverinc.com, Fort Wayne, IN), an insurance claim-based database of patient records, was utilized for the study. This database contains data from several different insurers including both Medicare and private insurers. Two databases were utilized for the present study and analyzed separately, as they represent distinct populations: a private payer database (2007–2015) and the 100% Medicare Standard Analytical Files (2005–2012).

These databases contain patient demographics and procedure volumes, among numerous other data for patients with International Classification of Diseases, 9th Revision (ICD-9) diagnoses and procedures or Current Procedural Terminology (CPT) codes. Overall, the private payer database contains about 20 million unique patients, while the Medicare database contains approximately 80 million unique patients. All data is de-identified and anonymous, and was thus deemed exempt by our Institutional Review Board.

Patients who underwent simple knee arthroscopy were identified using CPT codes 29870, 29873, 29877, 29879, 29880 and 29881 within each database [Table 1]. Patients undergoing knee arthroscopy for infection and those with concomitant open portions, or patients with more complex arthroscopic procedures including use of grafts were excluded using CPT codes for each of these procedures. Patients with a prior diagnosis of knee infection or a prior procedure for knee infection were also excluded using CPT and ICD-9 codes. Patient demographics, including age, geographic region, and comorbidities, were then queried and characterized for each cohort [Table 2].

The study endpoint of interest was infection within 90 days after knee arthroscopy. Many of the infection codes are not specific for knee arthroscopy, so a time period longer than 90 days was not appropriate, as the infection could be due to another procedure as the time between the infection and knee arthroscopy grows longer. Infection was defined as a diagnosis of postoperative infection or septic knee arthritis, or a procedure for these indications. The following codes were used for a diagnosis of

Table 1
CPT and ICD-9 codes of arthroscopic knee procedures and septic arthritis of the knee.

Code	Procedure
<i>CPT code</i>	
29870	Arthroscopy, knee, diagnostic, with or without synovial biopsy
29873	Arthroscopy, lateral release
29877	Arthroscopy, knee, surgical; synovectomy, limited plica or shelf resection
29879	Arthroscopy, knee, surgical; abrasion arthroplasty, including chondroplasty
29880	Arthroscopy, knee, surgical; with meniscectomy, medial and lateral, including debridement/chondroplasty
29881	Arthroscopy, knee, surgical; with meniscectomy, medial or lateral, including debridement/chondroplasty
10180	Incision and drainage, complex, postoperative wound infection
20005	Incision and drainage of soft tissue abscess, subfascial
27310	Arthrotomy, knee, with exploration, drainage, or removal of foreign body, infection
29871	Arthroscopy, knee, surgical; for infection, lavage and drainage
<i>ICD-9 code</i>	
998.51	Infected postoperative seroma
998.59	Other postoperative infection
711.06	Pyogenic arthritis involving the lower leg
711.46	Arthropathy involving lower leg associated with other bacterial diseases
711.86	Arthropathy involving lower leg associated with other infectious and parasitic diseases
711.96	Unspecified infective arthritis involving lower leg

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