



NOVEMBER 7-10, 2019

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Education

EDUCATIONAL ACTIVITY SCOPE

The **2019** AAHKS Annual Meeting is designed to provide practicing orthopaedic surgeons with research based, state-of-the-art information on diagnosis, surgical and non-surgical treatment options and overall management of hip and knee conditions. This educational activity includes the review of the most current scientific research study findings, faculty and participant discussions and interactive symposia. It covers multiple clinical topics such as primary and revision total hip arthroplasty, primary and revision total knee arthroplasty, non-arthroplasty, infection, complications other than infection as well as health policy. It is aimed at improving overall surgeon competence related to the care of patients with arthritis and degenerative disease.

OBJECTIVES

Upon completion of this educational activity, participants will be able to:

- Synthesize the most current research study findings in hip and knee condition management
- Evaluate various surgical and non-surgical treatment options (e.g., primary total joint arthroplasty, revision total joint arthroplasty, non-arthroplasty) in hip and knee condition management
- Assess the efficacy of new treatment options through evidence-based data
- Interpret relevant healthcare policy



ACCREDITATION AND CME CREDIT

The American Association of Hip and Knee Surgeons (AAHKS) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

The American Association of Hip and Knee Surgeons (AAHKS) designates this live activity for a maximum of *18 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

CLAIM CME CREDITS

AAHKS will send an **email** with a meeting evaluation upon conclusion of the Annual Meeting. At the end of the evaluation, there will be a link to claim CME credit. It is the meeting attendee's responsibility to claim credits based on the hour-for-hour participation actually spent in the educational activity.

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Education

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An indication of the participant's disclosure appears after his or her name as well as the commercial company or institution that provided the support. AAHKS does not view the existence of these disclosed interests or commitments as necessarily implying bias or decreasing the value of the author's participation in the course. Disclosures can be found in the back of this program and at www.AAHKS.org/Meeting.



Dr. Hofmann to Receive the 2019 AAHKS Humanitarian Award

Presenting the 2019 AAHKS Humanitarian Award to Aaron A. Hofmann, MD

Aaron A. Hofmann, MD has been selected as the 2019 American Association of Hip and Knee Surgeons (AAHKS) Humanitarian Award recipient. Dr. Hofmann, who is a 1991 charter member of AAHKS, founded Operation Walk Utah 15 years ago after traveling on an Operation Walk mission with Lawrence D. Dorr, MD to Guatemala. The focus of Operation Walk Utah is the Hospital Nacional Santa Tecla in El Salvador where more than 800 patients are on a waiting list for hip and knee replacement surgeries. Dr. Hofmann travels with his team twice a year and sees 55-70 patients on each trip.

Each year, Dr. Hofmann invites one trainee from El Salvador to his clinic for a six-week fellowship. The trainee then returns with the Operation Walk Utah team to El Salvador to help screen and operate on their patients. He is currently working with AAHKS and the Operation Walk Central Board to establish a training center in El Salvador to teach local surgeons how to perform hip and knee replacement surgery. Dr. Hofmann is also working with the Minister of Health and Salvadorian President to establish a joint center with local surgeons in order to help shorten the long wait list for joint replacement.

Erin Hofmann told the story of how her father not only has performed more than 1,000 surgeries for Salvadorians in need, but how he also stepped in when the program lost its storage room due to the hospital's need for the space. "My dad traveled to San Salvador for 36 hours on a weekend in between his own surgeries and clinics. He showed up with one other OpWalk volunteer, building materials and a local workforce...to move equipment, pour concrete and stack cinder blocks. The storage shed they built solidifies the commitment to return to El Salvador for many years to come."

According to Dr. Dorr, "Aaron's work has sparked other Operation Walk chapters in at least eight states. No other Operation Walk Surgeon has invested so much personal money or demonstrated such entrepreneurial enthusiasm for improving his team's delivery of care to people who would otherwise remain disabled throughout their lives."

The AAHKS Humanitarian Award recognizes AAHKS members who have distinguished themselves by providing humanitarian medical services and programs with a significant focus on musculoskeletal diseases and trauma including the hip and knee in the United States or abroad.

Nominations for the 2020 AAHKS Humanitarian Award are now being accepted through April 15, 2020 at www.AAHKS.org/Humanitarian.



No Difference in Survivorship or Functional Outcome Between Surgeon Preference for Computer Assisted Navigation vs. Conventional Instrumentation in 19,221 Total Knee Arthroplasties at 12 years

Introduction: This study compares the revision rates and functional outcomes of total knee arthroplasty (TKA) implanted using computer-assisted surgery (CAS) with conventional instrumentation from a large national database at up to 12 years follow-up. Recognizing that selection bias may arise from the preferential use of CAS in difficult or complex cases, the implant survival data and postoperative functional scores were analyzed with reference to whether the surgeon routinely implanted TKA using CAS or conventional instrumentation.

Results: After 12 years, the revision rate per 100 component years was 0.437 for the “routine CAS” surgeons compared to 0.440 for the “routine conventional” surgeons ($p=0.734$). For patients under the age of 65, the revision rate per 100 component years was equivalent for “routine CAS” surgeons compared to “routine conventional” surgeons (0.585 vs. 0.508, $p=0.524$). The OKQ scores were similar at six months (38.88 vs. 38.52, $p=0.172$), five years (42.26 vs. 41.77, $p=0.206$) and ten years (41.59 vs. 41.74, $p=0.893$) when comparing the two cohorts. Surgeons who performed more than 50 TKAs using CAS took 13 minutes longer on average than those using conventional instrumentation (89 minutes vs. 76 minutes, $p<0.001$).

Notes

Functional Gain and Pain Improvement After Primary Total Knee Replacement Are Influenced by Patient Characteristics and Not Implant Manufacturer

Introduction: Implant selection is largely based on institutional factors, surgeon training, and preference. International registries compare relative revision rates by implant but do not assess functional outcomes. We sought to quantify and compare functional outcomes by implant manufacturer. We compared pre-post primary total knee replacement (TKR) pain improvement and functional gain at 12 months in a contemporary multi-site patient cohort to determine if patient-reported gains differ among implant manufacturers.

Methods: 9,818 patients (mean age=65.8 years, 65% females) received implants by Stryker, Zimmer Biomet, Smith & Nephew or DePuy. Preoperative demographics including medical (modified Charlson), musculoskeletal, and emotional (SF; MCS) comorbidity data were collected and merged with pre- and post-TKR pain and function (KOOS pain and ADL) scores from each patient. Descriptive statistics, kernel density curves, and multivariable linear models, adjusted for variation within site, were performed. Statistical significance was set at $p < 0.05$.

Results: Manufacturer A, B, C and D implants were used in 5,658, 2,202, 1,283, and 675 patients respectively. The majority reported excellent pain relief and functional gains across implants. Across implant manufacturers, pre-post improvements in KOOS knee pain scores were comparable (A=35.6, B=35.8, C=35.9, D=34.3). Similar improvements were seen in KOOS ADL scores across all implants (A=30.9, B=30.5, C=30.2, D=28.3). In multivariable models adjusting for patient covariates, implant manufacturer was not significantly associated with postoperative pain or function. However, patient factors (older age, non-white race, smoker, low back pain, pain in non-operative hips/knees, low MCS) are associated with significantly ($p<0.05$) poorer gains in pain and function.

Conclusions: Multiple different implants are used for primary TKR. No differences in postoperative pain improvement or functional gain at 12 months were seen between implant manufacturers. However, patient factors continue to significantly influence gains in postoperative pain and function.

The Cumulative Effect of Depression and Substance Abuse on Postoperative Complications After Primary Total Knee Arthroplasty

Introduction: Substance abuse, alcohol abuse and depression have individually been shown to negatively affect total knee arthroplasty (TKA) outcomes. However, their cumulative effect on postoperative complications has not been well elucidated. Therefore, this study aimed to determine the impact of depression, substance abuse and alcohol abuse on postoperative complications following TKA.

Results: 11,403 TKA patients were identified: 1,536 with a history of depression, 591 with a history of substance abuse and 91 with a history of alcohol abuse. Univariate analysis showed that depression was associated with implant failures ($p<0.001$) and alcohol abuse with PJs ($p<0.001$) and deep vein thromboses ($p=0.003$). Substance abuse was associated with PJI ($p<0.001$), wound complications ($p=0.022$) and implant loosening ($p=0.007$). Multivariate analyses found that alcohol abuse (OR: 19.419, $p<0.001$), substance disorder (OR: 3.693, $p=0.010$), and depression plus substance (OR: 13.639, $p<0.001$) were associated with PJs. Additionally, depression plus alcohol (OR: 26.616, $p=0.000$) and depression plus substance abuse (OR: 4.401, $p=0.021$) were associated with cellulitis.

Notes

Preoperative Behavioral Pain Management Strategies in Total Joint Arthroplasty: A Prospective Randomized Controlled Trial Comparing Mindfulness, Hypnosis and Cognitive-Behavioral Psychoeducation

Introduction: To better support patients' recovery after total joint arthroplasty (TJA), we introduced evidence-based, preoperative behavioral pain management strategies to our existing multi-modal pain management protocol. This study examined the effect of three different adjunctive interventions (mindfulness meditation, hypnotic suggestion, cognitive-behavioral psychoeducation) on preoperative pain and anxiety as well as physical function in early recovery following primary TJA.

Results: Linear mixed modeling, adjusted for age, BMI, and comorbidities, revealed that mindfulness and hypnosis significantly reduced preoperative pain intensity by 24% and 26% respectively ($p < 0.001$), pain unpleasantness by 29% and 33% ($p < 0.001$), and anxiety by 43% and 29% ($p < 0.001$). Preoperative mindfulness training significantly increased PROMIS PF scores from patients' preoperative to 6-week postoperative visit (+5.62, $p < 0.001$, MCID 3.34) relative to hypnosis and psychoeducation, which showed no significant change from preoperative to 6 weeks.

Notes

The Effect of the IPACK Block on Pain Following Primary TKA: A Double Blinded, Prospective, Randomized Trial

Introduction: Regional anesthesia is utilized to minimize postoperative pain following total knee arthroplasty (TKA). The purpose of this study was to determine if preoperative infiltration of local anesthetic between the popliteal artery and posterior capsule of knee (IPACK) controlled posterior knee pain following TKA.

Results: There were 35 people in the IPACK group and 34 in the NO IPACK group. There was no difference demographically between the groups. In the Post Anesthesia Care Unit (PACU), the average ($P=0.0122$) and worst ($P=0.0168$) pain scores at rest were statistically (but not clinically) significant, with lower scores in the IPACK group. There was no difference in the pain scores during physical therapy ($P=0.2080$). There was no difference in opioid consumption in the PACU ($P=0.7928$), or at 24 hours ($P=0.7456$). There was no difference in pain scores on POD 1 in the morning (a.m.) ($P=0.4597$) or evening (p.m.) ($P=0.6273$), nor was there any difference in walking distance ($P=0.5197$). There was also no difference in length of stay in the PACU ($P=0.9426$) or hospital ($P=0.2141$).

Conclusions: The IPACK group had lower pain scores at rest in the PACU, but this was not clinically significant. The routine use of the IPACK Block is not supported by the results of this study. There may be use of the IPACK block as a rescue block in patients who have contraindications to a standard multimodal treatment regimen or in patients with chronic pain or opioid dependence.

Intraoperative Surgeon Administered Adductor Canal Blockade Is Not Inferior to Anesthesiologist Administered Adductor Canal Blockade: A Prospective Randomized Trial

Conclusions: Surgeon administered ACB is not inferior to anesthesiologist administered ACB with respect to range of motion, patient satisfaction, or opioid consumption, although pain on POD 0 may be greater. Surgeon administered ACB is an effective alternative to anesthesiologist administered ACB.

Quicker and More Predictable Return of Motor Function and Ambulation After Mepivacaine vs. Bupivacaine Spinal: A Double-Blind RCT in Primary TKA and THA

Introduction: Spinal anesthesia provides several benefits for patients undergoing total knee arthroplasty (TKA) and total hip arthroplasty (THA), but historically comes at the cost of slower return of lower extremity motor function. In this prospective, double-blind, randomized clinical trial, we sought to determine if a mepivacaine spinal would allow substantially quicker and more predictable return of motor function as compared to traditional low-dose bupivacaine spinal anesthesia during primary TKA and THA.

Results: Mean time to return of lower extremity motor function was 29 minutes quicker and less variable in patients receiving mepivacaine: 184 minutes (95% CI=168-199 minutes), compared to low-dose bupivacaine: 213 minutes (95% CI=184-241 minutes). Mean time to successful participation in physical therapy including ambulation was 20 minutes quicker and less variable in patients receiving mepivacaine: 399 minutes (95% CI=375-423 minutes), compared to low-dose bupivacaine: 419 minutes (95% CI=388-451 minutes). The proportion of patients experiencing postoperative orthostatic hypotension or transient neurologic symptoms in those receiving mepivacaine compared to low-dose bupivacaine was 18% vs. 11% and 0% vs. 0%, respectively (non-significant).

Conclusions: For patients undergoing primary TKA and THA, spinal anesthesia with mepivacaine allowed quicker and less variable return of lower extremity motor function compared to low-dose bupivacaine, without a concomitant increase in complications potentially associated with spinal anesthetics. This is particularly of value in an era of short-stay and outpatient surgery.

The Use of Tourniquet Does Not Negatively Influence Outcomes in Total Knee Arthroplasty: A Randomized Controlled Trial

Introduction: Intraoperative tourniquet use in total knee arthroplasty (TKA) is a common practice which may improve visualization of the surgical field and reduce blood loss. However, the safety and efficacy associated with tourniquet use continues to be the subject of debate among orthopaedic surgeons. The primary purpose of this study is to evaluate the effects of tourniquet use on pain, opioid consumption and patient-reported outcomes (PROs) following TKA.

Results: In total, 70 patients were included in this study, with 37 patients undergoing TKA without tourniquet and 33 patients with tourniquet. No statistically significant differences were found in surgical time (124.3 vs. 121.5 minutes; $p=0.80$), LOS (2.4 vs. 2.4 days; $p=0.98$), pain scores (2.0 vs. 2.2; $p=0.76$), inpatient opioid consumption (32.2 vs. 36.6 MMEs; $p=0.65$), outpatient opioid consumption (28.1 vs. 25.4 MMEs; $p=0.81$), KOOS, JR. scores (63.5 vs. 53.9; $p=0.17$), AM-PAC (21.1 vs. 21.1; $p=0.97$), VR-12 PCS scores (38.5 vs. 44.0; $p=0.39$), and VR-12 MCS (52.3 vs. 47.6; $p=0.55$) scores between the tourniquet-less and tourniquet cohorts, respectively. There were no readmissions in either cohort during the 90-day episode of care.

Conclusions: Utilization of a tourniquet during TKA does not negatively impact postoperative pain scores or opioid consumption. Furthermore, use of a tourniquet does not appear to affect patient satisfaction or outcomes.

Symposium I

Multimodal Anesthesia and Analgesia in Total Joint Arthroplasty: Where Do We Stand in 2019? A Collaborative Clinical Practice Guideline

Moderator: William G. Hamilton, MD

Faculty: Yale A. Fillingham, MD, Denis Nam, MD, MSc, James A. Browne, MD

Effective pain control after total joint arthroplasty (TJA) has been shown to improve outcomes including faster recovery, lower complication rates, reduced costs of care, and improved patient satisfaction. There are many anesthetic and analgesic options to control pain after TJA. Historically, opioids were a cornerstone of controlling pain after TJA. However, opioids have significant side effects and risks, including addiction, which has led to the opioid epidemic the United States is fighting today. Multimodal analgesic regimens in TJA have garnered significant interest because they limit the use of opioids perioperatively. Yet, today there is no consensus regarding the optimal anesthesia and anesthetic regimen for TJA that maximizes effective postoperative pain control and minimizes the risks associated with prescribing opioids. This symposium will present and discuss the initial findings of the Anesthesia & Analgesia in Total Joint Arthroplasty Clinical Practice Guidelines, which is a collaboration between the American Association of Hip and Knee Surgeons, American Academy of Orthopaedic Surgeons, American Society of Regional Anesthesia and Pain Medicine, the Hip Society, and the Knee Society. This will be the first of a two-part series presenting the findings on oral medications including opioids, nonsteroidal anti-inflammatories, acetaminophen, and gabapentinoids. We will discuss the current evidence for each of the medications and address current controversies, such as oral vs. intravenous acetaminophen, how to manage preoperative opioid users, and whether gabapentinoids should be used for both hip and knee arthroplasty.

Learning Objectives:

1. To discuss the current controversies and the current evidence on acetaminophen, nonsteroidal anti-inflammatories, and gabapentinoids for the treatment of pain during and after THA and TKA.
2. To understand the current opioid epidemic, the role of the arthroplasty surgeon, and how to minimize opioid use after THA and TKA.
3. To discuss the challenges associated with patients taking opioids prior to THA or TKA and the best evidence-based methods for treating these patients and their pain both prior to and after surgery.

Outline:

Introduction

William G. Hamilton, MD

Opioids in Arthroplasty: The Many Challenges Facing Arthroplasty Surgeons in 2019

Denis Nam, MD, MSc

Acetaminophen: Is There a Difference Between Oral and IV?

William G. Hamilton, MD

Gabapentinoids: How Effective Are They and Which Medication Should We Use?

James A. Browne, MD

NSAIDs: How Much, How Long, and What About Ketorolac?

Yale A. Fillingham, MD

Discussion

All Faculty

Notes

Simplifying the Hip-Spine Relationship for Total Hip Arthroplasty

Faculty: Michael P. Bolognesi, MD, Lawrence D. Dorr, MD, Douglas A. Dennis, MD

Jonathan M. Vigdorchik, MD

Pain Control After Total Hip Arthroplasty: A Randomized Trial Determining Efficacy of Fascia Iliaca Compartment Blocks in the Immediate Postoperative Period

Introduction: The purpose of this randomized trial was to identify whether fascia iliaca compartment blockade (FICB) reduces postoperative pain and narcotic consumption and improves early functional outcomes in primary THA performed through the mini-posterior approach.

Results: During the study period, 120 patients were recruited. There was no difference in the average pain scores at any time interval between the placebo and block groups during the first 24 hours ($p=0.21-0.99$). There was no difference between the pre-block and post-block pain scores in the block group (4.42 vs. 3.83, $p=0.97$). There was no difference in the cumulative morphine equivalents consumed between the two groups during any time interval postoperatively ($p=0.06-0.25$). Functional testing showed no difference between the two groups regarding distance walked during the first therapy session (65.6 vs. 76.8 ft, $p=0.33$) and timed-up-and-go testing (63.7 vs. 64.7 sec, $p=0.95$). There was an increased incidence of quadriceps weakness in the block group (22% vs. 0%, $p=0.004$) requiring the use of a knee immobilizer and alterations in therapy protocols.

Conclusions: This trial shows that FICB does not improve functional performance and does not decrease pain or narcotic usage after mini-posterior THA. However, it does increase the risk of quadriceps weakness, placing patients at an increased risk of falling and requiring changes in therapy protocols. Based on these results we do not recommend FICB after THA performed through the posterior approach.

Topical Tranexamic Acid Increases Early Postoperative Pain After Total Hip Arthroplasty[◇]

Risk of Dislocation by Surgical Approach Following Modern Primary Total Hip Arthroplasty

Introduction: There is renewed interest in dislocation after surgical approach with popularization of the direct anterior approach. The purported advantage of both the lateral and direct anterior approaches is decreased risk of dislocation. The purpose of this study was to assess the risk of dislocation by approach following modern primary total hip arthroplasty (THA).

Results: The cumulative incidence of dislocation at 1-year and 5-years by approach was as follows: posterior (2.1%; 3.0%), lateral (0.7%; 0.7%), direct anterior (0.4%; 0.4%) ($p<0.001$). Compared to the posterior cohort, the adjusted risk of dislocation was decreased for the lateral (hazard ratio [HR]=0.28, $p<0.001$) and direct anterior cohorts (HR=0.18, $p<0.001$). The cumulative incidence of revision for instability at 1-year and 5-years by approach was as follows: posterior (0.8%; 1.0%), lateral (0.6%; 0.6%), direct anterior (0%; 0%) ($p=0.09$). The adjusted risk of all-cause revision surgery was increased among the lateral cohort compared to posterior (HR=1.75, $p=0.003$) and direct anterior (HR=2.44, $p=0.002$) and among patients with diagnoses other than osteoarthritis (HR=2.89, $p<0.001$). Among patients who dislocated, 69 (83%) had anteversion $>25^\circ$.

Conclusions: This study documents the risk of dislocation by surgical approach among a large contemporary cohort undergoing primary THA. The risk of dislocation was higher following the posterior approach; whereas, all-cause revision surgery was found to be higher following the lateral approach.

The Majority of Total Hip Arthroplasty Patients with a Stiff Spine Do Not Have an Instrumented Fusion

Introduction: Total hip arthroplasty (THA) patients with limited lumbar flexion have increased rates of dislocation. An instrumented spinal fusion is a well-recognized cause that's risk increases with increasing number of levels fused. However, many patients without an instrumented fusion also exhibit abnormal spinopelvic mobility. The purpose of this study was to understand the proportion of THA patients without an instrumented fusion that have limited lumbar flexion and behave as if they are mechanically fused.

Results: Of the 6,340 patients, 207 (3%) had an instrumented fusion. Of these 207 patients, only 67 (32%) had a lumbar flexion <20 degrees. Of the combined 6,340 patients, 355 (6%) had limited lumbar flexion. Of these 355 patients, only 67 (19%) had an instrumented fusion.

Conclusions: The vast majority (81%) of THA patients with a stiff spine do not have an instrumented fusion. We recommend preoperative spinopelvic assessment of all patients undergoing THA, as only a minority of those with limited lumbar flexion have an instrumented fusion and may otherwise be overlooked. Lumbar degenerative disc disease is common in THA patients, limits the available lumbar flexion in the same way an instrumented fusion might and potentially increases the risk of dislocation in this subset of patients.

The Effect of Preoperative Anemia on Complications Following Total Hip Arthroplasty

Introduction: Complications following total hip arthroplasty (THA) can lead to increased costs and patient dissatisfaction. Current literature suggests that preoperative hematocrit levels may play an important role in determining risk for complications following THA. The purpose of this study was to determine the role of preoperative anemia status on 30-day complications following total hip arthroplasty.

Results: Multivariate logistic regression analysis identified mild anemia compared to normal hematocrit as a significant risk factor for total complications (OR 1.46, $p < 0.001$), mortality (OR 2.06, $p < 0.001$), renal complications (OR 2.59, $p < 0.001$), respiratory complications (OR 1.89, $p < 0.001$), sepsis (OR 2.01, $p < 0.001$), wound infection (OR 1.36, $p < 0.001$), and urinary tract infection (OR 1.44, $p < 0.001$). Severe anemia was also a risk factor with a higher odds ratio for total complications (OR 1.99, $p < 0.001$). Both mild and severe anemia were significant risk factors for increased rates of perioperative blood transfusion (mild: OR 4.04, severe: OR 5.58), non-home discharge (OR 1.74, OR 1.64), and unplanned hospital readmissions (OR 1.42, OR 1.66).

Notes

Does Femoral Morphology Predict the Risk of Periprosthetic Fracture After Cementless Total Hip Arthroplasty?

Introduction: Periprosthetic femur fracture remains a leading mode of early failure following cementless total hip arthroplasty (THA). The purpose of this study was to determine if a specific femoral morphology is associated with an increased risk of periprosthetic fracture after cementless THA.

Results: Greater endosteal width in fracture vs. control patients at 10cm distal to the lesser trochanter (15.28 vs. 14.37, $p=0.1$) resulted in differences in the CFI (3.05 vs 3.28, $p=0.03$), CCR (0.50 vs. 0.47, $p=0.03$), and CBR (0.46 vs. 0.43, $p=0.03$) between the two groups. These measurements indicate decreased meta-diaphyseal taper in fracture patients. Femoral neck angle was more varus in fracture patients (131.4 vs. 134.6 degrees, $p=0.04$). There were no differences in the stem canal fill (0.84 vs. 0.86 at mid-third, $p=0.1$; 0.85 vs. 0.88 at distal third, $p=0.09$), stem varus or valgus position ($p=0.08$), or distal stem-cortex contact ($p=0.6$) between cohorts.

Conclusions: Patients sustaining an acute, periprosthetic fracture with cementless femoral fixation after THA had thinner distal cortices and a decreased meta-diaphyseal taper. Surgeons should be aware of the potential risk of periprosthetic fracture in patients with this specific morphology when performing a cementless THA.

Does Femoral Component Cementation Affect Costs or Clinical Outcomes After Hip Arthroplasty in Medicare Patients?

Introduction: Although cementless femoral fixation in total hip arthroplasty (THA) is known to contribute to higher complication and reoperation rates when compared to cemented fixation, utilization of cementless femoral fixation continues to rise. New data is available from the Centers for Medicare and Medicaid Services (CMS) regarding total costs of care per surgical episode. Using this data, we investigated whether femoral cementation affects: (1) 90-day costs; (2) readmission rates; (3) re-operation rates; (4) length of stay (LOS); and (5) discharge disposition for Medicare patients undergoing THA.

Methods: We performed a multicenter retrospective cohort study of 1,671 primary THA cases in Medicare patients. CMS data was used to evaluate lump costs including the surgical admission and early postoperative period. Costs were correlated with clinical outcomes from electronic medical record review. Multiple regression analyses were performed to assess differences in costs and outcomes.

Results: Controlling for cohort differences, cemented patients were significantly more likely to be discharged home compared to cementless patients. Cemented patients also demonstrated trends toward lower costs, lower readmission rates, and shorter LOS compared to cementless patients. All reoperations within the early postoperative period occurred in patients managed with cementless femoral fixation.

Conclusions: In a large Medicare population, cemented femoral fixation outperformed cementless fixation with respect to discharge disposition and also trended toward superiority with regards to LOS, readmission, cost of care, and reoperation. Cemented femoral fixation remains relevant and useful despite the rising popularity of cementless fixation. Orthopaedic surgeons in training should become competent with femoral cementation technique.

Total Knee Arthroplasty Removal from the Medicare Inpatient-Only (IPO) List: Implications for Surgeons, Patients, and Hospitals

Faculty: Derek A. Haas, MBA, C. Lowry Barnes, MD, Charles M. Davis, MD, PhD

1. To understand the current state of adoption for outpatient TKAs across the country .
2. To become more attuned to the financial implications of TKA patients having different lengths of stay in the hospital and how their cases are coded.
3. To get ready for increased adoption of outpatient TKAs .
4. To be thoughtful about what payment models will enable you to be most successful based on your level of adoption of outpatient TKAs.

[illegible]

Removal of Total Knee Arthroplasty from the Inpatient Only List Adversely Affects Bundled Payment Programs

Introduction: Beginning in January 2018, the Centers for Medicare and Medicaid Services (CMS) removed total knee arthroplasty (TKA) from its inpatient only (IPO) list. Many hospitals inappropriately began to schedule all TKA procedures as an outpatient, excluding them from CMS bundled payment programs. The purpose of this study was to determine the impact of the removal of TKA from the IPO list on our institution's Bundled Payments for Care Improvement (BPCI) Initiative.

Results: Of the 2,135 primary TKA patients in 2018, 908 (43%) were classified as an outpatient. Of the outpatient cases, 147 (18%) had a length of stay beyond two-midnights, potentially qualifying for inpatient status. Inpatients had a longer length of stay (1.9 vs. 1.4 days, $p<0.001$) and higher rates of discharge to rehabilitation (17% vs. 3%, $p<0.001$), but no difference in medical comorbidities, complications, or readmissions (all $p>0.05$). Ninety-day episode-of-care claims cost increased when comparing the BPCI patients from 2017 to 2018, (\$19,222 vs. \$19,417, $p=0.002$). The removal of TKA from the IPO list resulted in a projected loss of at least \$2,896,520 in unrealized savings for our institution's BPCI program.

Conclusions: By excluding all outpatient TKA from bundled payment programs, the increased costs of BPCI may disincentivize providers from participating. CMS should provide clarity as to documentation for outpatient status and address the negative implications on alternative payment models.

The Clinical and Financial Consequences of the Centers for Medicare and Medicaid Services' Two-Midnight Rule in Total Joint Arthroplasty

Introduction: To lessen the financial burden of total joint arthroplasty (TJA) and encourage shorter hospital stays, the Centers for Medicare and Medicaid Services (CMS) recently removed total knee arthroplasty (TKA) from the inpatient-only (IPO) list. This policy change now requires providers and institutions to apply the two-midnight rule (TMR) to short-stay (one-midnight) inpatient hospitalizations (SSIH).

Results: The overall percentage of Medicare SSIH's increased significantly from 2.7% in 2012 to 17.8% in 2016 ($p < 0.0001$). Scenario 1 resulted in no change in out-of-pocket (OOP) costs to patients, no change in CMS payments, and hospital losses of \$117.0 million. Scenario 2 resulted in no change in patient OOP costs, reduction in payments from CMS of \$181.8 million, and hospital losses of \$357.3 million. Scenario 3 resulted in no change in patient OOP costs, no change in CMS payments, and an estimated \$1.71 billion of SSIH charges at risk to hospitals for audit.

Conclusions: The results of this analysis reveal the conflict between LOS trends following TJA and the imposition of the TMR. In the absence of a change in current policy, it is imperative that CMS provide stakeholders with unambiguous criteria for short-stay inpatient hospitalizations.

Surgeon Reimbursement Unchanged as Hospital Charges and Reimbursements Increase for Total Hip Arthroplasty

Introduction: As total hip arthroplasty (THA) incidence in the United States increases, healthcare entities look to reform policy to decrease costs while improving efficiency and quality of care. The relationship between surgeon and hospital charges and payments for THA has not been well examined. The goal of this study is to report trends and variation in hospital charges and payments compared to surgeon charges and payments for THA in a Medicare population.

Results: 56,228 patients were included. Hospital charges were significantly higher than surgeon charges throughout the study period and increased substantially (CM increased 8.7 to 11.5, $p < 0.0001$). Hospital payments relative to surgeon payments followed a similar trend (PM increased 11.0 to 15.2, $p < 0.0001$). Similar trends were noted in all four regions of the US. LOS decreased significantly throughout the study from 4.14 to 2.99 days ($p < 0.0001$), while CCI remained stable. As LOS decreased, the ratio of hospital to surgeon charges and payments paradoxically increased.

Conclusions: Hospital charges and payments relative to surgeon charges and payments have significantly increased for THA despite stable patient complexity, measured by CCI and decreasing LOS. As health care shifts toward value-based care with shared responsibility for outcomes and cost, more closely aligned incentives between hospitals and providers is needed.

Hospital Total Joint Arthroplasty Case-Mix Burden and Patient Flows in the Era of Payment Reform: Impact on Resource Utilization Among New York State Hospitals

Introduction: Alternative payment models have been increasingly adopted in orthopedic surgery; mainly bundled payments in total joint arthroplasty (TJA). Concerns persist regarding unintended consequences, such as the selection of healthier TJA candidates. We aimed to study potential selection in terms of: 1) trends in patient comorbidity burden; and 2) the association with costs.

Results: Overall, 46 (n=8,810), 39 (n=16,300) and 67 (n=11,255) hospitals were categorized into the increased, stable and decreased comorbidity burden categories, respectively. Hospitals with decreased patient comorbidity were generally those with a lower annual TJA volume (median: 481) compared to those with increased (median: 558) or stable patient comorbidity (median: 726, $p<0.0001$). Adjusting for relevant covariates, we found that increased patient comorbidity was associated with increased costs (maximum 22% CI 19%-25%, $p<0.0001$). However, this effect was moderated in hospitals with increased comorbidity burden. Similarly, increased patient comorbidity was associated with increased odds (maximum OR 3.06 CI 2.59-3.61, $p<0.0001$) of institutional post-acute care discharge. This effect was weakest in hospitals with increased patient comorbidity.

Conclusions: The majority of hospitals studied saw a decrease in TJA patient comorbidity burden, which may be suggestive of patient selection. Our findings also suggest that a redistribution of comorbid patients to select hospitals could be beneficial, as these hospitals may be better equipped to care for them.

Are We Treating Similar Patients? Hospital Volume and the Difference in Patient Populations for Total Knee Arthroplasty

Introduction: Early findings of superior total knee arthroplasty (TKA) outcomes at high-volume centers have led to distinct referral patterns based on patient factors and hospital volume. We compared characteristics of primary TKA patients at high-volume hospitals to those at lower volume hospitals.

Results: There was a greater percentage of high-risk patients at high-volume hospitals, compared to those at intermediate- or low-volume hospitals ($p<0.001$). Multivariate analysis showed that patients with a BMI >40 were more likely to be treated at high-volume centers compared to intermediate- (OR 1.4; $p<0.001$) and low-volume centers (OR 1.4; $p<0.001$). Patients with CCI scores ≥ 4 were more likely to be treated at high-volume hospitals compared to intermediate- (OR 1.5; $p<0.001$) or low- (OR 1.2; $p=0.002$) volume centers. Overall, patients with BMI >40 were 38% more likely to undergo TKA at high-volume hospitals (OR 1.4; $p<0.001$) and patients with CCI scores ≥ 4 were 38% more likely to undergo TKA at high-volume hospitals (OR 1.4; $p<0.001$) compared to both low- and intermediate-volume hospitals combined.

Conclusions: Analyzing disparities in patient populations is crucial to accurately interpret outcome comparisons between hospitals as they have substantial impact on reporting quality metrics. This study found hospitals performing >500 TKAs per year treated patients with higher BMIs and greater comorbidity burdens.

Reviews of Orthopedic Surgeons on Physician Rating Websites: Analysis of 11,535 Reviews

Introduction: Physician rating websites have become an increasingly popular method for patients to give feedback and obtain information about physicians and their past performances. Each physician rating website uses different criteria to evaluate physicians, with the option for patients to provide written reviews. Our goal was to identify factors that patients value when seeing an orthopedic surgeon.

Results: Online reviews of orthopedic surgeons in state analysis were evaluated in April 2019, accumulating a total of 11,535 reviews. The average overall rating of orthopedic surgeons was positive at 83.6 on our scale. The majority of physicians amassed 20 reviews or fewer on each website. Higher ratings of orthopedic surgeons were correlated with staff friendliness ($p=0.010$), punctuality ($p=0.009$), and knowledge/expertise ($p=0.031$). Analysis of written reviews showed that resolutions of original patient complaint were associated with a high-scoring review.

Notes

Body Mass Index Is a Better Predictor of Periprosthetic Joint Infection Risk than Local Measures of Adipose Tissue Following Total Knee Arthroplasty

Introduction: Both body mass index (BMI) and local measures of adiposity at the surgical site have been identified as potential risk factors for periprosthetic joint infection (PJI) following total knee arthroplasty (TKA). We aimed to evaluate previously used measures of assessing knee adiposity and to determine what measure is best for predicting both surgical duration and PJI following TKA.

Results: The PJI rate at one year was 0.7% (31/4, 745). There was a strong correlation between PJI risk and BMI >35 (OR 2.9, 95% CI 1.4-6.1). In contrast, neither KAI nor pre-patellar fat thickness showed a significant correlation with PJI risk ($p>0.05$). We observed substantial variability in local measures of adiposity (KAI and pre-patellar fat thickness) compared to BMI. Surgical duration was longer with higher BMI and higher measures of local adiposity (KAI and pre-patellar fat thickness).

Conclusions: Local adiposity at the knee varies greatly for any given BMI. BMI is superior to measures of local adiposity at the surgical site in predicting PJI following TKA. The systemic effects of obesity may be more important than local adipose tissue in PJI risk following TKA.

Fate of the Morbidly Obese Patient Who Is Denied Total Joint Arthroplasty

Introduction: The purpose of this study was to investigate the outcomes of patients denied total hip arthroplasty (THA) or total knee arthroplasty (TKA) due to morbid obesity (BMI>40kg/m2).

Results: 2,819 individuals were identified. 125 (4.4%) were denied THA or TKA due to morbid obesity. 24 of those (19.2%) met requisite weight and underwent arthroplasty at our institution. The remaining 101 were contacted: 31 (30.7%) agreed to participate including 7 (22.6%) with hip and 24 (77.4%) with knee arthritis. The average age at denial was 59.1 vs. 62.6 years at survey. Of those denied THA (n=7), three (42.9%) sought second opinions and received an average of two additional denials. None achieved a BMI under 40kg/m² or received THA. The average HHS (/100) at survey was 34.6±13.1. Of those denied TKA (n=24), thirteen (54.2%) sought second opinions and received an average of 0.75 additional denials. Five (38.5%) subsequently received TKA at an outside institution, with an average BMI of 49.2±6.3 kg/m² compared to 47.8±5.3 kg/m² at our denial (p=0.71). One (20.0%) developed prosthetic joint infection. One (4.2%) achieved requisite BMI (39.6kg/m²) but did not undergo arthroplasty. There was no difference in KSS Pain (/50) or Function (/100) between those denied TKA (8.8±11.5; 34.1±22.5) and those who subsequently underwent TKA elsewhere (13.0±19.9; 28.0±43.1) (p=0.55; 0.68).

Conclusions: At a minimum 2-year follow up, 80.0% never achieved a BMI under 40kg/m². Those who sought another opinion were often denied again due to obesity. In the small subset of patients that ultimately underwent arthroplasty by another surgeon, outcomes were poor and similar to non-arthroplasty.

Primary Total Knee Arthroplasty Performed Using High-Viscosity Cement Is Associated with Higher Odds of Revision for Aseptic Loosening

Introduction: Aseptic loosening (AL) is the most common reason for revision total knee arthroplasty (TKA). An association between high viscosity cement (HVC) and AL has been suggested by small, uncontrolled, case-series. This study sought to determine whether HVC use during primary TKA is independently associated with the development of AL requiring revision. Our null hypothesis was no difference in revision for AL rates between cement type groups.

Results: 10,016 patients were included. Revision for AL was significantly higher in the HVC cohort (91/4791; 1.9%) vs. the LVC cohort (48/5224; 0.92%) ($p < 0.001$). After controlling for potential confounders, logistic regression demonstrated HVC to be independently associated with higher odds of revision for AL (OR: 2.17, 95% CI: 1.46-3.21, $p < 0.001$). Younger age was associated with higher odds of revision for AL (OR: 0.96, 95% CI: 0.94-0.98, $p < 0.001$). Preoperative diagnosis, BMI and antibiotics in cement were not associated with AL, although implant manufacturer and type dynamically influenced rates of revision for AL in the HVC cohort.

Notes

Stiffness After Total Knee Arthroplasty: Is It a Result of Spinal Deformity?

Identification of Clinical and Biological Risk Factors for Postoperative Stiffness After Total Knee Arthroplasty for Osteoarthritis

Introduction: There is evidence that cytokines and adipokines play a role in the development of organ fibrosis, however the role of inflammation in the development of arthrofibrosis after total knee arthroplasty (TKA) has not been well explored. This study aims to identify differences in the perioperative clinical and cytokine profiles of patients who do and do not develop stiffness after TKA performed for osteoarthritis (OA).

Results: 19.8% (32/162) of patients met criteria for postoperative stiffness at 6 weeks following TKA for OA. Lower preoperative ROM and presence of neuropathic pain were associated with increased risk of postoperative stiffness. Postoperative plasma levels of 9/31 cytokines studied were significantly different between stiff and non-stiff patients ($p < 0.05$) including Interferon Gamma Induced Protein 10 (IP10) and Interleukins 5, 7, and 12p70.

Conclusions: Nearly 20% of patients in this cohort developed early postoperative knee stiffness, which was associated with limited preoperative ROM, neuropathic pain, and acute postoperative differences in levels of nine cytokines. These results support the theory that the biologic response to surgery in the first two days postoperatively may influence long-term clinical outcomes. Future research directed towards early control of inflammatory cytokines may identify interventions to reduce post-TKA stiffness.

Manipulation Under Anesthesia After Total Knee Arthroplasty: Who Still Requires a Revision?

Introduction: Stiffness after total knee arthroplasty (TKA) is a multifactorial complication involving patient, implant, surgical technique and rehabilitation factors occasionally necessitating manipulation under anesthesia (MUA) or revision. Few modern databases contain sufficient longitudinal information on all of these factors. We characterized the MUA after primary TKA population and identified independent risk factors for early revision TKA after MUA from the American Joint Replacement Registry (AJRR).

Methods: We retrospectively reviewed primary TKAs for patients ≥ 65 years old in the AJRR from 01/01/2012-3/31/2019. We linked these to the Centers for Medicare and Medicaid Services database to identify MUA and revision TKA procedure codes. We compared groups with Chi-squared testing and identified independent risk factors for subsequent revision with multivariable logistic regression presented as odds ratios with 95% confidence intervals.

Results: Of 871,032 primary TKAs included, 5,491 (0.6%) underwent MUA after a median of 2.0 ± 1.0 months. Revision surgery occurred in 350 (4.7%) of MUA patients after median of 7 months. The timing of MUA was not different between revision and no revision patients ($p=0.26$). Patients undergoing MUA were older than non-manipulation patients (70 vs. 67 years old, $p<0.01$) with a higher incidence of tobacco use (4.8% vs. 1.5%, $p<0.01$). However, younger age was an independent risk factor for revision after MUA (0.97, 0.96-0.98, $p<0.01$). The utilization of cruciate retaining implants was significantly lower in both MUA patients (13% vs. 55%, $p<0.01$) and patients undergoing revision after MUA (24% vs. 50%, $p<0.01$). Cruciate retaining design was not independently associated with revision TKA after MUA ($p=0.73$).

Conclusions: The incidence of MUA after primary TKA is low at 0.6% in the Medicare population but 4.7% of MUA patients progress to early revision after a median 7 months. Younger age was associated with revision TKA after MUA.

Polymerase Chain Reaction Multiplex Provides Minimal Utility in Periprosthetic Joint Infection Diagnosis

Introduction: Utilization of molecular sequencing modalities in periprosthetic joint infection (PJI) diagnosis and organism identification have gained popularity. Polymerase chain reaction (PCR) multiplex offers timely results of common organisms within 24 hours. The purpose of this study was to compare the diagnostic accuracy of PCR multiplex, culture, the Musculoskeletal Infection Society (MSIS) criteria, and the recently proposed criteria by Parvizi et al. in the diagnosis of PJI.

Results: When comparing to the MSIS criteria, concordance was significantly lower for PCR at 65.9% compared to 87.6% for culture ($p<0.001$). There was no significant difference based on prior infection ($p=0.706$) or sample collection method (tissue swab or synovial fluid) ($p=0.316$). Of the 78 patients that met MSIS criteria, only 20 (25.6%) samples identified an organism.

Conclusions: In our series, PCR has little utility as a stand-alone test for PJI diagnosis with a sensitivity of only 25.6% when using MSIS criteria as the gold standard. PCR also appears to be significantly less accurate than culture in the diagnosis of PJI. Currently, laboratory tests used for either criteria for PJI diagnosis should be obtained along with the overall clinical picture to help guide decision making for PJI treatment.

Prospective, Multicenter, Adjudicator-Blinded Clinical Trial of the Alpha-Defensin Lateral Flow Test for Periprosthetic Infection

Introduction: The purpose of this study was to evaluate the diagnostic performance of the alpha-defensin (AD) lateral-flow test for periprosthetic joint infection (PJI) for FDA submission, and secondarily to compare the AD lateral flow test to the AD laboratory-based test for PJI.

Results: The AD lateral flow test for PJI demonstrated a sensitivity of 94.3% (95% CI: 88.5-97.7%) and specificity of 94.8% (95% CI: 91.2-97.2%) in the combined cohorts. In the prospective cohort alone, the AD lateral flow test had a sensitivity of 89.7% (95% CI: 78.8-96.1%) and specificity of 94.8% (95% CI: 91.2-97.2%). The exclusion of 17 samples with a red blood cell count >1,000,000 cells/ul in this cohort yielded a sensitivity of 94.4% (95% CI: 84.6-98.8%). There was no statistically significant impact of prior antibiotic treatment, other medication treatment, underlying systemic inflammatory diagnoses or culture positivity. The sensitivity and specificity of the AD lateral flow test (94.3 and 94.8%) in combined cohorts did not demonstrate a statistically significant difference from the AD laboratory-based test (92.7 and 97.6%; both $p>0.05$).

Conclusions: This study demonstrates that the AD lateral flow test for PJI has excellent performance in diagnosing PJI, similar to the laboratory-based test for AD. It is now the first FDA-authorized diagnostic test to aid in detecting PJI.

Diagnostic Utility of a Novel Point-of-Care Test of Calprotectin for Periprosthetic Joint Infection in Total Knee Arthroplasty Patients

Introduction: Several synovial fluid biomarkers for diagnosis of periprosthetic joint infection (PJI) are being investigated, however point-of-care (POC) tests are not widely available. Synovial calprotectin can effectively exclude PJI diagnosis and a novel lateral flow POC test for synovial calprotectin has shown potential to be an effective PJI diagnostic tool. Thus, the objective of this study was to test the sensitivity and specificity of a calprotectin POC test for PJI in total knee arthroplasty (TKA) patients, using the gold standard Musculoskeletal Infection Society (MSIS) 2013 PJI diagnosis criteria.

Methods: Synovial fluid samples were prospectively collected from 73 patients who underwent revision TKA (rTKA) at two academic institutions. Patients followed the hospital standard of care for their diagnostic work-up. Data collection included demographic, clinical, and laboratory data following the MSIS 2013 PJI diagnosis criteria. Synovial fluid samples were analyzed by synovial calprotectin POC tests using manufacturer's instructions. Quantitative calprotectin read-outs were categorized into high risk (>50 mg/L), medium risk (14-50 mg/L) and low risk (<14 mg/L) for infection by the test reader system. Patients were categorized as septic or aseptic using MSIS 2013 PJI diagnosis criteria by two independent reviewers blinded to the calprotectin results. Test performance characteristics with sensitivities, specificities, and areas under the curve (AUC) were calculated for 2 thresholds for infection: 1) >50 mg/L, and 2) >14 mg/L.

Results: Following MSIS criteria, 26 rTKAs were MSIS positive and 47 rTKAs were MSIS negative. For threshold 1 (>50 mg/L), the POC performance showed a sensitivity, specificity, and AUC of 96.2%, 93.6%, and 0.949 respectively. For threshold 2 (>14 mg/L), there was a sensitivity, specificity, and AUC of 100.0%, 78.7%, and 0.894 respectively.

Conclusions: Calprotectin POC test has excellent diagnostic properties including high sensitivity and specificity for diagnosing PJI in rTKA.

Reinfection or Persistence of Periprosthetic Joint Infection? Next Generation Sequencing Reveals New Findings

Introduction: Surgical management of PJI remains challenging with patients failing treatment despite our best efforts. An important question is whether these later failures reflect reinfection or the persistence of infection. Proponents of reinfection believe hosts are vulnerable to developing infection and new organisms emerge. The alternative hypothesis is that later failure is a result of an organism that was present but had not been given the chance to become a pathogen or was under antibiotic pressure and then turned into a pathogen. This multicenter study explores the second theory. Utilizing next-generation sequencing (NGS), we hypothesize that failures are often the result of an organism present at the time of initial surgery.

Methods: This prospective study involving 15 institutions collected samples from 635 revision total hip (n=310) and knee (n=325) arthroplasties. Synovial fluid, tissue and swabs were obtained intraoperatively for NGS analysis. Patients were classified per 2018 Consensus definition of PJI. Treatment failure was defined as reoperation for infection that yielded positive cultures during minimum 1-year follow-up. Concordance of the infecting pathogen cultured at failure with NGS analysis at initial revision was determined.

Results: Among the total cohort, 203 revisions were considered infected and 432 were aseptic (based on ICM-criteria). Of the infected cases, 157 were NGS-positive and 46 NGS-negative. Twenty-nine ICM-positive patients (29/157; 18.5%) failed by reoperation with an organism confirmed on culture. In 23 of these (23/29; 79.3%), the organism at failure was present on NGS at initial revision. The remaining 6 cases detected discordant organisms between initial NGS and culture at failure. Of the 432 ICM-negative patients, NGS identified microbes in 48.1% (208/432) of “aseptic” revisions, and 17 of these failed. Thirteen of the 17 failures (76.5%) were due to an organism previously detected by NGS at initial revision.

Notes

Antibiotic Susceptibility of Organisms Recovered in Culture from Patients with Acute Prosthetic Joint Infection Following Primary Total Knee Arthroplasty

Introduction: Periprosthetic infection (PJI) after primary total knee arthroplasty (TKA) affects 1-2% of cases. Local prophylactic antibiotics, including tobramycin or gentamicin mixed in polymethylmethacrylate bone cement and vancomycin powder, are used despite mixed evidence for efficacy. Here, we report the antibiotic susceptibility of organisms recovered in culture from acute PJI after primary TKA to gentamicin, tobramycin and vancomycin.

Results: 18 cases of PJI after TKA were identified, including 4 polymicrobial infections (22.2%). Average time to revision was 38 days (range: 6-84 days). 34.8% of bacterial isolates were resistant to gentamicin, 39.1% were resistant to tobramycin and 17.4% were resistant to vancomycin. Of the 8 bacterial isolates resistant to gentamicin, 7 (87.5%) were susceptible tobramycin. Of the 9 bacterial isolates resistant to tobramycin, (88.9%) were susceptible to vancomycin. One bacterial isolate, a fusobacterium nucleatum from a polymicrobial infection was resistant to gentamicin, tobramycin and vancomycin.

Conclusions: Over one-third of bacteria causing acute PJI after primary TKA were resistant to aminoglycosides premixed in commercially available bone cements. All but one of the bacteria resistant to gentamicin and tobramycin were susceptible to vancomycin. The addition of vancomycin to bone cement or as powder in the surgical field can expand antibiotic coverage to include most organisms responsible for acute PJI after TKA.

Cutibacterium acnes Colonization: Implications for Total Hip Arthroplasty

Jacob M. Elkins, MD, PhD, Douglas A. Dennis, MD, Lindsay T. Kleeman-Forsthuber, MD, Todd M. Miner, MD, Charlie C. Yang, MD, Jason M. Jennings, MD

Introduction: *Cutibacterium acnes* (*C. acnes*) is now recognized as a clinical entity in periprosthetic joint infections (PJI) of the shoulder and spine. However, the colonization rate of *C. acnes* in the adult hip is currently unknown. Therefore, the purpose of this study was to investigate the rate of *C. acnes* colonization from the skin of healthy subjects from various anatomic locations corresponding to direct anterior and lateral/posterolateral surgical approaches.

Methods: 90 patients scheduled for hip or knee surgery were recruited for cultured biopsies. Four 3-mm dermal punch biopsies were collected after administration of anesthesia, but prior to delivery of perioperative antibiotics. Pre-biopsy skin prep consisted of a standardized preoperative 2% chlorhexidine skin cleanse and an additional 70% isopropyl alcohol mechanical skin scrub immediately prior to biopsy collection. Two culture samples 10-cm apart were collected from a location approximating a standard direct anterior skin incision, and two samples 10-cm apart were collected from a location approximating a lateral skin incision (suitable for a posterior, direct-lateral or anterolateral surgical approach). Samples were cultured for two weeks.

Results: 22 of the 90 (24%) patients had a positive culture biopsy, 14 of which (16% of all patients) were positive for *C. acnes*. Ten (71%) of the culture positive biopsies for *C. acnes* were obtained from the anterior location with 50% of those obtained from the most proximal sample site.

Conclusions: Approximately 16% of the patients in the study demonstrated positive *C. acnes* colonization about the hip, the majority of which occurred from an anterior location. *C. acnes* should be considered in the diagnosis of PJI after THA. Given the high rate of skin colonization, particularly regarding the direct anterior approach to the hip, these results have stimulated consideration for different skin preparations for the THA patient.

Notes

Symposium IV

The Current State of Practice Patterns of AAHKS Members

Moderator: Jay R. Lieberman, MD

During this symposium, the moderator will survey AAHKS members at the 2019 Annual Meeting to learn about their practice patterns.

Learning Objectives:

1. To learn the present practice of AAHKS members
2. To note any changes in practice patterns compared to prior surveys

Notes

The Lawrence D. Dorr Surgical Techniques and Technologies Award

Aseptic Reoperations Within One Year of Primary Total Hip Arthroplasty Markedly Increase the Risk of Later Periprosthetic Joint Infection

Ashton H. Goldman, MD, Douglas Osmon, MD, Arlen D. Hanssen, MD, Mark W. Pagnano, MD, Daniel J. Berry, MD, Matthew P. Abdel, MD

Introduction: Despite the success of primary total hip arthroplasty (THA), a subgroup of patients will require an aseptic reoperation within the first year of the index THA. The goal of this study was to evaluate the risk of periprosthetic joint infection (PJI) in patients undergoing an aseptic reoperation within one year of a primary THA.

Methods: A retrospective review utilizing our total joint registry identified 213 primary THAs requiring aseptic reoperation within the first year following index arthroplasty. Septic reoperations and closed procedures were excluded. A control group of 15,415 THAs not requiring reoperation within the first year was identified. Patients were divided into 2 groups based on time from the index THA: 1) less than 90 days (n=112 THAs; 40% instability, 34% fracture, 8% contained hematoma/seroma); 2) 90 days to 365 days (n=101 THAs; 37% instability, 29% fracture, 14% aseptic loosening). Mean age at THA was 64 years, with 61% female. Mean follow-up: 5 years.

Results: Patients undergoing an aseptic reoperation within the first 90 days had a PJI rate of 4.7% at 2 years, while patients undergoing an aseptic reoperation between 91 and 365 days had a PJI rate of 3.1% at 2 years. In comparison, the control group had a PJI rate of 0.2% at 2 years. Compared to patients without a reoperation within the first year, patients who underwent reoperation within 90 days had an elevated risk of PJI (HR 12; $p < 0.0001$), as did patients who had a reoperation between 91 and 365 days (HR 14; $p < 0.0001$).

Conclusions: Aseptic reoperations within the first year following primary THA lead to a 14-fold increased risk of subsequent PJI. The risk was similar regardless of whether the aseptic reoperation was very early (within 90 days) or later (91 to 365 days).

Notes

No Evidence for Higher Patient-Reported Outcome Scores After Total Hip Arthroplasty with the Direct Anterior Approach at 1.5 Months Postoperatively and Through a 5-Year Follow-Up

Symposium V

The Psychology of Total Joint Arthroplasty: Can We Modify Outcomes?

Moderator: Bryan D. Springer, MD

Faculty: Padma Gulur, MD, Wayne M. Sotile, PhD

Total knee arthroplasty (TKA) is an extremely successful surgical intervention for end-stage arthritis of the knee. It is associated with significant improvements in pain, function and quality of life. Overall, is it associated with a low morbidity and mortality. The utilization of TKA is expected to increase exponentially over the next two decades.

Despite its success, data exist that suggest up to 20% of patients are dissatisfied with the outcome of their TKA. The exact etiology has not been fully elucidated. Dissatisfaction has been associated with unmet expectations, unnatural feeling of the artificial joint, failure to reproduce normal knee kinematics and surgical technical errors. As such, there has been an explosion of technological advances to try and improve the 20% of patients that are dissatisfied with their TKA, including computer navigation, robotics and patient specific alignment (i.e. kinematic alignment). However, the results of these technologies on improving patient satisfaction have been negligible.

Considerable research has accumulated indicating that medical and physical variables alone cannot fully account for symptoms of pain and dissatisfaction. Biopsychosocial models have been put forward suggesting that a complete understanding of outcomes will require consideration of physical, psychological and social factors. Research has supported the view that psychological factors play a significant role in the experience of pain, disability and dissatisfaction associated with arthritis and outcomes following total knee arthroplasty. In other domains of research, variables such as pain catastrophizing, pain-related fears of movement, and depression have been identified as risk factors for prolonged pain and disability. High levels of pain catastrophizing predict ongoing pain and more severe disability in individuals with musculoskeletal conditions..

Learning Objectives:

1. Introduce the psychological aspects of surgery and recovery
2. Understand how resiliency can influence outcomes
3. Can resiliency be taught and/or modified to help improve outcomes following total joint arthroplasty?

4. Understand the ramifications of preoperative opioids use and its effect on outcomes
5. Discuss a preoperative optimization program for those on preoperative narcotics

Outline:

Introduction

Bryan D. Springer, MD

The Psychology of Total Joint Arthroplasty

Bryan D. Springer, MD

Can Surgical Resilience Be Assessed and Shaped in Total Joint Arthroplasty

Wayne M. Sotile, PhD

The Opioid Tolerant Patient: Preoperative Optimization

Padma Gulur, MD

Discussion

All Faculty

Notes

A Multi-Center Randomized Clinical Trial of Tranexamic Acid in Revision Total Hip Arthroplasty: Does the Dosing Regimen Matter?[◇]

Introduction: The purpose of this multicenter, randomized clinical trial was to determine the optimal dosing regimen of tranexamic acid (TXA) to minimize perioperative blood loss for revision total hip arthroplasty (THA).

Results: Demographic and surgical variables were equivalent between groups. No significant differences were found between TXA regimens when evaluating reduction in hemoglobin (single IV=3.4 g/dL, double IV=3.5 g/dL, combined=3.5 g/dL, oral=3.5 g/dL; $p=0.93$), calculated blood loss ($p=0.90$), or transfusion rates (single IV=14%, double IV=18%, combined=16%, oral=18%; $p=0.97$). Equivalence testing revealed all possible pairings were statistically equivalent, assuming greater than a 1g/dL difference in hemoglobin reduction as clinically relevant.

♦ The FDA has not approved tranexamic acid for use in orthopaedics.

Is There a Benefit to Modularity for Femoral Revisions When Using a Splined, Tapered Titanium Stem?

Introduction: Proposed benefits of modularity for femoral revisions in total hip arthroplasty (THA) include more precise biomechanical restoration, but this has not been proven with use of a splined, tapered design. This study's purpose was to compare radiographic outcomes of restoration of hip length and offset as well as complications with the use of modular vs. monoblock splined, tapered titanium stems in revision THA.

Results: Patients in the modular cohort were older (67.2+13.0 years vs. 60.2+12.1 years; $P<0.01$) and had a greater percentage of Paprosky IIIB or IV defects (20.5% vs. 5.3%; $P<0.01$). There were no significant differences in rates of intraoperative fracture (9.0% vs. 3.8%; $P=0.3$), postoperative fracture (3.0% vs. 1.3%; $P=0.5$), aseptic loosening (4.5% vs. 6.4%; $P=0.7$), dislocation (11.9% vs. 5.1%; $P=0.23$), or reoperation for any reason (22.3% vs. 17.9%; $P=0.7$) between the modular and monoblock cohorts, respectively. Leg length discrepancy differed between groups (0.89+12.1mm vs. -2.98+10.9mm; $P=0.04$), though there was no difference in rates of LLD >1 cm (35.8% vs. 38.5%, $P=0.74$). There were no differences in component subsidence >5 mm (3.13+5.6mm vs. 2.17+2.1mm; $P=0.4$) or hip offset (73.2+12.5mm vs. 75.9+9.3mm; $P=0.15$) between the modular and monoblock cohorts. Restoration of hip offset compared to the contralateral hip did not differ (-5.88+10.1mm vs. -5.07+12.2mm; $P=0.67$). Harris Hip Score was similar between groups (70.7+17.9 vs. 73.9+19.7; $P=0.36$) at minimum 2-year follow-up.

Conclusions: Modular and monoblock splined, tapered titanium stems demonstrated comparable subsidence, hip offset, and complication rates for femoral revisions. Future investigations including a greater number of patients are required to determine if modularity is beneficial for more complex femoral defect.

Projections of Revision Hip and Knee Arthroplasty in the United States to 2030

Introduction: As the incidence of primary total joint arthroplasty rises in the United States, it is important to investigate how this increase will impact rates of revision arthroplasty. There is an abundance of data on the current incidence of revision arthroplasty, but no recent projections of future incidence based on this most recent data. The purpose of this study was to project the current and future incidence of revision total hip arthroplasty (rTHA) and revision total knee arthroplasty (rTKA) to the year 2030. Anticipating surgical volume will aid surgeons in designing protocols to efficiently and effectively perform rTHA/rTKA.

Results: In 2016, there were 53,755 rTHA and 66,915 rTKA. From 2002 to 2016, the annual average percentage change was 2.02% for rTHA and 5.8% for rTKA. From 2016 to 2030, rTHA incidence is projected to increase by between 31%-44% (73,924-82,170 cases performed in 2030; linear and Poisson regression models, respectively). rTKA incidence is projected to increase by between 49%-91% (114,914-151,563 cases performed in 2030, linear and Poisson regression models, respectively).

Conclusions: The incidence of rTHA/rTKA is projected to increase substantially in the next decade. Given the known risk factor profiles and advanced costs associated with revision arthroplasty, our projections should encourage high-volume institutions to generate revision-specific protocols akin to the primary arthroplasty pathways that many hospitals are currently optimizing. Early anticipation and protocolization of a perpetually increasing demand for rTHA/rTKA could promote safe, high-throughput systems in a cost-effective manner that is commensurate with current healthcare trends towards value-based care.

Outcome of Re-Revision Surgery for Adverse Local Tissue Reaction in Metal-on-Polyethylene and Metal-on-Metal Total Hip Arthroplasty

Introduction: Adverse local tissue reactions (ALTR), initially described in metal-on-metal (MoM) total hip arthroplasty (THA), have also become an important risk factor for failure in metal-on-polyethylene (MoP) THA due to modular taper corrosion. Numerous studies have described a significant rate of complications and poor outcomes following revision surgery for ALTR, often requiring additional revision surgery. This study aims to report early complication rates, outcomes and potential risk factors associated with re-revision.

Methods: A total of 252 THA patients who underwent revision for ALTR were reviewed. There were 40 patients (16%) who underwent a second revision: 26 MoP taper corrosion and 14 MoM. Patient characteristics, complication rates, metal ion levels, and revision implant information were analyzed. Binary logistic regression was used to test for any associations between need for re-revision surgery and multiple different parameters.

Results: The overall complication rate following initial revision for ALTR was 21%. 16% of these revision patients required a re-revision. The most common indication for re-revision was dislocation (45%). Femoral heads exchanged during the initial revision surgery varied between groups ($p < 0.001$) with metal heads being more common in the re-revision groups (53%). The complication rate was 35% following a re-revision: dislocation (36%), infection (36%), fracture (14%), implant loosening (14%). The rate of patients requiring a third revision was 23% with the most common indications being dislocation (33%). The average time between re-revision surgery and a third revision was 14 months (range: 0-53).

Conclusions: The rate for re-revision surgery following initial revision for an ALTR is high at 16%, with those requiring re-revision having a higher proportion of metal heads and extensive intra-operative tissue necrosis. Within the re-revision group, there was a high rate of complications (35%) and third revision rate (23%). These findings provide clinically useful information in preoperative counseling of patients undergoing re-revision surgery for ALTR.

Patients Following Revision Total Hip Arthroplasty with Modular Dual Mobility Components Are at Risk of Increased Serum Metal Ion Levels

Introduction: Modular dual-mobility (MDM) total hip arthroplasty (THA) is designed with a cobalt-chromium liner inserted into a titanium acetabular component. The purpose of this study was to investigate the potential risks for fretting corrosion at this junction by measuring serum metal ions after MDM acetabular revision.

Results: The mean values of chromium and cobalt were 2.08 µg/L (95% CI, 0.9-3.2; range 0.02-11.8) and 1.99 µg/L (95% CI, 0.81-3.17; range 0.07-16.05), respectively. Eleven patients (29.7%) had ions level above the normal range, with 6 (16.2%) above 7 µg/L and 5 (13.5%) between 2 and 7 µg/L. A significant correlation was found between an elevated serum metal ions level (chromium/cobalt) and UCLA score ($p=0.016$). No significant correlation was found between serum metal ions values and patient's age ($p=0.375$), BMI ($p=0.525$) or follow-up length ($p=0.155$).

Conclusions: This is the first study of metal ions after revision MDM arthroplasty and we must conclude that serum metal levels elevation can occur secondary to metal debris resulting from corrosion of the index MDM THA. This potential risk must be included in the decision-making process when dealing with revision arthroplasty in active patients.

Serum Metal Ion Levels Following Total Hip Arthroplasty: A Comparison Between Monoblock and Modular Dual Mobility Components

Introduction: Modular dual mobility (DM) components were introduced to overcome the difficulties controlling orientation during component insertion and inability to confirm full implant seating limitations of monoblock-DM components. Due to the metal-on-metal interface on modular-DM implants (titanium cup and CoCr liner), fretting and corrosion releasing metal ions can be a concern. This study prospectively reviewed metal ions (cobalt, chromium, and titanium) on patients with monoblock-DM and modular-DM implants with a minimum 1-year follow-up.

Methods: All patients with monoblock-DM and modular-DM implants underwent evaluation of metal ions at their one-year follow-up appointment. Radiographic evaluation for acetabular polar gaps was performed. Elevated metal ions were determined using standard laboratory ranges. Differences were assessed using the Mann Whitney-U test and Fisher's exact test.

Results: Fifty consecutive patients (25 monoblock-DM and 25 modular-DM) were included in this study. All patients in the monoblock-DM group were primary THA and all in the modular-DM group were revision THA. Mean age and BMI were 73 and 26, respectively. Mean length of implantation was 1.2 years. We found no difference in metal ion elevations between groups at a minimum of one-year post implantation (cobalt, $p=1.0$; chromium, $p=0.49$; titanium $p=1.0$). Within the modular-DM and monoblock-DM cohorts, there were an equal number of patients with mildly elevated cobalt ($n=6$), as well as mildly elevated titanium ($n=1$). When reviewed as raw values, there was a difference in mean chromium levels between monoblock-DM and modular-DM cohorts (monoblock-DM=1.4 vs. modular-DM=1.2, $p=0.03$). Two monoblock-DM patients had a 1-mm polar gap. One modular-DM liner was malseated.

Conclusions: There were no differences in metal ion elevation minimum one-year post implantation between primary monoblock-DM and revision modular-DM cohorts. This is encouraging based on the titanium/cobalt chrome interface in the modular-DM implant.

Tips and Tricks to Save You During Revision TKAs: Video-Based Demonstrations

Faculty: Daniel J. Berry, MD, Craig J. Della Valle, MD, R. Michael Meneghini, MD

What Is the Impact of PAO Surgery on Patient Function and Activity Levels?

Introduction: The Bernese periacetabular osteotomy (PAO) is becoming a widely utilized procedure. Patients are younger, highly active, and may desire return to sport activity. Counseling and managing expectations in these patients is challenging as there is limited information regarding activity level after PAO. The purpose of this study was to analyze physical activity levels after PAO in a large, prospective multicenter cohort.

Results: UCLA scores were improved on average 0.6 points at final follow up ($p=0.001$). When stratified, the low activity and moderate activity groups had significant improvement in UCLA scores ($p<0.0001$ and $p=0.007$) while the high activity group saw a decrease in UCLA scores ($p<0.0001$). mHHS, HOOS Pain, and HOOS Sports and Recreation scores were significantly improved across all activity levels. Univariable linear regression analysis identified prior ipsilateral surgery, arthroscopy at time of PAO, and preoperative ACEA to be predictors of the change in UCLA score ($p<0.05$). With the multivariable model, the effect of prior ipsilateral surgery was maintained ($p=0.002$).

Conclusions: The data suggests that improvements in activity level and function can be expected following PAO surgery, with greater gains experienced by patients with lower preoperative level of activity.

Surgical Treatment of Femoroacetabular Impingement: A Minimum 10-Year Outcome and Risk Factors for Failure

Introduction: Femoroacetabular impingement (FAI) is one of the well-known causes of hip pain and dysfunction in active young adults. Surgical treatment has been widely popularized during past decades. However, most reported results are limited to short- and mid-term follow up. The long-term success rate and risk factors for failure are largely unknown. This study aims to report our long-term (minimum 10-year) clinical outcome and the risk factors for treatment failure of femoroacetabular osteoplasty (FAO) and labral repair.

Results: The mean age was 34.3 ± 10.4 years and 65 (39.6%) patients were female. There was significant improvement post-FAO in mean mHHS (58.2 ± 3.9 - 86.4 ± 3.2) and SF36 (60.4 ± 4 - 85 ± 4.1). At the latest follow-up (range: 10-14 years; mean: 12.5), 12.3% (n=22) of hips underwent THA and mean time to THA was 7.4 ± 3.8 years. Older age, longer preoperative symptomatic period, higher preoperative alpha angle, presence of hip dysplasia and full thickness acetabular chondral lesion were detected as risk factors for conversion to THA.

Conclusions: Patients with symptomatic FAI who undergo surgery experience pain relief and functional improvement that appears to endure over a decade in the majority. This study on a large cohort with long-term follow-up has also identified patients who are at higher risk of failure.

Hip Arthroscopy for Patients with Persistent Pain Following Periacetabular Osteotomy: No Significant Changes in Pre- and Postoperative Patient Reported Outcomes

Introduction: Periacetabular osteotomy (PAO) remains the gold standard procedure for joint preservation in symptomatic developmental dysplasia of the hip. To date, the role for hip arthroscopy (HA) to address intra-articular pathology for patients with unsatisfactory outcomes following PAO remains controversial, with little data available to guide clinicians. The purpose of this study was to harness the Academic Network of Conservational Hip Outcomes Research (ANCHOR) database to provide guidance regarding outcomes for patients undergoing HA for persistent pain following PAO.

Results: 29 patients (5 males, 24 females, age: 23.4 ± 8.4 years) undergoing 32 PAOs (21 right, 11 left) with subsequent arthroscopy at 7 high-volume centers were evaluated. Mean preoperative lateral center edge angle (LCEA) was $17.5 \pm 9.3^\circ$ which was corrected to $32.0 \pm 4.7^\circ$ at the time of PAO. Patients were followed for a mean of 3.9 ± 2.0 years after PAO and underwent HA at a mean of 1.5 ± 1.1 years, with 23 (72%) undergoing concurrent hardware removal. Following arthroscopy, no patient reported outcome measure demonstrated a statistically significant postoperative difference. HOOS changed from 56.5 ± 18.5 preoperatively to 58.1 ± 20.5 postoperatively ($p=0.74$), WOMAC changed from 73.7 ± 18.5 to 69.7 ± 20.7 ($p=0.63$), UCLA score from 6.6 ± 2.8 to 6.0 ± 2.7 ($p=0.64$), and HHS from 63.6 ± 17.0 to 65.0 ± 19.8 ($p=0.91$). At final follow-up, one hip (3%) had converted to THA at 4.1 years following PAO and 3.0 years following HA.

Conclusions: In the largest available cohort of its kind, patients undergoing HA following PAO demonstrated no statistically significant postoperative change in four different scores. Given these findings, patients and surgeons alike should expect a guarded prognosis for persistent pain following PAO undergoing evaluation for revision arthroscopic management.

Hemiarthroplasty vs. Total Hip Arthroplasty for Femoral Neck Fractures: 2010-2017 Trends in Complication Rates

Introduction: Optimal treatment for femoral neck fractures (FNF) remains debated. Recent data supports improved functional outcomes following total hip arthroplasty (THA) compared to hemiarthroplasty (HA) in active patients. However, temporal trends in complication rates between these treatments lacks study.

Results: 16,636 patients were identified. THA was associated with higher transfusion rates in 2010-2012 (mean: 0.34 vs. 0.28, $p=0.001$) and 2013-2015 (mean: 0.21 vs. 0.19, $p=0.002$), but not in 2016-2017 (mean: 0.13 vs. 0.14, $p=0.146$). Operation time was significantly higher for THA across all periods (p 's <0.001), but declined over time (e.g., mean difference: 25.51 minutes in 2010-2012 vs. 17.60 minutes in 2016-2017). In recent years, THA became associated with less major (2016-2017: 5.4% vs. 10.2%, $p=0.02$; 2013-2015: 5.3% vs. 10.3%, $p<0.001$) and minor (2016-2017: 6.2% vs. 9.8%, $p=0.02$; 2013-2015: 7.2% vs. 12.4%, $p<0.001$) complications compared to 2010-2012 where there was no difference (major: 7.2% vs. 10.6%, $p=0.87$; minor: 12.6% vs. 10.1%, $p=0.89$). No significant differences in 30-day readmission were noted across periods.

Conclusions: THA is associated with less major and minor complications compared to HA for the treatment of FNF, despite longer surgical time. THA trends in transfusions and operation time have improved over time. There were no differences in 30-day readmission rates within the study period.

Patient and Surgeon Satisfaction with and Utility of Routine Follow-Up at One Year After Primary Total Hip and Total Knee Arthroplasty

Introduction: Guidelines for the optimal timing and number of routine clinical visits for asymptomatic patients have been suggested, however, no consensus exists. The purpose of this prospective survey study was to determine the utility of the routine one-year follow-up visit after primary total hip arthroplasty (THA) or total knee arthroplasty (TKA).

Results: Between October 2017 and July 2018, 512 patients who underwent primary TJA or SRA agreed to participate in the study. The final cohort consisted of 195 patients (102 THAs, 94 TKAs, 5 UKAs, and 1 SRA) in which passive one-year follow-up was obtained. Mean age was 62.7 years (79 males, 40.5%) and 378 days mean follow-up. Patients reported a mean 4.71 rating with satisfaction of care provided by their surgeon and mean 4.64 when asked if the visit was worthwhile. When physicians were asked if any problems, issues diagnosed, or complications were avoided because of the visit, 23.03% said yes. When asked if the visit was worthwhile, 66.84% said yes. For visits during which no interventions were performed or ordered, 49.44% of physicians said the visit was worthwhile.

Notes

Can an Outpatient Risk Assessment Tool Predict Who Needs Postoperative Hemoglobin Monitoring?

Introduction: There have been recent improvements in surgical technique and perioperative blood management after total joint arthroplasty (TJA) that have decreased rates of transfusion. However, as many surgeons transition to outpatient total joint replacement, obtaining routine postoperative labs may be more challenging. Therefore, the following study was performed to determine if a commonly utilized outpatient assessment tool could predict who is at risk for requiring postoperative hemoglobin screening.

Methods: We performed a retrospective study of consecutive unilateral primary total knee arthroplasties (TKA) and total hip arthroplasties (THA) performed at a single institution. Retrospectively collected data included: preoperative and postoperative hemoglobin levels, need for blood transfusion, length of hospital stay, and Outpatient Arthroplasty Risk Assessment (OARA) score.

Results: There were 1,392 patients screened; however, only 504 patients met inclusion criteria. Mean age at time of primary arthroplasty was 65.3 years. 216 (42.9%) were primary THAs and 288 (57.1%) were primary TKAs. Six patients required a blood transfusion postoperatively (1.19%). Transfusion after surgery was associated with lower preoperative hemoglobin (mean of 10.9 vs. 13.8, $p=0.0001$), lower postoperative day one hemoglobin (mean of 8.5 vs. 11.3, $p=0.00005$), longer length of stay (1 vs. 2 days, $p=0.0004$), higher OARA score (mean of 60.0 vs. 5.0, $p=0.0011$), and total hip arthroplasty ($p=0.00595$). All patients that received a transfusion had an OARA score >34 . Blood transfusion was not associated with age, sex, BMI or ASA score.

Conclusions: Risk of blood transfusion after primary TJA is uncommon, with an incidence of 1.19%. Transfusion is associated with low preoperative hemoglobin and higher OARA scores. The OARA, not ASA, score reliably identified patients at risk for postoperative blood transfusion.

Periprosthetic Infection: A Practical Case-Based Approach

Faculty: Thomas K. Fehring, MD, Michael H. Huo, MD, Thorsten M. Seyler, MD, PhD

Opioid Use After Discharge Following Primary Unilateral Total Knee Arthroplasty: How Much Are We Overprescribing?

Introduction: The opioid crisis in America has resulted in increased pressure on orthopaedic surgeons to reduce the amount of narcotics prescribed for postoperative pain management. This study sought to quantify postoperative opioid use after hospital discharge for primary unilateral total knee arthroplasty (TKA) patients.

Methods: A prospective cohort of primary unilateral TKA patients by one of five senior fellowship trained arthroplasty surgeons were enrolled at a single institution. Detailed pain journals tracked all prescription and over-the-counter pain medication, quantity, frequency, and visual analog scale (VAS) pain scores. Narcotic and narcotic-like pain medications were converted to morphine milligram equivalents (MME). Statistical analysis was performed using student t-tests with <0.05 .

Results: Data from 89 subjects was analyzed; the average VAS pain score was 6.92 while taking narcotics. The average number of days taking narcotics was 16.81 days. The distribution of days taking narcotics was “right-shifted” with 52.8% of patients off narcotics after 2 weeks, and 74.2% off by 3 weeks postoperatively. The average MME prescribed was significantly greater than MME taken (866.6 vs. 428.2, $p<0.0001$). The average number of narcotic pills prescribed was significantly greater than narcotic pills taken (105.1 vs. 52.0, $p<0.0001$). The average excess narcotic pills prescribed per patient was 53.1 pills. 43 (48.3%) patients took fewer than 40 narcotic pills; 67 (75.3%) patients took fewer than 75 narcotic pills. 4 (3.4%) patients did not require any narcotics; 36 (40.5%) patients required a refill of narcotics. 8 (9.0%) patients went home the day of surgery.

Conclusions: Significantly more narcotics were prescribed than were taken in the postoperative period following TKA, with an average 53.1 excess narcotic pills per patient. Adjusting prescribing patterns to match patient narcotic usage could reduce the excess narcotic pills following TKA.

Education Increases Disposal of Unused Opioids After Total Joint Arthroplasty: A Cluster Randomized Trial

Introduction: The purpose of this study was to determine the impact of education on proper disposal rates of unused opioids.

Results: 539 (95.7%) patients completed the survey. 342 patients (60.1%) indicated that they had unused opioid pills at 6 weeks postoperatively; 89 patients in Group 1, 128 in Group 2 and 125 in Group 3. Of these 342 patients 9.0%, 32.8%, and 38.4% properly disposed of their unused opioids in Groups 1, 2 and 3 respectively ($p < 0.001$ for no education vs. either strategy with no difference between the two educational strategies). Unused opioid pills were kept by 82.0%, 64.1%, and 54.4% of patients in Groups 1, 2, and 3 ($p < 0.001$ for no education vs. either educational strategy). There were no differences between groups including daily inpatient opioid use, refill requirements, and preoperative opioid use other than gender (41.5%, 55.0% and 37.4% male; $p = 0.001$), suggesting appropriate randomization.

Conclusions: Education on proper opioid disposal more than triples the rate of proper opioid disposal compared to no education. Further innovation is warranted given the inadequate rates of disposal even with appropriate education.

Is Preoperative Tramadol a Safe Alternative to Opioids in Total Knee Arthroplasty?

Introduction: Preoperative opioid use has been shown to lead to postoperative opioid use following total knee arthroplasty (TKA). Tramadol is recommended for symptomatic treatment of osteoarthritis; however, it acts on opioid receptors and may confer similar adverse effects. The purpose of this study was to assess postoperative opioid use with preoperative opioid and tramadol use.

Results: 107,973 patients undergoing TKA were identified. Preoperatively, 29,890 (27.7%) patients filled a prescription for only opioids, 8,049 (7.5%) for only tramadol, 44,403 (41.1%) for either tramadol or opioids, and 63,570 (58.9%) did not fill a prescription for either. At 12 months after TKA, an opioid prescription was filled by 6.0% of preoperative opioid free patients, 35.2% preoperative opioid users (RR: 5.83 [5.63-6.03]), 9.2% preoperative tramadol users (RR: 1.52 [1.40-1.63]), and 29.5% preoperative opioid or tramadol users (RR: 4.88 [4.72-5.05]). Opioid or tramadol prescriptions were filled by 7.7% of preoperative opioid free patients, 37.3% preoperative opioid users (RR: 4.84 [4.70-4.99]), 26.2% preoperative tramadol users (RR: 3.40 [3.26-3.57]), and 35.7% preoperative opioid or tramadol users (RR: 4.64 [4.50-4.78]) at 12 months after TKA.

Conclusions: Patients taking tramadol preoperatively were found to be at lower risk for prolonged postoperative opioid use following TKA. However, patients taking either tramadol or opioids preoperatively continued to fill prescriptions for these medications at a significantly higher rate than those who were not. Additional studies are needed to assess if preoperative tramadol use is associated with inferior clinical outcomes.

The Effects of Opioid Use on Thromboembolic Complications, Readmission Rates and 90-Day Episode of Care Costs

Introduction: There is a paucity in the literature evaluating whether patients with a history of opioid use disorder (OUD) are at a greater risk of developing thromboembolic complications following primary total hip arthroplasty (THA). Therefore, the purpose of this study was to investigate whether OUD patients are at greater odds than non-opioid use disorder (NUD) patients in developing: 1) thromboembolic complications; 2) readmission rates; and 3) costs of care.

Results: Patients with a history of OUD were found to be at greater risk for 90-day VTEs (2.72 vs. 1.13%; OR 2.45, 95% CI 1.90-3.17, $p<0.001$) compared to matched NUD patients. Specifically, OUD patients were at greater risk for both DVT (OR 2.55, 95% CI 1.93-3.38, $p<0.001$) and PE (0.84 vs. 0.25%; OR 3.33, 95% CI 1.99-5.57, $p<0.001$). Additionally, patients with OUD were at an increased risk for 90-day readmission (OR 1.27, 95% CI 1.17-1.38, $p<0.001$) compared to controls. Primary THA patients with OUD incurred a 15% higher cost of care (\$21,595.82 vs. \$18,807.14) compared to NUD patients.

Notes

Use of Tetrahydrocannabinol and Cannabidiol Products in the Perioperative Period Around Primary Unilateral Total Knee Arthroplasty and the Impact on Opioid Consumption

Introduction: Given the opioid crisis in America, patients are trying alternative medications including tetrahydrocannabinol (THC) and other cannabidiol (CBD) containing products in the perioperative period, especially in states where the use of these products is legal. This study sought to analyze any association of CBD/THC products usage in the perioperative period with postoperative opioid use after hospital discharge for primary unilateral total knee arthroplasty (TKA) patients.

Results: Data from 84 patients following primary unilateral total knee arthroplasty were analyzed. 22.6% of TKA patients used THC/CBD products in the perioperative period. There was a wide variety of usage patterns among those using THC/CBD products. In comparing patients who did not use any THC/CBD products to those who did, there was no significant difference in the length of narcotic use (17.31 vs. 17.26 days, $p=0.9872$), total MME taken (441.31 vs. 450.33, $p=0.9316$), or narcotic pills taken (52.03 vs. 58.61, $p=0.5544$). Average pain scores were similar between groups (3.79 vs. 3.40, $p=0.3372$). There was no significant difference in the percentage of patients requiring a refill of narcotics (40.00% vs. 42.11%, $p=0.8694$) or length of stay (1.45 vs. 1.37 days, $p=0.7336$).

Conclusions: Understanding that THC/CBD usage was not consistent for patients who used these products, 22.6% of primary unilateral TKA patients tried THC/CBD products in the perioperative period, but THC/CBD use was not associated with a major effect on narcotic requirements. Further studies on the effects of THC/CBD in the perioperative period are needed as these therapies become more widely available in the US.

Adverse Local Tissue Reactions in THA: Who, When and How to Revise

Faculty: Joshua J. Jacobs, MD, Michael J. Taunton, MD, Douglas E. Padgett, MD, Adolph V. Lombardi, Jr., MD, FACS

What are the common pitfalls and pearls in performing revision surgery for ALTR?

67

Does Intermittent Catheterization Compared to Indwelling Catheterization Decrease the Risk of Periprosthetic Joint Infection Following Total Knee Arthroplasty?

Introduction: Catheterization for the treatment of urinary retention commonly occurs after total knee arthroplasty (TKA). Recent studies have questioned the use of the indwelling catheterization, especially in its potential role as a nidus for infection. We are still unsure of its downstream effects on periprosthetic joint infections (PJI). Therefore, this study aimed to compare the risks of postoperative PJI following intermittent vs. indwelling catheterization after TKA.

Results: 9,123 TKAs were performed, with urinary retention treated by indwelling catheter only (62%, n=734), intermittent straight catheter only (25%, n=299), or both indwelling and intermittent catheterizations (13%, n=160). Univariate analyses showed that PJIs occurred in 1.1% of no-catheter patients and 2.3% of patients treated with bladder catheterization ($p=0.002$). Using multivariate analyses, indwelling catheter use (OR: 2.647, $p<0.001$), diabetes (OR: 1.837, $p=0.005$), and peripheral vascular disease (OR: 2.372, $p=0.046$) were found to have a statistically significant increased risk for PJIs. The use of intermittent straight catheterization (OR: 1.249, $p=0.668$) or both indwelling and intermittent (OR: 1.171, $p=0.828$) did not increase the risk for PJIs.

Conclusions: Treatment with bladder catheterization is commonly needed for urinary retention after TKA. This study found that the use of an indwelling catheter only, but not intermittent catheterization, increased the risk for PJI. This is an important finding to guide treatment for urinary retention after TKA in order to decrease the risk of PJIs.

Dilute Povidone-Iodine Solution Prevents Intraoperative Contamination of Sterile Water Basins During Total Joint Arthroplasty

Introduction: Periprosthetic joint infection (PJI) is a major complication of total joint arthroplasty (TJA). The intraoperative splash basin has been found to be a potential source of contamination. Although consensus recommendations against the use of the splash basin have been made, splash basin use continues to be taught and utilized in practice. This study aims to investigate the effect of dilute betadine addition to the sterile water contents (0.02% solution) of the splash basin on contamination rates. This intervention could preserve the functionality and preferential use of the splash basin.

Results: Of the final 100 post-procedure samples, 0 (0.0%) were positive in the betadine group, while there were 23 (47.9%) positive samples in the SW group ($p < 0.001$). Of the positive cultures in the SW group, the most common species grown were coagulase-negative *Staphylococcus*, *Corynebacterium*, and *Micrococcus*.

Conclusions: In conclusion, treating sterile water splash basins with dilute povidone-iodine (0.02% solution) eliminates intraoperative contamination of splash basins in TJA procedures. This intervention is simple, low cost, and readily implementable, making it a reasonable addition to TJA protocols.

A Randomized Clinical Trial of Articulating and Static Spacers in the Management of Chronic Periprosthetic Knee Infection

Introduction: The purpose of this multi-center, randomized clinical trial was to compare static and articulating spacers in the treatment of periprosthetic joint infection (PJI) complicating total knee arthroplasty (TKA).

Results: Patients in the static spacer group had significantly longer mean hospital length of stay (LOS: 6.1 vs. 5.1 days; $p=0.032$). At final follow-up, the mean arc ROM in the articulating spacer cohort was significantly higher at 113.0° compared to 100.2° in the static spacer cohort ($p=0.001$). The mean Knee Society Score (KSS) was significantly higher in the articulating spacer cohort (79.4 vs. 69.8 points; $p=0.043$). Patients in the static spacer cohort had a greater need for an extensile exposure at the time of reimplantation (16.7% vs. 3.8%), and higher rates of reoperation (33.3% vs. 12.0%) and reinfection (12.0% vs. 8.0%). However, the latter differences did not reach statistical significance with the sample size studied.

Conclusions: This randomized study demonstrated that the use of an articulating spacer, compared to a static spacer, during the first stage of a two-stage exchange provided higher ROM, shorter LOS, and higher KSS. When the soft tissue envelope allows, and if there is adequate bony support, an articulating spacer is associated with improved outcomes.

Isolated Tibial Insert Exchange in Aseptic Revision TKA: Reliable and Durable for Wear; Less So for Instability, Insert Fracture/Dissociation, or Stiffness

Introduction: Modularity in total knee arthroplasties (TKA) allows for isolated tibial insert exchange with retention of well-fixed and well-aligned components. Simplicity makes this appealing, but published results for non-infectious indications are mainly small series. This study determined outcomes of isolated tibial insert exchange during aseptic revision TKA in a large, consecutive cohort.

Results: At 10 years, Kaplan-Meier survivorship free of re-revision was 68%. For diagnosis of insert wear, revision-free survivorship at 5 and 10 years was 89% and 74%, respectively. Re-revisions were more frequent for index diagnoses other than wear (HR 1.9; $p=0.01$) with 5- and 10-year survival of 74% and 69% for instability and 49% and 37% for liner fracture/dissociation. After exchanges for wear, the most common reason for re-revision was aseptic loosening (33%). After all other index diagnoses, the most common reason for re-revision was recurrence of that diagnosis. Other factors associated with re-revision were younger age (HR 1.4 per 10 years; $p<0.01$) and prior revision (HR 1.9; $p<0.01$). Mean Knee Society Scores improved from 54 preoperatively to 72 at 5 years and 78 at 10 years.

Conclusions: After isolated tibial insert exchange, the risk and reasons for re-revision correlated with preoperative indication. Best results were for polyethylene wear with 5- and 10-year survival of 89% and 74%. For other diagnoses, failure rate was higher and failure mode was most commonly a recurrence of the original diagnosis. TKA failures often are multi-factorial, and we advise some caution with this simplistic strategy.

Administration of Tranexamic Acid Improves Long-Term Outcomes in Total Knee Arthroplasty[◇]

Introduction: Allogenic blood transfusion in total knee arthroplasty (TKA) is associated with increased incidence of morbidity, including periprosthetic joint infection (PJI), revision surgery, and irrigation and debridement (I&D). Tranexamic acid (TXA) reduces the rate of blood transfusions, but there has been limited evidence demonstrating improved outcomes in TKA resulting from decreased transfusion related complications. The objective of this study was to determine if TXA improves long-term outcomes and minimizes adverse events.

Results: 27,079 cases of TKA met inclusion criteria. 18% (n=4,905) received TXA. Multivariate analysis demonstrated that TXA administration resulted in an approximate 50% decreased incidence of PJI within two years (OR 0.47; $p<0.0001$). TXA administration improved secondary outcomes, with a decreased incidence of revision surgery at two years (OR 0.29; $p<0.0001$) and I&D (OR 0.10; $p<0.0001$) as compared to patients that did not receive TXA. Patients who received TXA also had decreased incidences of 90-day hospital readmission (OR 0.85; $p=0.0001$) and DVT (OR 0.45; $p=0.0003$). Consistent with previous studies, a reduction in transfusion rates was observed (OR 0.13; $p<0.0001$).

♦ The FDA has not approved tranexamic acid for use in orthopaedics.

Fixed-Bearing Medial Unicondylar Knee Arthroplasty - Slight Varus, Just Right!

Sean E. Slaven, MD, John P. Cody, MD, Robert A. Sershon, MD, Henry Ho, MS,
Robert H. Hopper, Jr., PhD, Kevin B. Fricka, MD

Introduction: Mechanical axis alignment has been shown to influence the long-term outcome of fixed-bearing medial unicompartmental knee arthroplasty (UKA). However, a consensus on the optimal postoperative alignment target has not been established. This study compared the postoperative mechanical alignment of well-functioning UKAs against two groups of failed UKAs, including revisions for progression of lateral compartment arthritis (“progression”) and revisions for aseptic loosening or subsidence (“loosening”).

Methods: From our prospective institutional database of 3,539 medial fixed-bearing UKAs performed since 2000, we identified 37 UKAs revised for progression and 61 UKAs revised for loosening. Each of these revision cohorts was matched based on age at surgery, gender, body mass index, and postoperative range of motion with unrevised UKAs that had at least 10 years of follow-up and a Knee Society Score of 70 or greater (“success” groups). Postoperative alignment was quantified by the hip-knee-ankle (HKA) angle measured on long-leg alignment radiographs.

Results: The mean HKA at 4-month follow-up for the progression group was $0.3 \pm 3.6^\circ$ of valgus compared to $4.4 \pm 2.6^\circ$ of varus for the matched success group ($p < 0.001$). For the loosening group, the mean HKA was $6.1 \pm 3.1^\circ$ of varus compared to $4.0 \pm 2.7^\circ$ of varus for the matched success group ($p < 0.001$). The HKA angles were similar among both success groups ($p = 0.52$). The loosening group was revised at a mean of 3.3 ± 2.9 years compared to 5.4 ± 4.0 years for the progression group ($p = 0.004$).

Conclusions: Mechanical alignment in the coronal plane is an important factor in the setting of fixed-bearing, medial UKA. Patients with well-functioning UKAs at 10 years exhibited mild varus mechanical alignment of approximately 4°, whereas patients revised for progression of osteoarthritis averaged more valgus (mean 0.3° valgus) and those revised for loosening averaged more varus (mean: 6.1° varus). The optimal mechanical alignment for component survival is likely slight varus.

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Disclosures

Matthew P. Abdel, MD

American Association of Hip and Knee Surgeons: Board or committee member
International Congress for Joint Reconstruction: Board or committee member
Journal of Bone and Joint Surgery - British: Editorial or governing board
Minnesota Orthopaedic Society: Board or committee member
Stryker: Paid consultant

Jeffrey A. Ackerman, MD

This individual reported nothing to disclose.

Muyibat A. Adelani, MD

American Association of Hip and Knee Surgeons: Board or committee member

Edward M. Adler, MD

Abbott: Stock or stock Options
Journal of Arthroplasty, Bulletin of the NYU Hospital for Joint Diseases: Editorial or governing board
Procter & Gamble: Stock or stock Options
Stryker: Paid consultant

Ajay Aggarwal, MD

American Association of Hip and Knee Surgeons: Board or committee member
Journal of Arthroscopy and Joint Surgery: Editorial or governing board
Mid America Orthopaedic Association: Board or committee member
Stryker: Paid presenter or speaker; Research support

Oluwaseun Akinbo, MD

This individual reported nothing to disclose.

Derek F. Amanatullah, MD, PhD

AAOS: Board or committee member
DePuy, A Johnson & Johnson Company: Paid consultant
Exactech, Inc: IP royalties; Paid consultant
OREF: Research support
Osteosynthesis and Trauma

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Stryker: Paid consultant; Research support
WebMD: Publishing royalties, financial or material support
Zimmer: Paid consultant; Research support

Michael P. Ast, MD

American Association of Hip and Knee Surgeons: Board or committee member
Conformis: Paid consultant
Eastern Orthopaedic Association: Board or committee member
OrthAlign: Paid consultant; Stock or stock Options
OrthAlign Inc: Paid presenter or speaker
Osso VR: Stock or stock Options
Smith & Nephew: Paid consultant; Paid presenter or speaker; Research support
Stryker: Paid consultant
Surgical Care Affiliates: Paid consultant

Matthew S. Austin, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Corin U.S.A.: Paid consultant
Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board
Link Orthopaedics: Paid consultant
Zimmer: Research support

David C. Ayers, MD

AAOS: Board or committee member
American Orthopaedic Association: Board or committee member
Journal of Bone and Joint Surgery - American: Editorial or governing board
Trevor R. Banka, MD

This individual reported nothing to disclose.

C. Lowry Barnes, MD

American Association of Hip and Knee Surgeons: Board or committee member
ConforMIS: Research support
Corin U.S.A.: Other financial or material support
DJO: IP royalties
HealthTrust: Paid consultant
HipKnee Arkansas Foundation: Board or committee member
Journal of Arthroplasty: Editorial or governing board
JSOA: Editorial or governing board
Mid-American Orthopaedic Association: Board or committee member
None: Unpaid consultant
Responsive Risk Solutions: Paid consultant; Stock or stock Options
Southern Orthopaedic Association: Board or committee member
Zimmer: IP royalties

Hany S. Bedair, MD

DEF Medical: Stock or stock Options
Osteon Holdings: Stock or stock Options
Smith & Nephew: Paid consultant
Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Zimmer: Research support

Jaime L. Bellamy, DO

This individual reported nothing to disclose.

Don C. Beringer, MD, FAAOS

Clinical Orthopaedics and Related Research: Editorial or governing board

Daniel J. Berry, MD

Bodycad: Paid consultant; Stock or stock Options
Current Concepts in Joint Replacement (Hip Society and Knee Society): Board or committee member
DePuy, A Johnson & Johnson

Company: IP royalties; Paid consultant; Research support
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International Hip Society: Board or committee member
Journal of Bone and Joint Surgery - American: Editorial or governing board
Mayo Clinic Board of Governors: Board or committee member
Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Hari P. Bezwada, MD

Corentec: Paid consultant
Encore Medical: Paid consultant
Flexion Therapeutics: Paid consultant
Journal of Arthroplasty: Editorial or governing board
Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board

Kamil Bober, MD

This individual reported nothing to disclose.

Russell J. Bodner, MD

This individual reported nothing to disclose.

Michael P. Bolognesi, MD

Acelity: Other financial or material support
 Amedica: Stock or stock Options; Unpaid consultant
 American Association of Hip and Knee Surgeons: Board or committee member
 AOA Omega: Other financial or material support
 Arthroplasty Today: Editorial or governing board
 Biomet: Research support
 DePuy, A Johnson & Johnson Company: Research support
 Eastern Orthopaedic Association: Board or committee member
 Exactech, Inc: Research support
 Journal of Arthroplasty: Editorial or governing board
 Journal of Surgical Orthopaedic Advances: Editorial or governing board
 KCI: Research support
 Smith & Nephew: Other financial or material support; Unpaid consultant
 TJO: IP royalties; Paid presenter or speaker; Stock or stock Options
 Zimmer: IP royalties; Paid presenter or speaker; Research support

Kevin J. Bozic, MD, MBA

American Association of Hip and Knee Surgeons: Board or committee member
 American Joint Replacement Registry: Board or committee member
 Carrum Health: Stock or stock Options
 Centers for Medicare and Medicaid Services: Paid consultant
 Embold Health: Paid consultant
 Harvard Business School: Unpaid consultant

David P. Brigati, MD

This individual reported nothing to disclose.

Thomas E. Brown, MD

This individual reported nothing to disclose.

James A. Browne, MD

American Association of Hip and Knee Surgeons: Board or committee member
 American Joint Replacement Registry: Board or committee member
 DJ Orthopaedics: IP royalties; Paid consultant
 Heron Therapeutics: Paid consultant
 Journal of Arthroplasty: Editorial or governing board; Publishing royalties, financial or material support
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 Norvartis: Paid consultant
 OsteoRemedies: Paid consultant
 Radlink: Stock or stock Options
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 Southern Orthopaedic Association: Board or committee member
 Virginia Orthopaedic Society: Board or committee member

Leonard T. Buller, MD

This individual reported nothing to disclose.

Matthew W. Bullock, DO, PT

American Association of Hip and Knee Surgeons: Board or committee member
 Arthroplasty Today: Editorial or governing board

Frank A. Buttacavoli, MD

KCI: Paid consultant
 Zimmer: Paid consultant

Paul C. Buzhardt, MD

This individual reported nothing to disclose.

Antonia F. Chen, MD, MBA

3M: Paid consultant
 AAOS: Board or committee member
 ACI: Paid consultant
 AJRR: Board or committee member
 American Association of Hip and Knee Surgeons: Board or

committee member

American Medical Foundation: Paid consultant
 Annals of Joint: Editorial or governing board
 Avanos: Paid consultant; Research support
 bOne: Paid consultant
 Bone & Joint 360 Journal: Editorial or governing board
 Clinical Orthopaedics and Related Research: Editorial or governing board
 Convatec: Paid consultant
 DePuy, A Johnson & Johnson Company: Paid consultant
 European Knee Association: Board or committee member
 Graftworx: Stock or stock Options
 Healthcare Transformation: Editorial or governing board
 Heraeus: Paid consultant
 Hyalex: Stock or stock Options
 International Congress for Joint Reconstruction: Board or committee member
 Irrimax: Paid consultant; Stock or stock Options
 Joint Purification Systems: Stock or stock Options
 Journal of Arthroplasty: Editorial or governing board
 Journal of Bone & Joint Infection: Editorial or governing board
 Journal of Bone and Joint Surgery - American: Editorial or governing board
 Knee Surgery, Sports Traumatology, Arthroscopy: Editorial or governing board
 Musculoskeletal Infection Society: Board or committee member
 Recro: Paid consultant
 SLACK Incorporated: Publishing royalties, financial or material support
 Sonoran: Stock or stock Options
 Stryker: Paid consultant

Darwin D. Chen, MD

Conformis: Paid consultant
 DePuy, A Johnson & Johnson Company: Paid presenter or speaker
 Smith & Nephew: Paid consultant

Dennis Q. Chen, MD

This individual reported nothing to disclose.

George F. Chimento, MD

AAOS: Board or committee member
 DePuy, A Johnson & Johnson Company: Research support
 Journal of Arthroplasty: Editorial or governing board
 Louisiana Orthopaedic Association: Board or committee member
 Slight Medical: Stock or stock Options
 Stryker: Paid consultant
 Vizient: Unpaid consultant

Roberto Civinini, MD

Microport: Paid consultant
 Orthofix, Inc.: Paid consultant
 Smith & Nephew: Paid presenter or speaker

Matthew R. Cohn, MD

This individual reported nothing to disclose.

Herbert J. Cooper, MD

AAOS: Board or committee member
 DePuy, A Johnson & Johnson Company: Paid consultant
 Journal of Arthroplasty: Editorial or governing board
 Journal of Bone and Joint Surgery - American: Editorial or governing board
 KCI: Paid presenter or speaker; Research support
 KCI Medical Canada, Inc: Paid consultant
 KCI USA, Inc: Paid consultant
 OnPoint Knee, Inc.: Paid consultant
 Smith & Nephew: Research support
 Zimmer-Biomet: Paid consultant

David A. Crawford, MD

Kinetic Concepts, Inc.: Research support
 Zimmer: Research support

Disclosures

Brian M. Culp, MD

American Association of Hip and Knee Surgeons: Board or committee member
IntelliJoint: Paid consultant
Medacta: Paid consultant
Surgical Care Associates: Paid presenter or speaker

Brian M. Curtin, MD, MS

American Association of Hip and Knee Surgeons: Board or committee member
American Joint Replacement Registry Review Commission: Board or committee member
Biomet: Paid consultant
CareStream: Paid consultant
Clinical Orthopaedics and Related Research: Editorial or governing board
DePuy, A Johnson & Johnson Company: Paid presenter or speaker
European Journal of Orthopaedic Surgery and Traumatology: Editorial or governing board
International Congress for Joint Reconstruction: Board or committee member
Johnson & Johnson: Paid consultant
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Stryker: Paid consultant

David F. Dalury, MD

DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Paid presenter or speaker; Research support
Johnson & Johnson: Stock or stock Options
Robony: Stock or stock Options

Chris J. Dangles, MD

This individual reported nothing to disclose.

Charles M. Davis, III, MD, PhD

AAOS: Board or committee member
Journal of Arthroplasty: Editorial or governing board

Ivan De Martino, MD

Lima Corporate: Paid consultant

Carl A. Deirmengian, MD

Biomet: Paid consultant
Biostar Ventures: Paid consultant; Stock or stock Options
Domain: Stock or stock Options
Trice: Stock or stock Options
Zimmer: Paid consultant; Paid presenter or speaker; Research support

Daniel J. Del Gaizo, MD

Biomup: Research support
Conformis: Research support
DePuy, A Johnson & Johnson Company: Paid consultant; Research support
Journal of Arthroplasty: Editorial or governing board
Orthalign: Paid consultant
Pacira: Research support
Pacira Pharmaceuticals: Paid consultant; Paid presenter or speaker
Reflection Health: Research support
SPR Therapeutics: Paid consultant
Stryker: Research support
Zimmer: Research support

Craig J. Della Valle, MD

American Association of Hip and Knee Surgeons: Board or committee member
Arthritis Foundation: Board or committee member
DePuy, A Johnson & Johnson Company: Paid consultant
Hip Society: Board or committee member
Orthopedics Today: Editorial or governing board
Orthophor and Surgiphor: Stock or stock Options
Parvizi Surgical Innovations: Stock or stock Options
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Stryker: Research support

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Zimmer: IP royalties; Paid consultant; Research support

David E. DeMik, MD

This individual reported nothing to disclose.

Douglas A. Dennis, MD

Clinical Orthopaedics and Related Research: Editorial or governing board
Corin U.S.A.: Paid consultant; Paid presenter or speaker; Stock or stock Options
DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Paid presenter or speaker
DePuy, A Johnson & Johnson Company, Porter Adventist Hospital: Research support
Joint View: Stock or stock Options
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Orthopedics Today: Editorial or governing board
Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Matthew J. Dietz, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Heraeus Medical: Paid consultant
Synotrac/Graftworx: Stock or stock Options

Lawrence D. Dorr, MD

Biomet: IP royalties
DJ Orthopaedics: IP royalties
Joint Development, Inc.: Stock or stock Options
Operation Walk: Board or committee member
Total Joint Orthopedics: Unpaid consultant
Zimmer: IP royalties

Jacob M. Drew, MD

DePuy, A Johnson & Johnson Company: Paid presenter or speaker
Journal of Arthroplasty: Editorial or governing board
KCI: Paid consultant

Stephen T. Duncan, MD

Bone Support: Paid consultant
Heraeus: Paid consultant
Journal of Arthroplasty: Editorial or governing board
Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board
Kentucky Orthopaedic Society: Board or committee member
Morph: Unpaid consultant
Smith & Nephew: Paid consultant; Research support
Stryker: Research support
Zimmer: Paid consultant; Research support

Robert Easton, MD

Encore Medical: IP royalties; Paid consultant; Paid presenter or speaker

Jacob M. Elkins, MD, PhD

This individual reported nothing to disclose.

Karim A. Elsharkawy, MD

This individual reported nothing to disclose.

Orry Erez, MD

AAOS: Board or committee member
Brooklyn Orthopedic Society: Board or committee member
New York State Society of Orthopedic Surgeons: Board or committee member
Premia Spine: Stock or stock Options

Aidin Eslam Pour, MD

This individual reported nothing to disclose.

Thomas K. Fehring, MD

DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Paid presenter or speaker; Research support

Michael J. Feldstein, MD, MS

FT1: Stock or stock options
muvr: Stock or stock options
Pfizer: Stock or stock options

Yale A. Fillingham, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Johnson & Johnson: Paid consultant
Medacta: Paid consultant

Stuart J. Fischer, MD

AAOS: Board or committee member
AAOS Now: Editorial or governing board
AAOS OrthoInfo: Editorial or governing board
AAOS, NJOS, OSNJ, NJMLIPA: Board or committee member
Jones and Bartlett Publishers
Sudbury, MA: Publishing royalties, financial or material support

Michael A. Flierl, MD

Stryker: Research support

Mark G. Freeman, MD

Conformis: Paid consultant
HealthTrustPG: Paid consultant
Irrimax Corporation: Stock or stock Options
Smith & Nephew: Paid consultant; Paid presenter or speaker

Kevin B. Fricka, MD

2ndMD: Paid consultant
OrthAlign: Stock or stock Options
OrthoCareRN: Other financial or material support
Pulse: Stock or stock Options
Smith & Nephew: Paid consultant; Paid presenter or speaker; Research support
Zimmer: Paid consultant; Paid presenter or speaker
Zimmer, INOVA Health Care Services: Research support

Mark I. Froimson, MD, MBA

American Association of Hip and Knee Surgeons: Board or

committee member
American Journal of Orthopedics: Editorial or governing board
Arthritis Foundation: Board or committee member
Clarify Health, LLC: Stock or stock Options
Flexion: Paid consultant
Indago: Stock or stock Options
Johnson & Johnson: Paid consultant
Journal of Arthroplasty: Editorial or governing board
Journal of Bone and Joint Surgery - American: Editorial or governing board
Orthalign: Stock or stock Options
OSSO VR: Stock or stock Options
Pacira: Other financial or material support; Stock or stock Options
Thrive Peer Support: Stock or stock Options
UOC: Paid consultant

J. Luke Galloway, BA

This individual reported nothing to disclose.

Luke Garbarino, MD

This individual reported nothing to disclose.

Jonathan P. Garino, MD, MBA

American Association of Hip and Knee Surgeons: Board or committee member
Clinical Orthopaedics and Related Research: Editorial or governing board
Journal of Arthroplasty: Editorial or governing board
Knee: Editorial or governing board
Pennsylvania orthopedic society: Board or committee member
Shukla Medical: IP royalties
Smith & Nephew: IP royalties; Paid consultant; Research support
Zimmer: Research support

Jeremy M. Gililland, MD

AAOS: Board or committee member
American Association of Hip

and Knee Surgeons: Board or committee member
Biomet: Research support
CoNexions: Stock or stock Options
DJ Orthopaedics: Paid consultant
Journal of Arthroplasty: Editorial or governing board
Medacta: Paid consultant
OrthoGrid: IP royalties; Paid consultant; Stock or stock Options
Smith & Nephew: Paid consultant
Stryker: Paid consultant; Research support
Zimmer: Research support

Devon D. Goetz, MD

Clinical Orthopaedics and Related Research: Editorial or governing board
Journal of Bone and Joint Surgery - American: Editorial or governing board
society for arthritic joint surgery: Board or committee member

Peter A. Gold, MD

This individual reported nothing to disclose.

Ashton H. Goldman, MD

This individual reported nothing to disclose.

Jeffrey M. Goldstein, MD

Altus Spine: Paid consultant
Bulletin of the Hospital for Joint Diseases: Editorial or governing board
Globus Medical: Paid consultant
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Spine Journal: Editorial or governing board
Spine Surgery Today: Editorial or governing board
St. Teresa Medical: Stock or stock Options
Zimmer: Paid consultant

Gregory J. Golladay, MD

American Association of Hip and Knee Surgeons: Board or committee member
Arthroplasty Today: Editorial or governing board; Publishing royalties, financial or material support
Journal of Arthroplasty: Editorial or governing board
KCI: Research support
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Virginia Orthopaedic Society: Board or committee member

Joseph S. Gondusky, MD

DePuy, A Johnson & Johnson Company: Paid consultant
Zimmer: Paid consultant

Alexander C. Gordon, MD

OrthoSensor: Paid consultant; Research support; Stock or stock Options

Karan Goswami, MD

This individual reported nothing to disclose.

Christopher W. Grayson, MD

This individual reported nothing to disclose.

Max R. Greenky, MD

This individual reported nothing to disclose.

Matthew J. Grosso, MD

Convatec: Paid consultant

Padma Gulur, MD

American society of Anesthesiologists: Board or committee member

Derek A. Haas, MBA

This individual reported nothing to disclose.

Disclosures

Fares S. Haddad, FRCS

bostaa: Board or committee member
corin: IP royalties
Journal of Bone and Joint Surgery - British: Editorial or governing board
matortho: IP royalties
Orthopedics Today: Editorial or governing board
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Brian R. Hamlin, MD

AAOS: Board or committee member
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Journal of Arthroplasty, Transfusion: Editorial or governing board
Smith & Nephew: Paid consultant

William G. Hamilton, MD

Biomet: Research support
DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant; Paid presenter or speaker; Research support
Inova Health Care Services: Research support
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Charles P. Hannon, MD

ExplORer Surgical: Paid consultant

Matthew S. Hepinstall, MD

AAOS: Board or committee member
Corin U.S.A.: Paid consultant
Cymedica: Research support
Exactech, Inc: Paid consultant
Flexion Therapeutics: Research support
KCI: Paid consultant
Stryker: Paid consultant; Paid presenter or speaker; Research support

Shane R. Hess, DO

This individual reported nothing to disclose.

Mario Hevesi, MD

Moximed: Paid consultant

Carlos A. Higuera, MD

American Association of Hip and Knee Surgeons: Board or committee member
American Journal of Orthopedics: Editorial or governing board
CD Diagnostics: Research support
Cymedica: Research support
Ferring Pharmaceuticals: Research support
Journal of Arthroplasty: Editorial or governing board
Journal of Hip Surgery: Editorial or governing board
Journal of Knee Surgery: Editorial or governing board
KCI: Paid consultant; Paid presenter or speaker; Research support
Mid-American Orthopaedic Association: Board or committee member
Musculoskeletal Infection Society: Board or committee member
OREF: Research support
Orthofix, Inc.: Research support
Orthogenics: Research support
PSI: Stock or stock Options
Stryker: Research support
Zimmer: Paid consultant; Research support

James I. Huddleston, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
American Knee Society: Research support
Biomet: Paid consultant; Research support
California Joint Replacement Registry: Paid consultant
Corin U.S.A.: Paid consultant; Paid presenter or speaker; Research support
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Porosteon: Paid consultant; Stock or stock Options
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Zimmer: Paid consultant; Paid presenter or speaker

Jason R. Hull, MD

American Association of Hip and Knee Surgeons: Board or committee member

Michael H. Huo, MD

American Association of Hip and Knee Surgeons: Board or committee member
AO Foundation: Paid consultant
B-One Orthopedics: Paid consultant
DePuy, A Johnson & Johnson Company: Paid consultant
Implantcast: Paid consultant

Richard Iorio, MD

American Association of Hip and Knee Surgeons: Board or committee member
Bulletin of the Hospital for Joint Disease: Editorial or governing board
Clinical Orthopaedics and Related Research: Editorial or governing board
Covina: Stock or stock Options
Force Therapeutics: Stock or stock Options
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JBJS Reviews: Editorial or governing board
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committee member
MedTel: Paid consultant; Stock or stock Options
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Muve Health: Paid consultant; Stock or stock Options
Pacira: Paid consultant
Recro Pharma: Paid consultant
URX Mobile: Stock or stock Options
Wellbe: Stock or stock Options
Zimmer: Paid consultant

Joshua J. Jacobs, MD

American Board of Orthopaedic Surgery, Inc.: Board or committee member
Hip Society: Board or committee member
Hyalex: Stock or stock Options
Journal of Bone and Joint Surgery - American: Editorial or governing board; Publishing royalties, financial or material support
Medtronic Sofamor Danek: Research support
Nuvasive: Research support
Orthopaedic Research and Education Foundation: Board or committee member
Zimmer: Research support

Rina Jain, MD, FRCSC

This individual reported nothing to disclose.

Derek R. Jenkins, MD

This individual reported nothing to disclose.

Jason M. Jennings, MD

DePuy, A Johnson & Johnson Company: Research support
Total Joint Orthopedics: Paid consultant
Xenex: Paid presenter or speaker

Seth A. Jerabek, MD

Imagen Technologies: Stock or stock Options
Stryker: IP royalties; Paid consultant; Paid presenter or speaker; Research support

David S. Jevsevar, MD, MBA

American Association of Hip and Knee Surgeons: Board or committee member
Medacta: Paid consultant
Medscape: Publishing royalties, financial or material support

Atul F. Kamath, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
BMC Musculoskeletal Disorders: Editorial or governing board
DePuy, A Johnson & Johnson Company: Paid consultant; Paid presenter or speaker; Research support
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Mark S. Karadsheh, MD

Orthobullets: Publishing royalties, financial or material support

James A. Keeney, MD

American Orthopaedic Association: Board or committee member
DePuy, A Johnson & Johnson Company: Paid consultant
Flexion Therapeutics: Paid consultant
Journal of Hip Surgery: Editorial or governing board
Mid-American Orthopaedic Association: Board or committee member
Missouri State Orthopaedic Association: Board or committee member
Orthopedics: Editorial or governing board

Stephen J. Kelly, MD

American Association of Hip and Knee Surgeons: Board or committee member

Beau J. Kildow, MD

This individual reported nothing to disclose.

Meghan Kirksey, MD, PhD

This individual reported nothing to disclose.

Brian A. Klatt, MD

AAOS: Board or committee member
AAOSAAHKS Abstract Review Committee: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Clinical Orthopaedics and Related Research: Editorial or governing board
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MSIS: Board or committee member
SLACK Incorporated: Publishing royalties, financial or material support

David J. Kolessar, MD

DePuy, A Johnson & Johnson Company: Research support

Erik W. Kroger, MD

This individual reported nothing to disclose.

Chad A. Krueger, MD

Journal of Bone and Joint Surgeons- Deputy Editor: Board or committee member

Young-Min Kwon, MD, PhD

Biomet: Research support
Corentec: Research support
DePuy, A Johnson & Johnson Company: Research support
Smith & Nephew: Research support
Stryker: Research support
Zimmer: Research support

Claudette M. Lajam, MD

AAOS: Board or committee member
Arthrex, Inc: Paid presenter or speaker
Clinical Orthopaedics and

Related Research: Editorial or governing board
HJD Bulletin: Editorial or governing board
Journal of Arthroplasty: Editorial or governing board
NYSSOS: Board or committee member
Pfizer: Employee (spouse)

Jason E. Lang, MD

This individual reported nothing to disclose.

Maxwell K. Langfitt, MD

This individual reported nothing to disclose.

Charles M. Lawrie, MD

American Association of Hip and Knee Surgeons: Board or committee member
Medtronic: Paid presenter or speaker
MicroPort Orthopedics: Paid consultant
Zimmer: Research support

Eric A. Levicoff, MD

This individual reported nothing to disclose.

Brett R. Levine, MD, MS

American Association of Hip and Knee Surgeons: Board or committee member
Artelon: Research support
Biomet: Research support
CORD: Board or committee member
DJ Orthopaedics: Paid consultant
Exactech, Inc: Paid consultant
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Link Orthopaedics: Paid consultant
Medacta: Paid consultant
Merete: Paid consultant
SLACK Incorporated: Editorial or governing board
Zimmer: Research support

Jay R. Lieberman, MD

AAOS: Board or committee member
DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant
Hip Innovation Technology: Stock or stock Options

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Musculoskeletal Transplant Foundation: Board or committee member
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Western Orthopaedic Association: Board or committee member

Disclosures

Adolph V. Lombardi, Jr., MD, FACS

Central Ohio Orthopaedic Management Company: Board or committee member
Clinical Orthopaedics and Related Research: Editorial or governing board
Current Concepts in Joint Replacement: Board or committee member
Elite, Inc.: Stock or stock Options
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SPR Therapeutics: Research support
SPR Therapeutics, LLC: Stock or stock Options
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VuMedi: Stock or stock Options
Zimmer Biomet: IP royalties; Paid consultant; Research support

Jess H. Lonner, MD

American Association of Hip and Knee Surgeons: Board or committee member
American Journal of Orthopedics: Editorial or governing board
Biomet: IP royalties; Paid

presenter or speaker
Force Therapeutics: Paid consultant; Research support; Stock or stock Options
Muvr Labs: Paid consultant; Research support; Stock or stock Options
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Zimmer: IP royalties; Paid presenter or speaker
Zimmer Biomet: Paid consultant; Research support

Tad M. Mabry, MD

This individual reported nothing to disclose.

William B. Macaulay, Jr., MD

American Association of Hip and Knee Surgeons: Board or committee member
Clinical Orthopaedics and Related Research: Editorial or governing board
Journal of Arthroplasty: Editorial or governing board
ORamaVR: Unpaid consultant
OrthAlign: Stock or stock Options

Theodore T. Manson, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Clinical Orthopaedics and Related Research: Editorial or governing board
DePuy, A Johnson & Johnson Company: Research support
Globus Medical: Paid consultant
Journal of Arthroplasty: Editorial or governing board
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governing board
Stryker: Paid consultant
Synthes: Research support

Joseph D. Maratt, MD

Alexion Pharmaceuticals: Stock or stock Options
Biogen: Stock or stock Options
Dimension Therapeutics: Stock or stock Options
Merck: Stock or stock Options
Sage Therapeutics: Stock or stock Options
Sanofi-Aventis: Stock or stock Options
Zimmer Biomet: Paid consultant

John R. Martin, MD

This individual reported nothing to disclose.

J. Bohannon Mason, MD

American Association of Hip and Knee Surgeons: Board or committee member
DePuy, A Johnson & Johnson Company: IP royalties; Other financial or material support; Paid consultant
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Vasilios Mathews, MD

DePuy, A Johnson & Johnson Company: Paid consultant; Research support

Benjamin A. McArthur, MD

DJ Orthopaedics: Paid consultant
Journal of Arthroplasty: Editorial or governing board
D. Clinton McNabb, MD, FAAOS
Total Joint Orthopedics: Paid consultant

Simon C. Mears, MD, PhD

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Fragility Fracture Network: Board or committee member
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Journal of the American Geriatrics Society: Editorial or governing board
SAGE: Editorial or governing

board

R. Michael Meneghini, MD

DJ Orthopaedics: IP royalties; Paid consultant; Research support
Emovi: Stock or stock Options
International Congress for Joint Reconstruction: Board or committee member
Journal of Arthroplasty: Editorial or governing board
KCI: Paid consultant
Kinamed: Paid consultant
Knee Society: Board or committee member
MuveHealth: Stock or stock Options
Olio Health: Stock or stock Options
Orthopedics Today: Editorial or governing board
Osteoremedies: IP royalties; Paid consultant

Robert M. Molloy, MD

American Association of Hip and Knee Surgeons: Board or committee member
Stryker: Paid consultant; Paid presenter or speaker; Research support
Zimmer: Research support

Michael A. Mont, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Cymedica: Paid consultant
DJ Orthopaedics: Paid consultant; Research support
Flexion Therapeutics: Paid consultant
Johnson & Johnson: Paid consultant; Research support
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Knee Society: Board or committee member
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Ongoing Care Solutions: Paid consultant; Research support
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Pacira: Paid consultant
Peerwell: Paid consultant;
Stock or stock Options
Performance Dynamics: Paid consultant
Pfizer: Paid consultant
Skye Biologics: Paid consultant
Stryker: IP royalties; Paid consultant; Research support
Surgical Techniques International: Editorial or governing board
Tissue Gene: Paid consultant
TissueGene: Research support
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Vincent M. Moretti, MD

This individual reported nothing to disclose.

Michael J. Morris, MD

Joint Development Corporation: Stock or stock Options
KCI: Research support
SPR Therapeutics: Research support
SPR Therapeutics, LLC: Stock or stock Options
Total Joint Orthopedics: IP royalties; Paid consultant
Zimmer Biomet: Paid consultant; Paid presenter or speaker; Research support

Wayne E. Moschetti, MD, MS

DePuy, A Johnson & Johnson Company: Paid consultant; Paid presenter or speaker; Research support
Medacta: Other financial or material support
New England Orthopaedic Society: Board or committee member
Omni Life Science: Other financial or material support

Joseph T. Moskal, MD, FACS

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Corin U.S.A.: IP royalties; Paid consultant
DePuy, A Johnson & Johnson Company: IP royalties
Invuity: Stock or stock Options
Stryker: Paid consultant; Paid presenter or speaker
Think Surgical: Stock or stock Options
United Orthopaedic Company: Paid consultant

Calin S. Moucha, MD

3M: Paid presenter or speaker
Biocomposites: Paid presenter or speaker
Smith & Nephew: Paid consultant

Colin A. Mudrick, MD

DePuy, A Johnson & Johnson Company: Paid consultant

Thomas G. Myers, MD

Journal of Arthroplasty:

Editorial or governing board

Cindy R. Nahhas, BS

This individual reported nothing to disclose.

Denis Nam, MD, MSc

KCI: Paid consultant; Research support
Stryker: Paid consultant
Zimmer: Research support

Sumon Nandi, MD, FACS

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Journal of Arthroplasty: Editorial or governing board

Nader A. Nassif, MD

DePuy, A Johnson & Johnson Company: Paid presenter or speaker

Nathaniel J. Nelms, MD

AAOS: Board or committee member
Arthroplasty Today: Editorial or governing board
Stryker: Research support

Charles L. Nelson, MD

American Orthopaedic Association: Board or committee member
Exactech, Inc: Paid consultant
Journal of Hip Surgery: Editorial or governing board
Knee Society: Board or committee member
Zimmer: Paid consultant

W. Trevor North, MD

PeerWell: Stock or stock Options

Ryan M. Nunley, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons, Board of Directors and Treasurer: Board or committee member
Biocomposites: Paid consultant
Biomet: Research support
Cardinal Health: Paid consultant
DePuy, A Johnson & Johnson Company: Paid consultant;

Research support
Halyard: Paid consultant
Hip Society: Board or committee member
Hyalex: Stock or stock Options
Medical Compression System Inc: Paid consultant
Medical Compression Systems, Inc.: Research support
Medtronic: Paid consultant
Microport: IP royalties; Paid consultant
Mid-America Orthopaedic Association, Program Committee Chair, 2018 Program Chair: Board or committee member
Mirus: Paid consultant
Missouri State Orthopaedic Association, Board Member and President: Board or committee member
Smith & Nephew: Paid consultant; Research support
Southern Orthopaedic Assoc. 2018 President: Board or committee member
Stryker: Research support
The Knee Society, Education Committee, 2018 Program Chair: Board or committee member

Douglas E. Padgett, MD

DJ Orthopaedics: IP royalties; Paid consultant; Paid presenter or speaker
Journal of Arthroplasty: Editorial or governing board
The Hip Society: Board or committee member

Hari K. Parvataneni, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Arthroplasty Today: Editorial or governing board
Florida Orthopaedic Society: Board or committee member

Disclosures

Javad Parvizi, MD, FRCS

3M: Paid consultant
Alphaeon: Stock or stock Options
Cerbell: Stock or stock Options
Corentec: IP royalties; Paid consultant; Stock or stock Options
DataTrace: Publishing royalties, financial or material support
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Hip Innovation Technology: Stock or stock Options
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Zimmer: Paid consultant

Christopher E. Pelt, MD

AAOS: Board or committee member
Acelity, Inc.: Paid consultant;

Paid presenter or speaker
American Association of Hip and Knee Surgeons: Board or committee member
Joint Development, LLC: Stock or stock Options
TJO (Total Joint Orthopedics): IP royalties; Paid consultant; Paid presenter or speaker
Zimmer Biomet: Paid consultant; Paid presenter or speaker; Research support

Brett C. Perricelli, MD

AAHKS - Abstract Review Committee: Board or committee member
Biomet: Paid consultant
Journal of Arthroplasty: Editorial or governing board
Pacira Pharmaceuticals Inc: Stock or stock Options
Zimmer: Paid consultant
Zimmer Biomet: Paid presenter or speaker

Kevin I. Perry, MD

This individual reported nothing to disclose.

Jeffrey R. Petrie, MD

DePuy, A Johnson & Johnson Company: Other financial or material support
Medtronic: Paid consultant; Paid presenter or speaker

Kevin D. Plancher, MD, MPH

American Association of Hip and Knee Surgeons: Board or committee member
American Orthopaedic Society for Sports Medicine: Board or committee member
American Shoulder and Elbow Surgeons: Board or committee member
Arthroscopy Association of North America: Board or committee member
Arthroscopy: The Journal of Arthroscopic & Related Surgery: Editorial or governing board
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Medical Society of the State of New York: Board or committee member
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Operative Techniques in Sports Medicine: Editorial or governing board
Orthopaedic Research and Education Foundation: Board or committee member
Techniques in Orthopaedics: Editorial or governing board

Gregory G. Polkowski II, MD, MSc

American Association of Hip and Knee Surgeons: Board or committee member
Bone Support: Paid consultant
DJ Orthopaedics: IP royalties; Paid consultant

Mihail Radulescu, MD

This individual reported nothing to disclose.

Adam J. Rana, MD

Smith & Nephew: Paid consultant

Harold W. Rees, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Heliyon: Editorial or governing board
Journal of Arthroplasty: Editorial or governing board
Orthopedics: Editorial or governing board
PLOS one: Editorial or governing board

Benjamin F. Ricciardi, MD

Arthroplasty Today: Editorial or governing board
Clinical Orthopaedics and Related Research: Editorial or governing board

Andrew B. Richardson, MD

Total Joint Orthopedics: Paid consultant

Timothy Roberts, MBChB

This individual reported nothing to disclose.

David Rodriguez, MD

This individual reported nothing to disclose.

Robert P. Runner, MD

This individual reported nothing to disclose.

Alexander P. Sah, MD

Convatec: Paid presenter or speaker
Mallinckrodt: Paid presenter or speaker
NextStep: IP royalties
Pacira: Paid presenter or speaker
Zimmer: Research support

Adam A. Sassoon, MD, MS

American Association of Hip and Knee Surgeons: Board or committee member
Biocomposites Inc.: Paid consultant
Orthalign: Paid consultant
Smith & Nephew: Paid consultant

Nicholas Sauder, BA

This individual reported nothing to disclose.

Arjun Saxena, MD

American Association of Hip and Knee Surgeons: Board or committee member
American Board of Orthopaedic Surgery, Inc.: Board or committee member
DePuy, A Johnson & Johnson Company: Paid presenter or speaker
Eastern Orthopaedic Association: Board or committee member
Halyard: Research support
Journal of Arthroplasty: Editorial or governing board
Journal of Bone and Joint Surgery - American: Editorial or governing board
Journal of Surgical Orthopaedic Advances: Editorial or governing board
Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board
United Orthopaedics: Research support

H. Del Schutte, Jr., MD, FAAOS

Exactech, Inc: Paid consultant
Medtronic: Paid presenter or speaker
South Carolina Orthopedic Society: Board or committee member

Adam J. Schwartz, MD

Arthroplasty Today: Editorial or governing board

Andrew M. Schwartz, MD

This individual reported nothing to disclose.

Benjamin J. Schwartz, MD

Journal of Arthroplasty:
Editorial or governing board
Medacta: Paid consultant

Ran Schwarzkopf, MD, MSc

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Arthroplasty Today: Editorial or governing board
Gauss surgical: Stock or stock Options
Intelijoint: Paid consultant;
Stock or stock Options
Journal of Arthroplasty:
Editorial or governing board
Smith & Nephew: Paid consultant; Research support
Travis S. Scudday, MD
Exactech, Inc: Research support

Peter K. Sculco, MD

EOS Imaging: Paid consultant
Intellijoint: Research support
Lima Corporate: Paid consultant

Christopher E. Selgrath, DO

Hip Innovation Technology:
Stock or stock Options

Robert A. Sershon, MD

2ndMD: Paid consultant

Thorsten M. Seyler, MD, PhD

Advances in Orthopedics:
Editorial or governing board
American Association of Hip and Knee Surgeons: Board or committee member

Biomet: Research support
Heraeus: Paid consultant
KCI: Research support
MedBlue Incubator Inc: Research support
Reflexion Health Inc.: Research support
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Total Joint Orthopedics, Inc: IP royalties
Total Joint Orthopedics, Inc.: Paid consultant

Roshan P. Shah, MD

Link Orthopaedics: Paid consultant
U.S. Food and Drug Administration: Board or committee member

Vivek M. Shah, MD

Biomet: Paid presenter or speaker
DePuy, A Johnson & Johnson Company: Paid presenter or speaker
Medtronic: Paid consultant

Cambize Shahrdrar, Jr., MD

This individual reported nothing to disclose.

Joshua A. Shapiro, MD

Renal Physicians Association: Board or committee member

Rafael J. Sierra, MD

American Association of Hip and Knee Surgeons: Board or committee member
Anchor study group: Board or committee member
Biomet: Paid consultant; Paid presenter or speaker
Cytori: Research support
DePuy, A Johnson & Johnson Company: Research support
Journal of Arthroplasty:
Editorial or governing board
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Orthoalign: Paid consultant;
Stock or stock Options
Springer: Publishing royalties,

financial or material support
Stryker, Biomet: Research support
Zimmer: IP royalties; Research support

Sean E. Slaven, MD

This individual reported nothing to disclose.

James D. Slover, MD

AJRR Hip Society Steering Comm Member: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Biomet: Research support
Hip Society: Board or committee member
Knee Society: Board or committee member
Pacira: Paid presenter or speaker
PCORI Advisor Board Shared Decision Making: Board or committee member
Smith & Nephew: Research support

Nipun Sodhi, MD

This individual reported nothing to disclose.

Wayne M. Sotile, PhD

This individual reported nothing to disclose.

Mark J. Spangehl, MD

American Association of Hip and Knee Surgeons: Board or committee member
Arthroplasty Today: Editorial or governing board
BodyCad: Paid consultant
DePuy, A Johnson & Johnson Company: Research support
Journal of Arthroplasty:
Editorial or governing board
Sonoran Biosciences: Stock or stock Options
Stryker: Research support
Zimmer: Paid consultant

Jonathon M. Spanyer, MD

DePuy, A Johnson & Johnson Company: Paid presenter or speaker
Medacta International: Paid consultant
Smith & Nephew: Paid

presenter or speaker

Scott M. Sporer, MD, MS

American Joint Replacement Registry: Board or committee member
DJO Surgical: IP royalties; Paid consultant
Hip Society: Board or committee member
Knee Society: Board or committee member
Myoscience: Paid consultant;
Stock or stock Options
Osteoremedies: IP royalties; Paid consultant
SLACK Incorporated:
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Zimmer: IP royalties; Research support

Bryan D. Springer, MD

AJRR: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Arthroplasty Today: Editorial or governing board
Ceramtec: Paid presenter or speaker
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Journal of Arthroplasty:
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Stryker: IP royalties; Paid consultant

Jeffrey B. Stambough, MD

American Association of Hip and Knee Surgeons: Board or committee member

Garen D. Steele, MD

American Association of Hip and Knee Surgeons: Board or committee member
OrthoCor: Paid consultant
Zimmer: Paid consultant

Disclosures

Benjamin M. Stronach, MD, MS

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
DePuy, A Johnson & Johnson Company: Paid consultant; Research support
DJ Orthopaedics: Paid consultant
Joint Development LLC: Stock or stock Options
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Sawbones/Pacific Research Laboratories: IP royalties
Smith & Nephew: Paid consultant
Tightline Development LLC: IP royalties

Louis S. Stryker, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Journal of Arthroplasty: Editorial or governing board

Juan C. Suarez, MD

Arthroplasty Today: Editorial or governing board
Corin U.S.A.: IP royalties
DePuy, A Johnson & Johnson Company: Paid presenter or speaker

T. David Tarity, MD

This individual reported nothing to disclose.

Michael J. Taunton, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
DePuy, A Johnson & Johnson Company: Research support
DJ Orthopaedics: IP royalties; Paid consultant
Journal of Arthroplasty: Editorial or governing board
Mid America Orthopedic

Association: Board or committee member
Stryker: Research support

Matthew W. Tetreault, MD

This individual reported nothing to disclose.

Krishna R. Tripuraneni, MD

Arthroplasty Today: Editorial or governing board
DJO Surgical: Research support
Graftworx: Stock or stock Options
Journal of Arthroplasty: Editorial or governing board
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Zimmer: Research support

Creighton C. Tubb, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
Journal of Arthroplasty: Editorial or governing board
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Kimberly K. Tucker, MD

This individual reported nothing to disclose.

Kenneth L. Urish, MD, PhD

AAOS: Board or committee member
ASTM: Board or committee member
BodyCad: Research support
Smith & Nephew: Paid consultant

Hamed Vahedi, MD

This individual reported nothing to disclose.

Jonathan M. Vigdorchik, MD

Corin U.S.A.: Paid consultant
Intellijoint Surgical: Paid consultant; Stock or stock Options
Zimmer: Paid consultant

Frank R. Voss, MD

AAOS Coding, Coverage and Reimbursement Committee: Board or committee member
American Association of Hip and Knee Surgeons: Board or

committee member
American Medical Association, CPT committee member:
Board or committee member

Joseph P. Ward, MD

This individual reported nothing to disclose.

Lucian C. Warth, MD

American Association of Hip and Knee Surgeons: Board or committee member
Link Orthopaedics: Paid consultant
OsteoRemedies: Paid consultant
Stryker: Paid consultant

Jonathan E. Webb, MD

This individual reported nothing to disclose.

Samuel S. Wellman, MD

American Association of Hip and Knee Surgeons: Board or committee member
Biomet: Research support
DePuy, A Johnson & Johnson Company: Research support
Joint Development, LLC: Stock or stock Options
Journal of Arthroplasty: Editorial or governing board
Stryker: Paid consultant; Research support
Total Joint Orthopaedics: Paid consultant
Total Joint Orthopedics: IP royalties
Zimmer: Research support

Sigita Wolfe, MA

This individual reported nothing to disclose.

Cody C. Wyles, MD

This individual reported nothing to disclose.

Adolph J. Yates Jr., MD, FAOA

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
American Society of Hematologists: Board or committee member
Journal of Arthroplasty:

Editorial or governing board
Journal of Bone and Joint Surgery - American: Editorial or governing board
Orthoworld: Paid presenter or speaker
Zimmer: Paid presenter or speaker

Michael Yayac, MD

This individual reported nothing to disclose.

Simon W. Young, MBChB, FRACS, MD

American Association of Hip and Knee Surgeons: Board or committee member
Arthrex, Inc: Paid presenter or speaker
Smith & Nephew: Paid presenter or speaker
Stryker: Paid consultant; Paid presenter or speaker; Research support
Surgical Solutions: Stock or stock Options
Vidacare: Research support

Khalid M. Yousuf, MD

AAOS: Board or committee member
American Association of Hip and Knee Surgeons: Board or committee member
OrthAlign, LLC: Paid consultant

Mark W. Zawadsky, MD

American Association of Hip and Knee Surgeons: Board or committee member

Notes

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2021 AAHKS ANNUAL MEETING

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FUTURE AAHKS / THE HIP SOCIETY / THE KNEE SOCIETY SPECIALTY DAYS

March 28, 2020 | ORLANDO

March 13, 2021 | SAN DIEGO



9400 W. Higgins Rd., Suite 230
Rosemont, IL 60018-4976
847-698-1200
www.AAHKS.org