Projected Orthopaedic Surgeon Workforce Shortfall for Primary and Revision Total Joint Arthroplasty Procedures, 2030-2060

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INTRODUCTION:

The volume of total joint arthroplasty (TJA) procedures has continuously risen in the United States over recent years. However, provider supply is limited by the number of graduating residents relative to the number of retiring senior orthopaedic surgeons. Recent studies attempted to evaluate the impending shortfall of TJA providers. Despite the projection of a significant shortage, TJA procedures continue to climb beyond expected ceiling limits. This paper models TJA procedure volume in 2030 and 2060 in relation to projected practicing orthopaedic surgeon population and reviews the current trend toward delayed retirement required for sustaining growth.

METHODS:

A retrospective review of data collected by the American Academy of Orthopaedic Surgeons from 2000 to 2016 was performed. Linear regression was used to project the future growth rate of the orthopaedic surgeon population in the United States. A model based on data from the United States Census population projections combined with the National Inpatient Sample, a representative sample of annual hospital discharges in the United States, was used to predict future TJA volume. The projected orthopaedic surgeon and resident population was plotted. Primary and revision TJA procedures per surgeon and mean surgeon age were projected using linear regression.

RESULTS:

From 2000 to 2016, the number of practicing orthopaedic surgeons grew from 17,709 to 20,488 (15.7% increase). Linear regression projects continued significant surgeon growth of 211 surgeons per year (95% CI 192 to 230, R-square 0.97). From 2009 to 2016, orthopaedic surgery resident population remained flat, decreasing from 4,718 to 4,709. Linear regression projects no significant change in resident population (95% CI -21 to 15 per year, R-square 0.13).

From 2000 to 2014, the annual volume of TJA procedures per surgeon increased from 28 to 57 (98% increase). Primary TJA procedures increased from 25 to 51 per surgeon (104% increase), while revision TJA procedures increased from 3.4 to 5.6 per surgeon (61% increase).

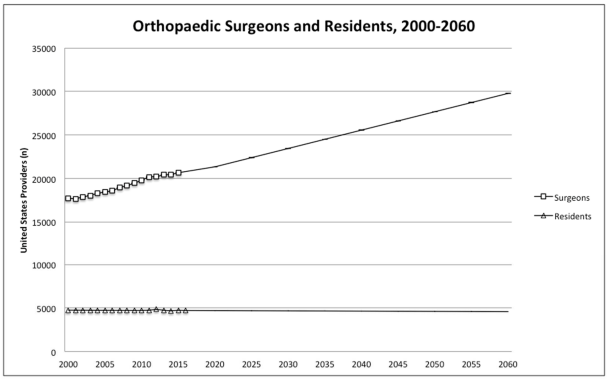
By 2030, combined linear regression models project 90 procedures per surgeon annually (57% increase from 2014), and 141 procedures per surgeon annually by 2060 (147% increase from 2014). Primary TJA procedures are expected to increase 59% by 2030 and 150% by 2060. Revision TJA procedures are expected to increase 47% by 2030 and 119% by 2060.

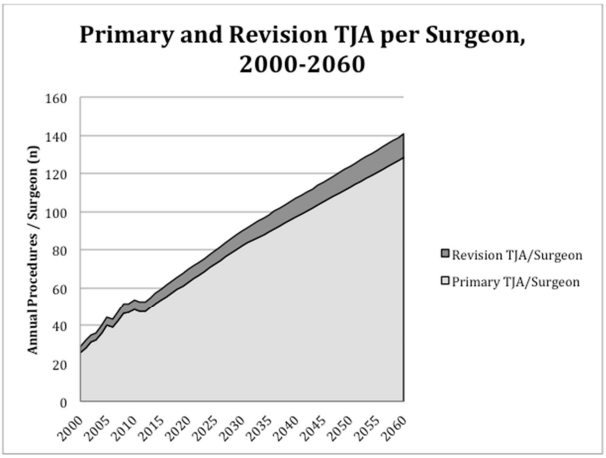
The average age of orthopaedic surgeons increased from 50.9 years in 2004 to 56.5 years in 2016 (11% increase). Linear regression estimates a 0.42 year average age increase per year among orthopaedic surgeons (95% CI 0.24 to 0.60, R-square 0.83). Projected to 2030, the average age of orthopaedic surgeons in the United States would increase to 62.4 years (10% increase from 2016), and 75.0 years (32% increase from 2016) by 2060.

DISCUSSION AND CONCLUSION:

TJA procedure volumes have sustained continuous growth over recent decades. For this trend to continue, provider supply must meet procedural demand. This study reports an approximate doubling of TJA procedures per surgeon since 2000, and projects an additional 150% increase per surgeon by 2060. Orthopaedic resident population has remained stable. It is likely that increased TJA procedure volume is sustained by increased efficiency per surgeon and delayed retirement by orthopaedic surgeons, with a rising average age of surgeons since 2004.

The average age of surgeons is on pace to reach 62.4 years in 2030 and 75.0 years in 2060, respectively. This estimate is likely untenable. We assume that the impending ceiling to delayed retirement age will eventually limit TJA procedure volume unless orthopaedic surgery resident volume is increased. The implications of this study are important for the future allocations of surgical resources as well as healthcare policy related to funding additional orthopaedic surgeon residency positions.


Orthopaedic Surgeons and Residents, 2000-2060
United States Providers (n)
35000
30000
25000
20000
15000
10000
5000
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
Surgeons
Residents


Primary and Revision TJA per Surgeon, 2000-2060
Annual Procedures / Surgeon (n)
160
140
120
100
80
60
40
20
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
2060
Revision TJA/Surgeon
Primary TJA/Surgeon