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Unmet Need for Total Joint Arthroplasty in Medicaid Beneficiaries After Affordable Care Act Expansion

Christopher J. Dy, MD, MPH[1], **Abigail R. Barker, PhD**[1], **Derek S. Brown, PhD**[1], **Matthew Keller, MS**[1], **Peter Chang, MD**[1], **Ken Yamaguchi, MD, MBA**[1], **Margaret A. Olsen, PhD, MPH**[1]

[1]Department of Orthopaedic Surgery (C.J.D., P.C., and K.Y.), Division of Public Health Sciences, Department of Surgery (C.J.D., A.R.B., D.S.B., and M.A.O.), and Division of Infectious Diseases, Department of Medicine (M.K. and M.A.O.), Washington University School of Medicine, St. Louis, Missouri

Abstract

Background: The utilization of total hip arthroplasty (THA) and total knee arthroplasty (TKA) increased after Medicaid expansion under the U.S. Affordable Care Act (ACA), suggesting a potential unmet need for THA and TKA. We examined the timing of THA and TKA in patients after obtaining Medicaid expansion insurance coverage. We hypothesized that patients with Medicaid expansion insurance would undergo a surgical procedure sooner than patients in traditional Medicaid populations.

Methods: We used administrative data from a Medicaid managed care company to determine the timing of primary THA and TKA in patients who were 18 to 64 years of age in 4 states with Medicaid expansion (Illinois, Ohio, Oregon, and Washington) and 4 states without Medicaid expansion (Louisiana, Mississippi, Texas, and Wisconsin) from 2008 to 2015. The insurance types were Medicaid expansion, Medicaid plans for Supplemental Security Income (SSI), or Temporary Assistance for Needy Families (TANF). Roughly, these 3 groups correspond to relatively healthy childless adults, relatively unhealthy disabled adults, and parents of children with Medicaid insurance. The main outcome measure was time from enrollment to the surgical procedure. The primary exposure of interest was insurance type. We used a generalized linear regression model to adjust for patient age, sex, social deprivation, surgeon supply and reimbursement, and state-level Medicaid enrollment.

Results: In the unadjusted analysis of 4,117 patients, there was a significantly shorter time from enrollment to THA and TKA for the expansion group (median, 7.5 months) relative to the SSI group (median, 16.1 months; $p < 0.0001$) and the TANF group (median, 12.2 months; $p < 0.0001$). In the adjusted analysis, the time from enrollment to THA and TKA was significantly shorter in the expansion group (β, −1.21 [95% confidence interval (CI), −1.35 to −1.07]; $p < 0.001$) compared with the TANF group (β, −0.27 [95% CI, −0.38 to −0.17]; $p < 0.001$) and the SSI group

dyc@wustl.edu.

Investigation performed at Washington University School of Medicine, St. Louis, Missouri

On the **Disclosure of Potential Conflicts of Interest** forms, *which are provided with the online version of the article*, one or more of the authors checked "yes" to indicate that the author had a relevant financial relationship in the biomedical arena outside the submitted work and "yes" to indicate that the author had other relationships or activities that could be perceived to influence, or have the potential to influence, what was written in this work.

(reference). Compared with the SSI group, these coefficients are equivalent to a 70% shorter time to the surgical procedure in the expansion group and a 24% shorter time to the surgical procedure in the TANF group.

Conclusions: Our findings suggest an unmet need for THA and TKA among newly enrolled Medicaid expansion beneficiaries. This need should be considered by surgeons, hospitals, and policymakers in ensuring access to care. Furthermore, consideration should be given to existing insurance-based disparities in access to orthopaedic care, as these may be exacerbated by an increased demand for THA and TKA from Medicaid expansion beneficiaries.

The expansion of state Medicaid programs in 2014 under the U.S. Affordable Care Act (ACA) has led to dramatic increases in insurance coverage among Americans. There is a growing body of literature supporting the ACA's role in improving self-reported health status[1–3] and reducing racial and ethnic disparities in access to care[4,5]. Furthermore, increases in the utilization of discretionary or elective inpatient surgical procedures, including total hip arthroplasty (THA) and total knee arthroplasty (TKA)[6–8], have been demonstrated in Medicaid expansion states.

The observations of increased utilization of discretionary or elective surgical procedures following Medicaid expansion invite the question of whether this increase will strain the capacity of the existing health-care supply. Within the field of orthopaedic surgery, there are an anticipated shortage of surgeons[9,10] and concerns about the existing and future geographic distribution of orthopaedic surgeons[11]. Furthermore, many orthopaedic surgeons are hesitant to care for patients with Medicaid insurance. In 2011, 40% of orthopaedic surgeons were not accepting new Medicaid patients[12]. Numerous "secret shopper" studies have demonstrated the difficulty that Medicaid beneficiaries face when trying to obtain an appointment, including orthopaedic care, and these issues have continued after the expansion of Medicaid through the ACA[13,14]. It is entirely plausible that the potential increased demand among newly insured Medicaid beneficiaries for elective surgical procedures such as THA and TKA may not be readily accommodated.

The sudden increase in the demand for health services after gaining insurance enrollment through the ACA has been demonstrated for outpatient primary care, specialist evaluation, and surgical admissions[15–18]. Indeed, a similar effect is seen when patients approach the eligibility age for Medicare; there is pent-up demand for THA and TKA immediately after Medicare enrollment that declines over time[19]. We used administrative data from a major Medicaid managed care organization to understand how the increase in insured individuals from Medicaid expansion impacted the utilization of THA and TKA. We hypothesized that patients newly enrolled in Medicaid expansion plans would have a shorter time from insurance enrollment to a surgical procedure, compared with patients in the traditional Medicaid population.

Materials and Methods

Following institutional review board exemption, we received data for this project from a major Medicaid managed care organization. Patients who underwent THA or TKA from 2008 to 2015 in 1 of 8 participating states were identified using the International

Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), procedure codes and the Current Procedural Terminology, Fourth Edition (CPT), codes for TKA (ICD-9-CM 81.54; CPT 27447) and THA (ICD-9-CM 81.51; CPT 27130). Patients were included in the study if they were 18 to 64 years of age and were covered by 1 of the following Medicaid managed care plans: Medicaid expansion, Medicaid plans for Supplemental Security Income (SSI), or Temporary Assistance for Needy Families (TANF). Roughly, these 3 groups correspond to relatively healthy childless adults, relatively unhealthy disabled adults, and parents of children with Medicaid insurance. Patients were excluded if they were dually enrolled in Medicare. The expansion states included in this study were Illinois, Ohio, Oregon, and Washington. The non-Medicaid expansion states included Louisiana, Mississippi, Texas, and Wisconsin. States were selected for inclusion in the study based on data available from the Medicaid managed care organization.

Additional patient-level information available for the arthroplasty population included age, sex, and ZIP-5 code of residence. ZIP code was used to determine rurality, based on the U.S. Department of Agriculture's Urban Influence Codes[20], and the deprivation index, based on the patient's county. The Area Deprivation Index[21] was used to control for local community factors. Patients with a missing ZIP code (n = 67) were excluded because rurality and the Area Deprivation Index could not be calculated.

The health-care system factors included in models were based on the patient's county and state of residence. We included the number of orthopaedic surgeons in the patient's county as a measure of surgeon availability. To account for economic factors affecting surgeon reimbursement for TKA or THA, we calculated the Medicaid-to-Medicare Fee Index (MMFI)[22] by state and quarter from publicly available data. The MMFI data for 2015 were not available at the time of our study. Instead, we used the MMFI data from the fourth quarter of 2014 for procedures occurring in 2015.

Statistical Analysis

The dependent variable was the number of days from the patient's enrollment in a Medicaid plan offered by the managed care organization to the first arthroplasty date. Continuous insurance enrollment was required. For patients who had a coverage gap (had prior enrollment, dropped coverage, then reenrolled), only the enrollment date most proximate to the arthroplasty date was used to determine the days to the procedure. The number of days to the procedure was transformed using the natural log in order to express results from the model as the percentage of change in the time to the surgical procedure. The deprivation index covariate was also natural log-transformed because of its skewed distribution.

Because Medicaid policies are state-specific, we included a state enrollment variable (see Appendix A) to control for enrollment changes over time that may have strained the health-care system. The state enrollment variable, which may range from 0 to 1, compares Medicaid enrollment for each state and year relative to its level in 2015. Prior to the ACA, there was significant variation across states and over time in Medicaid eligibility levels for non-disabled adults with children (the TANF population), as well as other adult eligibility groups. Expanding Medicaid thus represents a differential amount of additional strain on resources in different states. For example, in the expansion state of Oregon, total enrollment

in 2010 was about 32.2% of its size in 2015, whereas in the non-expansion state of Texas, total enrollment in 2010 was about 65.3% of its size in 2015. This comparison suggests that Oregon may have experienced a greater strain on Medicaid-related resource capacity than Texas did, and our state enrollment variable allows us to control for this potential impact.

For descriptive statistics, we used chi-square tests for categorical variables and Kruskal-Wallis analysis of variance tests for continuous variables. We performed multivariable analysis using a generalized linear regression model (GLM) with no intercept and the natural log of the time to the surgical procedure (in days) as the dependent variable. The results are presented below in months to facilitate interpretation. The primary exposure of interest was patient Medicaid insurance plan type, categorized as expansion, SSI, or TANF. The patient and additional factors discussed above were included in the GLM model to control for patient, surgeon, and state-level effects. All data management and analyses were conducted using SAS 9.4 (SAS Institute).

Results

We analyzed data for 4,117 patients undergoing THA or TKA from 2008 to 2015. The characteristics for each insurance type are shown in Tables I and II. The median patient age by insurance type was 56 years (interquartile range [IQR], 51 to 60 years) for Medicaid expansion plans, 55 years (IQR, 51 to 59 years) for SSI plans, and 50 years (IQR, 43 to 56 years) for TANF plans ($p < 0.0001$). There was a higher proportion of male patients undergoing THA and TKA covered by expansion plans (44%) compared with SSI plans (34%) and TANF plans (33%) ($p < 0.0001$). The proportion of arthroplasty patients undergoing THA was also higher among the expansion plans (46%) than the SSI plans (35%) and the TANF plans (36%) ($p < 0.0001$). A higher proportion of urban patients were covered by the expansion plans (85%) compared with the SSI plans (77%) and the TANF plans (62%) ($p < 0.0001$).

In the unadjusted analysis, there was a significantly shorter time from enrollment to THA and TKA for patients in the expansion group (median, 7.5 months [IQR, 3.5 to 7.5 months]) relative to patients in the SSI group (median, 16.1 months [IQR, 6.5 to 33.6 months]; $p < 0.0001$) and patients in the TANF group (median, 12.2 months [IQR, 4.3 to 28.1 months]; $p < 0.0001$). In the multivariable GLM regression adjusted for patient age, sex, urban or rural status, social deprivation, surgeon supply, surgeon reimbursement, and baseline state-level Medicaid enrollment, the time from enrollment to THA and TKA was significantly shorter in patients covered by expansion plans (β, −1.21 [95% confidence interval (CI), −1.35 to −1.07]; $p < 0.001$) compared with those with TANF coverage (β, −0.27 [95% CI, −0.38 to −0.17]; $p < 0.001$) and those with SSI coverage (reference group) (Table III). These coefficients are equivalent to a 70% shorter time to the surgical procedure in the expansion group and a 24% shorter time to the surgical procedure in the TANF group compared with the SSI group.

Discussion

There was a significantly shorter time from enrollment to THA and TKA for patients with Medicaid expansion coverage relative to those with SSI and TANF coverage. This relationship remained significant in a multivariable GLM adjusted for patient and surgeon factors and baseline state-level Medicaid enrollment (Table III). Our findings may represent an unmet need for THA and TKA among newly enrolled beneficiaries with Medicaid expansion plans. It is possible that these increases in utilization may continue over time if more states adopt Medicaid expansion. Previous work has demonstrated a pent-up demand for THA and TKA among patients who become newly eligible for Medicare[19]. Additionally, when other studies have compared geographically contiguous states, there was a notable increase in THA and TKA utilization among Medicaid beneficiaries in the state that expanded Medicaid compared with the state that did not expand Medicaid[7]. Although prior work has led policymakers and surgeons to expect an increase in THA and TKA utilization after Medicaid expansion[6,7], our results reveal that they should expect an early surge in demand rather than a gradual increase. When our findings are viewed in the context of the literature, it is possible that many patients who would benefit from THA and TKA do not undergo the surgical procedure due to insurance-based reasons, such those as shown by Labrum et al.[14]. Increases in health insurance coverage, whether via the ACA or other health-care reform proposals, are likely to lead to higher demand for THA and TKA. Accordingly, surgeons, hospitals, and policymakers may need to appropriately allocate future resources to accommodate the anticipated need. If Medicaid expansion continues and the anticipated surge in demand for THA and TKA is not met, there may be subsequent effects on the delivery of orthopaedic care: the eventual cost of care may increase, waiting times may end up increasing, and individual productivity may decrease as the underlying pathology worsens. Future study is needed to determine whether this demand will decline in the future as the insurance mix stabilizes in the United States, but continued challenges to the ACA in both legal and political settings may make it difficult to study.

There are a number of potential contributors to the difference in time from enrollment to the surgical procedure in the Medicaid beneficiaries included in our study. It is possible that the difference reflects improved access for Medicaid beneficiaries, potentially demonstrating the intended effect of the ACA. Our study design precludes the ability to illustrate a causal relationship, but prior work has used econometric methods (including a difference-in-difference study design) to show the impact of Medicaid expansion on the utilization of THA and TKA[7]. One other potential driver of the difference in time from enrollment to the surgical procedure may be intrinsic differences in the health of patients with expansion coverage relative to those with SSI or TANF coverage. The differences in health status may reflect general health (such as medical comorbidities) or orthopaedic-specific issues such as severity of arthritis and its impact on quality of life. We did not have access to other claims, diagnosis codes, or risk adjustment scores that could elucidate the former, nor did we have access to clinical data, radiographic images, or patient-reported measures that could depict the latter. Another potential contributor to the decreased time from enrollment to the surgical procedure may be differences in surgeon attitudes toward the newer Medicaid expansion coverage. Despite our attempt to adjust for characteristics related to surgeons (such as

surgeon supply and mean surgeon reimbursement by Medicaid in each state), the managed care organization may differentiate, via reimbursement or other expectations, between the plans under which it covers the expansion population and the plans under which it covers the traditional Medicaid population, that is, SSI and TANF-eligible individuals. Thus, it is possible that surgeons and their office staff may view expansion coverage differently.

An important consideration when interpreting our results is that our data only reflect those beneficiaries whose plans are within the product portfolio of a major Medicaid managed care organization. Our analysis focuses on patients with expansion plans (who qualified for Medicaid due to eased eligibility criteria based on 133% of the federal poverty level). Our findings may not apply to those patients with traditional fee-for-service Medicaid (who qualified for Medicaid based on each state's historic eligibility criteria relative to the federal poverty level) or to individuals who purchased U.S. Health Insurance Marketplace plans (which were sold on insurance exchanges to those individuals who did not qualify for Medicaid expansion and were another source of ACA coverage gains, especially in lower-income populations). We intentionally chose to examine the impact of the expansion plans because of our interest in assessing the influence that a policy adjustment to existing state Medicaid programs would have on the utilization of THA and TKA. Future work should examine the impact of various other efforts to increase health insurance coverage (such as Marketplace plans) on surgical utilization.

Our analysis of surgical utilization data demonstrates that patients with Medicaid expansion plans have a shorter time from enrollment to the surgical procedure, suggesting that there may be an unmet need for THA and TKA among newly enrolled Medicaid expansion beneficiaries. This need should be considered by surgeons, hospitals, and policymakers in ensuring access to care. Consideration should be given to existing insurance-based disparities in access to orthopaedic care, as these may be exacerbated by an increased demand for total joint replacement from Marketplace beneficiaries.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE I

Joint Replacement Procedures Performed by State and Insurance Type, with Stratification Before and After Expansion for States That Expanded Medicaid Under the ACA [*]

Demographic Characteristics	Insurance Type [†]		
	Expansion	SSI	TANF
Expansion states [‡]			
Illinois			
2008 to 2013	NA	91 (100%)	0 (0%)
2008 to 2015	63 (32.5%)	112 (57.7%)	19 (9.8%)
Ohio			
2008 to 2013	NA	408 (75.7%)	131 (24.3%)
2008 to 2015	281 (56.3%)	154 (30.9%)	64 (12.8%)
Oregon			
2008 to 2013	0 (0%)	15 (88.2%)	2 (11.8%)
2008 to 2015	129 (70.9%)	49 (26.9%)	4 (2.2%)
Washington			
2008 to 2013	NA	60 (85.7%)	10 (14.3%)
2008 to 2015	190 (69.1%)	71 (25.8%)	14 (5.1%)
Non-expansion states			
Louisiana, 2008 to 2015	NA	166 (89.2%)	20 (10.8%)
Mississippi, 2008 to 2015	NA	457 (87.9%)	63 (12.1%)
Texas, 2008 to 2015	NA	748 (70.0%)	320 (30.0%)
Wisconsin, 2008 to 2015	NA	168 (35.3%)	308 (64.7%)

[*] NA = not applicable.

[†] The values are given as the number of patients, with the row percentage in parentheses.

[‡] Medicaid expansion began January 1, 2014.

TABLE II

Demographic Data for Each Insurance Type*

Demographic Data	Insurance Type		
	Expansion	SSI	TANF
Age† *(yr)*	56 (51 to 60)	55 (51 to 59)	50 (43 to 56)
Sex‡			
Male	290 (44%)	856 (34%)	314 (33%)
Female	373 (56%)	1,643 (66%)	641 (67%)
Procedure‡			
TKA	360 (54%)	1,633 (65%)	616 (65%)
THA	303 (46%)	866 (35%)	339 (35%)
Region‡			
Rural	101 (15%)	572 (23%)	366 (38%)
Urban	562 (85%)	1,927 (77%)	589 (62%)
Year‡			
2008	0 (0%)	143 (6%)	42 (4%)
2009	0 (0%)	113 (5%)	60 (6%)
2010	0 (0%)	136 (5%)	78 (8%)
2011	0 (0%)	249 (10%)	61 (6%)
2012	0 (0%)	341 (14%)	149 (16%)
2013	0 (0%)	488 (20%)	211 (22%)
2014	207 (31%)	507 (20%)	183 (19%)
2015	456 (69%)	522 (21%)	171 (18%)

*All comparisons were significant at p = 0.0001 (Kruskal-Wallis or chi-square testing).

†The values are given as the median, with the IQR in parentheses.

‡The values are given as the number of patients, with the percentage in parentheses.

TABLE III

Adjusted Estimates for Time to Surgery *

Parameter	Parameter Estimate †	P Value	Marginal Effect
Insurance type			
Expansion	−1.21 (−1.35 to −1.07)	<0.001	70% shorter
TANF	−0.27 (−0.38 to −0.17)	<0.001	24% shorter
SSI	Reference		
State			
Illinois	2.83 (1.43 to 4.23)	<0.001	
Louisiana	3.56 (2.12 to 5.01)	<0.001	
Mississippi	3.61 (2.15 to 5.08)	<0.001	
Ohio	4.26 (2.85 to 5.67)	<0.001	
Oregon	4.59 (3.22 to 5.97)	<0.001	
Texas	3.63 (2.16 to 5.11)	<0.001	
Washington	3.88 (2.57 to 5.19)	<0.001	
Wisconsin	3.86 (2.40 to 5.30)	<0.001	
State enrollment variable	1.80 (1.52 to 2.08)	<0.001	
Age	0.00 (−0.00 to 0.01)	0.799	
Sex			
Female	0.19 (0.11 to 0.27)	<0.001	
Male	Reference		
Normalized Area Deprivation Index	−0.11 (−0.40 to 0.17)	0.439	
No. of orthopaedic surgeons	0.00 (−0.00 to 0.00)	0.128	
MMFI	0.98 (0.56 to 1.41)	<0.001	
Urban vs. rural region	0.16 (0.06 to 0.27)	0.003	

* The dependent variable is the natural log of time to the surgical procedure in days. Model $R^2 = 0.12$.

† The values are given as the parameter estimate, with the 95% CI in parentheses.