

# Incidence of Postoperative Infections Requiring Reoperation After Arthroscopic Knee Surgery

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**Purpose:** The purposes of this study were to determine the incidence of infection requiring reoperation after arthroscopic knee surgery during a 6-year period and to compare infection rates across different age groups, genders, geographic regions of the United States, and Current Procedural Terminology (CPT) codes through a retrospective review of a large insurance company database. **Methods:** A retrospective review of an insurance company database was performed for all knee arthroscopies performed in the United States from 2004 to 2009. The database was first queried for all knee arthroscopies, and the number of those cases requiring additional surgery for infection within 30 days was determined to calculate the incidence of infection. The incidence was stratified by gender, age group, region within the United States, and CPT code. A separate analysis for procedures using allografts was also performed. **Results:** A total of 432,038 arthroscopic surgeries were performed, and the number of infections requiring drainage was 638, for an overall incidence of infection from 2004 to 2009 of 0.15%. Among adults, men were affected almost twice as often as women ( $P < .001$ ), and among children, boys were affected almost 3 times as often as girls ( $P < .001$ ). A decreasing incidence was noted in patients 60 years or older between 2004 and 2009 ( $P = .01$ ). Overall, the incidence did not significantly vary by age, region, or CPT codes that specified the implantation of allograft tissue. Compared with diagnostic arthroscopy, the relative risk of infection was higher for CPT-29889 (posterior cruciate ligament reconstruction). **Conclusions:** The incidence of infection requiring reoperation after knee arthroscopy from 2004 to 2009 was 0.15%. The incidence was higher among male patients in both the adult and pediatric populations. The incidence of infection decreased from 2004 to 2009 in patients 60 years or older. Among adult patients, the incidence did not vary by age, by region, or by CPT codes that involved implantation of allografts. **Level of Evidence:** Level IV, cross-sectional study.

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**S**epsis is a rare but potentially devastating complication after arthroscopic knee surgery. The clinical presentation and sequelae of joint sepsis have been previously described.<sup>1</sup> The incidence of infection after arthroscopy has been the subject of numerous studies and is cited as varying between 0.04% and 1.7%.<sup>2-19</sup> The majority of these studies had fewer than 4,000 arthroscopy patients and involved single institutions,<sup>10-13,15-17,19</sup> whereas the largest was a nationwide survey of approximately 120,000 arthroscopies in which infection rates were determined by voluntary self-reporting.<sup>5</sup>

When the intrinsic infection rate of a procedure is so low, the effect of a small sample size, regional bias, and reporting bias becomes especially apparent. Patients who undergo surgery at one institution and may not be included in a particular study. Addressing this problem requires pooling data from very large samples throughout the country while minimizing the under-reporting often seen in surveys.

The purposes of this study were to determine the incidence of infection requiring reoperation after arthroscopic knee surgery during a 6-year period and to compare infection rates across different age groups, genders, geographic regions of the United States, and Current Procedural Terminology (CPT) codes through a retrospective review of a large insurance company database. The hypothesis was that the incidence of infection should not vary significantly between demographic groups.

## Methods

A retrospective review of the PearlDiver Patient Record Database ([www.pearldiverinc.com](http://www.pearldiverinc.com)); PearlDiver,

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Fort Wayne, IN, USA) was conducted for the years 2004 through 2009. This is a commercially available database of nearly 12 million orthopaedic patients searchable by CPT codes. Patient records are obtained from a single insurance company (United HealthCare). Patients who underwent knee arthroscopy were identified with CPT codes 29866 through 29868, 29870, 29873 through 29877, and 29879 through 29889. Because single surgeries are often multiply coded, the database was first queried for these codes collectively to determine the number of distinct cases. The codes were then searched for individually to determine how many times each of them appeared in the database. Infection in this study was defined as the need for reoperation within 30 days after the initial surgery. To capture cases of post-arthroscopy infection requiring additional surgery, the database was then queried for patients who underwent a secondary procedure (open or closed surgical drainage/lavage, represented by CPT codes 20000, 20005, 27310, and 29871) within 30 days of the index procedure. Secondary procedures after 30 days were excluded. To determine the effect of allograft implantation on the incidence of infection, a subgroup analysis was performed by use of the CPT codes 29867 and 29868. CPT code 29888 (anterior cruciate ligament [ACL] reconstruction) was not included in the analysis because there was no method to discern whether or not autograft or allograft tissue was implanted. Complete code descriptions can be found in [Appendix Table 1](#). A 30-day time interval was used because most cases of post-arthroscopy infection have been cited as presenting within 4 weeks after the index procedure.<sup>2,4,8,10,12,13,16-19</sup>

Each record provided the patient's age group, gender, and region within the United States. The incidence from 2004 to 2009 was calculated by dividing the number of infections by the total number of knee arthroscopies for each age group, gender, region, and CPT code. For statistical analysis, patients were categorized into the following age groups: 0 to 19 years, 20 to 39 years, 40 to 59 years, and 60 years or older.

We used  $\chi^2$  analysis to assess the statistical significance of variations between age groups, genders, and regions. Linear regression was used to determine the significance of differences in the data from year to year. Poisson regression was used to compare the incidence across all CPT codes. CPT-29870 (diagnostic arthroscopy) was used as a reference procedure for calculating the relative risk of infection associated with each CPT code. The significance level was set at  $P < .05$ .

## Results

### Overall

A total of 432,038 knee arthroscopies were identified between 2004 and 2009. The total number of secondary

**Table 1.** Incidence of Infection for Each CPT Code

CPT Code for Procedure	No. of Times Procedure Was Coded	Incidence of Infection When Procedure Was Coded
29866	943	0.21%
29867	857	0.12%
29868	309	0.32%
29870	7,866	0.33%
29873	18,843	0.27%
29874	15,956	0.18%
29875	44,631	0.17%
29876	36,815	0.28%
29877	131,083	0.15%
29879	45,057	0.14%
29880	83,675	0.14%
29881	255,463	0.12%
29882	19,886	0.17%
29883	2,345	0.30%
29884	2,739	0.40%
29885	720	0.28%
29886	1,569	0.19%
29887	1,468	0.07%
29888	71,311	0.19%
29889	1,217	0.82%

NOTE. The total number of procedures coded is greater than the total number of index surgeries performed because each surgery can be multiply coded.

procedures that likely represent infection within 30 days of these arthroscopies was 638, for an overall incidence of 0.15%. There were 83 cases of reoperation in the group aged 0 to 19 years, 174 in the group aged 20 to 39 years, 321 in the group aged 40 to 59 years, and 60 in the group aged 60 years or older. Male patients accounted for 451 cases, whereas female patients accounted for 187. The Midwest had 151 cases, the Northeast had 70, the South had 302, and the West had 115. There were 87 cases in 2004, 103 in 2005, 118 in 2006, 113 in 2007, 106 in 2008, and 111 in 2009.

The incidence of infection for each CPT code is summarized in [Table 1](#). The range of incidences observed was 0.07% (CPT-29887) to 0.82% (CPT-29889) ([Appendix Table 1](#)). The differences in incidence across all CPT codes were deemed significant ( $P < .001$ ). The incidence of infection for CPT-29870 (diagnostic arthroscopy) was 0.33%. This CPT code was chosen as the reference procedure for subsequent calculations of the relative risk of infection with other CPT codes because it was likely the least invasive procedure. The relative risk of infection requiring reoperation for each CPT code compared with diagnostic arthroscopy is shown in [Table 2](#) with accompanying 95% confidence intervals (CIs). The codes whose 95% CIs were less than 1 were 29874 through 29877, 29879 through 29882, and 29888. The only code whose 95% CI was greater than 1 was 29889 (arthroscopically aided posterior cruciate ligament repair/augmentation or reconstruction). The remaining codes' relative risks were not significantly different from 1.

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