



Where Do Knee Revisions for Infection, Fracture, and Other Revisions Get Treated?

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ABSTRACT

Complicated knee revision procedures require specific expertise that may not be available across the healthcare network. Teaching hospitals appear to perform more knee revisions overall than urban or rural hospitals. We examined the location of care and payer status for all knee revisions including complex revisions (infection, periprosthetic fracture). Although only 39.7% of all primary total knee cases were performed in teaching hospitals, over half of all knee revisions were performed in teaching hospitals. Knee revision procedures, including treatment of periprosthetic infections and fractures are performed more often in teaching hospitals than in urban and rural settings combined. Reimbursement that does not match the cost of care for complex revision and infection cases may have a disproportionate impact on teaching hospitals.

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Although primary knee joint replacement procedures are uniformly available at most inpatient hospitals throughout the U.S. healthcare network, treatment of total joint revision cases, particularly more complex cases such as those involving infection and periprosthetic fracture, appears to be less broadly available.

Treatment of complex knee revision cases requires specific resources, such as access to medical specialists and facilities equipped and prepared to handle more complex cases. Additionally, postoperative outpatient care for complex revision patients may require a more localized and robust rehabilitation network than is typically available near primary joint replacement centers. Perception that complex revision cases are best treated at specialty centers (usually teaching hospitals) may also play a role in the decision to refer a knee revision case to a specialty center instead of attempting first to treat the revision case at the site where the primary joint replacement procedure was performed.

It has been shown that the cost of treating a patient for an infected total joint is at least three times that of a primary joint surgery [1–3], and double that of a nonseptic knee revision [1]. Also, reimbursements for revision due to infection have been shown to result in a net loss to the hospital, with reimbursement for Medicare patients notably less than that for non-Medicare patients [1].

With the number of Medicaid and Medicare eligible patients increasing each year and rapidly increasing rates of knee revision and a percentage of overall total joint revision [4], both location of care

and payer status for revision due to total joint infection or periprosthetic fracture are of particular interest. We believe there exists a higher concentration of more complex knee revision cases in teaching hospital settings and, as a result, reimbursement that does not match the cost of care for complex revision and infection cases may have a disproportionate impact on teaching hospitals.

Materials and Methods

Over 900,000 knee replacement procedures reported in the National Inpatient Sample [5] were examined from 2000 through 2008. The Nationwide Inpatient Sample is a part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality Complex.

The ICD-9-CM procedure codes used to select primary ($n = 799,192$) and revision ($n = 111,679$) revision knee replacement cases are illustrated in Fig. 1. We excluded cases with concomitant hip replacement. To select revision for fracture cases back to 2000, we examined concomitant diagnoses in cases with a periprosthetic (996.44) fracture. Similarly, the set of infection diagnosis codes concomitant with implant infection (996.6x) are shown in the algorithm illustrated in Fig. 1. Revision cases with ICD-9-CM diagnosis codes for periprosthetic or pathologic fracture, and fractures of the femur, tibia or fibula were classified as a complex fracture case. Primary knee replacement cases with these diagnosis codes were excluded. Cases with a procedure code involving a spacer were classified as a complex revision, as were revision cases with a diagnosis of sepsis, implant, other infection, pyogenic arthritis or osteomyelitis. Primary cases with infection codes were excluded. For the period 2000–2008, knee revisions comprised 12.4% (112,179) of all total knee surgical interventions.

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Insurance status was specified in the order indicated in Table 1. For instance a patient with primary Medicare and secondary Medicaid was classified as Medicaid. Surgeon and hospital volume were stratified into low (lowest volume quartile) medium (middle two quartiles) and high (highest volume quartile) based on the number of cases performed each year. In 2000, the mean number of cases

performed by low and high volume surgeons was 7 and 125 and in 2008 these numbers increased to 16 and 310. In 2000 the mean number of cases performed by low and high volume hospitals was 48 and 428 and in 2008 these numbers increased to 121 and 925.

Logistic regression [Stata/SE 11.2 for Windows, College Station, TX] was used to identify associations between patient, surgeon and

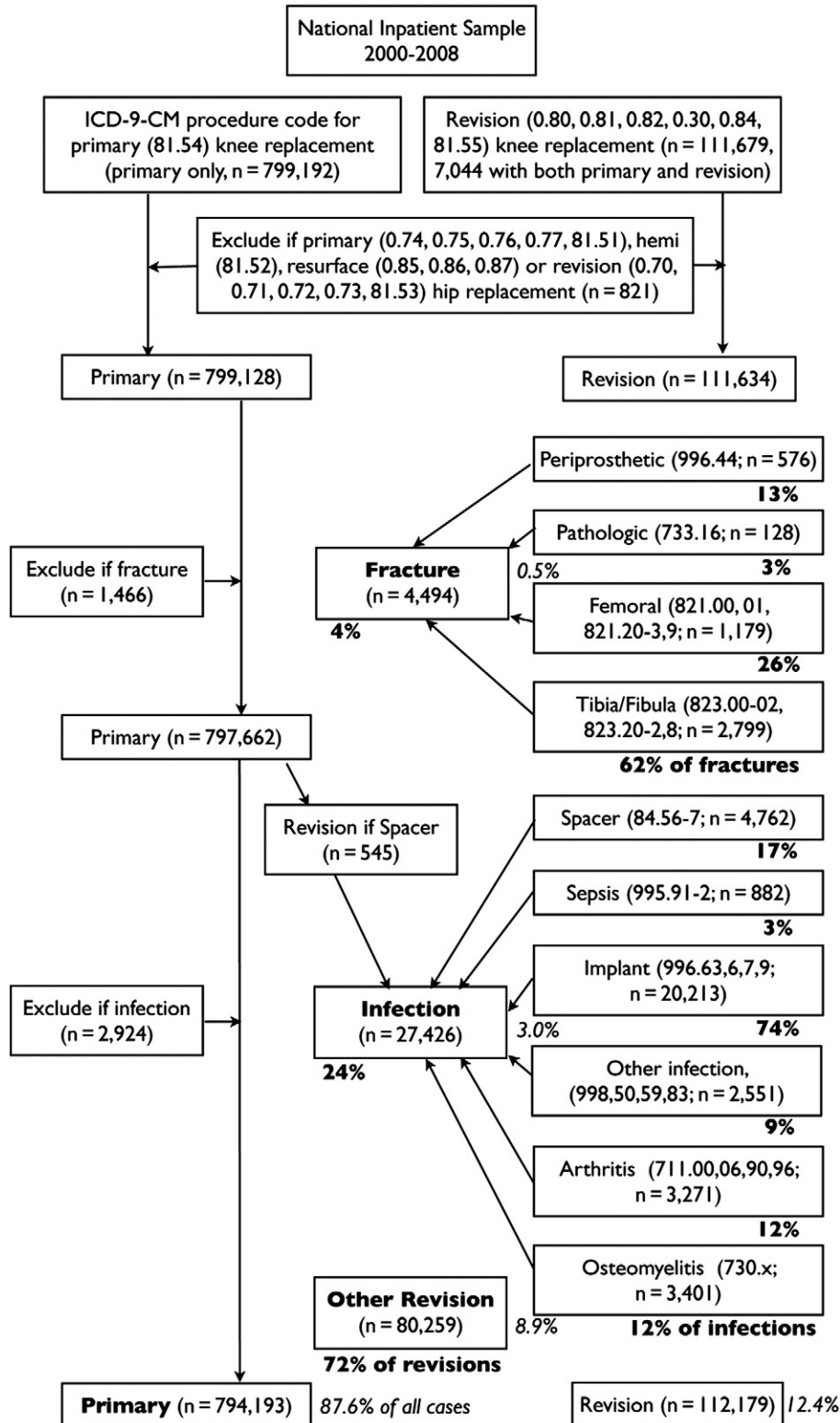


Fig. 1. Criteria used to define the four cohorts studied in this analysis.

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