

## Geographic Variation in Knee Replacement Surgery: Provider or Population Driven?

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**Abstract:** In recent years there has been rapid growth in the use of total knee arthroplasty (TKA). This study examines longitudinal and geographic trends for TKA in North Carolina between 2000 and 2009. Data are drawn from the North Carolina Discharge databases, linked to external datasets and analyzed by provider, facility, and county. Discharges with an ICD-9 procedure code for TKA (81.54) are included in the analyses. Between 2000 and 2009, TKA utilization doubled in North Carolina, increasing from 96 to 196 procedures per 100,000 persons. Utilization of TKA increased more rapidly for people under 65 compared with those over 65, and the proportion of procedures billed to Medicare decreased from 66% to 57%. The number of TKA procedures performed in low-volume hospitals declined by nearly 40%, while the volume in high-volume facilities tripled. The number of orthopedic surgeons performing TKA remained relatively constant over time, on average 378 physicians per year, but the average provider volume of TKA procedures more than doubled. Between 2000 and 2009, the number of orthopedic surgeons performing between 50 and 99 TKAs per year more than quadrupled, and the number performing more than 100 increased by a factor of seven. By 2009, approximately 70% of all discharges were performed by surgeons with annual volume of at least 50 procedures.

Multivariate spatial regression analysis of TKA utilization in 2008 found that the most significant predictors of county TKA utilization were supply related. County supply of primary care providers per 100,000 persons, the presence of a hospital with high-volume of TKA, the number of skilled nursing facilities, and number of hospital beds were all statistically significant predictors of use. The county rate of uninsurance, admission rate for marker conditions, and the spatial parameter representing TKA utilization for neighboring counties were also statistically significant factors.

Substantial growth in utilization and expenditures for TKA between 2000-2009 has motivated payers to consider new reimbursement policies which promote efficiency and require strong networks between providers and institutions, which could affect future access to the procedure. It is unclear whether the increasing volume of procedures among a relatively stable supply of providers and hospitals is sustainable or if new providers and institutions will be necessary to meet future demand.

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