2021 Research Symposium Book

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Beth Israel Lahey Health
New England Baptist Hospital

Table of Contents

A Letter From David Passafaro

Dear NEBH Community,

I am pleased to welcome back the Annual Research Symposium on July 14, 2021, a New England Baptist Hospital tradition, interrupted last year by COVID-19. The symposium is an opportunity for NEBH researchers to come together, present studies, share ideas and accomplishments. The research done by doctors, nurses, physical therapists and the research department is part of our academic mission to train and prepare the next generation of clinicians.

As a top-ranked specialty teaching hospital for orthopedics, NEBH considers research and intellectual curiosity at the heart of innovation and invention. The research studies highlighted here encompass many aspects of orthopedic care, including, large database outcomes studies, nursing care, care of vulnerable and underserved populations, and forward-thinking surgical care. I want to congratulate and thank all of the participants and researchers who are moving our knowledge and understanding forward into better care and better outcomes for our patients.

I want to thank Dr Carl Talmo, Dr. Eric Smith, Dr. Brian Hollenbeck, and all of the research staff for their administrative work in keeping the Research department at the Baptist vibrant and active. Also, a special thanks to Dr. Stephen J. Camer for his contribution of research funding from the Stephen J. Camer Surgical Fund to support teaching and research.

Congratulations and thanks to all.

Sincerely,

David Passafaro
President
New England Baptist Hospital

Agenda

17th NEBH Research Symposium

July 14, 2021
6:45 AM – 8:35 AM

Organized by:	Department of Research Administration
Venue:	Chapel (in-person) or Zoom (virtual)
Emcee	Dr. Carl T. Talmo

6:45 AM – 6:50 AM **Opening Remarks**

6:50 AM – 7:15 AM **Clinical Considerations in Arthroplasty (Moderator: Carl T. Talmo)**

John Pinski | Outcomes of Head and Liner Exchange for Trunnionosis with Accolade TMZF and the LFIT V40 Head

Ann Ell | Syncopal/ Presyncopal Episodes in Orthopedic Surgery Patients in the Postoperative Inpatient Population

Christopher Fang | Combined Treatment of Intraoperative Cell-salvage and Tranexamic Acid for Primary Unilateral Total Hip Arthroplasty: Are There Added Benefits?

Christopher Fang | Reducing Narcotic Usage with 0.5% Bupivicaine Periarticular Injections in Total Knee Arthroplasty

Panel Discussion – Q&A Session

7:15 AM – 7:40 AM **Clinical Considerations in Sports & Shoulder (Moderator: Sarav Shah)**

Julianne Forlizzi | Defining Proximal Hamstring Tears Using a Novel Imaged-Based Classification: Optimizing Communication and Outcomes

Julianne Forlizzi | Predictors of Poor and Excellent Outcomes after Reverse Total Shoulder Arthroplasty: Outcomes Predictors after Reverse Shoulder Arthroplasty

Robert Pettit | Primary Reverse Total Shoulder Arthroplasty Performed for Glenohumeral Arthritis: Does Glenoid Morphology Matter?

Robert Pettit | Lift the Restrictions? Return to Sport in High Demand Weightlifters Following Anatomic Total Shoulder Arthroplasty at Average 3.6 years Follow-up

Panel Discussion – Q&A Session

7:40 AM – 8:05 AM **Database Studies (Moderator: Andrew Jawa)**

Nicholas Pagani | Is There a Safe Number of Opioids to Prescribe to Opioid-Naïve Total Joint Arthroplasty Patients?

Raymond Hwang | Intraoperative Transverse Process Fractures and Posterolateral Lumbar Fusion Rates

Raymond Hwang | Mortality and Cost Associated with Lumbar Spinal Stenosis and Spondylolisthesis in a Medicare Population: Surgical vs. Non-Surgical Treatment

Sundeep Saini | Investigating a Potential Limit to Access to Care: Preoperative Cut-off Values for Body Mass Index for Shoulder Arthroplasty

Panel Discussion – Q&A Session

8:05 AM – 8:30 AM **Cost Analysis in Arthroplasty (Moderator: Eric L. Smith)**

Denise Cody | Measuring the Effect of a Pre-Operative High Carbohydrate Drink in Unilateral Primary Total Hip and Knee Arthroplasty Patients

Patrick Greenwell | Energy Expenditure of Femoral Broaching in Direct Anterior Total Hip Replacements – Comparison Between Manual and Automated Techniques

Christopher Fang | Variation in the Profit Margin for Different Types of Total Joint Arthroplasty

Christopher Fang | Prior Authorizations in Total Joint Arthroplasty: Use of Artificial Intelligence Software to Reduce Write-Offs

Panel Discussion – Q&A Session

8:30 AM – 8:35 AM **Closing Remarks**

Presentation Abstracts

Clinical Considerations in Arthroplasty

Title: Outcomes of Head and Liner Exchange for Trunnionosis with Accolade TMZF and the LFIT V40 Head

Authors: John Pinski[1], Steven Disegna[1], Christopher Fang[1], Carl Talmo[1]

[1] The New England Baptist Hospital, 125 Parker Hill Avenue, Boston, MA 02120

Background: The Stryker LFIT Anatomic CoCr V40 femoral head had a limited recall in August 2016. Currently there is sparse data on the incidence of symptomatic trunnion corrosion with this implant and the outcome of modular head and liner exchange as a treatment.

Methods: After IRB approval, our institutional joint registry was queried to identify all hip revisions involving the Accolade TMZF stem and the LFIT V40 head. A retrospective chart review and radiographic analysis was performed identifying all revisions in this patient population, and data collected included patient demographics, implant data, trunnion condition, intra-op pathology, pre and post-operative symptoms, and post-operative complications. Univariate and multivariate analyses were performed to examine factors that may correlate with post-operative pain.

Results: 43 patients were identified who underwent revision head and liner exchange for symptomatic trunnion corrosion, there were 15 female patients (average age 75, range 57-88) and 28 male (average age 67; range 56-83). Patients typically presented with weight bearing hip pain. The average time to revision surgery was 77±28 months with an average follow up of 27.5±22.9 months. The average male BMI was 31.3±6.8 and female BMI was 30.7±4.7. Average serum cobalt and chromium levels were Cobalt 4.1±3.3µg/mL; Chromium: 1.6±1.0µ/L; Cobalt/Chromium ratio: 2.9. MARS MRI demonstrated pseudotumor and adverse local tissue reaction in all cases. Pathology was consistent with chronic lymphohistiocytic inflammation and giant cells in all cases. Hip pain persisted in 23% (10/43) of the cohort after revision surgery. Other than pain, the most common post-operative complication was dislocation which occurred in 9% of patients (4/43). Multivariate analysis demonstrated a significant difference of lower cobalt levels with chronic pain (p=0.035). Age (p=0.21), sex (p=0.14), BMI (p=0.92), stem size (p=0.96), head size (p=0.73), chromium level (p=0.68) or time to revision surgery (p=0.17) were not associated with persistent post-operative hip pain in our study.

Conclusion: Head and liner exchange is a reasonable treatment strategy for symptomatic patients with evidence of ALTR and trunnionsis without evidence of gross trunnion failure. While hip pain can persist despite revision surgery, the most common complication of dislocation was similar to and slightly lower than other reports for head and liner exchange. Further studies with larger patient populations may help to better understand the relationship between Cobalt and Chromium ion levels and post-operative outcome.

SPONSOR: No funding was received for this study.
DISCLOSURE: None
ACKNOWLEDGEMENT(s): None
PRINCIPAL INVESTIGATOR NAME: Carl Talmo, MD
CO-INVESTIGATOR NAMES: John Pinski, Steven Disegna & Christopher Fang[1]

Title: Syncopal/ Presyncopal Episodes in Orthopedic Surgery Patients in the Postoperative Inpatient Population

Authors: Ann M.Ell BSN RN WCC, Shannon Traft BNS RN, Chiara Marcoccio BSN RN, and Kathleen Buckland BSN RN

Introduction: Syncopal/ Presyncopal episodes are occurrences of dizziness or lightheadedness followed by a rapid and complete recovery with or without loss of consciousness. However, these symptoms can sometimes be confused with cardiac events and to ensure patient safety, code green or rapid response is called. These patients, in general, will recover quickly with minimal treatment but may endure falls or injuries; thus, jeopardizing patient outcomes, increase length of stay, and cost. Research suggests that the main causes of syncopal/ pre-syncopal episodes include vasovagal syncope, cardiac arrhythmias, and orthostatic hypotension. In the intensive care unit, orthopedic surgical patients have multiple underlying risks for syncopal and pre-syncopal episodes including blood or fluid loss, blood pressure medications, pain medications, among other reasons. It is essential to determine the causes of syncope and patients who will be at high risk so that the episodes can be prevented, and patient safety can be warranted.

Objectives: Due to increased number of syncopal/ pre-syncopal episodes in the hospital, the purpose of this study is to examine the common causes of syncopal/ presyncopal episodes in postoperative orthopedic inpatients admitted to the hospital.

Methods: A retrospective chart review for total knee, total hip arthroplasty and various spine surgery patients admitted to the hospital was conducted. Patient characteristics, past syncopal history, past medical history, blood loss during surgery, current medications, and blood pressure readings were measured for all patients who experienced syncopal/ presyncopal episodes in 2019 and 2020. These patients were identified from the records of the patients who had code green or rapid responses.

Results: A total of 143 syncopal/ presyncopal episodes with patients aged 47 to 85 years old (Mean: 66 ± 8) with spinal and general anesthesia were examined. More than 50% of patients were on either a betablocker for blood pressure control or an opioid for pain management. Most of the episodes were related to ambulating patients to the bathroom, commode, or chair. Many patients had loss of consciousness, lightheadedness, and diaphoresis. A significant number of patients had around 20 mm Hg decrease in their blood pressure between last recorded blood pressure and during code blood pressure readings. For the majority of the patients, the ambulation that led to the syncopal/ presyncopal episode was not the first ambulation.

Conclusion: Identifying patients at risk for syncopal/ presyncopal episodes is essential in order to promote patient safety. Findings from this study suggest that the majority of patients experiencing syncopal/ presyncopal episodes have experienced orthostatic hypotension. The findings necessitate identifying necessary interventions to identify patients at risk for these episodes and introduce interventions that prevent syncopal/ presyncopal episodes such as orthostatic training and diligent blood pressure monitoring before ambulation.

Sponsor: None
Disclosure statement: None.
Acknowledgement(s):Principal investigator name: Ann M.Ell BSN RN WCC
Co-investigator names: Shannon Traft BNS RN, Chiara Marcoccio BSN RN, KathleenBuckland BSN RN

TITLE: Combined Treatment of Intraoperative Cell-salvage and Tranexamic Acid for Primary Unilateral Total Hip Arthroplasty: Are There Added Benefits?

AUTHORS: [1]Thea M Miller, BS; [1]Christopher J Fang, MD; [1]Andrew Hagar, MD; [1]Marie Anderson, BS; [1]Bishoy Gad, MD; [1]Carl T Talmo, MD

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INTRODUCTION: Blood management strategies in total hip arthroplasty (THA) are essential in reducing intraoperative blood loss, blood transfusion and associated complications. This study investigates whether using intraoperative cell-salvage (ICS) with tranexamic acid (TXA) has additional effects on blood loss and allogeneic transfusion in primary THA. Additionally, we evaluated the financial impact of using ICS on our institution.

METHODS: Using an institutional database, 1171 cases of primary unilateral THA performed between May 2015 and January 2016 were identified. Subjects were separated into those who received only TXA (n = 323) and those who received TXA and ICS (n = 848). Calculated blood loss and post-operative blood transfusions were assessed using logistic regression. Drop in hematocrit was assessed using linear regression. Multivariable models adjusted for intraoperative blood transfusions, pre-operative autologous blood donation, anticoagulation medications, sex, and body mass index. Pricing data was used to calculate the costs associated with these interventions.

RESULTS: The likelihood of post-operative allogeneic blood transfusion was similar for the combined group relative to the TXA group (OR = 0.63; 95% CI: 0.26, 1.54), as was the likelihood of any post-operative blood transfusion (OR = 1.13; 95% CI: 0.63, 2.01). There was no correlative relationship between use of ICS and hematocrit drop when accounting for baseline hematocrit (R2 = 0.118). Factoring in rental, service fees, and disposable equipment, the utilization of ICS added $146 to each case, resulting in a gross expenditure of over $123,000 during the study period.

CONCLUSION: The combination of ICS with TXA for primary unilateral THA did not improve blood loss or transfusion outcomes compared to TXA alone. As there was no observed clinical benefit to combined treatment, additional costs associated with routine usage of ICS may not be justifiable. Our institution would have reduced expenditures for blood loss management products by 85% during the study period if all patients had only received TXA.

SPONSOR: N/A
DISCLOSURE STATEMENT: N/A
ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Carl T Talmo
CO-INVESTIGATOR NAMES: Thea Miller, Christopher Fang, Andrew Hagar, Marie Anderson, Bishoy Gad

TITLE: Reducing Narcotic Usage with 0.5% Bupivicaine Periarticular Injections in Total Knee Arthroplasty

AUTHORS: [1]Andrew Hagar, MD; [2]Christopher J Fang, MD; [2]Joseph Dannenbaum, MD; [2]Eric L. Smith, MD; [2]James V. Bono, MD; [2]Carl T Talmo, MD

[1] Tufts Medical Center, Boston, MA, USA
[2] New England Baptist Hospital, Boston, MA, USA

INTRODUCTION: Periarticular injections (PAI) and adductor canal blocks (ACB) are widely accepted pain management strategies for total knee arthroplasty (TKA); however, the optimal anesthetic concentration to provide adequate pain relief while avoiding toxicity remains controversial. The purpose of this study was to evaluate the efficacy of different anesthetic concentrations for PAI alone and in combination with ACB.

METHODS: This retrospective cohort study of patients undergoing primary TKAs between March 2019 – November 2020, included 3 groups: 0.25% PAI (50cc 0.25% bupivacaine PAI diluted with 50cc saline and ketorolac), 0.5% PAI (50cc 0.5% bupivacaine with 50cc saline and ketorolac) and ACB+PAI (ultrasound-guided preoperative anesthesiologist-administered ACB and 0.25% PAI).
The primary outcome of this study was inpatient narcotic usage. Secondary outcomes included visual analog scale (VAS) pain scores, early functional data, and post-discharge narcotic usage. Analysis of Variance tests were used to compare groups.

RESULTS: 368 TKAs were analyzed (123 0.25%, 132 0.5% and 113 PAI+ACB). Patient demographics and VAS scores did not differ between groups. Total overall hospital narcotic usage in oral morphine equivalents (OME) was significantly lower for the 0.5% group (120.09 vs 165.26 and 175.75) compared to the 0.25% and PAI+ACB groups, respectively ($p<0.0001$). Cumulative OME for the first three shifts was also lower for 0.5% (68.7 vs 83.7 and 83.7) compared to 0.25% and PAI+ACB groups, respectively ($p=0.03$).
Total postoperative narcotics in OME were significantly lower for 0.5% (617.9 vs 825.2 and 1,047.6) than 0.25% and PAI+ACB, respectively ($p=0.0003$). Number of prescriptions within 6 weeks postoperatively were also significantly lower for 0.5% (1.7) than 0.25% (2.1) and PAI+ACB (2.4) ($p=0.0003$).

CONCLUSION: Patients receiving 0.5% PAI had lower narcotic usage compared to patients receiving 0.25% PAI and PAI+ACB. 0.5% PAI may be an optimal strategy for perioperative TKA pain control, which also eliminates the need for ACB.

SPONSOR: N/A
DISCLOSURE STATEMENT: N/A
ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Carl T Talmo
CO-INVESTIGATOR NAMES: Andrew Hagar, Christopher Fang, Joseph Dannenbaum, Eric L Smith, James V. Bono

Clinical Considerations in Sports & Shoulder

TITILE: Defining Proximal Hamstring Tears Using a Novel Imaged-Based Classification: Optimizing Communication and Outcomes

AUTHORS: [1]Forlizzi, JM, Nacca, CR, Saks, B, MacAskill, M, Chilton M, Shah, SS, Miller, SL

[1] The New England Baptist Hospital, 125 Parker Hill Avenue, Boston, MA 02120

INTRODUCTION: Proximal hamstring injuries range from partial-thickness to complete tears with different clinical presentations. A standardized classification is needed to assist with clinical prognostication and management of patient expectations.

OBJECTIVE: To develop a clinically meaningful proximal hamstring tear classification system and to present outcome data for defined subtypes.

METHODS: A retrospective review was undertaken on 114 patients diagnosed with proximal hamstring tears at a single institution from 2012-2019. Images were reviewed by an orthopedic surgeon and musculoskeletal radiologist. Tears were classified as Grade 1-partial with subtypes described; Grade 2 complete single-tendon tears with subtypes described, or Grade 3 complete tears with >2 cm retraction. Demographics, injection status, and time from injury to surgery were collected. Patient-reported outcome measures including Hip Outcome Score, Activities of Daily Living Subscore (HOS-ADL) and patient satisfaction were evaluated. A poor outcome was defined as HOS-ADL < 80%, and patient acceptable symptom state (PASS) was defined as HOS-ADL 89.7%.

RESULTS: Mean age was 52.43Y (SD 11.7) Mean follow-up was 38.6 months (SD 16.0). Classifications were as follows: 18.4% grade 1A, 19.2% grade 1B, 7.8% grade 2A, 3.5% grade 2B, and 50.9% grade 3. Intra-observer reliability had a mean Kappa of 0.985 (95% CI: 0.956,1.01) and inter-observer value was 0.905 (95% CI: 0.895 0.915). A total of 66 patients underwent surgical intervention, the highest proportion of which were grade 3 (68.97%). The mean HOS-ADL and PASS rate were higher for operatively treated patients (95%, 93.4%) than for non-operatively treated patients (81.86%, 44.7%). There were significantly more patients satisfied in the surgery group in both grades 1 and grade 3 tears (P=0.046 and P=0.049). BMI was a significant predictor of a poor outcome in grade 3 tears (P=0.039). History of corticosteroid or PRP injection, smoking, and diabetes were not significant predictors of a poor outcome.

CONCLUSION: We present an MRI-based classification system for proximal hamstring injuries with both excellent intra and inter-observer reliability. Outcome measures were improved in patients who underwent surgery.

SPONSOR: NONE
DISCLOSURE STATEMENT: NO DISCLOSURES
PRINCIPAL INVESTIGATOR NAME: SUZANNE MILLER, MD
CO-INVESTIGATOR NAMES: JULIANNE FORLIZZI, MD; CHRISTOPHER NACCA, MD

TITLE: Predictors of Poor and Excellent Outcomes after Reverse Total Shoulder Arthroplasty: *Outcomes Predictors after Reverse Shoulder Arthroplasty*

AUTHORS: [1]Forlizzi, JM, Puzzitiello, RN, Hart, P, Churchill, R, Jawa A, Kirsch JM

[1] The New England Baptist Hospital, 125 Parker Hill Avenue, Boston, MA 02120

INTRODUCTION: Favorable clinical and functional outcomes can be achieved with reverse shoulder arthroplasty (RSA). Given the expanding utilization of RSA in the United States, understanding the factors that influence both excellent and poor outcomes is increasingly important.

OBJECTIVE: To identify patient factors associated with poor and excellent outcomes following reverse shoulder arthroplasty.

METHODS: A single-surgeon prospective registry was utilized to identify patients who underwent RSA from 2013 to 2018 with minimum of 2-year follow-up. Excellent postoperative clinical outcome was defined as being within the top quartile for final American Shoulder and Elbow Surgeons (ASES) score. Poor outcome was defined as being in the bottom quartile of ASES score. Logistic regression was used to determine preoperative characteristics associated with both excellent and poor outcomes.

RESULTS: A total of 338 patients with a mean age of 71.5 years (SD 6.4) met inclusion and exclusion criteria. The average preoperative ASES score for the entire cohort was 35.3 (SD 16.4), which improved to 82.4 (SD 16.1) postoperatively ($P < .001$). Univariate analysis demonstrated that a diagnosis of primary osteoarthritis (OA), private insurance, and higher preoperative ASES scores were significantly associated with achieving excellent outcomes ($P < .01$ for all). Variables predictive of poor outcomes were worker's compensation status ($P = .03$), depression ($P = .02$), preoperative diagnosis of rotator cuff tear arthropathy (RCA) ($P < .01$), preoperative opioid use ($P < .01$), higher number of allergies ($P < .01$) and prior ipsilateral shoulder surgery ($P < .01$). Multivariate regression analysis demonstrated that OA (OR 5.6, 95% CI 1.2-26.5, $P = .03$) and private insurance (OR 2.7 95% CI 1.12-6.5, $P = .02$) correlated with excellent outcomes, whereas higher number of reported allergies (OR 0.83, 95% CI 0.71-0.97, $P = .02$), self-reported depression (OR 0.39, 95% CI 0.16-0.99, $P = .04$), history of prior ipsilateral shoulder surgery (OR 0.36, 95% CI 0.15-0.87, $P = .02$), and preoperative opioid use (OR 0.26, 95% CI 0.09-0.76, $P = .01$) were predictive of poor outcomes.

CONCLUSION: A preoperative diagnosis of primary osteoarthritis is the strongest predictor for excellent clinical outcomes following RSA. Patients with increasing number of reported allergies, self-reported depression, a history of prior ipsilateral shoulder surgery, and preoperative opioid use are significantly more likely to achieve poor outcomes after RSA. Given the increasing utilization of RSA, this information is important to appropriately counsel patients regarding postoperative expectations.

SPONSOR: None
DISCLOSURE: STATEMENT: No disclosures
PRINCIPALINVESTIGATOR NAME: Jacob Kirsch, MD
CO-INVESTIGATOR NAMES: Julianne Forlizzi, MD; Andrew Jawa, MD

TITLE: Primary Reverse Total Shoulder Arthroplasty Performed for Glenohumeral Arthritis: Does Glenoid Morphology Matter?

AUTHORS: Robert J. Pettit MD[1], Sundeep B. Saini DO[1], Richard N. Puzzitiello MD[1,3], Paul-Anthony J. Hart[2] BA, Glen Ross MD[1,4], Jacob M Kirsch M.D.[1,2], Andrew Jawa M.D [1,2]
[1]New England Baptist Hospital, Boston, Massachusetts, [2]Boston Sports and Shoulder Center, Boston, Massachusetts, [3]Tufts Medical Center, Boston, Massachusetts[4], Boston Orthopedics and Spine, Boston, Massachusetts

INTRODUCTION: Indications for reverse total shoulder arthroplasty (RTSA) have expanded to include primary glenohumeral osteoarthritis (GHOA) with an intact rotator cuff. Limited evidence exists on RTSA in patients with primary GHOA and no posterior glenoid wear (Walch A1, A2, and B1 morphologies).

OBJECTIVE: The purpose of this study was to determine if glenoid morphology is associated with clinical outcomes in patients undergoing RTSA for primary GHOA.

METHODS: A retrospective review of prospectively collected data was performed in 247 patients undergoing primary RTSA for GHOA with a minimum of 2-year clinical follow-up. Preoperative computed tomography (CT) and magnetic resonance imaging (MRI) were used to categorize glenoid morphology as described by the modified Walch Classification. Pre- and post-operative American Shoulder and Elbow Surgeons (ASES), Single Assessment Numeric Evaluation (SANE), visual analog scale (VAS) pain scores, and range of motion (ROM) measurements were compared across Walch glenoid-subtypes. The percentage of patients that reached previously established clinically significant thresholds for minimal clinically important difference (MCID) and substantial clinical benefit (SCB), was also comparatively assessed. Multivariable analysis was used to evaluate the association between glenoid morphology and postoperative ASES score while controlling for potentially confounding variables.

RESULTS: Of the 247 consecutive patients, 197 were available at a minimum 2-year follow-up (80%). Significant improvements were seen in ASES, VAS-pain, SANE, and ROM from baseline to final postoperative follow-up in the combined patient cohort (all $P < .001$). Most (98.0%) patients reached MCID and 90.9% of patients reached SCB for ASES threshold. No significant differences were found amongst Walch sub-types in terms of pre- to post-operative improvement in ASES ($P= .39$), SANE ($P= .4$), VAS-pain ($P= .49$), forward elevation ($P = .77$), external rotation ($P = .45$) or internal rotation ($P= 0.1$). The only significant difference in postoperative outcomes between Walch glenoid-subtypes was higher post-op ASES scores among type-B3 glenoids compared to type-A1 glenoids ($P= .03$) on univariate analysis. However, no individual Walch glenoid-subtype was associated with lower post-op ASES scores on multivariable analysis ($p>0.05$)

CONCLUSION: Primary RTSA provides excellent mid-term outcomes in patients with glenohumeral arthritis with intact rotator cuff, regardless of the degree of preoperative glenoid deformity. Surgeons can use this data to support the use of reverse total shoulder arthroplasty for glenohumeral arthritis in a more standardized way.

SPONSOR: None
DISCLOSURE STATEMENT: We report no disclosures
PRINCIPAL INVESTIGATOR NAME: Andrew Jawa MD
CO-INVESTIGATOR NAMES: Robert J. Pettit MD, Sundeep B. Saini DO, Richard N. Puzzitiello MD, Paul-Anthony J. Hart BA, Glen Ross MD, Jacob M Kirsch MD

TITLE: Lift the Restrictions? Return to Sport in High Demand Weightlifters Following Anatomic Total Shoulder Arthroplasty at Average 3.6 years Follow-up

AUTHORS: Robert Pettit, MD[1], Sarav Shah, MD[1], Lambert Li[2], Julianne Forlizzi MD[1], Matthew Chilton[3], Brendan Gaylord[3], Naser Alnusif, MD, FRCS(C) [1], Alaia Christensen[3], Glen Ross, MD[1]
[1] New England Baptist Hospital, Boston, Massachusetts, USA, [2]Brown School of Medicine, [3]Tufts School of Medicine

INTRODUCTION: Return to sport in high demand weightlifters following total shoulder arthroplasty has rarely been investigated, as most surgeons recommend against these patients returning to heavy lifting postoperatively. However, it is presumed that many patients elect to continue significant lifting despite the risk expressed by their surgeon.
OBJECTIVE: The purpose of this study is to determine the incidence of return to sport, patient reported outcomes, satisfaction, performance, and failures of high demand weightlifters that continue lifting after undergoing total shoulder arthroplasty.
METHODS: A retrospective review of patients with a history of high demand weightlifting prior to undergoing total shoulder arthroplasty with at least 1 year follow-up. Prospective surveys determining pre and postoperative lifting participation including maximum weight, frequency and duration of workouts, Single Assessment Numeric Evaluation, patient satisfaction, and post-op range of motion. Secondary outcomes included failure, revision surgery, risk factors for not returning to weightlifting, and percentage of prior max bench press. Bivariate analysis and multivariate analysis performed to compare cohorts and identify risk factors, respectively.
RESULTS: The majority (23/42) shoulders admitted to returning to heavy weightlifting activities postoperatively. Mean Single Assessment Numeric Evaluation score for current weightlifters and retired weightlifters were 86.9 and 91.6 respectively (p= 0.148). In the weightlifting cohort, 78.3% of patients achieved patient-acceptable symptom state threshold for Single Assessment Numeric Evaluation while 91.3% were within 0.5 of patient-acceptable symptom state. Patient satisfaction and return to sport satisfaction in current weightlifting shoulders were good-excellent in 91.3% (p = 0.922) and 82.6% (p = 0.972) respectively. Current weightlifters showed substantially decreased maximum weight in all lifts compared to prior maximum. No patient underwent revision surgery.
CONCLUSION: Most patients with a history of weightlifting often return to high demand weightlifting post-operatively against surgeons' recommendation but without early catastrophic failure and at a lower performance level than pre-symptomatic state. Compared to retired weightlifters current weightlifting patients have similar Single Assessment Numeric Evaluation scores, satisfaction rates, and range of motion compared to age matched cohort at average 3.6 years postoperatively.

SPONSOR: None
DISCLOSURE STATEMENT: We report no disclosures
PRINCIPAL INVESTIGATOR NAME: Glen Ross MD
CO-INVESTIGATOR NAMES: Robert Pettit, MD, Sarav Shah, MD, Lambert Li,Julianne Forlizzi MD, Matthew Chilton, Brendan Gaylord, Naser Alnusif, MD, FRCS(C) , Alaia Christensen

Database Studies

TITLE: Is there a safe number of opioids to prescribe to opioid-naïve total joint arthroplasty patients?

AUTHORS: Nicholas R. Pagani, MD[1,2], Ruijia Niu, MPH[2], Mei Chung, PhD[3], David M Freccero, MD[4], Eric L. Smith, MD[3]

1. Department of Orthopaedic Surgery, Tufts Medical Center, Boston, MA, USA
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4. Department of Orthopaedic Surgery, Boston Medical Center, Boston, MA, USA

INTRODUCTION: For patients undergoing total joint arthroplasty (TJA), the safe number of opioid pills to prescribe to opioid-naïve patients after primary total joint arthroplasty is not known.

OBJECTIVE: The purpose of this study was to define the safe number of opioid pills to prescribe to opioid-naïve patients after primary total joint arthroplasty (TJA). The secondary purpose was to determine the rate of conversion of opioid-naïve patients to chronic users within 6 months postoperatively. The authors hypothesized that increasing the number of opioid pills prescribed following total joint arthroplasty would increase the risk of chronic opioid use in a stepwise fashion.

METHODS: In this retrospective cohort study, patients 18-64 years old who underwent TJA from 2016-2019 with minimum 6 months of follow up in the IBM MarketScan insurance database were included. Patients who underwent bilateral, revision, or major surgery for infection were excluded. The rate of conversion to chronic use (≥2 opioid prescriptions 6 months postoperatively) among opioid-naïve patients (0 opioid prescriptions 6 months preoperatively) was determined. The number of pills prescribed at discharge and 30 days postoperatively was calculated. Patients were classified into quintiles based on number of opioid pills prescribed at discharge. Descriptive and multivariate regression analyses were performed.

RESULTS: 68,960 patients (61% TKA; 39% THA) were included. 73% (TKA) and 42% (THA) of opioid-naïve patients became chronic users. The average number of opioids prescribed at discharge decreased from 61 pills in 2016 to 22 in 2019. Compared to quintile 1 (0 pills), TKA patients who received 27 pills (quintile 2) did not have an increased risk of conversion to chronic users. Prescribing 52 pills (quintile 3) had 16% increased risk of chronic use postoperatively ($p<0.0001$) among TKA patients, after adjusting for year of operation, age, and sex. The risk of conversion increased 191% (TKA) and 204% (THA) in quintile 5 (146 pills for both TKA and THA) ($p<0.0001$).

CONCLUSION: TKA had higher risk of conversion to chronic opioid use than THA. Prescribing more than 50 (TKA) or 82 (THA) pills total in 30 days significantly increased risk of chronic use. We recommend limiting total opioid prescription to 30 pills within 30 days of primary TJA.

SPONSOR: No funding was received for this study.
DISCLOSURE STATEMENT: ELS is a paid consultant for Conformis, Depuy, receives research support from Conformis, Depuy. DMF receives research support from Conformis, Depuy.
ACKNOWLEDGEMENT(s): None
PRINCIPAL INVESTIGATOR NAME: Eric L. Smith, MD
CO-INVESTIGATOR NAMES: Nicholas R. Pagani, MD, Ruijia Niu, MPH, Mei Chung, PHD, David M Freccero, MD

Title: Intraoperative Transverse Process Fractures and Posterolateral Lumbar Fusion Rates

Authors: [1]Raymond W. Hwang, [1]Gyu-Ho Lee, [1]Ruijia Niu, [2]Kevin C. Baker, [3]Paul Arnold, [4]Rick Sasso, [2]Daniel Park, and [2]Jeffrey Fischgrund, [1]David H. Kim
[1]New England Baptist Hospital, Boston, MA, USA
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Introduction: Avoidance of intraoperative transverse process fracture (TPF) is a technical dictum of posterior lumbar fusion surgery. Nevertheless, TPF commonly occurs at multiple stages including exposure, hemostatic packing, decortication, graft placement, and instrumentation. Although the adverse effect of TPF on posterolateral fusion (PLF) appears self-evident, actual rates of TPF and association with fusion rates have not previously been reported.

Objective: To determine the effect of TPF on fusion rates after PLF with or without transforaminal lumbar interbody fusion (TLIF)

Materials/Methods: Computed tomography (CT) of patients undergoing single-level PLF or PLF with TLIF surgery using local autograft bone were reviewed. 6-month CTs were reviewed for evidence of TPF. Side (right vs. left), vertebral level, and severity of TPF (≥50% or <50%) were recorded. 12-month CTs were reviewed for evidence of solid posterolateral fusion (right vs. left). Preoperative and postoperative patient reported outcome measures (PROMs) included VAS back pain, ODI, and SF-36 physical component scores.

Results: A total of 147 patients underwent postoperative CT at both 6 and 12 months. Of these, 90 patients underwent PLF only (PLF group) and 57 underwent PLF with TLIF (TLIF group). Overall TPF rate was 19.0% of patients (28/147) and 4.8% of transverse processes (28/588). No patient demonstrated more than one TPF. The TPF rate was higher in the PLF group vs. TLIF group (25.6% vs. 8.8% of patients, p=0.017). No difference in TPF rate was observed based on gender (p=0.780). Patients with TPF were older. (p=0.04). In the PLF group, TPF was associated with an 8.7% (2/23 sides) rate of ipsilateral fusion at one year compared to 29.3% (46/157 sides) without TPF (p=0.037). In the TLIF group, TPF was associated with a 0% (0/5 sides) rate of ipsilateral fusion compared to 7.3% (8/109 sides) without TPF (p=1.00). Severity of TPF did not impact fusion rates for either PLF (p=0.96) or TLIF (p=0.59). Patients who underwent TLIF and had TPF did not experience significant improvement of ODI, VAS back pain (at 6 or 12 months), SF-26 PF and VAS leg (at 6 months). Patients in all other groups experienced significant improvement of these measures at both post-operative time points compared to preoperatively.

Conclusion: TPF occurs frequently during posterior lumbar fusion surgery and is associated with a decreased rate of successful one-year ipsilateral fusion in the setting of PLF. The association with fusion in patients undergoing TLIF remains unknown. However, TPF in the setting of TLIF is associated with less improvement in PROMs postoperatively. Lower fusion rates in this study population may be due to use of only local autograft and different results may be associated with use of extenders or bone graft substitutes.

Principal Investigator: David H. Kim
Co-investigators: Raymond W. Hwang, Gyu-Ho Lee, Ruijia Niu, Kevin C. Baker, Paul Arnold, Rick Sasso, Daniel Park, and Jeffrey Fischgrund

Title: Mortality and Cost Associated with Lumbar Spinal Stenosis and Spondylolisthesis in a Medicare Population: Surgical vs. Non-surgical treatment

Authors: [1]Raymond W. Hwang, [2]Catherine M. Briggs, [2]Scott Greenwald, [2]Paul J. Manberg, [2]Nassib Chamoun, [1]Scott G. Tromanhauser, [1]New England Baptist Hospital, Boston, MA, USA [2]Health Data Analytics Institute, Dedham, MA, USA

Introduction: Spine surgery has demonstrated cost-effectiveness in improving quality of life through reduction of pain and restoration of function. Such improvements can initiate a cascade of benefits that promote general health and in turn reduce both future medical expenditures and longer-term mortality. The impact of spine surgery along these dimensions has not been well described. Furthermore, the optimal approach to surgical treatment for common symptomatic conditions such as stenosis and spondylolisthesis remains controversial. Nevertheless, elective lumbar fusion rates have recently increased as decompressions have decreased. Changes in practice should be data driven, but in the absence of compelling evidence to guide treatment, surgical decision-making for these conditions remains challenging.

Objective: To describe the effect of surgical treatment for lumbar stenosis with or without spondylolisthesis on overall patient mortality, resource utilization and healthcare expenditure as well as the differential impact of surgical approach on these outcomes.

Methods: A retrospective review of the Medicare National Database Fee for Service Files between 2011-2017 was performed. Paired and unpaired comparisons of mortality, cost, and spine-related healthcare utilization (pain medications, MRI, injections and physical therapy) for two years post-diagnosis were conducted. Surgical treatment included decompression, fusion, or decompression with fusion. The paired analysis matched subjects based on standard demographics. A two-year risk prediction of mortality (risk stratification index, or RSI) was used as an overall measure of the subject's baseline health status. Baseline characteristics were compared using *t* or χ^2 tests, as appropriate. The outcomes of surgical treatment were compared to non-surgical treatment. A secondary analysis comparing fusion or decompression to combined fusion and decompression was also performed.

Results: There were 61,534 patients with stenosis alone and 83,813 with stenosis and spondylolisthesis. All surgical cohorts exhibited lower two-year mortality compared to the non-surgical group (as much as 32% lower). These differences remained significant after adjusting for baseline risk. The use of pain medications, MRIs, and physical therapy was generally higher in non-surgically treated subjects compared to surgically treated subjects, reaching statistical significance in isolated pairings. Total costs were significantly lower in surgically treated subjects compared to non-surgically treated subjects in all comparisons (as much as 41% lower) except for patients with stenosis only who received fusion surgery. When fusion or decompression was compared to combined fusion and decompression, there was no significant difference in mortality but decompression alone led to significantly lower two-year costs in the treatment of both stenosis alone as well as stenosis with spondylolisthesis.

Conclusions: The results of the current study demonstrate that surgical treatment for stenosis and spondylolisthesis is associated with significantly lower mortality and total medical expenditures over the two years following diagnosis as compared to non-surgical treatment. Given the lack of consensus regarding the optimal treatment of these highly prevalent lumbar conditions, particularly in an increasingly resource constrained environment, we believe the findings from this study help support the rationale for surgical intervention for these conditions in appropriate subjects within the Medicare population.

Principal Investigator: Raymond Hwang
Co-investigators: Catherine M. Briggs, Scott Greenwald, Paul J. Manberg, Nassib Chamoun, Scott G. Tromanhauser

TITLE: Investigating a Potential Limit to Access to Care: Preoperative Cut-off Values for Body Mass Index for Shoulder Arthroplasty

AUTHORS: Sundeep Saini, D.O.[1], Olivia Bono[2], Lambert Li[2], Meghan MacAskill[2], Matthew Chilton[2], Glen Ross, M.D.[1,2], Sarav Shah, M.D.[1,2, 1]New England Baptist Hospital, Department of Sports Medicine, 125 Parker Hill Avenue, Boston, MA 02120, [2]New England Shoulder and Elbow Center, 20 Guest Street, Suite 225, Brighton, MA 02135

Introduction: The primary purpose of this study was to determine the number of patients that would be denied a complication-free total shoulder arthroplasty (TSA) based on implementation of body mass index (BMI) eligibility cutoffs.

Methods: The National Surgical Quality Improvement Program database was queried to identify all patients who underwent primary TSA. Patient demographics and 30-day postoperative complications were compared according to BMI stratification using Pearson's Chi-Square test and binary logistic regression analysis adjusted for age and modified Charlson Comorbidity Index. A BMI eligibility criterion of ≥40 kg/m^2 was used to calculate the positive predictive value (PPV) in order to assess the number of complication-free TSAs that would be denied in order to avoid a complication in a single patient.

Results: The overall complication rate was 7.2%. Using a BMI cutoff of ≥40 kg/m^2 would yield a PPV of 7% for all major complications. This means that 14 complication-free procedures would be denied in order to avoid a major complication. Additionally, BMI ≥40 kg/m^2 served as an independent risk factor for acute renal failure, pulmonary embolism, ventilator use >48 hours and readmission. The PPV for these clinically significant complications using BMI ≥40 kg/m^2 as a cutoff was 4.9%. This translates into 20 patients being denied a complication-free procedure in order to avoid a single clinically significant medical complication. If this policy was enforced on the 2,426 patients who exceeded BMI ≥40 kg/m^2 in the present study, nearly 2,307 patients would be denied the potential benefit of surgery in order to prevent 119 complications.

Conclusion: The use of eligibility criteria for primary TSA or RSA based solely on BMI threshold values presents a potential limitation in access to care to these patients who otherwise would have a complication-free procedure.

Disclosures: Glen Ross, M.D., is a paid consultant for Arthrex Inc. (paid presenter or speaker), Stryker (paid presenter or speaker), and Tornier. Sarav Shah, M.D., is a board/committee member of the American Academy of Orthopaedic Surgeons and a member of the editorial/governing board of Arthroscopy.

Principle Investigator Name: Sarav Shah, M.D.
Co-investigator Names: Sundeep Saini, D.O., Olivia Bono, Lambert Li, Meghan MacAskill, Matthew Chilton, Glen Ross, M.D.

Cost Analysis in Arthroplasty

Title: Measuring the effect of a pre-operative high carbohydrate drink in unilateral primary total hip and knee arthroplasty patients

Authors: Denise Cody, MSN, RN and Chris Bell, PhD, RN

Introduction: Patients who are scheduled for surgery are instructed to fast from midnight until time of surgery. However, some surgeries are scheduled later in the day and these patients would have fasted more than 14 hours which results in patient dissatisfaction, discomfort, potential nausea/vomiting, and a possible increased length of stay in the PACU (post anesthesia care unit). Current literature shows that a protocol that enables patients to drink clear liquids up to two hours before surgery is safe and can prevent alterations to the patient's physiologic state and maintains metabolic balance. This enhanced recovery after surgery (ERAS) protocol modulates the stress response of surgery, decreases morbidity, reduces hospital length of stay, improves recovery and leads to cost savings. However, ERAS protocols for the orthopedic population are not very well studied.

Objectives: The purpose of this study was to examine the effect of a pre-operative high carbohydrate drink (HCD) on unilateral, primary total hip arthroplasty (THA) and total knee arthroplasty (TKA) patients by measuring post-operative antiemetic medication use and length of stay in the PACU.

Methods: A Quasi-experimental design was used where prospective data were collected with patients scheduled for THA and TKA and received the HCD and instructions on fasting and solids consumption guidelines. Patients who were known to be Type I Diabetic, Type II Diabetic on insulin or injectables, and/or A1C equal or greater than 8 were excluded from the study. Patients in the prospective group were given three HCDs (2 evening and 1 morning). Retrospective data were collected for the control group using the same inclusion criteria with patients who were instructed to fast overnight and from the previous year during the same months as the prospective study (July – September).

Results: A total of 827 patients (retrospective control group n=381 and prospective intervention group n=446) were included in the study. Around 89.5% of patients in the intervention group consumed all three HCDs. Comparing both groups, the prospective intervention group had more females (62% vs. 53%), were more likely to have spinal anesthesia and were less likely to receive preoperative antiemetic medications. There were no group differences in BMI, OR time, procedure, and intraoperative antiemetics. Overall, 4.6% (n=38) patients received preoperative antiemetics and 6.8%(n=56) received postoperative antiemetics. Relative to the control group, patients in the intervention group were less likely to receive preoperative antiemetics (*OR=0.33, 95%CI: 0.16, 0.68*) and were less likely to receive postoperative antiemetics (*OR=0.57, 95%CI: 0.33, 0.99*). Compared to the retrospective group, prospective patients' median PACU stay was 13-minutes shorter (p<.0001). Prospective and retrospective groups had similar average time-in-OR (137 min and 138 minutes for retrospective and prospective, respectively).

Conclusion: Preoperative carbohydrates drinks given to patients before TKA and THA decreased PACU stay and decreased antiemetic medication use. Ultimately, the HCD decreased the fasting duration for patients and led to better patient outcomes. These findings were used to change preoperative policies for orthopedic patients to enhance satisfaction and outcomes.

Sponsor: None
Disclosure statement: None.
Acknowledgement(s):
Principal investigator name: Denise Cody, MSN, RN
Co-investigator names: Chris Bell, PhD, RN

TITLE: Energy Expenditure of Femoral Broaching in Direct Anterior Total Hip Replacements – Comparison Between Manual and Automated Techniques

AUTHORS: Greenwell, P., Niu, R., Fang, C., Talmo, C., Smith, E.

New England Baptist Hospital, Boston, MA

INTRODUCTION: Total hip replacement has been an extensively studied procedure with excellent and reproducible results. However, most of the literature to date has focused on topics such as patient outcomes, technique guides, or complication rates. Little information is known regarding the energy expenditure of the surgeon during this procedure, especially during the most strenuous parts such as femoral broaching. Historically, this has been accomplished using a mallet and manual force. Due to the strain that this could impose on a high-volume arthroplasty surgeon, automated devices have been introduced to help facilitate this step of the surgery. Given the novelty of such devices, there are no current studies that quantify their energy expenditure or compare them to a manual technique.

OBJECTIVE: The purpose of this study is to compare the energy expenditure associated with broaching the femoral canal during a direct anterior total hip replacement using two techniques: manual and automated.

METHODS: Using a Hexoskin Smart Shirt, the following parameters were recorded: energy expenditure (calories), minute ventilation (liters/minute), heart rate (beats per minute), and total time (minutes). These were measured by a single surgeon while broaching the femoral canal during a direct anterior total hip replacement using two different techniques: manual broaching with a mallet (n = 26) and automated broaching with a Kincise System (n = 20).

RESULTS: Manual broaching required a significantly longer time compared to automated broaching (6.1±1.1 vs. 3.7±0.9 minutes; $p<0.001$) with a significant increase in overall energy expenditure (32.6±7.0 vs. 16.0±7.1 calories; $p<0.001$). The surgeon's average heart rate was significantly higher with manual broaching when compared to automated broaching (99.4±9.8 vs. 90.1±9.8 beats per minute; $p=0.003$), along with average minute ventilation (36.5±7.0 vs. 30.3±5.8; $p=0.003$). There were no intra-operative complications in either group during femoral broaching.

CONCLUSION: Automated femoral broaching during a direct anterior total hip replacement can decrease the energy expenditure of broaching by 50% and time of broaching by 40%, when compared to the manual technique. There was no increase in complications. Given the physical strain that a high-volume arthroplasty surgeon may face over time, an automated femoral broaching system can provide a safe and more effective method to perform this step during a direct anterior total hip replacement.

SPONSOR: None
DISCLOSURE STATEMENT: Smith, E. – Depuy Synthes
ACKNOWLEDGMENT(s): None
PRINCIPALINVESTIGATORNAME: Eric L Smith, MD
CO-INVESTIGATORNAMES: Patrick Greenwell, Ruijia Niu, Christopher Fang, Carl Talmo

TITLE: Variation in the Profit Margin for Different Types of Total Joint Arthroplasty

AUTHORS: [1]Christopher J Fang, MD; [1]Jonathan Shaker, MS; [1]Paul-Anthony Hart, BA; [2]Charles Cassidy, MD; [1]David A Mattingly, MD; [1]Andrew Jawa, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: As health care shifts to a value-based model with bundled-payment methods, it is important to understand the costs and reimbursements of arthroplasty procedures that represent the largest expenditure of Medicare. Our aim is to characterize the variation in (1) total hospital costs, (2) reimbursement and (3) and profit margin for different arthroplasty procedures.

METHODS: The total hospital cost of total knee arthroplasty (TKA), total hip arthroplasty (THA), total shoulder arthroplasty (TSA), reverse shoulder arthroplasty (RSA), total elbow arthroplasty (TEA) and total ankle arthroplasty (TAA) were calculated using time-driven activity-based costing (TDABC) at an orthopaedic institution from 2018 to 2020. Average reimbursement for each type of procedure was determined. Profit margin, defined as the reimbursement profit after direct costs, was calculated by deducting average TDABC total hospital costs from reimbursement. Multivariate analyses were performed to evaluate significant associations between costs, reimbursement and profit margins.

RESULTS: 13,555 arthroplasty procedures were analyzed for this study, with 6,636 TKA's, 5,902 THA's, 346 TSA's, 577 RSA's, 84 TAA's, and 10 TEA's. Costs and reimbursement were highest for TAA and TEA. THA and TKA resulted in the highest profit margins, while RSA and TEA resulted in the lowest. The strongest associations with profit margin were private insurance (0.46547), age (-0.22732), and implant cost (-0.19240).

CONCLUSION: THA and TKA have greater profit margins overall than TAA and upper-extremity arthroplasty. Profit margins for RSA, TSA, TEA and TAA are all 28% or more lower than TKA or THA. Private insurance is the main driver of higher reimbursements, resulting in increased profit margins as compared to patients with Medicare. Continued effort towards decreased implant costs and length of stay will decrease costs and increase profit margins for hospitals for all arthroplasty procedures.

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DISCLOSURE STATEMENT: Eric L Smith is a paid consultant and receives research support from Conformis and Depuy Synthes. David A Mattingly receives royalties and is a paid consultant for Depuy Synthes. Andrew Jawa receives royalties from Depuy Synthes, and is a paid speaker and consultant for DJO Global, paid consultant for Ignite Orthopaedics, and has equity in Boston Outpatient Surgical Suites.
ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Jonathan Shaker, Paul-Anthony Hart, Charles Cassidy, David Mattingly, Andrew Jawa

TITLE: Prior Authorizations in Total Joint Arthroplasty: Use of Artificial Intelligence Software to Reduce Write-Offs

AUTHORS: [1]Christopher J Fang, MD; [1]Jonathan Shaker, MS; [1]Ruijia Niu, MPH; [1]Carl T Talmo, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: Prior Authorization (PA) is a requirement placed on providers to obtain medical permission for services before insurance will cover costs. PAs can generate significant financial loss in the form of denials, in which payers refuse to reimburse for services deemed unwarranted. Therefore, strategies to reduce write-offs from PA denials are essential for hospitals to remain solvent. In our study, we sought to determine if implementing an artificial intelligence (AI) PA software (AI-PA) could improve PA denial financial return.

METHODS: We implemented AI-PA software in January 2019 across total joint arthroplasty (TJA), pain injections, advanced imaging, and outpatient rehabilitation service lines. We retrospectively analyzed the twelve months prior (January 2018 – December 2018) and the most recent twelve months after (January 2019 – December 2019) implementing AI-PA for the intervention and non-intervention service lines. We investigated the total financial loss due to PA denials, and percentage of expected reimbursement collected for each group before and after AI-PA. We employed a difference-in-differences model to investigate the magnitude of the AI-PA effect.

RESULTS: Collections on PA denials increased 25.5% after utilization of the AI-PA for the intervention service lines, compared to 11.9% for non-intervention service lines. Intervention service lines yielded a $167,325 decrease in PA denial write-offs and increased collections 5.06% more than non-intervention service lines (p=0.67).

CONCLUSION: The AI-PA software was helpful in reducing financial loss and increasing our collections from PA denials, though these results were not significant. We believe that in the future, the third-party, commercial vendor in collaboration with the hospital, can provide important financial value on the PA process.

SPONSOR: N/A

DISCLOSURE STATEMENT: Eric L Smith is a paid consultant and receives research support from Conformis and Depuy Synthes. David A Mattingly receives royalties and is a paid consultant for Depuy Synthes.
ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Jonathan Shaker, Ruijia Niu, Carl Talmo, David Mattingly

Featured Abstracts

TITLE: Using the Iowa Model of Evidence-Based Practice to Develop a Skin Tear Guideline & Algorithm

AUTHORS: [1]Bell, C.A.F., [2]Gilmore, M., [3] White, M., [4]Anderson, S., [5]Bennett, M., [6]Hamilton, M.,[7]Hughes, M., [8]Koloski, L., [9]Morgan, L., [10]Peters, P., & [11]Weisberger, E.

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Background: Skin tears occurring on patients both present on admission or sustained during the hospital stay were being assessed, documented and treated in a non-standardized fashion by nursing and medical staff. There was no consistency or common language used in classifying or documenting skin tears. Treatments used were not evidence-based.

Purpose of the study: The purpose of this EBP was: 1) to find a classification tool to implement standardized assessment and documentation of skin tears, 2) to review the literature for best practices of treatment protocols, and 3) to develop and implement an algorithm and guidelines according to current evidence.

Methods: Following the Iowa Model of EBP, an extensive literature search was conducted. Two classification tools were trialed by the Wound Care Team for ease of use and clarity. One was chosen and a 4 week trial was conducted. Best practices of treatment were lifted from the literature and dressing order sets were developed. An educational competency with a pre-test/post-test element was released to all nursing staff to orient them to the new algorithm and order set. Certified wound care nurses were available for consultation and support during the implementation process.

Results: During the trial of four weeks, seven skin tears were found by clinical practice nurses and the ISTAP skin tear classification system was used to assess and document in the electronic medical record. The skin tear algorithm was followed and dressings were placed according to Type classification and surrounding skin conditions. All seven skin tears were Type II.

Discussion/Conclusion: The literature supports the need for standardization of skin tear care and treatment. Skin tears are under-reported and can progress to complex or chronic wounds if not treated appropriately. Standardization of assessment, documentation and treatment of skin tears enhances consistency of care to patients and may improve outcomes. Education and awareness of skin tears is needed to provide best practice and positive outcomes

Principal Investigator: Christine A. Fournier PhD, RN
Co-Investigators: Megan Gilmore, BSN, Maureen White, BSN

TITLE: Standardizing Care for Patients with Insulin Pumps

AUTHORS: Primary Investigator: [1]Denise Cody MSN, RN, CPAN
Co-Investigators: [2]Christine A.F. Bell PhD, RN, CAPA, WCC,
Primary Members: [3]Mary Dillon RN, CAPA; [4]Paula Cote BSN, RN, [5]Aileen Keating BSN, RN, [6]Lauren Jasminski MSN, RN,[7]Tim Fouche, PharmD, [8]Katelynn Cali BSN, RN

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INTRODUCTION: An increase in the number of patient with subcutaneous insulin pumps was noted in the surgical population. Multiple types of insulin pumps and various levels of patient knowledge were being noted by perioperative staff.

OBJECTIVE: The objective of this project was to 1) Standardize the perioperative process of insulin pump management, 2) Create a clinical practice guideline specific for this population, and 3) Systematically educate staff of the new process and guideline.

METHODS: A multidisciplinary team was assembled and the current practice was analyzed to identify gaps. Multiple areas of practice were identified. Monthly meetings were held with leaders from each area contributing to the practice guideline development.

RESULTS: A multidisciplinary clinical practice guideline was developed in conjunction with endocrinology physicians, hospitalists, anesthesiologists, nurses and pharmacists to standardize the process from pre-admission screening to discharge. A new process was created in the electronic medical record to record the patients pump, basal rate and bolus amounts given. Education for staff was developed and distributed hospital wide. This is collected every six months and compliance measure by the PI.

DISCUSSION: This QI project targeted a clinical gap and created a team from nursing, medicine, pharmacy, nutrition, anesthesiology and informatics to standardize practice for a low volume, high risk process. This project ensures that patients with insulin pumps are identified in the pre-screening unit and are assessed for their independence in pump management.

CONCLUSION: Patients with insulin pumps are now admitted day of surgery with a detailed plan of care from an endocrinologist. Accurate documentation of patient's insulin pump and activity is now standardized. This assists with communication between nursing staff and anesthesia, and aides in promoting positive outcomes for surgical patients.

ACKNOWLEDGMENT(s): Collaboration with Joslin Clinic Staff & NEBH Anesthesia Staff
PRINCIPAL INVESTIGATOR NAME: Denise Cody, MSN RN CPAN
CO-INVESTIGATOR NAME: Christine Bell PhD RN CAPA WCC

Title: Recognizing In-hospital Stroke in a Musculoskeletal Specialty Hospital

Authors: Edward Burch DNP, RN, CNRN

Introduction: One out of every five strokes occur in a hospitalized patient admitted for another reason such as surgery or cardiac events. Patients who experience in-hospital strokes have higher morbidity and mortality as compared to patients who experience a stroke in the community. However, already being in a hospital setting, patients can potentially be assessed more rapidly and subsequently could be candidates for early intervention and better outcomes. Early recognition of stroke symptoms and determining the time the patient was last known well are important to decrease the amount of damage to brain tissue. Nurses work at the bedside and play a vital role in the recognition of stroke symptoms of hospitalized patients. Increasing awareness and training among nurses may reduce delays in assessment of patients who have strokes while in hospital; thus, preventing complications and enhancing patient outcomes. This training is especially important for nurses working at a musculoskeletal specialty hospital and who do not often see stroke patients in order to maintain their stroke assessment competence.

Objectives: The purpose of this study was to test the efficacy of an interactive in-hospital stroke assessment and management training module.

Methods: A prospective pretest posttest design was used for an in-hospital stroke training module that was designed to be interactive with potential to be administered virtually. The training module was initiated after adding a stroke assessment and quality indicators to the emergent care record so nurses attending the training can simulate documentation. A total of 186 nurses who are currently working across the different hospital units participated in the study. A pretest and posttest assessment were used to test knowledge gained after attending the interactive training module.

Results: Findings showed that the interactive in-hospital stroke training module significantly enhanced nurses' knowledge of nurses in the posttest as compared to the pretest. After attending the module, nurses' confidence level improved in their ability to respond to a patient experiencing symptoms of a stroke. There was a high rate of documentation accuracy in the emergent care record post training. Results suggest that the in-hospital interactive stroke training module is effective in increasing nurses' preparedness to early detect stroke among patients undergoing orthopedic surgeries.

Conclusion: Enhancing tools for documentation of stroke along with improved recognition of neurological changes in musculoskeletal surgery patients may improve outcomes in patients experiencing an in-hospital stroke. Findings from this study contributed to enhancing documentation of emergent neurologic events indicative of stroke. Preliminary chart reviews show that emergent care record is actively being utilized for documentation of emergent neurologic events indicative of stroke.

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Disclosure statement: None.
Acknowledgement(s): n/a
Principal investigator name: Edward Burch DNP, RN, CNRN
Co-investigator names: n/a

TITLE: Online Crowdsourcing to Explore Public Perceptions of Robotic-Assisted Orthopedic Surgery

AUTHORS: Nicholas R. Pagani, MD[1,3], Michael A. Moverman, MD[1,3], Richard N. Puzzitiello, MD[1,3], Mariano E. Menendez, MD[1,3], C. Lowry Barnes, MD[2], Joseph J. Kavolus MD[3]

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INTRODUCTION: The clinical benefits of robotic-assisted technology in total joint arthroplasty are unclear, but its use is increasing. This study employed online crowdsourcing to explore public perceptions and beliefs regarding robotic-assisted orthopedic surgery.

OBJECTIVE: The purpose of this study was to explore public perceptions and beliefs regarding robotic-assisted orthopedic surgery. The authors hypothesized that: 1) the majority of the public would believe robotic-assisted orthopedic surgery leads to improved results, fewer complications, less pain, and faster recovery and 2) the minority of the public would accurately understand the actual role of the robot in the operating room.

METHODS: A 30-question survey was completed by 588 members of the public using Amazon Mechanical Turk (MTurk). Participants answered questions regarding robotic-assisted orthopedic surgery, sociodemographic factors, and validated assessments of health literacy and patient engagement. Multivariable logistic regression modeling was used to determine population characteristics associated with preference for robotic technology.

RESULTS: Most respondents believe robotic-assisted surgery leads to better results (69%), fewer complications (69%), less pain (59%), and faster recovery (62%) than conventional manual methods. About half (49%) would prefer a low-volume surgeon using robotic technology to a high-volume surgeon using conventional manual methods. The 3 main concerns regarding robotic technology included lack of surgeon experience with robotic surgery, robot malfunction causing harm, and increased cost. Only half of respondents accurately understand the actual role of the robot in the operating room. Overall, 34% of participants have a clear preference for robotic-assisted surgery over a conventional manual approach. After multivariable regression analysis, Asian race, working in healthcare, early technology adoption, and prior knowledge of robotic surgery were independent predictors of preferring robotic-assisted surgery.

CONCLUSION: The public's unawareness of the dubious outcome superiority associated with robotic-assisted orthopedic surgery may contribute to misinformed decisions in some patients. Robotic-assisted technology appears to be a powerful marketing tool for surgeons and hospitals.

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PRINCIPAL INVESTIGATOR NAME: Nicholas R. Pagani, MD

CO-INVESTIGATOR NAMES: Michael A. Moverman, MD, Richard N. Puzzitiello, MD, Mariano E. Menendez, MD, C. Lowry Barnes, MD, Joseph J. Kavolus MD

TITLE: Chronic Opioid Use Among Patients Undergoing Multiple Total Joint Arthroplasty Procedures

AUTHORS: Nicholas R. Pagani, MD[1,3], Kelly Copeland Cara, MS[2], Raminta V. Theriault, MD[1,3], Ruijia Niu, MPH[3], David M Freccero, MD[4], Eric L. Smith, MD[3]

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INTRODUCTION: For patients undergoing multiple total joint arthroplasties (TJAs), the timing of surgery and its impact on opioid use is unknown. The purpose of this study was to characterize the risk of chronic opioid use for patients undergoing multiple TJAs.

OBJECTIVE: The primary purpose of our study was to first identify risk factors for prolonged post-operative opioid use following the first THA or TKA procedure of staged multiple procedures. Secondly, we sought to compare the likelihood of prolonged post-operative opioid use for patients undergoing staged multiple TKA or THA based on the timing of their first and second procedures. The authors hypothesized that 1) larger initial opioid prescriptions following the first of staged procedures would increase the risk of prolonged post-operative opioid use. 2) We hypothesized that the odds of prolonged post-operative opioid use would increase with longer periods of time between staged multiple procedures performed within one year.

METHODS: This retrospective cohort study used a national commercial-claims insurance database to identify patients who underwent multiple TJAs between 2007 and 2014. Logistic regression analyses were performed to determine the odds of chronic opioid use based on the timing of TJAs, preoperative opioid use, knee or hip arthroplasty, and number of opioid pills prescribed.

RESULTS: Overall, 38,961 patients were included. Younger age (P<0.0001), chronic preoperative opioid use (P<0.0001), TKA (P<0.0001), multiple procedures within one-year (P<0.0001), long-term disability (P<0.0001) and longer hospital length of stay (P<0.0001) were associated with chronic opioid use following first TJA when controlling for all other covariates. Patients with TJAs 3-6 months (OR = 1.29, 95% CL: 1.19, 1.39) and 6-9 months apart (OR = 1.37, 95% CL: 1.23, 1.48) had higher odds for chronic opioid use than 0-3 months apart. There was no clear linear association between opioid prescribing patterns and prolonged post-operative use.

CONCLUSION: Among patients undergoing multiple TJAs, younger age, preoperative opioid use, long-term disability, TKA, and staging procedures <1 year apart appear to increase risk of chronic opioid use. Given the ongoing opioid epidemic in the United States, arthroplasty surgeons should consider these findings when planning staged TJAs.
SPONSOR: No funding was received for this study.

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ACKNOWLEDGEMENT(s): We thank Dr. Mei Chung for her supervision on data analysis.
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CO-INVESTIGATOR NAMES: Nicholas R. Pagani, MD, Kelly Copeland Cara, MS, Raminta V. Theriault, MD, Ruijia Niu, MPH, David M Freccero, MD

Title: Incidence and treatment of sacroiliac joint pain after scoliosis instrumented fusions in adults that include pelvic implants.

Authors: Yu-Tien Hsu, MD, MPH 1; Ya-Ching Hung, MD, MPH 2; Ya-Wen Chen, MD, MPH 3; Yanik Bababekov, MD, MPH 3; Isabel Smith, BS 4; Suzanne Kent, BA 4; Brooks Udelsman, MD, MHS 3; David Chang, PhD, MPH, MBA 3; Stephen Camer, MD 4; Frank Rand, MD 4
Department of Social and Behavioral Science, Harvard School of Public Health, Boston, Mass., USA., Department of Surgery, Sinai Hospital of Baltimore, Baltimore, Maryland, US, Department of Surgery, Mass General Hospital/Harvard Medical School, Boston, Mass,New England Baptist Hospital, Boston, Mass.

Introduction: This is an observational study to review among other problems the incidence and summarize the treatment of sacroiliac joint pain/dysfunction after adult scoliosis surgeries that include fixation into the sacrum/pelvis.

Objective: Past studies of long-segment fusions to the sacrum/pelvis include various instrumentation techniques have approximately a 20% incidence of sacroiliac joint pain/dysfunction in follow up. The aim of our study is to review 5 years of experience with 382 patients to see what our incidence is of sacroiliac joint dysfunction/pain and summarize a treatment algorithm. A retrospective chart review of patients who underwent multilevel posterior spinal fusions (PSF) by an adult spinal deformity surgeon from 2013 to 2017 was performed. The incidence of sacroiliac joint dysfunction was gleaned from the charts and the algorithm of treatment that was used.

Results: Of 382 patients in the original study, average age 64.2 years, with a mean follow up of 34.7 months, 130 or 34% had prior surgical procedures. Among these 382 patients, 241 or 63.3% of the patients had pelvic fixation and 40 (10.6%) had staged posterior spinal fusions. Median number of segments fused was 5, range 3-7. The incidence of SI joint pain/dysfunction was 18.1% and was the most common morbidity in follow up.

Conclusion/Discussion: An 18% incidence of sacroiliac joint dysfunction occurring postoperatively in a group of adult patients undergoing scoliosis surgery is very consistent with past reports. The advent of newer fixation techniques, namely intrapelvic screws, has not really changed the incidence of SI joint dysfunction in this group of patients. The algorithm for treatment includes a local anesthetic injection in a symptomatic patient with an appropriate history. This is followed by local with steroid which can be repeated if effective, followed by a radiofrequency ablation if needed. Prior to the wide spread and effective use of radiofrequency ablation many patients, approximately 20%, might have one iliac screw removed related to symptoms once a fusion was demonstrated by CT scan. With radiofrequency ablation, this number is virtually zero and has been effective in eliminating the need for implant removal. There is 1 patient in this series that had a single pelvic screw placed and, in fact, went on to require a second to be placed on the opposite side as this side became symptomatic and while responding to steroid, reoccurred and was treated effectively with placement of a second pelvic implant on the side that was originally un-instrumented. Currently there is interest in performing primary SI joint fusions at the time of long-segment scoliosis fusions. The data presented above clearly does not support such treatment.

Correspondence to Frank Rand, MD
Financial disclosure: None.
Funding Source: Camer/Rand Foundation.

TITLE: Evaluation of Acetabular Component Orientation Among Obese Patients Using a Novel Mechanical Navigation Device

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INTRODUCTION: Acetabular cup malpositioning during total hip arthroplasty may lead to impingement, instability, and wear-induced osteolysis. Hip instability, of which acetabular malpositioning is the primary cause, is the single greatest reason for revision THA in the United States, accounting for 22.5% of all revisions in the US Medicare population. These risks are further amplified among obese patients as increased BMI makes accurate component placement more difficult.

OBJECTIVE: The purpose of this study is to determine the accuracy of acetabular cup orientation using a novel mechanical navigation device in obese patients compared with non-obese patients.

METHODS: We retrospectively assessed planned pre-operative vs post-operative cup orientation in a series of 48 patients who underwent primary THA using a mechanical navigation device (HipSextant; Surgical Planning Associates) between 2010-2015. Inclusion criteria were all patients who had a primary THA with the HipSextant mechanical navigation device to assist with cup orientation and had a post-operative CT scan of the pelvis to allow for pre-operative and post-operative comparisons. Exclusion criteria were those patients without the necessary post-operative radiographic studies. Patients were divided into obese (BMI≥30.0) and nonobese (BMI<30.0). Angles (inclination and anteversion) were measured on post-operative CT scan of the pelvis. Data were analyzed using one-tailed t test with statistical significance set at $p < 0.05$.

RESULTS: Of the 48 patients who met the inclusion criteria, 14 were categorized as obese (BMI≥30.0) while the remaining 34 patients were categorized as nonobese (BMI<30.0). Among patients in the obese cohort, the mean error for anteversion was 2.66° ± 1.23° compared to 4.25° ± 2.69° among patients in the nonobese cohort (p=0.02). Among patients in the obese cohort, the mean error for inclination was 3.59° ± 1.99° compared to 3.68° ± 1.97° among patients in the nonobese cohort (p=0.44)

CONCLUSION: To our knowledge, this is the first novel mechanical navigation device to be shown to navigate acetabular component anteversion and inclination in obese patients with no decrease in accuracy when compared to nonobese patients. Further research is warranted to assess the accuracy and cost of this mechanical navigation device to robotic-assisted acetabular cup positioning.

DISCLOSURE STATEMENT: SBM is principal owner of HipXpert and Surgical Planning Associates as well as a paid consultant for MicroPort Orthopedics.

PRINCIPAL INVESTIGATOR NAME: Stephen B. Murphy, MD
CO-INVESTIGATOR NAMES: Daniel R. Schmitt, MD

TITLE: Superior Outcomes Associated with Reverse Shoulder Arthroplasty for Glenohumeral Osteoarthritis Compared to Rotator Cuff Tear Arthropathy

AUTHORS: Sundeep Saini D.O.[1], Robert Pettit M.D.[1], Richard Puzzitiello, M.D.[1], Paul Hart, B.A.[2], Sarav S. Shah M.D.[1,3], Andrew Jawa M.D.[1,2], Jacob M. Kirsch M.D.[1,2] [1]New England Baptist Hospital, Department of Sports Medicine, 125 Parker Hill Avenue, Boston, MA 02120 [2]Boston Sports and Shoulder Center, 840 Winter Street, Waltham, MA 02451, [3]New England Shoulder and Elbow Center, 20 Guest Street, Suite 225, Brighton, MA 02135

Introduction*:* The primary purpose of this study was to evaluate the clinical outcomes of patients who underwent reverse total shoulder arthroplasty (RTSA) performed for glenohumeral osteoarthritis with an intact rotator cuff (GHOA) compared to rotator cuff tear arthropathy (CTA).

Methods: This was a retrospective review of prospectively collected data including consecutive patients who underwent primary RTSA for GHOA or CTA with a minimum of two-year follow-up. Baseline patient demographics and clinical outcomes including active range of motion (ROM), American Shoulder and Elbow Surgeons (ASES) score, Single Assessment Numerical Evaluation (SANE) and Visual Analog Scale (VAS) for pain were collected. Univariate and multivariate regression analyses were performed to evaluate the effect of preoperative diagnosis on clinical outcomes.

Results*:* Three hundred and fourteen patients were included in this study, including 200 patients with GHOA compared to 114 patients with CTA. Mean follow-up was 28.1 months for patients with GHOA and 27.6 months for patients with CTA. Baseline demographics and preoperative functional scores (ASES, SANE, VAS-pain) were similar for both groups ($P > 0.05$). Patients with a preoperative diagnosis of GHOA demonstrated significantly better postoperative active forward elevation (139° vs. 127°; $P < 0.01$), external rotation (54° vs. 44°; $P < 0.01$) and change in internal rotation (Δ 2.1 points vs. Δ 1.3 points; $P < 0.01$). Patients with GHOA demonstrated significantly better postoperative ASES (86.8 vs. 76.8; $P < 0.01$), SANE (89.6 vs. 78.6; $P < 0.01$) and VAS scores (0.62 vs. 1.2; $P < 0.01$). Minimal clinically important difference for ASES score was achieved by 97.5% of patients with GHOA compared to 86.8% of patients with CTA ($P< 0.01$) whereas substantial clinical benefit was achieved by 90.5% of patients with GHOA and 71.9% of patients with CTA ($P< 0.01$).

Conclusion*:* RTSA performed in patients with GHOA is associated with superior functional and clinical outcomes compared to those patients treated for CTA.

Disclosures: Dr. Andrew Jawa is a board/committee member of the American Academy of Orthopaedic Surgeons and the American Shoulder and Elbow Surgeons Society. This author is a member of the editorial/governing board of the Journal of Shoulder and Elbow Surgery. This author reports IP royalties, stock/stock options from Ignite Orthopaedics; Paid consultant, paid presenter/speaker fees, and research support from personal fees from DJO Global.

Principle Investigator: Jacob Kirsch, M.D.
Co-investigators: Sundeep Saini D.O., Robert Pettit M.D., Richard Puzzitiello, M.D., Paul Hart, B.A., Sarav S. Shah M.D., Andrew Jawa M.D.

TITLE: Anterior Mechanical Navigation Device is Accurate for Total Hip Arthroplasty Acetabular Inclination and Anteversion.

AUTHORS: [1]Christopher J Fang, MD; [2]Justin Koh, MD; [2]Jean Kang, MD; [1]Eric L. Smith, MD; [2]David Freccero, MD, [1] New England Baptist Hospital, Boston, MA, US. [2] Boston Medical Center, Boston, MA, USA

INTRODUCTION: In total hip arthroplasty (THA), accurate acetabular component position promotes prosthetic hip joint stability and longevity, and minimizes polyethylene wear. Image-based mechanical navigation is known to improve accuracy and reproducibility of accurate cup position intraoperatively via the posterior approach and the superior capsular approach. The purpose of this study was to assess the accuracy of acetabular component position using image-based mechanical navigation via the direct anterior approach (DAA).

METHODS: We prospectively followed 96 patients who underwent THA with one fellowship-trained arthroplasty surgeon over a twelve-month period. Thirty-three patients underwent DAA THA with the anterior HipXpert device (Anterior group), and 63 patients underwent posterior approach THA with the lateral HipXpert mechanical navigation device, serving as an operative control group (Lateral group). Standard postoperative plain film radiographic measurements of acetabular component inclination and anteversion were assessed.

RESULTS: The average inclination angle was 38.6 degrees and 40.6 degrees in Anterior and Lateral groups, respectively. The average anteversion angle was 27.6 degrees and 30.1 degrees in Anterior and Lateral groups, respectively. There were no postoperative hip dislocations and no study patients underwent revision THA at an average follow-up of 12 months. There were no patient outliers in either group with inclination angles or anteversion angles outside 10 degrees of the preoperatively planned values.

CONCLUSION: The anterior HipXpert mechanical navigation device enhances accurate acetabular component position and may reduce outlier component placement. Acetabular socket position is as accurate using the anterior device as it is using the lateral device.

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PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Justin Koh, Jean Kang, David Freccero

TITLE: Coinfection of HIV and Hepatitis C Increases Complication Rates After Total Joint Arthroplasty.

AUTHORS: [1]Christopher J Fang, MD; [2]Ella Cornell, BA; [2]Quinten Dicken, BA; [2]David Freccero, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD; New England Baptist Hospital, Boston, MA, USA, [2] Boston Medical Center, Boston, MA, USA

INTRODUCTION: As advances in efficacy of human immunodeficiency virus (HIV) and hepatitis-C virus (HCV) anti-viral medications increase, patients are able to maintain higher quality of lives than ever before. While these patients live longer lives, the unique patient population of those co-infected with both HIV and HCV increases. As these older patients seek orthopaedic care, it is important to understand their unique outcome profile. The purpose of this study was to evaluate the complication rate after total joint arthroplasty (TJA) in patients with HIV and HCV coinfection compared with patients with HIV or HCV only.

METHODS: A retrospective review of patients undergoing primary total joint arthroplasty (TJA) at our urban, academic hospital between April 2016 and April 2019 was conducted. Patients were stratified into three groups according to viral status: HIV only, HCV only, or HIV and HCV coinfection. Baseline demographics, intravenous drug (IV) use, surgery type, CD4+ count, follow-up and complications were analysed.

RESULTS: Of the 133 patients included in the study, 28 had HIV, 88 had HCV and 17 were coinfected with both HIV and HCV. Coinfected patients were more likely to have a lower BMI ($p < 0.039$) and a history of IV drug use ($p < 0.018$) compared to patients with either HIV or HCV only. Coinfected patients had a higher complication rate (41%) than both HIV only (7%; $p < 0.001$) and HCV only (12.5%; $p < 0.001$) patients.

CONCLUSION: Patients coinfected with HIV and HCV undergoing TJA have a higher complication rate than patients with either infection alone. As this unique population of coinfected patients continues to expand, increasingly they will be under the care of arthroplasty surgeons. Improved awareness and understanding of the baseline demographic differences between these patients is paramount. Recognition of the increased complication rates grants the opportunity to improve their orthopaedic care through preoperative and multidisciplinary management.

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DISCLOSURE STATEMENT: Eric L Smith is a paid consultant and receives research support from Conformis and Depuy Synthes. David A Mattingly receives royalties and is a paid consultant for Depuy Synthes.

ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Ella Cornell, Quinten Dicken, David Freccero, David Mattingly

TITLE: Reference Pricing Reduces Total Knee Implant Costs

AUTHORS: [1]Christopher J Fang, MD; [1]Jonathan Shaker, MS; [1] Geoffrey E. Stoker, MD; [1] Andrew Jawa, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD; [1] New England Baptist Hospital, Boston, MA, USA

INTRODUCTION: Reference pricing establishes a set price a hospital is willing to pay for total knee arthroplasty (TKA) components regardless of vendor. The hospital contracts with vendors that sell implants to the hospital at the hospital-dictated prices. Orthopedic surgeons are free to utilize any implant system that has met the reference price using their best clinical judgment. Our hypothesis is that vendors will meet the set price and selection of different vendors and technologies will not change.

METHODS: We retrospectively analyzed the 12 months prior (May 2017-2018) and the most recent 12 months after (March 2019-2020) implementing reference pricing at our institution. We investigated differences in average prices for total implant and component costs. We evaluated cost of implants with respect to surgeon volume, assessed the rate of cementless TKAs used, and number of companies purchased from before and after reference pricing.

RESULTS: In total, 7148 TKAs were included in the study with 3790 arthroplasties before and 3358 after implementation of reference pricing. Overall implant costs decreased by 16.7% ($P < .0001$). All individual knee component costs decreased by at least 11% ($P = .0003$). No difference in prices were found among surgeons ($P = .9758$). Cementless knee use increased by 9% ($P < .0001$; odds ratio 1.94, 95% confidence interval = 1.69-2.24). No vendor business was lost.

CONCLUSION: The strategy of reference pricing significantly reduced costs for TKA implants at our institution. The reduction in implant costs was regardless of surgeon volume. Newer technologies were utilized more often after reference pricing. This strategy represents a significant cost-savings approach for other hospitals.

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DISCLOSURE STATEMENT: Eric L Smith is a paid consultant and receives research support from Conformis and Depuy Synthes. David A Mattingly receives royalties and is a paid consultant for Depuy Synthes. Andrew Jawa receives royalties from Depuy Synthes, and is a paid speaker and consultant for DJO Global, paid consultant for Ignite Orthopaedics, and has equity in Boston Outpatient Surgical Suites.

ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Jonathan Shaker, Geoffrey Stoker, Andrew Jawa, David Mattingly

TITLE: Reducing the Price of Total Hip Arthroplasty Implant Costs through Reference Pricing: an Economic Evaluation

AUTHORS: [1]Christopher J Fang, MD; [1]Jonathan Shaker, MS; [1]Daniel M. Ward; [1] Andrew Jawa, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: Reference pricing establishes a set price an institution is agreeable to pay for total hip arthroplasty (THA) to all vendors. The hospital financially aligns itself with surgeons and then contracts with vendors to sell implants at newly-dictated prices. Orthopaedic surgeons may utilize any implant system using their best clinical judgement that has met the reference price. Our hypothesis is that vendors will meet the set price, and vendors and technologies will not change.

METHODS: We retrospectively analyzed the twelve months prior (May 2017-2018) and the most recent twelve months after (March 2019-2020) implementing reference pricing at our institution. We investigated differences in average prices for total implant and component costs. We evaluated cost of implants with respect to surgeon volume, assessed changes in implant utilization, and number of companies purchased from before and after reference pricing.

RESULTS: 6,199 THA's were included in the study with 3,464 arthroplasties before and 2,735 after implementation of reference pricing. Overall implant costs decreased by 22.7% ($p<0.0001$). All individual hip components decreased by at least 21% ($p<0.0001$). No difference in prices were found among surgeons ($p=0.98$). Implant selection did not change ($p=0.18$) and vendor business increased by one company after reference pricing.

CONCLUSION: The strategy of reference pricing significantly reduced costs for THA implants at our institution. The reduction in implant costs were regardless of surgeon volume, and did not change surgeon implant selection. We conclude that this strategy represents a significant cost-savings approach for other hospitals.

SPONSOR: N/A

DISCLOSURE STATEMENT: Eric L Smith is a paid consultant and receives research support from Conformis and Depuy Synthes. David A Mattingly receives royalties and is a paid consultant for Depuy Synthes. Andrew Jawa receives royalties from Depuy Synthes, and is a paid speaker and consultant for DJO Global, paid consultant for Ignite Orthopaedics, and has equity in Boston Outpatient Surgical Suites.

ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Jonathan Shaker, Daniel Ward, Andrew Jawa, David Mattingly

TITLE: Limb Lengthening after Primary Total Knee Arthroplasty: Customized Patient Specific Instrumentation Does Not Affect Expected Limb Lengthening

AUTHORS: [1]Christopher J Fang, MD; [2]Kenneth McAlpine, MD; [2]Michael Gustin, MD; [1]Ruijia Niu, MPH; [2]David Freccero, MD; [3]Matthew Gordon, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: Expectations for limb length differences after TKA are important for patient perception and outcomes. Limb length discrepancies may occur due to postoperative leg length increases, which can lead to decreased patient functionality and satisfaction and even possible litigation. The purpose of this study is to examine the frequency and extent of limb lengthening among various preoperative deformities and between two different implant systems.

METHODS: Preoperative and postoperative full-length standing radiographs were obtained between August 2018 and August 2019 to measure mechanical axis and limb length of operative limbs. Demographic information such as age, sex, and BMI was also collected. Patients were grouped into categories for pre- and postoperative subgroup analysis: valgus, varus, customized implant, and conventional implant. Regression analysis was performed to evaluate significant relationships.

RESULTS: Of the 121 primary TKAs analyzed, 62% of the knees showed an increase in limb length after TKA, with an average lengthening of 5.32 mm. Preoperative varus alignment was associated with a mean lengthening of 3.14 mm, while preoperative valgus alignment was associated with a mean lengthening of 16.2 mm. Overall, there were no statistically significant differences in limb lengths pre- and postoperatively ($p = 0.23$) and no significant changes in limb length for any subgroup. Further, no variables were associated with limb length changes ($p = 0.49$), including the use of customized implants ($p = 0.2$).

CONCLUSION: Limb lengthening after TKA is common and, on average, occurs more significantly in valgus knees. No significant difference in limb lengthening could be demonstrated using customized over conventional implants. Preoperative counseling is important to manage patient expectations.

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PRINCIPAL INVESTIGATOR NAME: Eric L Smith
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TITLE: Differences in Hospital Costs among Octogenarians and Nonagenarians Following Primary Total Joint Arthroplasty

AUTHORS: [1]Christopher J Fang, MD; [2] Andrew Hagar, MD; [2]Matthew Gordon, MD; [1]Carl T Talmo, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: The proportion of patients over the age of 90 years continues to grow, and the anticipated demand for total joint arthroplasty (TJA) in this population is expected to rise concomitantly. As the country shifts to alternative reimbursement models, data regarding hospital expenses is needed for accurate risk-adjusted stratification. The aim of this study was to compare total in-hospital costs following primary TJA in octogenarians and nonagenarians, and to determine the primary drivers of cost.

METHODS: This was a retrospective analysis from a single institution in the U.S. We used time-drive activity-based costing (TDABC) to capture granular total hospital costs for each patient.

RESULTS: 889 TJA's were included in the study, with 841 octogenarians and 48 nonagenarians. Nonagenarians were more likely to undergo total hip arthroplasty (THA) (70.8% vs. 42.4%; $p < 0.0001$), had higher ASA classification (2.6 vs. 2.4; $p = 0.049$), and were more often privately insured (35.4% vs. 27.8%; $p = 0.0001$) as compared to octogenarians. Nonagenarians were more often discharged to skilled nursing facilities (56.2% vs. 37.5%; $p = 0.0011$), experienced longer operating room (OR) time (142 vs. 133; $p = 0.0201$) and length of stay (3.7 vs. 3.1; $p = 0.0003$), and had higher implant and total in-hospital costs ($p < 0.0001$ and 0.0001). Multivariate linear regression showed implant cost (0.700; $p < 0.0001$), length of stay (0.546; $p < 0.0001$), and OR time (0.288; $p < 0.0001$) to be the strongest associations with overall costs.

CONCLUSION: Primary TJA for nonagenarians was more expensive than octogenarians. Targeting implant costs, length of stay, and OR time can reduce costs for nonagenarians in order to provide cost-effective value-based care.

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ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Andrew Hagar, Matthew Gordon, Carl Talmo, David Mattingly

TITLE: Reopening of Elective Total Joint Replacement Surgery in a High-Volume Single-Specialty Hospital Within a COVID-19 Epicenter

AUTHORS: [1]Taryn E. LeRoy, MD; [1]Raminta V. Theriault, MD, MS; [1]Nathan J. Sinz, MD; [1]Gabriel S. Perrone, MD, MS; [2]Christopher J Fang, MD; [2]David A Mattingly, MD; [2]Eric L. Smith, MD;

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INTRODUCTION: The coronavirus disease (COVID-19) pandemic has created significant change globally
in healthcare systems. With the recommendation to stop elective surgery, healthcare systems incurred
significant financial losses. As the initial surge begins to decline, hospitals and surgery centers are devising
plans to resume elective cases. Therefore, the aim of this study is to describe an approach to resuming
elective surgery for total joint replacement at our single-specialty, orthopaedic-only institution.

METHODS: With our multidisciplinary team, our hospital created an approach to resume elective surgery for
total joint replacement under the COVID-19 pandemic conditions and state regulations. We describe our
steps and processes to remain a COVID-19 negative institution.

RESULTS: Through our approach, our orthopaedic-only specialty institution was able to return to elective
total joint arthroplasty procedures at significant volume during the pandemic, and, to date, has remained
COVID-19 negative through these efforts.

CONCLUSION: This manuscript aims to summarize an approach to the resumption of elective surgery f ocusing on four main areas of care: (I) preoperative screening and care, (II) operative care, (III) immediate post-operative care, and (IV) inpatient concerns. Our example may serve as a basic model which can be used as a template and customized to meet the specific needs and restrictions of other institutions as they work through returning to baseline.

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ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Taryn LeRoy, Raminta Theriault, Nathan Sin, Gabriel Perrone, Christopher Fang, David Mattingly

TITLE: The Cost of Hip and Knee Revision Arthroplasty by Diagnosis-Related Groups: Comparing Time-Driven Activity-Based Costing and Traditional Accounting

AUTHORS: [1]Christopher J Fang, MD; [1]Jonathan Shaker, MS; [1]Jacob M. Drew, MD; [1]Andrew Jawa, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: Traditional hospital cost accounting (TA) has innate disadvantages that limit the ability to meaningfully measure care pathways and quality improvement. Time-driven activity-based costing (TDABC) allows a meticulous account of costs in primary total joint arthroplasty (TJA). However, differences between TA and TDABC have not been examined in revision hip and knee TJA (rTJA). We aimed to compare total costs of rTJA by the diagnosis-related group (DRG), measured by TDABC vs TA.

METHODS: Overall costs were calculated for rTJA care cycles by DRG for 2 years of financial data (2018-2019) at our single-specialty orthopedic institution using TA and TDABC. Costs derived from TDABC, based on time and resources used, were compared with costs derived from TA based on historical costs. Proportions of implant and nonimplant costs were measured to total TA costs.

RESULTS: Seven hundred ninety-three rTJAs were included in this study, with TA methodology resulting in higher cost estimates. The total cost per DRG 468, rTJA with no comorbidities or complications (CC), DRG 467, rTJA with CC, and DRG 466, rTJA with major CC, estimated by TDABC was 69%, 67%, and 49% of the estimation by TA, respectively. Implant and nonimplant costs represented different proportions between methodologies.

CONCLUSION: Considerable differences exist, as TA estimations were 31%-51% higher than TDABC. The true cost is likely a value between the estimations, but TDABC presents granular and patient-specific cost data. TDABC for rTJA provides valuable bottom-up information on cost centers in the care pathway and, with targeted interventions, may lead to a more optimal delivery of value-based health care.

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ACKNOWLEDGMENT(s): N/A
PRINCIPAL INVESTIGATOR NAME: Eric L Smith
CO-INVESTIGATOR NAMES: Christopher Fang, Jonathan Shaker, Jacob Drew, Andrew Jawa, David Mattingly

TITLE: Financial Burden of Revision Hip and Knee Arthroplasty at an Orthopaedic Specialty Hospital: Higher Costs and Unequal Reimbursements

AUTHORS: [1]Christopher J Fang, MD; [1]Jonathan Shaker, MS; [1]Daniel M. Ward, MD; [1]Andrew Jawa, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD;

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INTRODUCTION: As demand for primary total joint arthroplasty (TJA) continues to grow, a proportionate increase in revision TJA (rTJA) is expected. It is essential to understand costs and reimbursement of rTJA as our country moves to bundled payment models. We aimed (1) to characterize implant and total hospital costs, (2) assess reimbursement, and (3) determine revenue for rTJA in comparison with primary TJA.

METHODS: The average implant and total hospital cost of all primary and rTJA procedures by diagnosis-related group (DRG) was calculated using time-driven activity-based costing at an orthopedic hospital from 2018 to 2020. Average reimbursement and payer type were assessed by DRG. Revenue was calculated by deducting average time-driven activity-based costing total costs from reimbursement.

RESULTS: 13,946 arthroplasties were included in the study. Implant cost comprised 55.8% of total hospital costs for rTJA DRG 468, compared with 43.6% of total hospital costs for primary TJA DRG 470. Total hospital costs for DRG 468 were 61.1% more than DRG 470. Reimbursement for rTJA was 1.23x more than primary TJA. Private payers paid 23.2% more than Medicare for rTJA. Margin for DRG 468 was 1.5% less than primary DRG 470.

CONCLUSION: rTJA requires more hospital resources and costs than primaries, yet hospital reimbursement may be inadequate with the additional expenditures necessary to provide optimal care. If hospitals cannot perform revision services under the current reimbursement model, patient access may be limited. Implant costs are a major contributor to overall rTJA cost. Strategies are needed to reduce revision implant costs to improve value of care.

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TITLE: Elimination of Routine Urinalysis before Elective Orthopaedic Surgery Reduces Antibiotic Utilization without Impacting CAUTI or SSI Rates

AUTHORS: [1]Brian L. Hollenbeck, MD; [1]Megan Hoffman, BA; [1]Christopher J Fang, MD; [1]Kevin Counterman, BA; [1]Susan Cohen, BA; [1]Christine A. Bell, RN.

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INTRODUCTION: Routine pre-operative urinalysis has been the standard of care for the orthopedic population for decades, regardless of symptoms. Studies have demonstrated antibiotic overuse and low concordance between bacteria cultured from the surgical wound and in the urine. Testing and treatment of asymptomatic urinary tract colonization before total joint arthroplasty (TJA) is unnecessary and increases patient risk. We investigated reducing antibiotic use by (1) modifying testing algorithms to target patients at risk (2) modifying reflex to culture criteria and (3) providing treatment guidelines.

METHODS: A pre-post study was conducted to determine identify the impact of eliminating universal urinalysis prior to TJA on surgical site infection (SSI) and catheter-associated urinary tract infection (CAUTI) rates and number of antibiotic prescriptions. Patients who underwent primary hip or knee TJA or spinal fusions from February 2016 to March 2018 were included. Patient data was collected for pre- and post-practice change period (February 2016-October 2016 and & August 2017-March 2018). Patient demographics, urinalysis results, urine culture results, and antibiotic prescriptions were analyzed retrospectively from every tenth chart in the pre-period and prospectively on all patients in the post-period.

RESULTS: A total of 4,663 patients were studied. There was a 96% decrease in urinalyses performed ($p<0.0001$), and a 93% reduction rate in antibiotic utilization ($p<0.001$). No significant difference in SSI and CAUTI rates was observed did not significantly differ ($p>0.303$).

CONCLUSION: The elimination of routine urinalysis before orthopedic surgery resulted in a reduction in antibiotic utilization with no significant change in the SSI or CAUTI rates. Cost savings resulted from reduced antibiotic usage, laboratory materials and manpower hours.

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TITLE: Episode of Care Costs for Revision Total Joint Arthroplasty by Decadal Age Groups

AUTHORS: [1]Christopher J Fang, MD; [2] Nicholas Pagani; [2]Matthew Gordon, MD; [1]Carl T Talmo, MD; [1]David A Mattingly, MD; [1]Eric L. Smith, MD; [1] New England Baptist Hospital, Boston, MA, USA, [2] Tufts Medical Center, Boston, MA, USA

INTRODUCTION: Demand for revision total joint arthroplasty (rTJA) is expected as the age of the population continues to rise. Accurate cost data regarding hospital expenses for differing age groups is needed to deliver optimal care within value-based healthcare (VBHC) models. The aim of this study was to compare total in-hospital costs by decadal groups following rTJA, and to determine the primary drivers of cost for these procedures.

METHODS: This was a retrospective analysis from a single institution in the U.S. Time-driven activity-based costing (TDABC) was used to capture granular hospital costs.

RESULTS: 551 rTJA's were included in the study, with 294 sexagenarians, 198 septuagenarians and 59 octogenarians and older. Sexagenarians had lower ASA classification (2.3 vs 2.4 and 2.7; $p < 0.0001$) and were more often privately insured (66.7% vs 24.2% and 33.9%; $p < 0.0001$) as compared to septuagenarian and octogenarians and older, respectively. Sexagenarians were discharged to home at a higher rate (85.3% vs 68.3 and 34.3%; $p < 0.0001$), experienced longer operating room (OR) time (199.8 vs 189.7 and 172.3; $p = 0.0195$), and had differing overall hospital length of stay (2.8 vs 2.7 and 3.6; $p = 0.0086$) compared to septuagenarians and octogenarians and older, respectively. Sexagenarians had 7% and 23% less expensive personnel costs from post-anesthesia care unit (PACU) to discharge ($p < 0.0001$), and 1% and 24% more expensive implant costs ($p = 0.077$) compared to septuagenarians and octogenarians and older, respectively. Sexagenarians had a lower total in-hospital cost for rTJA by 0.9% compared to septuagenarians, but 12% more expensive total in-hospital costs compared to octogenarians and older ($p = 0.185$). Multivariate linear regression showed implant cost (0.88389; $p <0.0001$), OR time (0.12140; $p < 0.0001$), personnel cost from PACU through discharge (0.11472; $p = 0.0007$) and rTHA (-0.03058; $p < 0.0001$) to be the strongest associations with overall costs.

CONCLUSION: Focusing on implant costs and OR time to reduce costs for all age groups for rTJA is important to provide cost-effective VBHC.

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PRINCIPAL INVESTIGATOR NAME: Eric L Smith

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TITLE: Defining the Natural History of Knee Motion Following Total Knee Arthroplasty

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INTRODUCTION: Range of knee motion (ROM) is an important outcome measure following total knee arthroplasty (TKA). Knee flexion correlates with patient satisfaction and improved quality of life. Previous studies have evaluated preoperative ROM in relation to patient outcomes, but further evidence to predict likely outcomes following TKA is limited. Therefore, the aim of this study was to define the timing and natural history of ROM after TKA. This information will help surgeons counsel patients on expectations of recovery.

METHODS: A retrospective review of patients undergoing primary TKA at a tertiary hospital between April 2016 and December 2018 was conducted. Demographic data, surgical factors and pre- and postoperative (6 weeks & 1 year) range of motion (ROM) measurements were collected and compared. Patients were categorized by implant design and analyzed to evaluate the impact of variables on knee motion.

RESULTS: 827 TKA procedures were included in the study. Compared to preoperative measurements, patients showed an improvement of 0.58 degrees of extension ($p=0.0002$) and an average reduction of flexion of 7.66 degrees ($p<0.0001$) at first postoperative visit. At final postoperative visit, an improvement of 1.38 degrees of extension ($p<0.0001$) and no significant change in flexion was noted compared to preoperative measurements. Patients with flexion contractures had similar values to those without at final postoperative visit. Patients with less than 110° of flexion at first postoperative visit improved at final postoperative visit (109.2° $p<0.001$)

CONCLUSION: Flexion following TKA is similar to preoperative values in most patients. Preoperative flexion contractures resolve in most patients and often have no effect on final ROM. Patients recover flexion up to the one-year mark. Meeting patient expectations after TKA is critical for a successful outcome, thus surgeons should counsel patients on the natural history of ROM recovery after TKA.

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TITLE: Arthroplasty Costs Excluding Implants: Anatomic Total Shoulder vs Reverse Shoulder Arthroplasty

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INTRODUCTION: The incidence of reverse shoulder arthroplasty (RSA) has been rising exponentially in recent years. Compared to anatomic total shoulder arthroplasty (TSA), RSA incurs higher total hospital costs, largely due to implant prices. However, RSA requires less operating room (OR) time and is a cementless procedure, potentially representing important cost-savings. Our aim is to evaluate (1) the difference in total hospital costs for RSA and TSA excluding implant costs and (2) identify cost factors between the two procedures. Our hypothesis is that RSAs and TSAs will have similar costs excluding implants due to offsetting personnel and supply costs.

METHODS: Time-driven activity-based costing (TDABC) was utilized to determine the costs of RSAs and TSAs at our single-specialty hospital from January 2018 to 2020. Implant costs were subtracted from total hospital costs to determine costs excluding implants. Other demographic and cost parameters were also compared.

RESULTS: 921 primary shoulder procedures were analyzed (577 RSAs and 344 TSAs). Patients undergoing RSA had increased age, American Society of Anesthesiologists (ASA) classification and length of stay (LOS), but less OR time, home discharges and non-Medicare insurance ($p < 0.04$). For RSA, personnel, implant and overall hospital costs were 1.03x, 1.16x, and 1.09x more expensive than TSA, respectively ($p < 0.004$). However, excluding implants, supply costs and overall hospital costs were 0.86x and 1.01x the cost of TSA, respectively ($p < 0.0001$ & $p = 0.56$). Implants accounted for 97% of the difference in overall hospital costs between RSA and TSA.

CONCLUSION: Excluding implants, RSA and TSA have similar hospital costs. The savings from decreased OR time and supplies are offset by the length of stay. Decreasing RSA implant prices to the level of TSA would equate the costs for these two procedures. As the incidence of RSA rises, strategies to decrease implant costs are important for decreasing overall health expenditures.

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TITLE: Total Joint Arthroplasty in Homeless Patients at an Urban Safety-Net Hospital

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INTRODUCTION: Homelessness has been a key social determinant of health as this population grew to 580,000 in 2020. Total joint arthroplasty (TJA) is an effective treatment for symptomatic end-stage osteoarthritis of the hip and knee and has been shown to improve health-related quality of life in the general population. However, there is a lack of literature on the outcome of TJA among homeless patients.

METHODS: We retrospectively reviewed 442 patients who underwent TJA between January 2016 and August 2017 at an urban, tertiary, academic safety-net hospital. Based on self-reported living status, we identified 28 patients to be in the Homeless group, and the rest 414 patients as non-Homeless group. Fisher's exact tests, student's t-tests, and multivariate logistic regression was used to compare the demographics, preoperative conditions, and surgical outcomes of Homeless patients to the non-Homeless patients.

RESULTS: The Homeless group were more often males, younger, current smokers, had alcohol use disorder, and used illicit drugs. After controlling for age, sex, and preoperative medical and social conditions, Homeless patients were 15.83 times more likely to have an ED visit (adjusted OR = 15.83; 95% CI 5.05– 49.59; $p < 0.0001$) within 90 days, but had similar rates of readmission ($p = 0.25$) and reoperation ($p = 0.38$) when compared to non-Homeless patients.

CONCLUSION: Our results are similar to previous studies on surgical homeless patients. It takes a collaborative effort to optimize patients for TJA and achieve surgical success. Our study is limited by its retrospective design and underpowered sample size. Future studies are recommended to investigate this association further.

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TITLE: Hip Fractures in the Super-Obese: An Analysis of the National Surgical Quality Improvement Program

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INTRODUCTION: The number of people with a body mass index (BMI) value ≥50 kg/m2 ("super-obese") is growing faster than that in any other BMI category in the United States. Recent studies have documented an "obesity paradox": a seemingly protective effect of overweight and obesity against poor outcomes after certain surgical procedures. This has been demonstrated in hip fracture surgery; however, there is a scarcity of evidence regarding whether this obesity paradox also provides a protective effect to the super-obese.

OBJECTIVE: The purpose of this study was to determine whether this "obesity paradox" extends to patients with "super-obesity" by comparing rates of 30-day major and minor complications and mortality among super-obese patients with those of patients in other body mass index (BMI) categories. We hypothesized that the obesity paradox seen in overweight and obese patients would not be present in super-obese patients.

METHODS: Using the National Surgical Quality Improvement Program database, we identified >100,000 hip fracture surgeries performed from 2012–2018. Patients were categorized as underweight (BMI <18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), obese (BMI 30–39.9), morbidly obese (BMI 40–49.9), or super-obese (BMI ≥50). We analyzed patient characteristics, surgical characteristics, and 30-day outcomes. Using multivariate regression with normal-weight patients as the referent, we determined odds of major complications, minor complications, and death within 30 days by BMI category.

RESULTS: Of 440 super-obese patients, 20% had major complications, 33% had minor complications, and 5.2% died within 30 days after surgery. When comparing patients in other BMI categories with normal-weight patients, super-obese patients had the highest odds of major complications (odds ratio [OR]: 1.6, 95% confidence interval [CI], 1.2–2.0) but did not have significantly different odds of minor complications (OR: 1.2, 95% CI, 0.94–1.4) or death (OR: 0.91, 95% CI, 0.59–1.4).

CONCLUSION: Super-obese patients had significantly higher odds of major complications within 30 days after hip fracture surgery compared with all other patients. This "obesity paradox" did not apply to super-obese patients.

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