


# Patient Satisfaction After Lower Extremity Total Joint Arthroplasty: An Analysis of Medical Comorbidities and Patient Demographics

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## Abstract

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey has received increased attention to determine which demographics may influence patient satisfaction after Total Hip and Knee Arthroplasty. The purpose of this study was to evaluate the various effects that patient-specific factors, medical comorbidities, and demographics had on patient satisfaction. Two thousand and ninety-two patients underwent lower extremity total joint arthroplasty at our institution between 2014 and 2018. Nine hundred twenty-three of these patients responded to their HCAHPS survey (44%). Most patients (609, 66%) underwent primary total knee arthroplasty followed by 244 (26.4%) total hip arthroplasties, 35 (3.8%) revision total knee arthroplasties, 28 (3.0%) bilateral total knee arthroplasties, and 7 (0.8%) revision total hip arthroplasties. Increasing age and length of stay were associated with a decrease in patient satisfaction whereas patients who were married reported higher satisfaction. Patients discharged to a rehabilitation facility had a 12% decrease in top-box response rate compared to those discharged home. Contrary to our hypothesis, specific procedure type and the presence of comorbidities failed to predict patient satisfaction. The results of this study shed light on the intricate relationship between patient satisfaction and patient-specific factors. Furthermore, health care workers can counsel patients on expected satisfaction when considering total hip and knee arthroplasty.

## Keywords

orthopedic surgery, HCAHPS, patient satisfaction, value-based purchasing, total joint arthroplasty, orthopedics

## Introduction

Value-Based Purchasing Program is a Centers for Medicare & Medicaid Service (CMS) initiative that rewards hospitals for the quality of care provided with incentivized payments (1,2). These payments are based on a total performance score (TPS), which include various measures such as adhering to clinical practice guidelines, quality of medical care provided, and patient satisfaction during their hospital visit (2,3). In October 2012, CMS reduced the base operating diagnosis-related group (DRG) payments to create an incentive fund distributed to top-performing hospitals and withheld funding from underperforming hospitals based on their TPS (4,5). To track and measure patient satisfaction nationally, the Hospital Consumer Assessment and Healthcare Provider Systems Survey (HCAHPS) was created as a standardized instrument and data collection tool, which

comprises 30% of the TPS. Of the CMS reimbursements, some of the highest payments come directly from Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA), collectively referred to as Total Joint Arthroplasty (TJA) (6,7).

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Patient satisfaction has become a cornerstone for understanding and improving patient care and has implications for a vast audience including patients, nurses, hospital staff, administrators, and treating physicians. An understanding of the modifiable and nonmodifiable factors that may contribute to patients' satisfaction would be invaluable in improving patient-centered care. In regard to TJA, studies have linked medical comorbidities to increased short-term complications and worse functional outcomes in patients undergoing primary and revision TJA (8–10). To name a few, a recent meta-analysis demonstrated that patients with diabetes, chronic lung disease, and kidney disease were at higher risk of surgical site infections, post-operative venous thromboembolism, and surgical complications, respectively (8). In addition to optimizing clinical outcomes, patients' satisfaction has become paramount as a standardized comparator between hospitals as a surrogate for quality of care. However, there remains a paucity of research analyzing how these factors may impact their satisfaction.

The purpose of this study was to evaluate the various effects that patient-specific factors and demographics had on HCAHPS surveys in patients who underwent TJA. The primary aim of the study was to evaluate the association between medical comorbidities and patient satisfaction. Furthermore, we sought to answer the following questions:

1. Do patient medical comorbidities have an effect on patient satisfaction, with a focus on medical conditions that have been shown to influence outcomes after TJA?
2. Are there patient-specific social factors and general demographics that influence satisfaction after TJA?
3. Does undergoing a more complex procedure with a more difficult recovery (revision TKA and THA versus primary) have an effect on patient satisfaction?

The authors hypothesize that medical comorbidities and patients undergoing more complex procedures would have decreased satisfaction paralleling the inferior outcomes that have been documented in the literature.

## Methods

After institutional review board approval, the authors queried patients who were hospitalized for primary or revision THA and TKA, or bilateral TKA's between January 2014 and December 2018 at our academic community hospital (N = 2092). Bilateral TKA's at our institution are performed during a single procedure. Electronic health records were retrospectively reviewed to determine if patients met inclusion criteria and were admitted for the appropriate DRG codes. Informed consent was not necessary given the retrospective nature of the study. Patients were included if they were over 18 years of age, had one of the aforementioned procedures, and successfully filled out an HCAHPS survey. Patients were excluded if they failed to complete the

survey or underwent surgery for either infection or fracture (N = 1169). Completed surveys from all patients who met inclusion criteria were included in our analysis (N = 923).

The HCAHPS survey is a reliable survey that consists of 32 questions administered to adult hospital inpatients within 48 hours to 6 weeks of discharge (11). Surveys were distributed in 1 of 3 survey modes: mail only, telephone only, or mixed (mail with telephone follow-up). Patients who met inpatient criteria with appropriate DRG codes were prospectively enrolled following the CMS HCAHPS Quality Assurance Guidelines protocol (11). At our institution, patients are enrolled to be sent the survey for quality improvement initiatives, irrespective of their involvement in the present study. The HCAHPS survey is divided among 8 domains: Communication with Nurses, Communication with Doctors, Staff Responsiveness, Pain Management, Communication about Medications, Discharge Information, Cleanliness and/or Quietness, and Overall Hospital Rating.

Hospital Consumer Assessment of Healthcare Providers and Systems survey responses were converted into a "top-box" response variable, described by CMS (2). The top-box represents the highest mark for each survey question. If a patient scores a question in the top-box range, that response is graded as a 1. Any other non-top-box response is graded as 0. For example, consider the question "Would you recommend this hospital to your friends and family?" with the answers being (1) definitely no, (2) probably no, (3) probably yes, and (4) definitely yes. Definitely yes would be considered the top-box answer and get credited as 1, whereas answers 1-3 would receive no credit (a score of 0). We subsequently used the survey response scores from the HCAHPS survey questions to create a composite satisfaction score.

A review of the patient's medical records was performed to record comorbidities and demographics. Demographics included patient age, gender, body mass index (BMI), marital status, type of procedure (Primary TKA, Primary THA, Revision TKA, Revision THA, Bilateral TKA), length of stay (LOS), discharge disposition, and home living arrangements. Patient comorbidities included smoking status, diabetes mellitus (DM), obstructive sleep apnea (OSA), chronic kidney disease (CKD), chronic obstructive pulmonary disease (COPD), and hypertension (HTN). Cardiovascular disease was not included as a comorbid condition because patients were risk stratified as minimal cardiovascular risk because our institution is not considered a cardiac center.

## Data Analysis

The calculated top-box score was used to create the continuous primary outcome variable for this study, top-box response percentage (%), using the following computation: # top-box responses/# completed responses\*100 (11). Multivariable linear regression was used to compare the range of potential predictive variables to each patient's top-box response score in order to study the effects of demographics,

comorbidities, and hospital course on HCAHPS scores. Covariates analyzed in the initial model included: gender, age, BMI, length of hospital stay, comorbid conditions, procedure type, discharge disposition, marital status, living arrangement, and smoking status. Sub analysis subsequently assessed predictors of top-box response score following each individual procedure type included in this study (primary/revision TKA, primary/revision THA, bilateral TKA) using a multivariable linear regression model in a forward stepwise fashion. Accordingly, only significant predictors of the outcome variable (top-box response score) were reported in this model. All statistical analyses were performed using SPSS (version 25.0, IBM Corp). B-values with corresponding standard error and beta values from each regression were reported with statistical significance set to  $P < .05$ .

## Results

Overall, from January 2014 to December 2018, 2092 patients underwent TJA at our community hospital by 10 orthopedic surgeons. Of these, 923 patients responded to the HCAHPS survey (44% response rate). The mean time between hospital discharge and survey completion was 37 days, with a standard deviation of  $\pm 19$  days. The average top-box response score was 72.9% with a standard deviation  $\pm 25.8\%$ .

Overall, patient demographics demonstrated a mean age (years) of  $67 \pm 9.3$  and a mean BMI ( $\text{kg}/\text{m}^2$ ) of  $31.8 \pm 6.50$ . The average LOS (days) was  $2.2 \pm 1.3$  with 742 (80.4%) patients being discharged home and 174 (18.9%) being discharged to a rehabilitation facility. In terms of comorbidities, 593 (64.5%) patients had a diagnosis HTN, 148 (16.1%) with DM, 111 (12.1%) with OSA, 78 (8.9%) with COPD, and 8 (1%) with CKD. A total of 221 (23.9%) patients had multiple comorbidities documented. Additional demographics can be seen in Table 1.

Regression analysis demonstrated that each additional year of increasing age was associated with a 0.35% decrease in top-box score ( $P < .001$ ). For each additional day spent in the hospital (LOS) there was a 3.3% decrease in top-box score ( $P < .001$ ). As compared to married patients, those patients who were single, divorced/separated, or widowed had a 5.38% ( $P = .033$ ), 9.07% ( $P = .002$ ), and 5.31% ( $P = .036$ ) decrease in top-box score, respectively. As compared to disposition home or home with home health services, those who went to a rehabilitation facility had a 12% decrease in top-box score ( $P < .001$ ). Finally, patients living with a spouse had 6.1% higher score than those living alone ( $P < .02$ ). No specific procedure type had a significant effect on patient satisfaction. In addition, smoking and medical comorbidities such as OSA, DM, CKD, COPD, and HTN were not found to independently influence patient satisfaction ( $P > .05$ ). A detailed analysis of the included covariates in the multivariable regression can be seen in Table 2.

Sub analysis of the covariates as predictors of patient satisfaction for each individual procedure type included in this study (primary/revision TKA, primary/revision THA)

**Table 1.** Demographic Statistics.

|  |                 |
|--|-----------------|
| Age (y)                                    | 67 $\pm$ 9.3    |
| Body mass index ( $\text{kg}/\text{m}^2$ ) | 31.8 $\pm$ 6.50 |
| Length of stay (days)                      | 2.2 $\pm$ 1.3   |
| Gender                                     |                 |
| Male                                       | 369 (40%)       |
| Female                                     | 554 (60%)       |
| Medical comorbidities                      |                 |
| Hypertension                               | 598 (64.8%)     |
| Diabetes mellitus                          | 141 (15.3%)     |
| Obstructive sleep apnea                    | 108 (11.7%)     |
| COPD                                       | 75 (8.1%)       |
| CKD  | 8 (1%)          |
| Procedure                                  |                 |
| Primary total knee arthroplasty            | 609 (66%)       |
| Primary total hip arthroplasty             | 244 (26.4%)     |
| Revision total knee arthroplasty           | 35 (3.8%)       |
| Revision total hip arthroplasty            | 7 (0.8%)        |
| Bilateral total knee arthroplasty          | 28 (3.0%)       |
| Lives with                                 |                 |
| Alone                                      | 180 (19.5%)     |
| Spouse/significant other                   | 548 (59.4%)     |
| Other                                      | 195 (21.2%)     |
| Marital status                             |                 |
| Married                                    | 568 (61.5%)     |
| Single                                     | 127 (13.8%)     |
| Divorced/Separated                         | 93 (10.1%)      |
| Widowed                                    | 126 (13.7%)     |
| Unknown                                    | 9 (1%)          |
| Smoking status                             |                 |
| Never                                      | 536 (58.1%)     |
| Former                                     | 308 (33.4%)     |
| Current                                    | 59 (6.4%)       |
| Unknown                                    | 20 (2.2%)       |
| Discharge disposition                      |                 |
| Home                                       | 246 (26.7%)     |
| Home with home health care                 | 496 (53.7%)     |
| Rehabilitation facility                    | 77 (8.3%)       |
| Skilled nursing facility                   | 97 (10.5%)      |
| Unknown                                    | 7 (0.8%)        |

Abbreviations: CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; M, meters; Kg, kilograms; Y, years.

can be seen in Table 3. This sub analysis found that there were no variables which significantly affected top-box response rate in patients undergoing bilateral TKA. Therefore, this procedure type was not included in Table 3.

## Discussion

Centers for Medicare & Medicaid Service has placed increased emphasis on hospitals to improve the patient experience while simultaneously enhancing patient care and optimizing clinical outcomes. To the authors' knowledge, this is the first study to investigate how medical comorbidities influence patient satisfaction after TJA, and few that have looked at the social demographics and complexity of procedure as variables affecting satisfaction. From the results of our study, patients who were younger, married, lived with a

**Table 2.** Multivariable Regression: HCAHPS Top-Box Response Rate.

| Variable                 | B         | Std. error | Beta   | P-Value         |
|--------------------------|-----------|------------|--------|-----------------|
| Gender                   |           |            |        |                 |
| Female                   | Reference |            |        |                 |
| Male                     | 0.921     | 1.736      | 0.017  | .596            |
| Age                      | -0.351    | 0.091      | -0.126 | <b>&lt;.001</b> |
| BMI                      | -0.028    | 0.137      | -0.007 | .840            |
| LOS                      | -3.282    | 0.655      | -0.162 | <b>&lt;.001</b> |
| Comorbidity              |           |            |        |                 |
| Any                      | -0.377    | 1.868      | -0.007 | .840            |
| OSA                      | 0.071     | 2.664      | 0.001  | .979            |
| CKD                      | -2.559    | 9.234      | -0.009 | .782            |
| DM                       | 2.706     | 2.378      | 0.038  | .256            |
| COPD                     | 0.316     | 3.133      | 0.003  | .920            |
| HTN                      | -0.850    | 1.802      | -0.016 | .637            |
| Procedure                |           |            |        |                 |
| Primary TKA              | Reference |            |        |                 |
| Bilateral TKA            | 5.240     | 6.745      | -0.027 | 0.406           |
| Revision TKA             | -5.609    | 1.947      | 0.053  | 0.115           |
| Primary THA              | 3.076     | 9.813      | 0.008  | 0.818           |
| Revision THA             | 2.253     | 4.987      | 0.035  | 0.294           |
| Discharge disposition    |           |            |        |                 |
| Home/Home health aid     | Reference |            |        |                 |
| SNF/Rehabilitation       | 12.012    | 2.126      | -0.183 | <b>&lt;.001</b> |
| Marital status           |           |            |        |                 |
| Married                  | Reference |            |        |                 |
| Single                   | -5.384    | 2.515      | -.072  | <b>.033</b>     |
| Divorced/Separated       | -9.070    | 2.866      | -.106  | <b>.002</b>     |
| Widowed                  | -5.305    | 2.523      | -.071  | <b>.036</b>     |
| Lives with:              |           |            |        |                 |
| Alone                    | Reference |            |        |                 |
| Spouse/Significant other | 6.192     | 2.595      | 0.118  | <b>.017</b>     |
| Other                    | 4.508     | 2.599      | 0.086  | .083            |
| Smoker Stats             |           |            |        |                 |
| Never                    | Reference |            |        |                 |
| Former                   | 0.046     | 2.012      | 0.001  | .982            |
| Current                  | -3.057    | 4.001      | -0.026 | .445            |

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; HCAHPS, Hospital Consumer Assessment of Healthcare Providers and Systems; HTN, hypertension; OSA, obstructive sleep apnea; THA, total hip arthroplasty; TKA, total knee arthroplasty.

Bold values indicate statistical significance  $p < 0.05$ .

spouse had a shorter LOS after surgery, and those who were discharged home reported the highest satisfaction. Gender, BMI, presence of medical comorbidities, complexity of the procedure, and smoking status were not found to be predictors of patient satisfaction.

Included in the analysis was the evaluation of patient comorbidities and their effect on patient satisfaction. Although studies have documented HCAHPS scores among TJA patients based on various patient demographics, to the authors knowledge, this is the first paper to include specific medical comorbidities and their association with patient satisfaction (12–15). Studies have shown that medical

**Table 3.** Multivariable Regression: HCAHPS Top-Box Response Rate, by Procedure Type.

| Procedure (significant top-box predictors) | B      | Std. error | Beta   | P-value         |
|--|--------|------------|--------|-----------------|
| Primary TKA                                |        |            |        |                 |
| LOS  | -3.262 | 0.839      | -0.157 | <b>&lt;.001</b> |
| Age  | -0.321 | 0.118      | -0.109 | <b>.007</b>     |
| Married                                    | 4.375  | 2.181      | 0.081  | <b>.045</b>     |
| Revision TKA                               |        |            |        |                 |
| LOS  | -5.991 | 2.450      | -0.392 | <b>.02</b>      |
| Primary THA                                |        |            |        |                 |
| Married                                    | 11.334 | 3.135      | 0.227  | <b>&lt;.001</b> |
| Revision THA                               |        |            |        |                 |
| Gender (male)                              | 41.001 | 8.205      | 0.961  | <b>.008</b>     |
| BMI  | 2.917  | 0.990      | 0.567  | <b>.042</b>     |

Abbreviations: BMI, body mass index; HCAHPS, Hospital Consumer Assessment of Healthcare Providers and Systems; LOS, length of stay; THA, total hip arthroplasty; TKA, total knee arthroplasty.

Bold values indicate statistical significance  $p < 0.05$ .

comorbidities complicate clinical outcomes after TJA (12–17). Yang et al found that diabetic patients undergoing primary TJA were at increased risk for postoperative medical complications including surgical site infections and had worse functional outcome scores (16). Furthermore, studies have shown that HTN, cardiovascular disease, diabetes, and CKD have all been shown to be associated with worse outcomes after TJA (8,17–20). However, the aforementioned investigations failed to include how patient's medical comorbidities relate to their satisfaction after surgery. The authors hypothesized that the presence of comorbidities would be associated with decreased patient satisfaction. Despite including medical comorbidities in the analysis, smoking status, presence of DM, COPD, CKD, HTN, OSA were not found to be significantly correlated with patient satisfaction and indicates that after TJA surgery, patient satisfaction and overall hospital experience is not impacted by the presence of the medical comorbidities that the authors examined. It is difficult to determine why the presence of these comorbidities did not influence satisfaction. It is possible that although medical comorbidities can impact clinical outcomes, patient satisfaction may be resistant to these comorbidities and is likely multifactorial in nature. This information can be useful when counseling patients on the benefits of making the decision to undergo TJA, carefully weighing the increased risks of complications, but also informing that satisfaction may be unaffected.

In regard to procedure type, literature has shown that revision TJA carries an increased risk of morbidity and decreased functional outcomes compared to primary TJA (21–24). Specifically, Nichols and Vose (21) found that when controlling for patient characteristics and comorbid diagnoses, the presence of any complication during the index hospitalization was lower for the primary TKA and THA than for revision procedures (21). Contrary to our hypothesis

that satisfaction would parallel clinical outcomes based on procedure complexity, the present analysis failed to show any differences in satisfaction based on procedure type. Our results differ from a recent study by Eftekhary et al (25), who found that as compared to revision THA, primary THA patients had a significantly higher top-box scores (25). Potential reasons for this difference include overall quality improvement measures between the different study time periods, our exclusion of patients having surgery for prosthetic joint infection, or differences in methodology of analyzing patient satisfaction scores. Lastly, bilateral TKA carries with it increased morbidity and double the rehabilitation which the authors postulated would influence satisfaction after surgery (26). In concordance with the increased complexity of revision procedures, undergoing bilateral TKA did not have an effect on patient satisfaction. Because of a paucity of literature on patient satisfaction after revision and bilateral TJA, further research is needed before we can draw confident conclusions and educate patients accordingly on their expected satisfaction after these procedures.

Consistent with previous literature, increased LOS, increased age, and discharge to rehabilitation facilities were associated with lower patient satisfaction (27). Studies have shown that shorter LOS and discharge home instead of to a rehabilitation facility has been associated with higher patient satisfaction and at least equal, if not better, functional outcomes (12,28,29). This information can be used to help educate patients on their expected satisfaction with planned discharge home versus rehabilitation facility. Physicians, hospital staff, and nurses can confidently counsel patients on the benefits of being discharged home and leaving the hospital sooner after these procedures with the understanding this will lead to improved satisfaction. Our findings also echo previous studies that have shown increasing age is associated with a decreased patient satisfaction (30). Further research is needed to elucidate the reasons behind this finding and potential interventions to improve patient satisfaction in an older cohort.

Our data demonstrates that patients who are married or live with a spouse reported significantly higher satisfaction rates. The support from a spouse or close partner after surgery cannot be overstated. This support can come in the form of positive reinforcement, empathy, or physical support, and have been shown to positively affect patient outcomes, pain tolerance, and physical function (31,32). Keefe et al demonstrated that spouse-assisted coping skill training in patients with osteoarthritis demonstrated significant improvements in outcomes and pain control compared to those without spousal involvement (32). Concurrently, a patient's self-efficacy beliefs are another important factor to consider when recovering from arthroplasty surgery. Patients with higher self-efficacy have been shown to tolerate higher pain intensity and have better physical function (31). Therefore, patients with poor self-efficacy and those without a spouse or close partner support can lead to perceived worse outcomes and lower satisfaction rates.

Our in-depth analysis of the effect of medical comorbidities and social demographics on TJA patient satisfaction can provide useful information for the health care provider in treating patients with osteoarthritis and aid in counseling and predicting realistic outcomes for patients after TJA surgery.

The authors note some limitations of this study. First, due to the retrospective nature of the study we acknowledge the potential for selection bias. The HCAHPS survey is randomly distributed to a set number of patients for completion and by design is unable to capture all patients who underwent TJA surgery. This could have a potential effect on the results as these results are limited to only those who respond to the surveys. However, our response rate was 44% which is above the national average and likely captured a large and diverse sample of patients. Second, our study was performed at one institution which limits generalizability to other patient populations. Third, because our institution was not a high-risk cardiac center, patients with significant cardiac comorbidities were not analyzed. Fourth, we included medical comorbidities into the analysis to better appreciate their effect on patient satisfaction; however, we were unable to analyze the association with post-operative complications and readmission rates. It would have been beneficial to be able to follow patients for complications, outcomes, and readmission rates.

## Conclusion

The present study adds valuable information to a growing body of literature surrounding the potential factors that influence patient satisfaction. Our results showed that medical comorbidities did not influence patient satisfaction after TJA. In addition, patients undergoing revision and bilateral TJA were not found to have decreased satisfaction as compared to those undergoing primary TJA. In practice, physicians and health care providers can use this information to counsel patients on anticipated satisfaction when considering surgery. Future research should aim to correlate patient satisfaction with complications, readmissions, and functional outcomes after TJA and identify specific interventions to improve satisfaction are needed.

## Authors' Note

The present study was IRB approved at our institution, and informed consent was not required given the retrospective nature of the study and the lack of identifiable health information to be published.



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## References

- Porter ME, Teisberg EO. *Redefining Health Care: Creating Value-Based Competition on Results*. Harvard Business School Press; 2006.
- Hospital Value-Based Purchasing | CMS. Published May 9 2021. Updated February 18 2021. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Hospital-Value-Based-Purchasing->
- Stapleton E, Frane N, Lentz J, Yngstrom K, Healy C, Cohn R, et al. Impact of a resident-guided rounding initiative on the hospital consumer assessment of healthcare providers and systems survey scores in orthopaedic surgery inpatients. *J Am Acad Orthop Surg Glob Res Rev*. 2019;3:e041. doi:10.5435/JAOSGlobal-D-18-00041
- Rau J. Medicare to begin basing hospital payments on patient-satisfaction scores | Kaiser Health News. Published May 9 2021 Updated April 28 2011. <https://khn.org/news/medicare-hospital-patient-satisfaction/>
- HCAHPS Online. Published May 9 2021. Updated February 23 2021. <https://www.hcahpsonline.org/en/summary-analyses>
- Rana AJ, Bozic KJ. Bundled payments in orthopaedics. *Clin Orthop Relat Res*. 2015;473:422-5. doi:10.1007/s11999-014-3520-2
- Bozic KJ, Ward L, Vail TP, Maze M. Bundled payments in total joint arthroplasty: targeting opportunities for quality improvement and cost reduction knee. In: *Clinical Orthopaedics and Related Research*. Vol 472. Springer New York LLC; 2014:188-93. doi:10.1007/s11999-013-3034-3
- Podmore B, Hutchings A, van der Meulen J, Aggarwal A, Konan S. Impact of comorbid conditions on outcomes of hip and knee replacement surgery: a systematic review and meta-analysis. *BMJ Open*. 2018;8:e021784. doi:10.1136/bmjopen-2018-021784
- Santaguida PL, Hawker GA, Hudak PL, Glazier R, Mahomed NN, Kreder HJ, et al. Patient characteristics affecting the prognosis of total hip and knee joint arthroplasty: a systematic review. *Can J Surg*. 2008;51:428-36. doi:10.1016/S0008-428X(08)50119-6
- Schwartz FH, Lange J. Factors that affect outcome following total joint arthroplasty: a review of the recent literature. *Curr Rev Musculoskelet Med*. 2017;10:346-55. doi:10.1007/s12178-017-9421-8
- Health Services Advisory Group C. *Quality assurance guidelines CAHPS<sup>®</sup> hospital survey (HCAHPS)*. 2020. Published May 9 2021. [https://www.hcahpsonline.org/globalassets/hcahps/quality-assurance/2020\\_qag\\_v15.0.pdf](https://www.hcahpsonline.org/globalassets/hcahps/quality-assurance/2020_qag_v15.0.pdf)
- Shulman B, Hutzler L, Karia R, Bosco J. The effect of length of stay and discharge disposition on hospital consumer assessment of healthcare providers and systems scores in orthopaedic patients. *J Am Acad Orthop Surg*. 2019;27:e418-e422. doi:10.5435/JAOS-D-17-00552
- Vovos TJ, Ryan SP, Hong CS, Howell CB, Risoli TJ Jr, Attarian DE, et al. Predicting inpatient dissatisfaction following total joint arthroplasty: an analysis of 3,593 hospital consumer assessment of healthcare providers and systems survey responses. *J Arthroplasty*. 2019;34:824-33. doi:10.1016/j.arth.2019.01.008
- Peres-da-Silva A, Kleeman LT, Wellman SS, Green CL, Attarian DE, Bolognesi MP, et al. What factors drive inpatient satisfaction after knee arthroplasty? *J Arthroplasty*. 2017;32:1769-72. doi:10.1016/j.arth.2017.01.036
- Mistry JB, Chughtai M, Elmallah RK, Le S, Bonutti PM, Delanois RE, et al. What influences how patients rate their hospital after total hip arthroplasty? *J Arthroplasty*. 2016;31:2422-5. doi:10.1016/j.arth.2016.03.060
- Yang Z, Liu H, Xie X, Tan Z, Qin T, Kang P. The influence of diabetes mellitus on the post-operative outcome of elective primary total knee replacement: a systematic review and meta-analysis. *Bone Joint J*. 2014;96B:1637-43. doi:10.1302/0301-620X.96B12.34378
- Tan TL, Kheir MM, Tan DD, Filippone EJ, Tischler EH, Chen AF. Chronic kidney disease linearly predicts outcomes after elective total joint arthroplasty. *J Arthroplasty*. 2016;31:175-9.e2. doi:10.1016/j.arth.2016.03.019
- Wasielewski RC, Weed H, Prezioso C, Nicholson C, Puri RD. Patient comorbidity: relationship to outcomes of total knee arthroplasty. *Clin Orthop Relat Res*. 1998;85-92. Retrieved April 6, 2020, from: <http://www.ncbi.nlm.nih.gov/pubmed/9917672>
- Elmallah RDK, Cherian JJ, Robinson K, Harwin SF, Mont MA. The effect of comorbidities on outcomes following total knee arthroplasty. *J Knee Surg*. 2015;28:411-6. doi:10.1055/s-0035-1549023
- Loth FL, Giesinger JM, Giesinger K, MacDonald DJ, Simpson AHRW, Howell CR, et al. Impact of comorbidities on outcome after total hip arthroplasty. *J Arthroplasty*. 2017;32:2755-61. doi:10.1016/j.arth.2017.04.013
- Nichols CI, Vose JG. Clinical outcomes and costs within 90 days of primary or revision total joint arthroplasty. *J Arthroplasty*. 2016;31:1400-6. e3. doi:10.1016/j.arth.2016.01.022
- Fernández-Fernández R, Cruz-Pardos A, García-Rey E. Revision total hip arthroplasty: epidemiology and causes. In: *Revision Total Joint Arthroplasty*. Springer International Publishing; 2020:43-57. doi:10.1007/978-3-030-24773-7\_4
- Bozic KJ, Kurtz SM, Lau E, Ong K, Vail DTP, Berry DJ. The epidemiology of revision total hip arthroplasty in the United States. *J Bone Joint Surg—Ser A*. 2009;91:128-33. doi:10.2106/JBJS.H.00155
- Bosco JA, Karkenny AJ, Hutzler LH, Slover JD, Iorio R. Cost burden of 30-day readmissions following Medicare total hip and knee arthroplasty. *J Arthroplasty*. 2014;29:903-5. doi:10.1016/j.arth.2013.11.006
- Eftekhary N, Feng JE, Anoushiravani AA, Schwarzkopf R, Vigdorichik JM, Long WJ. Revision versus primary hospital consumer assessment of healthcare providers and systems scores in total joint arthroplasty. *J Arthroplasty*. 2019;34:S84-90. doi:10.1016/j.arth.2018.11.019

26. Memtsoudis SG, Ma Y, Chiu YL, Poultides L, Gonzalez Della Valle A, Mazumdar M. Bilateral total knee arthroplasty: risk factors for major morbidity and mortality. *Anesth Analg*. 2011; 113:784-90. doi:10.1213/ANE.0b013e3182282953
27. Eftekhary N, Feng JE, Anoushiravani AA, Schwarzkopf R, Vigdorich JM, Long WJ. Hospital consumer assessment of healthcare providers and systems: do patient demographics affect outcomes in total knee arthroplasty? *J Arthroplasty*. 2019;34:1570-4. doi:10.1016/j.arth.2019.04.010
28. Gauthier-Kwan OY, Dobransky JS, Dervin GF. Quality of recovery, postdischarge hospital utilization, and 2-year functional outcomes after an outpatient total knee arthroplasty program. *J Arthroplasty*. 2018;33:2159-64. e1. doi:10.1016/j.arth.2018.01.058
29. Maiorano E, Bodini BD, Cavaiani F, Pelosi C, Sansone V. Length of stay and short-term functional outcomes after total knee arthroplasty: can we predict them? *Knee*. 2017;24: 116-20. doi:10.1016/j.knee.2016.09.022
30. Gwam C, Mistry J, Mohamed N, Chughtai M, Thomas M, Mont MA, et al. Does age influence how patients rate their experience of care after total knee arthroplasty? *J Knee Surg*. 2017;30:647-51. doi:10.1055/s-0037-1603339
31. Gere J, Martire LM, Keefe FJ, Stephens MAP, Schulz R. Spouse confidence in self-efficacy for arthritis management predicts improved patient health. *Ann Behav Med*. 2014;48: 337-46. doi:10.1007/s12160-014-9608-9
32. Keefe FJ, Caldwell DS, Baucom D, Salley A, Robinson E, Timmons K, et al. Spouse-assisted coping skills training in the management of knee pain in osteoarthritis: long-term follow-up results. *Arthritis Care Res*. 1999;12:101-11. doi:10.1002/1529-0131(199904)12:2<101:: aid-art5>3.0.co;2-9