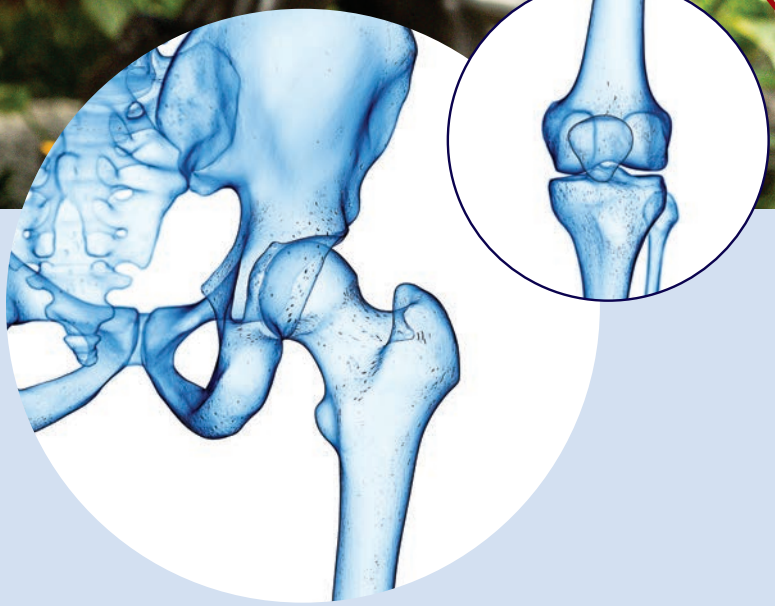
AAHKS
26th ANNUAL MEETING

November 10 – 13, 2016 | Dallas, Texas



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Poster Abstracts

AAHKS

2017 SPRING MEETING

MAY 5 – 6 • SAN FRANCISCO

Do you enjoy the fall meeting but miss the intimate interactions of AAHKS meetings of the past? Are you looking to get your questions answered by leading experts in a small group setting? Then the AAHKS Spring Meeting is for you!

The meeting will be centered around a case-based discussion format in small groups with a maximum of 10 participants per faculty member and symposia on important topics ranging from the business of orthopaedics to perioperative optimization and management. The meeting will facilitate the ideal learning atmosphere for the practicing hip and knee surgeon wanting to learn more about primary and revision hip and knee arthroplasty.

Friday, May 5 – Saturday, May 6, 2017

The Westin St. Francis
San Francisco on Union Square

- Limited attendance
- Instructional Course Lectures (ICL)
- Small group breakouts with faculty

Sign in now to register at www.AAHKS.org.

2016 Posters

PRIMARY KNEE

1 Total Knee Arthroplasty after Anterior Cruciate Ligament Reconstruction: Not Just Another Routine Primary

2 Pain Catastrophizing as a Predictor for Post-Operative Pain and Opiate Consumption in Total Joint Arthroplasty Patient

3 Navigated Total Knee Arthroplasty has Lower Rates of Perioperative Complications Compared to Conventional Total Knee Arthroplasty

4 Radiographic Differences in Total Knee Arthroplasty Patients with Anterior Pain

5 Does Total Knee Arthroplasty Range of Motion have a Greater Improvement with Home Care or a Skilled Nursing Facility?

6 Pericapsular Injection with Free Ropivacaine Provides Equivalent Postoperative Analgesia as Liposomal Bupivacaine following Unicompartmental Knee Arthroplasty

7 Does Shared Decision Making Result in Better Health Outcomes in Hip and Knee Osteoarthritis? Results of a Longitudinal Cohort Study

8 Factors Associated with Range of Motion Recovery following Manipulation under Anesthesia

9 KOOS JR: A Prediction Tool for Identifying Patients Who Need Joint Replacement?

10 Ten-Year Prospective Results of Uncemented Tibial Fixation for Total Knee Arthroplasty in Patients under Age 55

11 Right TKR Patients Treated with Enhanced Pain and Rehabilitation Protocols Can Drive at 2 Weeks

12 Prior Knee Arthroscopy Does Not Influence TKA Outcomes and Survivorship at 10 Years

13 Do Socioeconomic Factors Contribute to Predictive Models for Total Knee Arthroplasty Outcomes?

14 Current Total Knee Designs: Effect of Baseplate Roughness and Locking Mechanism on Polyethylene Backside Wear

15 Painful Knee Arthroplasty Patients Walk with Altered 3D Knee Kinematics: A Case Control Study

16 Reasons for Lawsuits following Total Joint Arthroplasty in One Metropolitan Area

17 Genu Recurvatum Analysis in the Context of Computer Assisted Total Knee Arthroplasty: A 14-Year Retrospective Study

18 Manual vs. Robotic Assisted Unicompartmental Knee Arthroplasty: A Comparison of Validated Clinical Outcomes at 3 Years

19 Initial Experience with Nonselective Patient Next Day Discharge after Total Knee Arthroplasty

20 The Sequential Effects of Ligament Releases to Soft Tissue Tension in a Valgus Total Knee Replacement

21 Liposomal Bupivacaine Offers No Benefit over Ropivacaine for Multimodal Periarticular Injection in Total Knee Arthroplasty

22 Prospective, Randomized Evaluation of the Quality of Wound Closure with Barbed vs. Standard Suture after TJA

23 High Supply Cost Patient Outliers and their Influence on the Average Cost of Primary Knee Replacement

24 Pre-Operative Freezing of Sensory Nerves for Post-TKA Pain: Preliminary Results from a Prospective, Randomized, Double-Blind Controlled Trial

25 Preoperative and Discharge Predictive Tools for 30-Day Readmission following Total Knee Arthroplasty

26 Is Day of Surgery Associated with Adverse Clinical and Economic Outcomes following Primary Total Knee Arthroplasty?

27 Bundled Payments for Care Improvement (BPCI): Boom or Bust?

28 Which Factors Drive the National Economic Burden of Hospital Readmissions following Total Knee Arthroplasty?

29 Effect of Thickness on Oxidation Induced by Compressive Cyclic Loading of Conventional Polyethylene

30 Contemporary Results of I&D with Component Retention for Acute Periprosthetic Knee Infections

31 Objective Knee Functional Assessment to Document Appropriateness for Total Knee Arthroplasty

32 Knee Flexion at Time of Hospital Discharge Best Indicates Ultimate Range of Motion after Total Knee Arthroplasty

33 Preoperative PROMIS Scores Help Identify Patients Who Will Fail to Improve from Total Knee Replacement at 6-12-Month Follow-Up

34 No Difference in Gait Analysis in Kinematic vs. Mechanical Alignment in Total Knee Joint Arthroplasty (TKA)–A Randomized Trial

2016 Posters

35 Direct-to-Patient Patient Reported Outcomes Collection to Support Quality Improvement in Total Joint Replacement

36 Satisfaction Rates and Quality of Life Changes following Total Knee Arthroplasty in Age-Differentiated Cohorts

37 Optimizing Risk Adjustment Models When Comparing TJR Outcomes: ASA Score vs. Charlson Comorbidity Index

38 Predictors of Discharge to Skilled Nursing Facility (SNF) after Primary TKR

39 Knee-Specific Measures of Pain and Function after Primary Total Knee Replacement Reflect Consistent Patient Gains

40 Different Optimal Alignment but Equivalent Functional Outcomes in Medial and Lateral Unicompartmental Knee Arthroplasty

41 Increased Migration of Modular Tantalum Total Knee Replacements in a Randomized Controlled Trial

42 Kinematic Alignment Does Not Put the Tibial Component in TKA at Risk for Early Aseptic Loosening: Results from a RSA RCT of Patient-Specific Cutting Blocks vs. Computer Navigation

43 Dislocation Rates Following Anterior Approach THA: The Role of Functional Pelvic Tilt

44 Posterior Cruciate Ligament Avulsion during Cruciate-Retaining Total Knee Arthroplasty: Incidence and Outcomes

45 Is Patellar Baja Associated with Higher BMI in Patients Undergoing Primary Total Knee Arthroplasty?

46 The Effect of Implant Design on Sagittal Plane Stability: A Randomized Trial of Medial Pivot vs. Posterior Stabilized Total Knee Arthroplasty

47 Randomized Clinical Trial of Conventional vs. Highly Cross-Linked Polyethylenes in Total Knee Arthroplasties

48 Obstructive Sleep Apnea in Total Joint Arthroplasty Patients – Prevalence

49 Should Tibial Stem Extensions Be Utilized in Obese Patients Undergoing Primary Total Knee Arthroplasty?

50 Readmissions after Primary Total Knee Replacement Does It Affect Postoperative Outcomes?

51 Leaving Residual Varus Alignment after Total Knee Arthroplasty Does Not Improve Patient Pain, Function and Outcomes

52 KT-1000 Analysis of Bicruciate-Retaining Total Knee Arthroplasty

53 Is Orthopaedic Department Teaching Status Associated with Adverse Outcomes of Primary Total Knee Arthroplasty?

54 Five-Year Prospective Randomized Study of Knee Arthroplasty: Cruciate-Substituting vs. Posterior-Stabilized

55 Effect of Body Surface Area on Outcomes after Total Knee Arthroplasty

56 Intravenous vs. Intraarticular Tranexamic Acid in Total Knee Arthroplasty with No Postoperative Suction Drains: A Randomized Controlled Trial

57 How Do Pre-Operative Medications Influence Outcomes in Total Joint Arthroplasty?

REVISION KNEE

58 Proximalization of The Tibial Tubercle Osteotomy: A Solution for Patella Infera during Revision Total Knee Arthroplasty

59 Significant Damage of Modular Junctions is Commonly Seen in TKR Retrievals

60 Survivorship of Metaphyseal Sleeves in Revision Total Knee Arthroplasty

61 Mid-term Results of Tibial Metaphyseal Sleeves Used in Revision Total Knee Arthroplasty for Aseptic Loosening in Obese Patients

62 Regional vs. General Anesthesia in Revision Knee Arthroplasty Patients: A Risk-Stratified, Propensity-Matched Analysis

63 Does the Tibia Component Design Affect the Need for Offset Stems in Revision Total Knee Arthroplasty?

64 Mid-Term Results of Revision Total Knee Arthroplasty Using Metaphyseal Sleeves: Minimum 5-Year Follow-Up

65 Effect of Modular Stem Size and Fixation Method on Mechanical Failure after Revision TKA

66 Optimizing Mechanical Alignment with Modular Stems in Revision Total Knee Arthroplasty

67 Dismal Reconstructive Outcomes of Concomitant Periprosthetic Joint Infection and Extensor Mechanism Disruption

PRIMARY HIP

68 High Revision Rate of the Rejuvenate Modular Neck Femoral Stem at 3–5 Years Follow-Up

69 Dislocation of Primary Total Hip Arthroplasty is More Common in Patients with Lumbar Spinal Fusion

70 Risk of Total Hip Arthroplasty Dislocation after Adult Spinal Deformity Correction

71 Multi-Surgeon Assessment of THA Head-Trunnion Assembly Forces Using a Surgical Simulator

72 Preoperative Fluid Administration in Total Joint Arthroplasty Patients Limits Anesthesia Interventions: A Randomized, Controlled, Blinded Study

73 Total Hip Arthroplasty in the Spinal Deformity Population: How Does Deformity Impact Hip Stability?

74 Fixation Using Alternative Implants for the Treatment of Hip Fractures: A Large, Blinded, International Multi-Centre Randomized Trial

75 Radiographic Predictors of Loose Wedge Tapered Cementless Femoral Stems

76 Co-Infection with Hepatitis C and HIV in Total Hip Arthroplasty: An Incremental Effect of Disease Burden

77 Direct Anterior Hip Replacement Does Not Pose Undue Radiation Exposure Risk

78 A Perioperative Patient Management Support System was Unable to Mitigate the Risk of Hospital Readmission for THA Patients with High ASA grades

79 Discharge to Continued Inpatient Care after Total Hip Arthroplasty is Associated with Increased Post-Discharge Morbidity: A Propensity-Adjusted Cohort Study

80 Osteonecrosis Increases Transfusion Rate and Readmission after Primary Total Hip Replacement

81 Bone Ingrowth in Retrieved Porous Coated Acetabular Components

82 If You Live Alone, There is No Place Like Home after Total Joint Arthroplasty

83 Survivorship and Complications of Total Hip Arthroplasty in Dwarf Patients

84 Higher Patient Expectations Predict Greater Patient Satisfaction and Patient Reported Outcomes in Total Hip Arthroplasty Patients: A Prospective Multi-Center Study

85 Hip and Knee Arthroplasty in the Outpatient vs. Inpatient Setting

86 The Clinical Relevance of Functional Pelvic Tilt: A Preoperative Analysis of 3,173 Patients

87 Self-Reported Penicillin-Allergic Patients Can Safely Receive Cephalosporin Prophylaxis for TJA: An Algorithm for Management

88 Quantifying Patient Activity before and after Total Hip and Knee Arthroplasty

89 To Cement or Not to Cement? Modern Hybrid Total Hip Replacement - Low Risks and Excellent Results with Cemented Femoral Fixation

90 First Report of Early Results of a Commonly Used Cementless Single Tapered Femoral Component in Primary Total Hip Arthroplasty

91 Postoperative Impact of Diabetes and Chronic Kidney Disease vs. Diabetes and Renal Transplant after Total Hip Arthroplasty

92 Relevance of Intraoperative Anteroposterior Radiograph during Total Hip Arthroplasty

93 Minimum 13-year Multi-Center Study of THR with Highly Cross-Linked Polyethylene and Standard Diameter Ceramic or Cobalt Chrome Femoral Heads

94 THA in Patients with Previous Lumbar Fusion Surgery: Are There More Dislocations and Revisions?

95 Assessment of Early Subsidence, Periprosthetic Fracture, and Revision of Cementless Femoral Stems via the Direct Anterior Approach

96 Diabetes Mellitus and Hyperglycemia and the Risk of Aseptic Loosening in THA and TKA

97 Preoperative and Discharge Predictive Tools for 30-Day Readmission following Total Hip Arthroplasty

98 Has Health Care Reform Legislation Reduced the Economic Burden of 90-Day Readmissions following Total Hip Arthroplasty?

99 Modified Frailty Index is an Effective Risk Assessment Tool in Primary Total Hip Arthroplasty

100 In-Vivo Wear Performance of Highly Cross-Linked Polyethylene across Three Femoral Head Articulations

101 Patient Decision Aids in Routine Orthopaedic Care Improve Shared Decision Making and Reduce Surgical Rates: A Prospective Cohort Study

2016 Posters

102 Soft-Tissue Infiltration of an Analgesic Mixture during Primary Total Hip Arthroplasty is an Effective Strategy for Pain Control during the First 24 hours after Surgery

103 Outcomes Associated with Same-Day Discharge in Direct Anterior Total Hip Arthroplasty

104 Serum Metal Ions in Well-Functioning Total Hip Arthroplasty: Does Femoral Stem Metallurgy Affect Results?

105 Evaluating the Use of Intra-Articular Injections as a Treatment for Painful Hip Osteoarthritis: A Randomized, Double-Blinded, Controlled Study Comparing Hylan G-F 20 and Saline

106 Smoking Increases Reoperations for Infection within 90 Days after Primary Total Joint Arthroplasty

107 The Accuracy of Acetabular Component Position Using the Anterior and Posterior Approach: Clinical Value of a Novel Method to Determine Anteversion

108 Does Acetabular, Femoral and Combined Hip Anteversion in Standing Position Reside within the Proposed Safe Zone in Most Patients after Primary Total Hip Arthroplasty?

109 Randomized Trial of the Effect of Femoral Stem Length on Subsidence and Functional Outcome following THA: An EBRA-FC Analysis

110 Lateral Incision Reduces Risk of Lateral Femoral Cutaneous Nerve Palsy after Direct Anterior Total Hip Arthroplasty

111 7-year RSA Evaluation of Vitamin E Diffused Highly Cross-Linked Polyethylene Wear and Stability of Femoral Stems

112 An Oldie but Goodie: Midterm Results of a Dual Offset Tapered Femoral Stem for Total Hip Arthroplasty

113 The Rising Use of Total Hip Arthroplasty for Femoral Neck Fractures in the United States

114 The Impact of Myasthenia Gravis and Multiple Sclerosis on Total Hip Arthroplasty

115 Modified Precautions in Posterior Approach THA Does Not Increase Dislocation Risk

116 Impact of a Rapid-Recovery Approach to Elective Total Hip Arthroplasty on Patient Outcomes and Episode Cost

117 Determining Health-Related Quality-of-Life Outcomes Using the SF-6D following Total Hip Arthroplasty

118 Mental Health Disease and Perioperative Outcomes following Hip Surgery

119 Hepatitis C is an Independent Risk Factor for Perioperative Complications and Adverse Events in Patients with Hip Fractures

120 Direct Anterior Approach is a Viable Option for Hemiarthroplasty in Elderly Patients with Femoral Neck Fracture

REVISION HIP

121 Infection is Not a Risk Factor for Perioperative and Postoperative Blood Loss and Transfusion in Revision Total Hip Arthroplasty

122 Alpha-Defensin Test for Diagnosis of PJI in the Setting of Failed Metal-on-Metal Bearings or Corrosion

123 Re-Revision Total Hip Arthroplasty: Epidemiology and Factors Associated with Outcomes

124 Sustainable Improvements in Clinical Function and Health Utility in Revision Cases with Paprosky 3A and 3B Acetabular Defects Implanted with a Porous Titanium Acetabular Component

125 A Note to Surgeons: Biphasic Trends in Revision of ASR THA

126 The Utility of Metal Ion Trends in Predicting Revision in Metal-on-Metal THA

127 Multicenter Study of 94 Custom Acetabular Triflange Components at Mid-Term Follow-Up: Not for the Faint of Heart

128 What Pre-Operative Risk Factors Are Associated with Poor Outcomes of Revision Surgery for Pseudotumours in Patients with Metal-on-Metal Hip Arthroplasty?

129 Mid-term Survivorship after Revision Total Hip Arthroplasty with a Triflange Acetabular Component

130 Revision THA for Aseptic Femoral Loosening: More Common with the Direct Anterior Approach

131 Do Cemented Dual Mobility Cups Confer Stability for Complex Acetabular Revisions?

132 Proximal Femoral Replacement in Non-Oncologic Patients Undergoing Revision Hip Arthroplasty

133 Cementing Constrained Liners into Secure Cementless Shells: A Minimum 15-Year Follow-Up Study

134 Cleaning the Taper in Retained Stems: 3 Methods Show What is Left and What is Taken Away

135 Patient Characteristics and Surgical Factors Associated with Early Reoperation following Revision Total Hip Arthroplasty: A Case Control Study

136 Outcomes Following Revision of a Modular Acetabular Metal-on-Metal Total Hip Arthroplasty Implant

NON-ARTHROPLASTY

137 Intraoperative Fluoroscopic Correction Highly Correlates with Postoperative Radiographic Correction in Periacetabular Osteotomy

138 5-Year Natural History of Asymptomatic FAI: A Prospective Matched Cohort Study

139 Comparative Analysis of Radiographic Hip Joint Geometry Using Measurement Tools on Picture Archiving and Communication System: A Prospective Study of 100 Pelvic Radiographs

140 Demographics and Early Functional Outcomes of Periacetabular Osteotomy after Previous Hip Arthroscopy

141 The HOOS, JR and Other Osteoarthritis-Based Patient-Reported Outcome Tools Demonstrated Large Ceiling Effects following Periacetabular Osteotomy

142 What are the Risk Factors for Disease Progression in Femoroacetabular Impingement? A Prospective Analysis of the Contralateral Hip in FAI patients

143 Current Practices for Treatment of Knee Osteoarthritis Are Not in Line with AAOS Guidelines

144 Long-Term Complications after Periacetabular Osteotomy

145 A Less Invasive Approach to Periacetabular Osteotomy Improves Patient Reported Outcomes without Compromising Orientation

146 6-Year Follow-up of Hip Decompression with Concentrated Bone Marrow Aspirate to Treat Femoral Head Osteonecrosis

147 Regional Variation in Promotion of Direct Anterior Approach THA and Minimally Invasive THA and TKA by Members of the American Association of Hip and Knee Surgeons

INFECTION

148 Beware of Periprosthetic Joint Infection in a Bundled Payment System for Total Joint Arthroplasty

149 I&D prior to Resection for Treatment of Periprosthetic Hip Arthroplasty Infection May Decrease Overall Cure Rate

150 Intraoperative Methylene Blue Staining Allows for Visualization of Microbial Biofilm-Associated Tissue in Periprosthetic Joint Infection

151 Case Order Has an Effect on Periprosthetic Joint Infection Risk

152 Polymicrobial Periprosthetic Joint Infections: Outcome of Treatment and Identification of Risk Factors

153 Assessment of Musculoskeletal Infection Society (MSIS) Diagnostic Criteria as Prognostic Markers for Implant Retention in Patients with Prosthetic Joint Infection

154 An Evidence-Based Clinical Prediction Algorithm for the Musculoskeletal Infection Society (MSIS) Minor Criteria

155 Interpretation of Leukocyte Esterase for the Detection of PJI Stratified Based Upon ESR and CRP

156 Risk Factors for Repeat Debridement, Spacer Retention, Amputation, Arthrodesis, and Mortality after Removal of an Infected TKA with Spacer Placement

157 The Old Dog but a New Trick! At Last a Serum Marker for Diagnosis of Periprosthetic Joint Infection

158 Diagnosing Periprosthetic Joint Infection: And the Winner is?

159 Dislocation Following Two-Stage Revision Total Hip Arthroplasty: Alarming Concern is Warranted

160 Why are Some Synovial Fluid Samples Alpha-Defensin-Negative but Culture-Positive?

161 Do Multiple Pre-Operative Intra-Articular Steroid Hip Injections Have Increased Risk of Periprosthetic Joint Infection Compared to Single Injections?

162 Antibiotic Loaded Cement Spacers Can Result in Rapid Changes in Antibiotic Susceptibility

163 Malnutrition Increases the Risk of Failure of a Two-Stage Revision for a Periprosthetic Joint Infection

164 Risk of Reinfection after Irrigation and Debridement for Treatment of Acute Periprosthetic Joint Infection following TKA

165 Survival Improves with Increased Antibiotic Duration after Total Knee Arthroplasty Irrigation and Debridement

2016 Posters

HEALTH POLICY

166 Do Conversion Total Hip Arthroplasty Yield Comparable Results to Primary Total Hip Arthroplasty?

167 Health Literacy is Associated with Use of Inpatient Rehabilitation Services after Total Joint Arthroplasty

168 Patient Education Reduces Both Discharge to Post-Acute Care Facilities and Postoperative Complications

169 Validity and Responsiveness of the Knee Injury and Osteoarthritis Outcome Score and KOOS, JR.: A Comparative Study among U.S. Total Knee Replacement Patients

170 Moving the Needle: Less Cost, Improved Care from a Gainsharing Supported Integrated Rehab Network

171 What Factors Drive Inpatient Satisfaction after Total Joint Arthroplasty?

172 Predictors of Same-Day Discharge in Primary Total Joint Arthroplasty Patients and Risk Factors for Post-Discharge Complications

173 Home Discharge After Primary Elective Total Hip Arthroplasty: Post-Discharge Complication Timing and Risk Factor Analysis

174 Analysis of Outcomes Following THA: Do All Databases Produce Similar Findings?

175 Electronic Medical Record Implementation Results in Less Efficient Delivery of Care

176 No Correlation Between Press Ganey Survey Responses and Outcomes in Post-Total Hip Arthroplasty Patients

177 ID Badges in the Operating Room Environment: Is Reconsideration Warranted?

178 Short-Term Morbidity and Readmissions Are Increased with Skilled Nursing Facility Discharge following TJA

179 Navigating the Bundle: Total Hip vs. Hemiarthroplasty in Patients with Displaced Femoral Neck Fractures

180 Variation in Patient Cost Risk Scores for Total Joint Arthroplasties

COMPLICATIONS NOT INCLUDING INFECTION

181 ABO Blood Group is a Predictor for the Development of Venous Thromboembolism following Total Joint Arthroplasty

182 Primary Total Hip Arthroplasty with 4th Generation Ceramic on Ceramic: Analysis of Complications in 939 Consecutive Cases Followed for 2 to 10 Years

183 Reproducibility of the Postoperative Glycemic Response and 90-Day Complications in Staged Bilateral Total Joint Arthroplasty: Learning from the First Stage

184 Incidence, Risk Factors, and Clinical Implications of Pneumonia following Surgery for Geriatric Hip Fracture

185 Cachexia Significantly Increases the Risk of Major Peri-Operative Complications and In-Hospital Mortality in Total Joint Replacement Patients: Results of a Matched Cohort Study

186 Patient-Related Risk Factors for Early Failure after CRPP of Femoral Neck Fractures Requiring Conversion to Hip Arthroplasty

187 Do Mortality and Complication Rates Differ Between Periprosthetic and Native Hip Fractures?

188 Patient Perceptions of Sleep Quality before and after Primary Total Joint Replacement

189 Preoperative Anemia Independently Predicts 30-Day Complications after Aseptic and Septic Revision Total Joint Arthroplasty

190 Serum Albumin Predicts Survival and Postoperative Course following Surgery for Geriatric Hip Fracture

191 Neurocognitive Dysfunction in Patients Undergoing Total Joint Arthroplasty

192 A Comparison of Two Dosing Regimens of ASA following Total Hip and Knee Arthroplasty

193 Radiographic Outcomes of Cable-Plate vs. Cable-Grip Fixation in Periprosthetic Fractures of the Proximal Femur

194 Genetic Predilections in a Group of Metal on Metal THR Revisions

195 Intra-Ocular Pressure Changes Associated with Intra-Articular Knee Injections of Kenalog for The Treatment of Knee Arthritis

196 Surgical Approach and BMI Can Influence Effectiveness of TXA Administration in Total Hip Arthroplasty

197 Patient Preferences Regarding Anticoagulation for Venous Thromboembolism Prophylaxis after Total Hip and Knee Replacement

198 The Effect of Implant Used for fixation of Intertrochanteric Femur Fracture on the Outcomes of Subsequent Conversion Total Hip Arthroplasty (THA)

199 Normalization of Metal Ion Levels after Revising Metal on Polyethylene Bearings in Total Hip Arthroplasty

200 Pharmacological Hemostatic Agents in Total Joint Arthroplasty – A Cost Effectiveness Analysis

GUEST SOCIETIES

201 Is Loading Pattern Restored After TKR in Deformed Knees? Pedobarographic Analysis in Varus Knees

202 Prevalence of Radiographic Morphology of Femoroacetabular Impingement: A Multi-Centric Study

203 Patient Satisfaction after Total Knee Arthroplasty

204 Lateralization of Femoral Entry Point to Improve the Coronal Alignment during Total Knee Arthroplasty in Patients with Bowed Femur

205 Ninety Days Morbidity and Mortality in Patients undergoing Primary Elective Total Knee Arthroplasty in a Multispecialty High Volume Center

206 The Unsuspected Periprosthetic Joint Infection: The Consequence of Unexpected Positive Intraoperative Cultures during Revision Arthroplasty

207 In Vitro Kinematics of a Bicruciate Retaining Total Knee Arthroplasty

208 Effect of Referencing Technique for the Tibial Slope in Cruciate-Retaining Total Knee Arthroplasty

209 An Economic Evaluation of Unicompartmental Compared to Total Knee Replacement: Analysis Using Large, Matched, Routinely-Collected Observational Data from the UK

210 No Benefit of Computer-Assisted TKA: 10-Year Results of a Prospective Randomized Study

POSTER #1

Total Knee Arthroplasty after Anterior Cruciate Ligament Reconstruction: Not Just Another Routine Primary

Tyler S. Watters, MD, Yuan Zhen, MD, J. Ryan Martin, MD, Daniel L. Levy, BS, Jason M. Jennings, MD, DPT, Douglas A. Dennis, MD

Introduction: Despite the success of restoring joint stability and improving functional outcomes after anterior cruciate ligament reconstruction (ACLR) for rupture, the long-term risk of developing symptomatic osteoarthritis requiring knee arthroplasty is higher than the uninjured population. The purpose of this study was to compare operative characteristics and early outcomes of patients undergoing TKA after ACLR with control subjects having routine osteoarthritis.

Methods: All patients who had undergone TKA from 2006 to 2013 at our institution with a history of prior ACLR and minimum two-year follow-up where identified from a prospective research database. These patients were matched by demographic and surgeon variables to patients who had not undergone prior ACLR. Outcomes included Knee Society Scores (KSS), range of motion, operative variables, complications, and reoperations.

Results: 122 patients were identified in the ACL study group and compared to the matched control cohort. The mean age at surgery was 58 years and 55% of the patients were male. Mean follow-up in the ACL and control groups was 3.3 and 3.0 years, respectively. KSS scores were generally similar between groups both pre and post-operatively. Although preoperative flexion was statistically lower in the ACL group (119 degrees) than in the control (123 degrees) ($p = 0.005$), there was no difference between groups postoperatively. Fifty percent of ACL patients required hardware removal at the time of TKA. The operative time was significantly longer in the ACL group (88 minutes) compared to the control group (72 minutes) ($p < 0.001$). There were 11 total reoperations in the ACL group, including four periprosthetic infections, whereas there were only two reoperations in the control group. The risk of reoperation in the ACL group was more than five times higher than the control group (relative risk 5.5, 95% confidence interval 1.2 to 24.3; $p = 0.01$).

Conclusion: The results of this retrospective matched cohort study suggest that prior ACLR is a results in longer operative time and increased risk of early reoperation after TKA.

POSTER #2

Pain Catastrophizing as a Predictor for Post-Operative Pain and Opiate Consumption in Total Joint Arthroplasty Patient

Ran Schwarzkopf, MD MSc, Melinda Hoang, Bcc, David Wright, MS

Introduction: Pain catastrophizing has been suggested as a prospective risk factor for poor postoperative pain outcomes in total joint arthroplasty (TJA). However, results from previous studies have been mixed and failed to control for postoperative opiate consumption. This study investigates pain catastrophizing and postoperative pain intensity in TJA patients, adjusting for analgesic intake. We hypothesized that "pain catastrophizers" would exhibit higher pain scores and increased analgesic requirements postoperatively.

Methods: In this prospective cohort study, 123 TJA patients completed the Pain Catastrophizing Scale (PCS) questionnaire. Patients were defined as catastrophizers (PCS>30), or non-catastrophizers (PCS≤30). The primary outcome was visual analog scale (VAS) pain scores at 3-month. Secondary outcomes included length of stay (LOS), total daily opiate consumption, and VAS pain scores on postoperative days 0, 1, 2, and 3 through discharge. Multivariable regression was used to control for total daily morphine equivalent dose consumed during the stay in addition to other clinical and demographic factors.

Results: There were 87 patients in the "non-catastrophizing" and 36 in the "catastrophizing" groups. There was no significant difference in VAS pain scores between groups at 3-month follow-up. Patients with a length of stay≥3 postoperative days differed in VAS pain scores ("non-catastrophizers"=5.08 vs. "catastrophizers"=7.13;p=0.002) and were 2.4 times more likely to be catastrophizers than non-catastrophizers (p=0.042). There were no differences in the remaining secondary outcomes.

Conclusion: In TJA patients, pain catastrophizing is a poor predictor of post operative chronic pain and for those with a length of stay≤2 postoperative days. However, it may be a risk factor for increased LOS, as well as increased pain in these patients.

POSTER #3

Navigated Total Knee Arthroplasty has Lower Rates of Perioperative Complications Compared to Conventional Total Knee Arthroplasty

Jonathan Yin, MD, Robert L. Parisien, MD, David Sing, BS, Emily Curry, BS, Eric L. Smith, MD, Xinning Li, MD

Introduction: Primary total knee arthroplasty (TKA) is the most common elective inpatient surgery performed in the United States. Randomized controlled studies have demonstrated physiologic differences between conventional TKA and computer-navigated TKA, specifically with decreased systemic embolic loads in patients who underwent navigated TKA that avoided instrumentation of the femoral intramedullary canal. The purpose of this retrospective cohort database study is to compare the risk for in-hospital perioperative complications between computer-navigated and conventional TKA using an adequately powered sample.

Methods: The Nationwide/National Inpatient Sample (NIS) database was used to identify adult patients who had undergone elective primary TKA with and without computer assistance from 2005 through 2013 in this retrospective cohort study. Each patient who had a navigated TKA was exact matched in a 1:4 ratio to a conventional TKA patient for age, sex, race, insurance type, procedure year, hospital characteristics, number of Elixhauser comorbidity measures, and cardiopulmonary-specific comorbidities. Rates of perioperative complications were compared between the navigated and conventional TKA groups using the Pearson chi-square test.

Results: It was determined that 43,739 patients in the database underwent TKA with navigation. Of those, 36,702 (84%) were matched to 146,808 conventional TKA patients. Navigated TKA patients was found to have a significantly lower incidence of in-hospital pulmonary embolism (odds ratio [OR] 0.63, 95% confidence interval [CI] 0.52-0.77, $p<0.001$); other respiratory complications (OR 0.65, CI 0.54-0.78, $p<0.001$); cardiac complications (OR 0.75, CI 0.63-0.89, $p<0.001$); hematoma or seroma (OR 0.68, CI 0.57-0.81, $p<0.001$); surgical site infection (OR 0.56, CI 0.39-0.81, $p=0.002$); and rate of transfusion of packed red cells (OR 0.80, CI 0.77-0.83, $p<0.001$).

Conclusion: Computer-navigated TKA demonstrated a significantly lower risk of developing in-hospital pulmonary embolism, respiratory, cardiac and hematologic complications compared to conventional TKA. Large multi-center prospective trials with longer postoperative follow-up are needed to provide further validation of this finding.

POSTER #4

Radiographic Differences in Total Knee Arthroplasty Patients with Anterior Pain

Sherwin Su, MD, Kaitlin Carroll, BS, Yuo-Yu Lee, MS, Jared Newman, MD, David Mayman, MD, Michael Cross, MD

Introduction: Anterior knee pain is one of the most common, as well as one of the least understood complaints following total knee arthroplasty. While there are multiple factors, the mechanics of the patellofemoral joint have been hypothesized to be a strong determinant of satisfaction following surgery. Previous studies have not found any correlation with radiographic measures and knee pain.

Methods: In this study, we retrospectively compared 100 cases with post-operative anterior knee pain to 100 cases without post-operative anterior knee pain. All patients had pre-operative anterior knee pain and were operated on by one surgeon utilizing a single prosthesis with a patella resurfacing component. The groups were matched by age, gender, and BMI. We then looked at multiple radiographic measures of patellofemoral alignment, which included: Insall-Salvati ratio, posterior offset, sulcus angle, congruence angle, patella displacement, patella tilt, and lateral patellofemoral angle. Pre-operative and post-operative values were compared within the groups, as well as the change in values (Pre minus Post) between the groups. Statistical significance was determined using Student's t-test.

Results: There were no significant pre-operative radiographic differences between the group with anterior knee pain and the group without. In both groups, there were significant changes post-operatively in patella tilt, patella displacement, and congruence angle. However, in the group without anterior knee pain, the change in patella displacement and congruence angle was significantly greater than the group with anterior knee pain -- with a difference of -1.1 mm and -8.4 degrees, representing further patella medialization.

Conclusion: To our knowledge, this is the first study to demonstrate a measurable radiographic difference in patients without anterior knee pain compared to patients with pain. This finding can potentially identify patients at risk for persistent post-operative anterior knee pain, as well as apply to other procedures such as unicondylar or patellofemoral knee replacement.

POSTER #5

Does Total Knee Arthroplasty Range of Motion have a Greater Improvement with Home Care or a Skilled Nursing Facility?

Scott D. Anseth, MD, Owen R. O'Neill, MD, Sara M. Bryan, MPT,
M. Russell Giveans, PhD

Introduction: It is a common belief that skilled nursing facilities (SNF) provide a more rigorous and comprehensive experience therapy than home health (HH). This study compared the range of motion (ROM) outcomes and total physical therapy (PT) visits of total knee arthroplasty (TKA) patients discharged to SNF followed by HH versus those discharged directly with HH.

Methods: A case control study was completed of the practice's elective traditional Medicare patients that had a TKA from January 2015-March 2016. All patients had a pre-op cardiac MET level of =/>4 and BMI< 45. Twenty patients were discharged from hospital to SNF and then home with HH and 53 patients were discharged from hospital home with HH. Data collected via chart review included hospital discharge passive ROM, initial and discharge HH passive ROM, number of HH PT visits, number of outpatient (OP) PT visits for all patients and length of stay in SNF.

Results: SNF patients stayed an average 7.8 days. Hospital Discharge Flexion ROM of the SNF group was 82.5° compared to 89° for the HH group (p=.018). Hospital Discharge Extension ROM was 7.3° for SNF group and 7.2° for HH group (p=.825). There was no significant difference in the improvement in ROM from the hospital discharge to HH discharge for neither flexion ROM (24.1° in SNF group and 19.1° in HH group p=.202) or extension ROM (6.1° SNF group vs 6.3° in HH group p=.928). No significant difference existed in the number of total PT visits. Discharge to SNF had total HH + OP visits of 16.1 versus 18.2 visits for those discharged to HH (p=.196).

Conclusion: Patients discharged to SNF following TKA do not achieve better ROM outcomes than those discharged home with HH. With the shift towards value based care, cost of discharge to SNF should be weighed against perceived outcomes of knee ROM.

POSTER #6

Pericapsular Injection with Free Ropivacaine Provides Equivalent Postoperative Analgesia as Liposomal Bupivacaine following Unicompartmental Knee Arthroplasty

Gregory Kazarian, BS, David Merkow, BS, Jess H. Lonner, MD

Introduction: Multimodal analgesia, including pericapsular injection, is common in unicompartmental knee arthroplasty (UKA). Liposomal bupivacaine or free ropivacaine are often utilized. The purpose of this study was to compare the efficacy of these local anesthetics.

Methods: This is a prospective parallel-cohort study of patients who underwent medial UKA. All patients undergoing surgery at Site 1 received ropivacaine injections (RI group, n= 30); patients at Site 2 received a mixture of free bupivacaine and liposomal encapsulated bupivacaine (LEBI group, n= 30), based on what was approved for use at each site. Perioperative pain management protocols were otherwise identical. The RI and LEBI groups were statistically identical in terms of age (63.1 vs. 57.3, p= .211) and BMI (30.8 vs. 29.0, p= .211). Narcotic consumption and Visual Analog Scale (VAS) pain were recorded on postoperative days (POD) 0-3. Mann-Whitney U test were used for statistical comparisons.

Results: No differences were detected between the RI and LEBI groups in terms of current, minimal, or maximal pain on individual postoperative days or when averaged over PODs 0-3. However, narcotic consumption was significantly greater in the LEBI group compared to the RI group, with patients consuming 7.7 more morphine equivalents on POD 2 (p= .0121) and 8.2 more on POD 3 (p= .0093). Average narcotic consumption on POD 0-3 was significantly greater in the LEBI group by 5.6 morphine equivalents per day (p< .0001), representing a cumulative difference of 22.1 morphine equivalents during this time-period.

Conclusion: Pericapsular injections of liposomal bupivacaine and free ropivacaine provided equivalent pain relief following UKA; however, patients treated with liposomal bupivacaine required more narcotic medication during POD 0-3. Coupled with the roughly $255 per-patient cost savings associated with the use of free ropivacaine instead of liposomal bupivacaine, we recommend pericapsular ropivacaine injections in UKA.

POSTER #7

Does Shared Decision Making Result in Better Health Outcomes in Hip and Knee Osteoarthritis? Results of a Longitudinal Cohort Study

Karen R. Sepucha, PhD, Steven J. Atlas, MD, MPH, Yuchiao Chang, PhD, Janet Dorrwachter, MSN, DNP, Andrew Freiberg, MD, Mahima Mangla, MPH, Harry Rubash, MD, Leigh H. Simmons, MD, Thomas Cha, MD, MBA

Introduction: Many clinical guidelines promote shared decision making (SDM), and emphasize the importance of having patients be well informed and receive their preferred treatment. The purpose of this study was to examine whether SDM leads to better health outcomes.

Methods: A prospective cohort study enrolled eligible patients with knee or hip osteoarthritis. Participants were surveyed one week after their visit with a surgeon to assess knowledge, preferred treatment, and baseline quality of life (QoL) (EQ-5D, KOOS, Harris Hip Score). Patients with a passing knowledge score (60% or higher) who received their preferred treatment (either surgery or non-surgical) were considered to have made an informed, patient-centered (IPC) decision. A follow-up survey at six months assessed QoL, regret and satisfaction. We tested hypotheses that patients who made IPC decisions would have higher QoL, lower decision regret and higher satisfaction with treatment at follow-up. Analyses accounted for clustering of patients within clinicians and controlled for surgery, age, gender, joint and baseline QoL. With 380 responses the study would have 80% power to detect difference of 0.05 on EQ-5D.

Results: The majority responded to the 1 week (449/613, 73.2%) and follow-up surveys (387/449, 86.2%). About half (57.0%) had surgery within 6 months. About one third (35%) met the criteria for IPC decisions. Patients who made IPC decisions reported significantly higher overall QoL (unadjusted increase of 0.029 for EQ-5D, p=0.014) and disease-specific QoL (4.72 points KOOS symptoms, p=0.009, 2.93 points Harris Hip Score p<0.0001). Participants who made IPC decisions were more likely to be extremely satisfied (72.11% vs. 38.89%, p=0.027) and to have less decisional regret (5.3 vs. 13.2, p=0.008).

Conclusion: Patient engagement in elective surgery decisions is important ethically, and this study provides evidence that it leads to higher satisfaction and small improvements in health outcomes for hip and knee osteoarthritis patients.

POSTER #8

Factors Associated with Range of Motion Recovery following Manipulation under Anesthesia

Johannes F. Plate, MD, PhD, Andrew D. Wohler, MD, Matthew L. Brown, MD, Maxwell K. Langfitt, MD, Jason E. Lang, MD

Introduction: Arthrofibrosis following total knee arthroplasty (TKA) is a complex and multifactorial complication that may require manipulation under anesthesia (MUA). However, patient and surgical factors that influence knee stiffness following TKA remain debated. This study sought to identify patient and surgical factors that influence arthrofibrosis following TKA by assessing a cohort of patient that underwent MUA and comparing them to a matched cohort of patients without arthrofibrosis.

Methods: The joints registry of a university hospital was searched for patient that underwent MUA following primary TKA between 2004 and 2013. Demographic and surgical information was obtained from the electronic medical record including range of motion (ROM), comorbidities and timing of MUA. Patients who underwent MUA were then double-matched by baseline (prior to primary TKA) knee ROM to patients who underwent primary TKA without postoperative arthrofibrosis during the same time period.

Results: Fifty-two patients (56 TKAs, 71% female, mean BMI 32.2kg/m2) underwent MUA after TKA. MUA was performed a mean of 13.6 weeks after primary TKA. Study patients were then double-matched by baseline flexion (mean 107º±2º) to 111 patients (112 TKAs) with a similar mean baseline flexion (104º±2º, p=0.138). Patient requiring MUA were younger (mean age 56 vs. 64 years, p<0.001), had more comorbidities (5 vs. 3, p<0.001), and a higher number of previous knee surgery (56% vs. 21%, p<0.001) compared with controls. The risk for requiring MUA following primary TKA was significantly higher (2.4, p<0.001) in patients with previous knee surgery (arthroscopy for meniscal pathology, ACL reconstruction, osteotomies).

Conclusion: Younger patients with more comorbidities and a history of previous knee surgery were found to have significantly higher risk for developing arthrofibrosis and requiring MUA after primary TKA in the current study. Patients with this risk profile need to counseled regarding the risk for arthrofibrosis possibly requiring MUA after primary TKA.

POSTER #9

KOOS JR: A Prediction Tool for Identifying Patients Who Need Joint Replacement?

Ryan Charles, MD, Joseph Maratt, MD, Brian Hallstrom, MD

Introduction: KOOS for Joint Replacement (KOOS, JR) was developed to address limitations in existing outcome measurements and provides a validated short-form of questions aimed at patients with end-stage knee arthritis. We seek to answer whether the KOOS, JR can be a predictive tool for determining who is a surgical candidate for a total knee arthroplasty (TKA).

Methods: Implementation of KOOS, JR began in August 2015 at a single academic institution. We collected KOOS, JR scores from August 2015 to May 2016 for two surgeons on 141 patients who were advised to continue non-operative management and not offered surgery, and compared these scores to 50 patients who were offered a TKA. We analyzed scores using two-sample t-test to determine statistically significant variations between groups. PROMIS-10 Global Health Scales were collected and investigated in the same manner. We assessed patient demographic factors including age, gender, and BMI. We analyzed radiographic severity and joint space narrowing between the two cohorts. Previous use of physical therapy, intra-articular injections, bracing and ambulatory aids was assessed by chi-squared analysis.

Results: KOOS, JR scores were found to be statistically significant between groups, mean scores were 50.50 and 43.27 in the non-operative and operative group, respectively ($p=0.01$). This finding was substantiated when controlling for patients not offered surgery for BMI greater than 40. PROMIS-10 scales for physical, mental and pain parameters were not found to be statistically significant and thus not predictive of patients offered surgery. Demographic factors including mean age, gender and BMI were not statistically significant. Mean joint space narrowing and measured radiographic severity between non-operative and operative groups was statistically significant, 3.0mm and 1.7mm, respectively ($p < 0.05$). We found that surgery was offered to 6% of individuals not having attempted injection therapy.

Conclusion: KOOS, JR and radiographic knee severity scores provide statistically significant metrics to potentially help identify surgical candidates for TKA. Further investigation is needed to assess the clinical significance of the KOOS, JR.

POSTER #10

Ten-Year Prospective Results of Uncemented Tibial Fixation for Total Knee Arthroplasty in Patients under Age 55

Christopher J. DeFrancesco, BS, Atul F. Kamath, MD, Jose Canseco, MD, Charles L. Nelson, MD, Craig L. Israelite, MD

Introduction: Although tibial component loosening has historically been considered a concern in uncemented total knee arthroplasty (TKA), such implants have been used in younger patients due to potential for ingrowth and preservation of bone stock. However, mid- and long-term studies are lacking regarding fixation methods with modern uncemented implants. We previously reported promising prospective 5-year outcomes using an uncemented tibial component in a cohort of patients who underwent surgery before age 55. There were no failures of fixation in this experimental group at 5 years. We now present the 10-year clinical and radiographic follow-up for this cohort.

Methods: We prospectively followed 80 patients (98 knees) who were less than 55 years old at the time of TKA with a single-design, posterior-substituting, uncemented tibial component (uncemented femoral component). All surgeries were performed by one high-volume surgeon. Knee Society Scores, radiographic evaluation, and any complications or revisions were recorded.

Results: There was >80% follow-up in this prospective cohort. 5 patients were deceased at latest follow-up (no revisions prior to death). 5 patients underwent revision for reasons unrelated to tibial fixation: femoral component loosening (1), stiffness (1), and instability (3). There were no cases of tibial component loosening. The average implant age at radiographic follow-up was 9.7 years (standard deviation 0.76). No radiograph showed a radiolucency more than 1mm wide or lucencies in more than one peri-implant zone (4 patients, each with isolated 1mm line). The average Knee Society Score for Function was 68 (standard deviation 26).

Conclusion: Our results show no cases of tibial component loosening at 10-year follow-up in a prospective cohort with uncemented tibial fixation using a porous metal implant. The promising clinical and radiographic results presented at 5-year and now 10-year follow-up for this group of young patients support the use of uncemented tibial components in this population.

POSTER #11

Right TKR Patients Treated with Enhanced Pain and Rehabilitation Protocols Can Drive at 2 Weeks

David F. Dalury, MD, Danielle M. Chapman, BS., David T. Schroder, MD

Introduction: Enhanced pain and rehabilitation protocols have become commonplace and have revolutionized the post-operative recovery following TKR. A common concern and frequent question of patients who have had a right TKR is “When can I drive? The purpose of our study is to evaluate when a series of right TKR patients could return to their pre-operative driving capabilities.

Methods: 45 consecutive patients undergoing right TKR agreed to participate in the study. Patients were tested within 14 days of surgery by an Occupational Therapist on a computerized driver simulator. After a series of practice trials, an average of 5 trials of the time for: gas off, transition time, reaction time and distance traveled following brake application were recorded. All patients then received a cemented tricompartmental TKR and were treated with a local infiltrative analgesia protocol along with a multimodal pain management and rapid rehab program. All patients then returned to the office where the same Occupational Therapist performed the same measurements two weeks after surgery. 4 patients declined to return for follow up at 2 weeks and withdrew; 1 patient was readmitted for post op pneumonia, leaving a final group of 40 knees (40 subjects). Average age of the final group was 69 (range 48 to 84). Average BMI was 29 (range 20 to 41). There were 30 females in the study group.

Results: Of the 40 patients who completed the study, 36 of them had returned to or improved upon their baseline driving parameters by 2 weeks. The other 4 patients achieved this milestone at the 3 weeks. 13 subjects had no assistive devices, and 17 were using narcotics.

Conclusion: With improvements in pain control and more rapid mobilization, this study shows that most patients undergoing right TKR have returned to their driving capabilities earlier than previously expected with the majority back to baseline by the 2-week mark. This information can help provide guidance for counseling when patients may return to driving.

POSTER #12

Prior Knee Arthroscopy Does Not Influence TKA Outcomes and Survivorship at 10 Years

Matthew P. Abdel, MD, Anthony Viste, MD, PhD, Matthieu Ollivier, MD, Aaron J. Krych, MD, Arlen D. Hanssen, MD, Daniel J. Berry, MD

Introduction: The effect of prior arthroscopic procedures on the outcomes of subsequent TKA is debated. The purpose of this study was to compare the 10-year clinical outcomes, survivorship, and complications between TKA patients who did or did not have a previous non-ACL arthroscopic procedure.

Methods: A retrospective review of 1315 TKAs (1163 patients) who underwent a primary TKA for osteoarthritis or post-traumatic arthritis at our institution between 2003 and 2004 were identified. Of these, 160 TKAs (160 patients) had previous non-ACL arthroscopic procedures (arthroscopy group). These 160 patients were 2:1 matched to a control group (no previous arthroscopy) based on age (± 5 years), gender, year of surgery, and surgical approach (standard vs. MIS). Clinical outcomes were assessed via Knee Society Score (KSS). Complications were recorded. Survivorships free of revision for aseptic loosening, revision for any reason, and reoperation for any reason were evaluated. Mean follow-up was 9 years.

Results: KSS increased from 36 to 84 points in the arthroscopy group vs. 36 to 85 points in the control group ($p = 0.7$). Complication rates were similar in both groups (6.2% in the arthroscopy group vs. 5.3% in the control group; $p=0.7$) with infections occurring in 3 patients (1.9%) with previous arthroscopy and 2 patients (0.6%) in the control group ($p=0.2$). The Kaplan-Meier survivorship free of revision for aseptic loosening, revision for any reason, and reoperation for any reason were similar at 10 years (96.5%, 95%, and 89%, respectively, in the arthroscopy group vs. 96%, 96%, and 91.5%, respectively, in control group).

Conclusion: In this large-scale 2:1 matched control study, there was no difference in clinical outcomes, survivorship, or complications in TKAs patients who did or did not have a previous non-ACL arthroscopic procedure. These data are reassuring in an era in which many candidates for TKA will have had previous arthroscopic knee surgery.

POSTER #13

Do Socioeconomic Factors Contribute to Predictive Models for Total Knee Arthroplasty Outcomes?

Benjamin J. Keeney, PhD, Karl M. Koenig, MD, MS, Nicholas G. Paddock, BSc, Wayne E. Moschetti, MD, MS, Michael B. Sparks, MD, David S. Jevsevar, MD, MBA

Introduction: We sought to determine whether SES variables independently contribute to predictive models for TKA length of stay (LOS) >3 days, facility discharge, and clinically significant (5 points) Veterans RAND-12 Physical Component Score (PCS) improvement, using pre-operative variables.

Methods: We prospectively collected clinical care data on 2,198 TKAs at a high-volume tertiary academic rural hospital from April 2011 through March 2016. SES variables included race/ethnicity, living alone, education, employment, and household income. Adjusting variables included surgeon, age, sex, alcohol use, tobacco use, Charlson Comorbidity Index, VR-12 PCS and mental component score, year, bilaterality, and body mass index. For the PCS model, we adjusted for the time period of post-operative PCS. We determined individual SES predictors and whether the inclusion of all SES contributed to each cross-validated area under the model's receiver operating characteristic (AUC).

Results: In each adjusted model, at least 1 SES predicted each outcome. Non-white patients (OR 2.39, P=0.003) and those with incomes < $35,000 (OR 2.74, P=0.017) predicted longer LOS. Non-white patients (OR 4.43, P<0.001), the unemployed (OR 1.78, P-0.031), and those living alone (OR 2.62, P<0.001) predicted facility discharge. Unemployed patients (OR 0.55, P=0.031) were less likely to achieve PCS improvement (OR 0.55, P=0.031). Without the 5 SES, the AUC values of the LOS, discharge, and PCS models were 0.74 (95% confidence interval (CI) 0.72-0.77, "acceptable"; 0.86 (CI 0.84-0.87, "excellent"); and 0.80 (CI 0.78-0.82, "excellent"), respectively. Including the 5 SES in the models, the AUC values were 0.76 (CI 0.74-0.79); 0.87 (CI 0.85-0.88); and 0.81 (0.79-0.83), respectively.

Conclusion: Individual SES variables predicted longer TKA LOS, facility discharge, and PCS improvement. However, the inclusion of five SES variables did not meaningfully improve the predictive value of the adjusted models.

POSTER #14

Current Total Knee Designs: Effect of Baseplate Roughness and Locking Mechanism on Polyethylene Backside Wear

Zachary W. Sisko, MD, Matthew G. Teeter, PhD, Brent A. Lanting, MD, James L. Howard, MD, Richard W. McCalden, MD, Douglas D. Naudie, MD, Steven J. MacDonald, MD, Edward M. Vasarhelyi, MD

Introduction: Previous retrieval studies demonstrated increased tibial baseplate roughness and loosening of the locking mechanism leads to higher polyethylene backside wear in total knee arthroplasty (TKA). This study's purpose was to examine modern locking mechanisms influence, in both polished and non-polished tibial baseplates, on backside tibial polyethylene damage and wear.

Methods: Five TKA implant designs were selected with six retrieved polyethylenes per group. Groups were matched on time in vivo (TIV), age, BMI, gender, number of revisions, and revision reason. Primary outcomes were backside visual damage scores, visual damage modes, and linear wear rates on micro-computed tomography (micro-CT) scan in mm/year.

Results: Groups were similar for TIV ($p=0.962$), age ($p=0.609$), BMI ($p=0.951$), gender, revision number, and reason. There was a difference across groups for visual total damage scores ($p=0.031$). The polished design with a partial peripheral capture and anterior constraint had lower scores than the non-polished design with a complete peripheral-rim locking mechanism (13.0 vs. 22.0, $p=0.019$). Abrasions were different among the groups ($p=0.006$) as the polished design with a tongue-in-groove locking mechanism demonstrated more abrasions than one of the non-polished designs (5.83 vs. 0.83, $p=0.016$). Only the two non-polished baseplates designs demonstrated dimpling (5.67 and 8.67, $p<0.0001$). There was a difference among groups for linear wear ($p=0.003$) with two polished baseplate designs demonstrating lower wear rates than the non-polished design with a complete peripheral-rim locking mechanism ($p=0.008$ and $p=0.032$). There were no other differences in damage scores, modes, or wear rates between groups.

Conclusion: Total damage scores and wear rates were similar between all groups except for one of the non-polished baseplate designs. However, the other TKA model with a non-polished baseplate had similar damage scores and wear rates to the polished designs, likely due to its updated locking mechanism. Dimpling was specific for non-polished baseplates while abrasions were identified in increased with the tongue-in-groove locking mechanism. Even in the setting of a non-polished tibial baseplate, modern locking mechanisms decrease backside wear similar to other current TKA designs.

POSTER #15

Painful Knee Arthroplasty Patients Walk with Altered 3D Knee Kinematics: A Case Control Study

Nicola Hagemeister, PhD, Celia Planckaert, MSc, Gabriel Larose, MD, Alexandre Fuentes, PhD, Marc Lacelle, Pht, Julio C. Fernandes, MD, Hai Nguyen, MD, Guy Grimard, MD, Pierre Ranger, FRCS (Ortho), MD, MSc

Introduction: About 8% of total knee arthroplasty (TKA) patients report anterior knee pain after surgery. Once known causes of pain such as infection, implant loosening or rotational errors have been ruled out, it is difficult to understand the source of symptoms and how to manage patients. The aim of this study is to compare 3D knee kinematics during gait of painful TKA patients to an asymptomatic (AS) TKA group.

Methods: 19 painful TKA patients, reporting a pain level higher than 6 /20 on the WOMAC pain scale, calculated from the KOOS, and 20 asymptomatic TKA patients were included. All patients received the same posterior-stabilized knee implant and patella resurfacing. A clinical work-up, radiological assessments (X-ray and CT), patient reported outcomes (KOOS) and a 3D knee kinematic assessment during treadmill walking was collected at a mean follow up of 2 years post-surgery.

Results: Patient demographics and KOOS scores are presented in Table 1. CT scan evaluation revealed for the painful TKA group a mean neutral combined tibial and femoral component rotation (1.4° ±7.0° of internal rotation), while the AS TKA group was externally rotated (7.3° ±6.1°) ($P<0.01$). Painful TKA group adopted a stiff knee gait characterized with a lower maximum flexion during loading (14.1° ±5.7° versus 18.0° ±6.6° for AS group) $P<0.05$. The painful TKA group presented a valgus functional alignment during terminal stance phase and push off phase compared to AS TKA group ($P<0.05$).

Conclusion: Gait loading phase requires a quadriceps eccentric contraction while increasing knee flexion, which increases significantly patellofemoral (PF) loads. Stiff knee gait adopted by painful TKA group was previously reported in PF pain syndrome patients to limit symptoms. The valgus functional lower-limb alignment during terminal stance in the painful group could help explain symptom's since it increases the Q angle, lateralize the patella, and therefore increases patellofemoral stresses. Results bring new insights to develop personalized conservative management.

POSTER #16

Reasons for Lawsuits following Total Joint Arthroplasty in One Metropolitan Area

Michael M. Kheir, MD, Alexandra Woolsey, BA, Heather Hansen, JD, Javad Parvizi, MD, FRCS

Introduction: A prior survey of members of the American Association of Hip and Knee Surgeons revealed that 78% of responding surgeons were named as a defendant in at least 1 lawsuit over their lifetime and that 69% of these lawsuits were dismissed or settled out of court. They also found that the most common sources of litigation were nerve injury, limb length discrepancy, and infection in that order. The purpose of this study was to examine the most common reasons for lawsuits after total joint arthroplasty (TJA) in a single metropolitan area.

Methods: A retrospective review of lawsuits filed between 2009 and 2015 in a five-county metropolitan area was performed, consisting of 30 hospitals and 113 TJA surgeons. Complaints from all counties were obtained and underwent a manual review to determine the number of lawsuits and the specific allegations filed against each surgeon during this time period.

Results: Thirty-one (27.4%) surgeons were named as a defendant in at least 1 lawsuit during this time period. Eighty-three total lawsuits (34 hips, 49 knees) were filed during the study period, 30 (36.1%) of which were dismissed or settled outside of court. Top reasons for lawsuits were, in descending order: infection (25.3%), nerve injury (13.8%), chronic pain (10.3%), vascular injury (8.0%), periprosthetic fracture (6.9%), retention of foreign body (5.7%), dislocation (4.6%), limb-length discrepancy (3.4%), venous thromboembolism (3.4%), loosening (2.3%), and compartment syndrome (1.1%), and other medical complaints (14.9%).

Conclusion: The data from lawsuits filed from one metropolitan area reveals that infection appears to be the basis of most lawsuits after TJA. In this litigious age, surgeons should be aware of the great potential for a lawsuit for common complications and should strive to better communicate with patients regarding preoperative informed consent and disclosure after adverse events. Furthermore, surgeons should minimize performing surgery in patients at high risk of the aforementioned complications, such as patients with a higher likelihood of developing postoperative infection or patients on chronic pain medications.

POSTER #17

Genu Recurvatum Analysis in the Context of Computer Assisted Total Knee Arthroplasty: A 14-Year Retrospective Study

Samer Kakish, FRCS (Tr and Orth), Mary Bayers-Thering, MS, MBA, Kenneth A. Krackow, MD, Brian E. McGrath, MD, Sonja Pavlesen, MD, MS, Matthew J. Phillips, MD

Introduction: Genu recurvatum is a rare deformity. Little is known in literature about the effect of recurvatum on coronal knee stability.

Methods: A retrospective chart review of patients who underwent computer assisted total knee arthroplasty from October 2001 to November 2015. Stratification was based on the degree of recurvatum into four groups: < 5 degrees, ≥5 to 10 degrees, 10 to ≤15 degrees and ≥ 15 degrees. Further stratification based on the pre-operative coronal deformity into varus and valgus groups was performed. Data analysis included descriptive and analytical statistics of patients' demographics, coronal deformity, coronal stability on varus and valgus stresses and postoperative correction in both sagittal and coronal planes.

Results: A total of 394 patients (12.9 %) had any degree of recurvatum out of a total population of 3037 patients. There was no difference between the 4 groups with regards to demographics. There was a constant change in the pre-operative coronal deformity from varus to valgus (1: -3.21±6.44 to 4: 2.18±10.62, p: 0.0001). Significant correlation was detected between the degree of recurvatum and knee stability in the coronal plane on varus and valgus stresses represented by the arc range (1: 9.92±4.05 to 4: 15.80±9.06, p: 0.0002). A statistically significant correlation was detected between the degree of recurvatum and knee stability on varus stress (groups 1: 4.12±2.31, 2: 4.55±3.02, 3: 6.04±3.80 and 4: 6.04±3.80, p < 0.0001). Sub-group analysis revealed that this significant correlation with regards to the arc range and varus stress stability outcome measures was only observed in the valgus recurvatum group.

Conclusion: Genu recurvatum deformity's incidence in patients undergoing total knee arthroplasty is higher than what is reported in literature. This deformity is associated with coronal knee deformity and instability which warrants intra-operative attention especially if associated with a valgus deformity in the coronal plane.

POSTER #18

Manual vs. Robotic Assisted Unicompartmental Knee Arthroplasty: A Comparison of Validated Clinical Outcomes at 3 Years

Eamon D. Bernardoni, MS, Scott J. Hetzel, MS, Richard L. Illgen II, MD

Introduction: Component positioning and limb alignment affect outcome after unicompartmental knee arthroplasty (UKA). Robotic assisted UKA (rUKA) has been introduced to optimize surgical accuracy. The goal of this study is to compare validated functional outcomes and revision rates of rUKA and mUKA at three years' follow-up.

Methods: This retrospective cohort study reviews outcomes of mUKA and rUKA performed at one institution between 2001 and 2013. All patients receiving UKAs with completed preoperative functional outcomes were included. Outcome measures included: revision rate, Knee Society Score (KSS), Short Form-12 Health Survey Physical Component (SF-12), Western Ontario McMasters Universities Arthritis Index (WOMAC), and the University of California Los Angles (UCLA) Activity Score. Statistical analysis included ANOVA and Fischer's tests.

Results: Patient demographics (age, gender, BMI, pre-operative functional scores) were not significantly different between groups. 32 mUKA and 31 rUKA patients met the inclusion criteria with a mean follow-up of 3.3 ±0.6 years. Mean functional outcomes improved pre-operative vs. post-operative for both mUKA and rUKA: KSS (43.8 vs 89.9, $p<0.001$; 46.3 vs 89.7, $p<0.001$, respectively), SF-12 (32.5 vs 45.6, $p<0.001$; 33.1 vs 44.7, $p<0.001$, respectively), WOMAC (41.8 vs 15.6, $p<0.001$; 40.2 vs 18.5, $p<0.001$, respectively), UCLA (5.9 vs 6.7, $p=0.04$; 5.7 vs 6.7, $p=0.002$, respectively). No significant differences were noted comparing mUKA and rUKA post-operative functional outcomes: KSS (89.9 vs 89.7, $p=0.97$), SF-12 (45.6 vs 44.7, $p=0.69$), WOMAC (15.6 vs 18.5, $p=0.48$), and UCLA (6.7 vs 6.7, $p=0.99$). Revision rates were not statistically different (mUKA- 3.7%, rUKA- 2.7%, $p=0.73$).

Conclusion: Statistically significant post-operative functional improvement was noted in both groups with low revision rates at three years. No statistical differences were noted between groups in functional outcomes or revision rates at this follow-up interval. Further study is needed to determine if functional outcomes or failure rates will vary with longer follow-up.

POSTER #19

Initial Experience with Nonselective Patient Next-Day Discharge after Total Knee Arthroplasty

Alexander Sah, MD

Introduction: Improved perioperative protocols including pain management, blood conservation, and rapid rehabilitation have allowed earlier discharge after total knee arthroplasty. The purpose of this study is to evaluate the initial experience of implementing a next day TKA discharge program to a consecutive series of unselected patients.

Methods: The first 150 consecutive primary total knee replacement patients after initiation of a next day discharge protocol were compared to the prior 150 patients before the program. The only difference between the protocols for the two groups was mobilization the evening of surgery for the rapid recovery group to allow discharge the following day. The two groups were evaluated for perioperative complications and clinical outcomes.

Results: The two groups before and after program initiation were similar in age, BMI, and gender distribution. Serum hematocrit values and blood loss collected in knee drains were similar. All patients in the rapid recovery program ambulated the evening of surgery. Knee range of motion was greater in the early mobilization group (102 versus 95 degrees, $p<0.0001$) at time of discharge. In spite of earlier mobilization, drain volume and hematocrits were similar between groups. In the rapid recovery group, 72% of patients were discharged home safely the day after surgery. The patients discharged day one were younger (68 versus 73, $p<0.003$), with fewer co-morbidities. There was no increase in postoperative complications/readmissions. Improved knee motion continued at the two-week evaluation in the rapid recovery group (112 versus 105 degrees, $p<0.001$).

Conclusion: Concerns of increased bleeding and knee stiffness after same day ambulation in total knee arthroplasty patients prove to be unwarranted. In this initial experience of an unselected group of patients undergoing a rapid recovery protocol, blood loss was not greater and knee motion was better than with standard protocols. In addition, 72% of a consecutive series of patients were able to be discharged home the day following surgery, without an increase in post-discharge complications, and with continued better knee motion postoperatively.

POSTER #20

The Sequential Effects of Ligament Releases to Soft Tissue Tension in a Valgus Total Knee Replacement

Martin Roche, MD, Tsun yee Law, MD, William Leone, MD, Kevin Wang, MD

Introduction: Traditional releases in valgus knees incorporate the lateral collateral ligament (LCL), popliteus, posterior capsule, and the iliotibial band (ITB). The effect of each release is to decrease lateral soft issue tension in the lateral compartment and achieve a balanced knee. The purpose of this study was to use objective intraoperative sensor data to determine the effects of these soft tissue releases during total knee replacement (TKR) surgery.

Methods: A retrospective review of 100 valgus TKR cases utilizing intraoperative sensor data while performing total knee replacement in 4 separate knee systems. Soft tissue tension before and after releases of the soft tissue were analyzed. Statistical analysis of this study was primarily descriptive.

Results: Of the 100 TKR cases reviewed, 98% of the imbalance was found to be in extension (10 degrees) while 2% was in flexion. Pie-crusting as the initial release of the ITB did not document any improvement in pressure data in the extension position. Initial release of the posterior lateral capsule and arcuate complex achieved a balanced state in extension 95% of the time with no other releases required. The ITB was then pie-crusted in the following 5% to achieve a balanced state. Pie-Crusting of the popliteus tendon was seen to effect lateral flexion tension and achieved a balance in the 2 cases of lateral flexion imbalance.

Conclusion: With appropriate alignment and femoral rotation, the majority of lateral imbalance case in valgus knees is seen in the extension gap. The sequence of the arcuate complex release as the initial approach achieved a balance state in 95% of cases irrespective of the amount of pressure in the imbalanced state. The ITB is a secondary soft tissue constraint in the extension gap.

POSTER #21

Liposomal Bupivacaine Offers No Benefit over Ropivacaine for Multimodal Periarticular Injection in Total Knee Arthroplasty

Benjamin M. Frye, MD, Lindsey N. Bravin, MD, Emily P. Ernest, BS, Matthew J. Dietz, MD

Introduction: Periarticular injections have become a mainstay for total knee arthroplasty (TKA). A criticism of liposomal bupivacaine studies has been the lack of an immediate-acting medication to allow for an accurate comparison due to its delayed onset. The goal of this study was to compare efficacy and cost between injections containing liposomal bupivacaine and ropivacaine.

Methods: Between September 2013 and January 2016 patients undergoing primary TKA were retrospectively reviewed. All patients received the same preoperative and postoperative multimodal medication regimen and were performed under spinal anesthesia. Intraoperatively patients received an injection with either (300mg ropivacaine, 30mg ketorolac, 80mcg clonidine, and 1mg epinephrine), or (266mg liposomal bupivacaine, 93mg bupivacaine, 30mg ketorolac, 80mcg clonidine, and 1 mg epinephrine) with the same technique. Postoperative visual analog pain scores (VAS), narcotic requirements, distance walked, range of motion (ROM), length of stay (LOS), Knee Society Scores (KSS), and need for manipulation under anesthesia (MUA) were recorded.

Results: Two hundred forty-two primary TKAs were reviewed. The ropivacaine group had a lower postoperative average VAS at 23-32 hrs (4.7 vs 5.5, p=0.004), average VAS over the entire hospitalization (3.7 vs 4.2, p=0.02), shorter LOS (51 hrs vs 73 hrs, p=0.04) and higher ROM at two weeks (98 degrees vs 94 degrees, p=0.04) when compared to the liposomal bupivacaine group. There were no differences in pain scores, narcotic requirements, ROM, or distance walked at any other time points. There were no differences in KSS, or incidence of MUA. Per injection cost was higher with the liposomal bupivacaine mixture ($329.60 vs $19.36).

Conclusion: This study compares liposomal bupivacaine to ropivacaine when used with a multimodal periarticular injection. The bupivacaine added to liposomal bupivacaine allowed for an equally-matched comparison. The increased cost of liposomal bupivacaine is not warranted given the equivalent or inferior results compared to ropivacaine.

POSTER #22

Prospective, Randomized Evaluation of the Quality of Wound Closure with Barbed vs. Standard Suture after TJA

Alexander Sah, MD

Introduction: Wound closure after total joint replacement is important in minimizing wound drainage, optimizing soft tissue healing, and reducing infection risk. Challenges in wound closure include time pressures to quickly complete a case, early ambulation after joint replacement, and drainage from the wound in the early postoperative period. The purpose of this study is to compare running knotless barbed suture versus standard monofilament for incision closure after TJA.

Methods: A consecutive series of 320 joint arthroplasty patients were prospectively randomized to have soft tissue and skin closure with either barbed knotless or standard suture. Time for closure and number of suture breakages was recorded. An absorptive dressing that remains in place for one week was used and bandage weight and saturation surface area were measured. Wounds were followed at 2, 6, and 12 week postoperative visits to evaluate the quality of incision healing.

Results: The running knotless barbed suture closure was on average 4.1 minutes faster than standard monofilament suture ($p<0.001$). Suture breakage or needle disengagement occurred more often with standard suture, but was not statistically significant (7 versus 2 times, $p=0.17$). Dressing evaluation revealed bandages that were average 2.1 gms heavier when standard suture was used ($p<0.05$). Surface area measured on the dressings was similar between all groups. There were no episodes of wound dehiscence, in spite of ambulation the day of surgery in all cases. Postoperative wound complications including stitch abscess or wound irritation occurred more frequently with standard suture, 11 versus 2 times ($p<0.02$).

Conclusion: Running sutures have been reported to allow improved blood flow and soft tissue healing compared to staples or other closure types. In this study, barbed knotless suture closure was faster and had fewer suture breakages intraoperatively, thereby saving on operating room cost. In addition, barbed suture provided better watertight incision closure based on lower dressing weights, is strong enough to withstand rapid mobilization, and is associated with fewer postoperative wound complications than standard sutures.

POSTER #23

High Supply Cost Patient Outliers and their Influence on the Average Cost of Primary Knee Replacement

Eric R. Swenson, PhD, Charles M. Davis, MD, PhD

Introduction: Many hospitals have focused on optimizing implant pricing for primary total knee arthroplasty (TKA) but receive smaller discounts for high-priced implants used in revision surgery and for some complex primary TKAs. We hypothesized that the use of revision implants in a small group of DRG 469/470 TKA patients would significantly increase total costs and average implant cost for the entire group.

Methods: We reviewed the implant costs for each DRG 469/470 TKA over a 26-month period (709 cases) to determine the frequency and impact of high-cost cases. Total implant costs and average implant costs were compared among the entire cohort, those patients with implant costs 1.5 times above the average contracted primary implant price (high-cost group) and those patients with implant costs less than 1.5 times the average contract price cost (low-cost group).

Results: 5.9% of the patients required high cost implants and these cases disproportionately increased average cost of implants by 11.1% and accounted for 15% of total implant costs. The average implant cost of the high-cost group was nearly three times the average cost of the low cost group ($7000 difference). The high-cost group added an additional $292,980 to the total implant expenditure compared to the low-cost group. The average cost for the entire cohort was $411 higher than the average cost of the low-cost group indicating the high-cost group added $411 to every case.

Conclusion: Most cases requiring high-cost implants were re-implantations following infection which fell into DRG 469/470 or complex deformities requiring specialized implants. Hospitals and surgeons should carefully assess the need for these implants given the added costs. This is especially true as bundling becomes more prevalent. Hospitals should negotiate better pricing for revision implants and consider including a high cost implant pass through to commercial payor contracts to mitigate unexpected financial risk.

POSTER #24

Pre-Operative Freezing of Sensory Nerves for Post-TKA Pain: Preliminary Results from a Prospective, Randomized, Double-Blind Controlled Trial

Vinod Dasa, MD, Richard Berkowitz, MD

Introduction: A recently published retrospective study (n=100) compared pre-operative cryoneurolysis to the standard of care and demonstrated a 45% reduction in opioid use post-TKA (Dasa, 2016). The purpose of the prospective study presented here was to evaluate the effect of pre-operative cryoneurolysis on post-operative opioid use and post-operative pain, stiffness and function in a controlled patient population.

Methods: A prospective, multi-center, randomized, controlled trial was performed on primary, unilateral TKA patients. Both patient and physician were blinded to the use of either the cryoneurolysis or sham treatment with iovera. Post-operative opioid use and WOMAC scores were recorded at baseline and at 2, 4, 6 and 12 weeks after surgery. Adverse events were also recorded.

Results: The results presented here are from two of the eight sites in the multicenter study and represent n=43 patients. The average cumulative daily morphine equivalent of post-operative opioids used were significantly lower in the cryoneurolysis group versus the sham group at each time point (2 weeks: 38.3mg vs. 55.3mg, p=0.087; 4 weeks: 25.2mg vs. 39.8mg, p=0.034; 6 weeks: 20.4mg vs. 34.1mg, p=0.039; and 12 weeks: 11.4mg vs. 20.5mg, p=0.032). Over the 12-week post-operative recovery period this represents a 44% reduction in overall opioid use and is consistent with the previous retrospective study results. The WOMAC scores for the cryoneurolysis group were significantly lower (improved) than the sham group at 2 weeks (-51.5 vs. -11.3, p=0.036) and lower at all other time points (4 weeks: -76.6 vs. -49.5, p=0.128; 6 weeks: -85.5 vs. -56.5, p=0.121; and 12 weeks: -108.5 vs. -85.5, p=0.260). There were no device-related adverse events.

Conclusion: Preliminary results from this prospective, randomized controlled trial demonstrate that pre-operative freezing of sensory nerves results in improved post-operative WOMAC scores and reduced post-operative opioid use.

POSTER #25

Preoperative and Discharge Predictive Tools for 30-Day Readmission following Total Knee Arthroplasty

Jayson Zadzilka, MS, Alison Klika, MS, Kevin Chagin, MS, Nicholas Schiltz, PhD, Suparna Navale, MS, MPH, Wael Barsoum, MD, Carlos Higuera, MD

Introduction: Unplanned hospital readmission following surgery is a quality metric targeted by healthcare reform programs and includes patients readmitted after elective total knee arthroplasty (TKA). Predicting readmission risk is paramount for improving outcomes and for reimbursement risk stratification. Most readmission studies only analyze preoperative factors without considering inpatient factors. We aimed to develop multivariable clinical tools for predicting likelihood of 30-day readmission after primary and revision TKA for use preoperatively and at discharge.

Methods: A total of 319,936 primary and 24,094 revision TKA admissions were identified using data from the New York and California State Inpatient Databases from 2007-2011. Comorbidities, demographic, behavioral and medical history variables were used to create a model to preoperatively predict probability of 30-day readmission. A discharge model was created using all variables from the preoperative model in combination with inpatient data. Online calculators were developed from these models to determine the readmission likelihood for each patient at the point of care.

Results: Overall 30-day readmission rates were 4.1% for primary and 6.8% for revision TKA. Infection was the most frequent reason for readmission among both primary and revision TKA groups. Multivariate analysis identified several risk factors for readmission, of which history of solid-organ transplant, congestive heart failure, and paralysis had the greatest impact on the models. The c-statistics indicate that including inpatient variables in the predictive models (Primary TKA, c = 0.647; Revision TKA c = 0.668) yielded slightly better results than using preoperative variables alone (Primary TKA, c = 0.637; Revision TKA c = 0.635).

Conclusion: Comprehensive predictive models using preoperative and inpatient factors were developed to build online calculators that predict the likelihood of readmission both preoperatively and at the time of discharge. These calculators may be useful for guiding appropriate patient selection for surgery, preoperative optimization, and postoperative interventions to prevent readmissions.

POSTER #26

Is Day of Surgery Associated with Adverse Clinical and Economic Outcomes following Primary Total Knee Arthroplasty?

Matthew R. Boylan, MD, MPH, Dean C. Perfetti, BA, Qais Naziri, MD, Aditya V. Maheshwari, MD, Michael A. Mont, MD

Introduction: As orthopaedics transitions to value-based purchasing, hospitals and providers are incentivized to identify inefficiencies of care delivery. In our experience, weekends are characterized by decreased staffing of ancillary services to coordinate patient discharges, which can lead to prolonged hospital stays for many of our primary total knee arthroplasty (TKA) admissions. In this study, we evaluated the outcomes associated with day of surgery for TKA.

Methods: We identified 115,053 patients who underwent primary TKA on a weekday between January 1, 2009 and December 31, 2013 in the New York Statewide Planning and Research Cooperative System. We compared length of stay (LOS), 90-day readmission, and cost according to the day of TKA. Mixed effects regression models controlled for hospital and year of surgery as random effects variables and categorical age, sex, race, insurance, categorical Deyo score and MS-DRG as fixed effects variables.

Results: The mean LOS was significantly higher for surgeries performed on Wednesday ($p<0.001$), Thursday ($p<0.001$), and Friday ($p<0.001$). There was no significant difference 90-day readmission risk according to day of surgery. The mean cost was significantly higher for surgeries performed on Wednesday ($p<0.001$), Thursday ($p<0.001$), and Friday ($p<0.001$). When LOS was held constant across every day of the week, the mean cost of TKA decreased by $234 for Wednesday, $554 for Thursday, and $448 for Friday.

Conclusion: Primary TKA performed later in the week is associated with an increased LOS and increased costs of admission, but a similar risk of 90-day readmission. Preferential scheduling of primary TKA cases early in the week, as well as the development of standardized clinical care pathways with appropriate weekend staffing of social work and rehabilitation services, could help to decrease the daily variation in LOS and increase the value of TKA episodes.

POSTER #27

Bundled Payments for Care Improvement (BPCI): Boom or Bust?

Brian M. Curtin, MD, Robert D. Russell, MD, Susan M. Odum, PhD

Introduction: Centers for Medicare and Medicaid Services (CMS) beginning in 2013 introduced the Bundled Payments for Care Improvement (BPCI) initiative to test innovative payment and service delivery models. Early implementers of the BPCI program, mostly large academic centers, have shown decreased hospital length of stays, discharges to inpatient facilities, and readmission rates with overall cost savings. As private practice early implementers of BPCI we sought to compare similar metrics compared to baseline data.

Methods: CMS data was used to compare total expenditures of all diagnosis related groups (DRGs). Medicare patients who underwent orthopedic surgery between January 2009-December 2012 were defined as non-BPCI (n=8415) and expenditures were compared to BPCI patients (n=4757) from January 2015-December 2015. Post-acute events within the 90-day episode including admission to an IRF/SNF, home health (HH) and readmissions were analyzed. Expenditures were converted to 2016 dollars using Consumer Price Index (CPI). Statistical analysis was performed with Wilcoxon tests.

Results: Median expenditures were $22,193 (IQR $17,903-$31,239) for non-BPCI and $19,476 (IQR $16,013-$28,241) for BPCI ($p<0.001$). Median post-acute care spend was $6,861 (IQR $4,452-$14,552) for non-BPCI and $5,360 (IQR $3,559-$12,207) for BPCI patients ($p<0.001$) Compared to non-BPCI, BPCI patients had a lower rate of SNF admissions (non-BPCI 43% vs 37% BPCI; $p<0.001$), IRF admissions (non-BPCI 3% vs 4% BPCI; $p=.005$), HH (non-BPCI 79% vs 73% BPCI; $p<0.001$) and readmissions (non-BPCI 12% vs 10% BPCI; $p=.02$). Changes in LOS for post-acute care were only significant for HH with BPCI utilizing a median 12 days (IQR 8-17) and non-BPCI utilizing 24 days (IQR 18-30).

Conclusion: Through substantial efforts both financially and human resource utilization to contain costs with clinical practice guidelines, patient navigators and a BPCI management team, the expenditures for CMS were significantly decreased for BPCI patients.

POSTER #28

Which Factors Drive the National Economic Burden of Hospital Readmissions following Total Knee Arthroplasty?

Steven M. Kurtz, PhD, Edmund C. Lau, MS, Kevin L. Ong, PhD,
Edward M. Adler, MD, Frank R. Kolisek, MD, Michael T. Manley, FRSA, PhD

Introduction: Hospitals are financially responsible for readmissions (RA) in a bundled payment economic model. However, little is known about the financial burden of readmissions after primary TKA and what factors drive such costs.

Methods: The Nationwide Readmissions Database (NRD) from HCUP (2,006 hospitals from 21 states) was used to identify 468,510 primary TKA procedures and 32,900 (7.0%) 90d RA in the first 9 months of 2013 based on ICD-9-CM codes. We classified reasons for readmissions as either procedure- or medical-related based on the primary diagnosis. Cost-to-charge ratios supplied with the NRD were used to compute the individual per-patient cost of 90d RA in a general linear model in which the payer, as well as patient, clinical, and hospital factors, were covariates.

Results: The average (±SD) cost per readmitted patient within 90d was $14,332±$197 and was slightly lower than the cost of the primary surgery, $17,715±$255. The five most important variables responsible for the cost of 90-day TKA readmissions (in rank order) were length of stay (LOS), all patient refined diagnosis related group (APRDRG) severity, gender, hospital procedure volume, and hospital ownership. After adjusting for covariates, average 90d RA costs reimbursed by private insurance were, on average, $1,061 greater than Medicare ($p < 0.001$). The overall annualized economic burden for 90d RA after TKA was $629M (95% CI: $593-$664M), 66% of the economic burden for 90d RA was covered by Medicare, and 50% of the burden was attributed to medical readmissions.

Conclusion: Hospital readmissions following TKA represent a massive economic burden on the US health care system. However, half of the economic burden was found to be medical and unrelated to the TKA procedure. Our findings support further optimization of the delivery of care, especially to the length of stay, to reduce the economic burden of hospital readmissions.

POSTER #29

Effect of Thickness on Oxidation Induced by Compressive Cyclic Loading of Conventional Polyethylene

Brad R. Micheli, BS, Zachary B. Konsin, BS, Keith K. Wannomae, BS, Orhun K. Muratoglu, PhD

Introduction: Oxidation of polyethylene (UHMWPE) can lead to failure of joint implants. Cyclic loading is postulated to be a mechanism leading to in vivo oxidation. We developed an accelerated aging test incorporating compressive cyclic loading and hypothesized that thinner components would be more susceptible to load-induced oxidation due to higher stresses.

Methods: All samples tested were GUR1050 UHMWPE that was gamma sterilized in vacuum with three different thicknesses: 3 mm, 5 mm, and 10 mm (n=3 each). A sinusoidal compressive cyclic stress between 1 and 10 MPa was applied at 5 Hz for 7 days at 80°C in air by a 12.5 mm diameter metal applicator on each sample. Post-test Fourier Transform Infrared Spectroscopy (FTIR) analysis quantified oxidation through the thickness of the sample at various points ranging from directly underneath the load applicator to 10 mm away from the load applicator.

Results: Oxidation markedly increased directly under the load applicator for all samples. Thinner samples had higher oxidation levels; normalizing the maximum oxidation level (MaxOI) to the control samples under no load, the 3 mm sample had MaxOI = 6x controls, the 5 mm sample had MaxOI = 4x controls, and the 10 mm sample had MaxOI = 1.5x controls.

Conclusion: Oxidation induced by cyclic loading could lead to long term mechanical instability, especially with thinner polyethylene components, such as tibial inserts.

POSTER #30

Contemporary Results of I&D with Component Retention for Acute Periprosthetic Knee Infections

John T. Weston, MD, Chad D. Watts, MD, Douglas Osmon, MD, Tad M. Mabry, MD, Arlen D. Hanssen, MD, Daniel J. Berry, MD, Matthew P. Abdel, MD

Introduction: Reports are variable on the success of irrigation and debridement with component retention (IDCR) of the acutely infected total knee arthroplasty (TKA), and risk factors for failure remain poorly defined. We aimed to evaluate the contemporary outcomes of IDCR combined with chronic antibiotic suppression. Specifically, we evaluated survival free of 1) death, 2) subsequent infection, and 3) component resection.

Methods: We conducted a single-center retrospective review of 143 primary TKAs that underwent IDCR. Infections within four weeks of the index procedure were defined as acute postoperative infections (API). All others were defined as acute hematogenous infections (AHI). Patients were treated with IV antibiotics for 4-6 weeks, followed by chronic antibiotic suppression. Survival estimates were made using the Kaplan-Meier survival method and proportional hazard regression multivariate analysis was performed.

Results: There were 39 patients with API and 104 patients with AHI. Comparing the API and AHI groups, survival free of subsequent infection was 74% vs. 83% at 1 year, and 60% vs. 57% at 5 years (p=0.81). Male gender was a risk factor for subsequent infection (HR 2.1, p=0.03) and component resection (HR 2.3, p=0.02). Age <60 increased the risk of subsequent infection (HR 2.3, p=0.03) and component resection (HR 3.2, p=0.003). Infection with any staphylococcal species increased risk of death (HR 1.9, p=0.04), subsequent infection (HR 3.3, p=0.0002), and component resection (HR 3.6, p=0.0004). MSIS type A and C hosts did not have significantly different infection outcomes. MSIS local extremity grade (p=0.9), BMI (p=0.6), duration of symptoms prior to IDCR (p=0.2), rifampin combination antibiotic therapy for Staph species (p=0.98), and the presence of a monoblock tibia (p=0.7) had no significant effect on the outcome of IDCR.

Conclusion: In a rigorously defined group of acute periprosthetic knee infections treated with modern methods and chronic antibiotic suppression, IDCR produces fair results at 5 years. Younger male patients with Staphylococcal species are at highest risk of failure.

POSTER #31

Objective Knee Functional Assessment to Document Appropriateness for Total Knee Arthroplasty

Michael J. Dunbar, MD, FRCSC, PhD, Neila Mezghani, PhD, Youssef Ouakrim, MSc, Alexandre Fuentes, PhD, Hilary Macdonald, PT, Sara Whynot, MLT, dHSA, Christopher G. Richardson, MD, FRCSC, MSc

Introduction: As clinical care moves towards increased accountability in decision-making, need has arisen for objective quantifiable data to support appropriateness for total knee arthroplasty (TKA). Knee kinematic assessment has shown the ability to identify functional changes associated with osteoarthritis (OA) allowing for objective disease severity assessment. The goal of this study is to assess the utility of 3D knee kinematic data to objectively differentiate surgical candidate (SC) or nonsurgical candidate (NSC) TKA groups and validate this method based on determination of SC or NSC by standard surgeon/patient decision-for-surgery.

Methods: Two experienced arthroplasty surgeons assigned patients to SC or NSC groups using standard assessment criteria. After IRB approval 89 participants with moderate to severe knee OA were enrolled in this prospective observational study. Participants completed a knee 3D kinematic evaluation, physical therapy assessment and health questionnaires. These data were used to build a decision tree to classify patients as SC or NSC. Parameters with the most discriminative value were identified by incremental selection on a regression tree. The classification method was validated using a 10-fold cross-validation method. Effectiveness of the regression tree was further evaluated using receiver operating characteristic (ROC) curve, sensitivity and specificity.

Results: Forty-four SC (12 male, 32 female, mean age 65, mean BMI 33.8) and 40 NSC patients (18 male, 22 female, mean age 64, mean BMI 31.4) completed the protocol. Parameters generating the highest classification rates were maximum axial rotation during swing phase, axial rotation at push-off, minimum flexion angle during loading, and total Oxford Knee score. Area under the ROC curve reached 0.881 with 88.6% sensitivity and 87.5% specificity.

Conclusion: Results show strong correlations between surgeon recommendation for surgery and objective metrics. Development of a clinically validated, objective assessment method has the potential to help standardize surgical decision process and provide documentation of appropriateness for TKA.

POSTER #32

Knee Flexion at Time of Hospital Discharge Best Indicates Ultimate Range of Motion after Total Knee Arthroplasty

Alexander Sah, MD

Introduction: Stiffness after total knee arthroplasty remains a common complication with manipulation rates reported from 1.3-54%. Prior studies suggest preoperative or intraoperative motion are indicators of subsequent knee motion. The purpose of this study is to evaluate knee flexion at the time of discharge as an indicator of ultimate knee range of motion.

Methods: From 2010-2014, 1226 consecutive primary total knee replacements performed by a single surgeon were evaluated. Knee range of motion was recorded preoperatively, during hospitalization, at time of discharge, and at each postoperative visit. As part of the surgical procedure, a goal was to achieve knee flexion of minimum 100 degrees against gravity with trial components. Decision for knee manipulation was made at 6 weeks if flexion of 110 degrees was not achieved easily.

Results: Twenty-two patients (1.8%) required knee manipulation. Preoperative knee motion between patients having manipulation did not differ from those who did not (121 versus 118 degrees, respectively, $p=0.2$). Patient BMI, age, tourniquet time, drain output, patellar thickness before and after resurfacing were also similar between the two groups. Knee flexion at discharge was 88 degrees for patients requiring manipulation, and 98 for those who did not ($p<0.0001$). Knee flexion at discharge correlated the best with final range of motion, better than preoperative or intraoperative motion. Average knee flexion prior to manipulation was 98 degrees, 126 during the procedure, then 118 at discharge. Ultimate knee flexion at latest follow-up was similar at 122 degrees for patients having manipulation versus 125 degrees for those who did not ($p=0.2$).

Conclusion: Neither preoperative nor intraoperative knee motion predicted joint stiffness in this study. Rather, patient knee flexion measured immediately prior to discharge was the strongest indicator of subsequent knee stiffness requiring manipulation, and also correlated best with final range of motion. Different from the others, knee motion measured at discharge incorporates elements of patient effort and ability, possibly explaining its better correlation.

POSTER #33

Preoperative PROMIS Scores Help Identify Patients Who Will Fail to Improve from Total Knee Replacement at 6-12-Month Follow-Up

Benjamin Strong, MD, Nathan Kaplan, MD, Richard Okafor, MD, Bryant Ho, MD, Jeff Houck, PhD, Judith Baumhauer, MD, MPH, Christopher Drinkwater, MD, John Ginnetti, MD

Introduction: The purpose of this analysis was to determine whether the use of preoperative PROMIS scores increases the probability of identifying who will fail to improve at 6-12-month following TKA.

Methods: Prospective PROMIS physical function (PF), pain interference(PI), and depression scores were collected for all orthopaedic patient clinic visits at a multi-surgeon tertiary total joint clinic from February 2015 to May 2016. Primary TKA for osteoarthritis were identified by ICD-9 and CPT code. Of the 743 patients identified, 118 patients had complete data for a minimum of 6-months follow-up. The minimal clinical important difference (MCID) was calculated using the distributive method. Receiver operating curves (ROC) were utilized to determine sensitivity/specificity for various cut points to estimate patients failing to achieve a MCID for each PROMIS domain (PF, PI, Depression). Cutoffs corresponding to 95% specificity for not achieving MCID were chosen. Pre- and post-test probabilities were then calculated using the selected cutoffs.

Results: Average follow-up was 240 days (181-379 days). Pre-test probability for patients who failed to improve physical function scores to the MCID was 47.5 %. Patients with a preoperative PROMIS PF score of 44.5 or higher had an 88.1% probability of failing to reach the MCID. Pre-test probability for patients who failed to improve pain interference scores to the MCID was 40.7 %. Patients with preoperative PROMIS PI of less than 52.4 had a 69.5% probability of failing to meet the MCID. Pre-test probability for patients who failed to improve depression scores to the MCID was 58.8%. Patients with PROMIS depression less than 39.32 had a 90.0% probability of failing to meet the MCID.

Conclusion: Preoperative PROMIS domain scores of physical function, pain interference, and depression can be utilized to identify patients who are unlikely to show improvement following TKA at 6-12-month follow-up.

POSTER #34

No Difference in Gait Analysis in Kinematic vs. Mechanical Alignment in Total Knee Joint Arthroplasty (TKA)– A Randomized Trial

Simon W. Young, FRACS, Nicholas Dominick, PhD, Richard Kelly, MBChB, Mark Boocock, PhD, Bill Farrington, FRCS, Peter McNair, PhD

Introduction: Kinematic alignment (KA) attempts to match implant position to the prearthritic anatomy of individual patients, potentially restoring more normal gait kinematics for that patient. This study compares of the effect of mechanical alignment (MA) and kinematic alignment (KA) in restoring bilateral limb symmetry during walking following unilateral TKA.

Methods: Twenty-seven patients with unilateral osteoarthritis who had been randomized to receive a MA (n=14) or KA (n=13) procedure underwent gait analysis in a biomechanics laboratory at a minimum of 24 months post operation. Eligible patients had a well-functioning native knee on the contralateral side to their TKA. A motion analysis system was used to collect 3D kinematic data of the left and right limbs as subjects performed walking trials. 3D ground reaction forces and moments during the stance phase were recorded. Differences in variables across legs were calculated, and these differences were then compared across groups in the statistical analysis (independent t-tests).

Results: We observed no difference in the kinematic variables of frontal plane knee angle at footstrike (mean difference [MD] -0.12°, 95% confidence interval [CI], -4.41° to 4.17°, p=0.95), sagittal plane knee angle at footstrike (MD -0.47°, 95% CI, -4.69° to 3.75°, p=0.82), frontal plane maximum flexion in loading (MD -0.41°, 95% CI, -3.75° to 2.92°, p=0.80), and sagittal plane maximum flexion in loading (MD 1.40°, 95% CI, -2.88° to 5.67°, p=0.51). Similarly, we observed no difference in the kinetic variables of frontal plane peak moment (Nm/kg) in initial loading (MD -0.22, 95% CI -0.53 to 0.08, p=0.14), sagittal plane peak moment in initial loading (MD 0.03, 95% CI, -0.12 to 0.18, p=0.65), and sagittal plane power (W/kg) at the knee (MD -0.16, 95% CI, -0.35 to 0.03, p=0.10).

Conclusion: We found no significant differences across the KA and MA procedures in relation to bilateral limb symmetry during walking ($p > 0.05$) across all variables studied. The theoretical advantage of KA technique in restoring a more natural gait was not observed in this study.

POSTER #35

Direct-to-Patient Patient Reported Outcomes Collection to Support Quality Improvement in Total Joint Replacement

Hua Zheng, PhD, Celeste Lemay, RN, MPH, Wenyun Yang, MS,
Patricia D. Franklin, MD, MBA, MPH

Introduction: The new CMS bundled payment program Comprehensive Care for Joint Replacement (CJR) incentivizes surgeons to collect pre- and post-operative patient-reported outcomes (PROs) to improve quality for knee and hip replacement. We compared two PRO collection processes, at scheduled office visits and direct-to-patient collection, to evaluate timing and completeness of both approaches.

Methods: At a TJR center, post-TJR patients complete a PRO survey on a computer at follow-up clinic visits. In contrast, one TJR cohort manages post-operative PRO surveys across dozens of offices by sending PROs to patients directly (web-based or scannable paper). We calculated post-operative PRO response rates and timing from these two approaches and compared patient physical outcomes between them.

Results: Data were collected between 2012 and 2014. In the clinic, out of 892 patients who had TJR surgery during this period, 392 (44%) completed post-operative surveys, 115 (29%) between 5 months and 7 months after surgery, 192 (49%) before 5 months, and 85 (22%) after 7 months. Direct to patient PRO surveys were centrally distributed in the fifth month after surgery. Out of 11702 TJR patients, 8283 (71%) completed survey within 5 to 9 months, with more than 90% returned between 5 and 7 months. SF36 PCS scores were comparable between approaches for data collected from 5-9 months, and lower for data collected before 5 months in office visits.

Conclusion: While PRO collection at the office visit can support individual patient care decisions, patients return to the surgeon office at varied time points after TJR. Direct to patient PRO collection with appropriate retention processes can lead to uniform data timing and optimal completeness. Quality monitoring programs will benefit from consistent data across providers and should consider these factors in designing PRO procedures.

POSTER #36

Satisfaction Rates and Quality of Life Changes following Total Knee Arthroplasty in Age-Differentiated Cohorts

Jeffrey Lange, MD, Yuo-yu Lee, MS, Sara Spiro, BS, Steven B. Haas, MD

Introduction: Some previous studies have identified age as one factor predictive of satisfaction rates following total knee arthroplasty (TKA). However, the literature lacks direct comparisons of satisfaction rates following TKA between large, rigorously matched cohorts differentiated by age. Here, we sought to compare satisfaction rates following TKA in large, age-differentiated, propensity-score matched cohorts.

Methods: This IRB-approved retrospective study identified institution-wide primary TKAs performed between May 2007 and May 2011. Exclusion criteria were a diagnosis of inflammatory arthritis and age outside of the defined ranges (younger: 18-55, older: 65-75). 529 younger patients and 2001 older patients were identified. 1:1 propensity-score matching between groups yielded 529 younger patients and 529 older patients. Matched variables included sex, body-mass index (BMI), American Society of Anesthesiologists (ASA) grade, Charlson-Deyo Comorbidity Index (CCI), and SF-12 mental health component score (MCS). Satisfaction surveys were collected 2 years postoperatively. Satisfaction outcomes were compared between propensity-score matched groups using Wilcoxon rank sum test.

Results: After matching, there were no statistical differences in baseline BMI, ASA grade, CCI, SF-12 MCS, or sex between groups (N = 529 in each group). Satisfaction with knee surgery was 86% in the younger cohort and 91% in the older cohort. Quality of life improvement was 91% in the younger cohort and 96% in the older cohort. Distribution of satisfaction responses was shifted toward lower overall satisfaction in younger patients and trended toward less quality of life improvement in younger patients ($p < 0.001$ and $p = 0.181$, respectively).

Conclusion: Satisfaction with knee surgery was over 85% and quality of life improvement was over 90% regardless of age. Younger patients were more likely than older patients to report being dissatisfied. Further research is required to understand why younger patients have lower overall rates of satisfaction and quality of life improvement.

POSTER #37

Optimizing Risk Adjustment Models When Comparing TJR Outcomes: ASA Score vs. Charlson Comorbidity Index

Steven Disegna, MD, Celeste A. Lemay, RN, MPH, David C. Ayers, MD, Patricia D. Franklin, MD, MBA, MPH

Introduction: Hospital and surgeon quality measures after total joint replacement are publicly compared with greater frequency today so it is important to optimize risk adjustment measures in order to provide fair comparisons. We validated a predictive model for physical function at 6-12 months after primary total knee arthroplasty (TKA) based on patient demographics, BMI, pre-operative emotional (MCS), medical, and musculoskeletal comorbidities (low back pain, pain in other joints). The goal of this study was to determine the incremental predictive value of adding the Charlson Comorbidity Index (CCI) versus the American Society of Anesthesiolgists physical classification (ASA) to this model.

Methods: ASA, CCI, medical, emotional, and musculoskeletal comorbidities were captured for a subset of primary TKA cases from a multi-site study with 8300 primary TKR patients. Staged multivariate modeling sequentially added each of the risk-adjustment factors to our model to evaluate the significance to the model's ability to predict 6-12 month post-operative SF36/12 PCS.

Results: The distribution of ASA score found that 99% of patients were ASA score 2 or 3, whereas the distribution of modified CCI scores was diverse. After adjusting for age, BMI, pre-op function, emotional and musculoskeletal comorbidities, the addition of either the Charlson ($p<0.000$) or the ASA score ($<p<0.001$) significantly improved the model. However, the Charlson score differentiates between none, low (1 comorbidity) and moderate (2-5) medical comorbidity burden more successfully. When both CCI and ASA are included in the model, the ASA is no longer significant, but the Charlson (2-5 count) remains significant (0.000).

Conclusion: Based on prior reports and these analyses, the Charlson Comorbidity index improves risk adjustment for readmission, complications and patient-reported outcomes. Hospitals and surgeons can use administrative data to calculate the Charlson comorbidity index using ICD data for more robust risk-adjustment to assure fair comparisons.

POSTER #38

Predictors of Discharge to Skilled Nursing Facility (SNF) after Primary TKR

Patricia D. Franklin, MD, MBA, MPH, Celeste Lemay, RN, MPH,
Wenyun Yang, MS, David C. Ayers, MD

Introduction: As inpatient stays for total knee replacement (TKR) falls to the national average of 3 days, or shorter, the discharge disposition should be determined in advance of surgery. To guide efficient discharge planning in this era of bundled payment and to optimize safe return to home, we evaluated pre-operative TKR patient factors associated with post-discharge Skilled Nursing Facility (SNF) use or direct return to home.

Methods: Pre-operative demographic, medical (modified Charlson), musculoskeletal, and emotional (SF; MCS) comorbidities, and pre-TKR pain and function (KOOS) and global function (SF; PCS) and discharge status were identified for a subset of patients in a cohort n=8300 primary TKRs. Descriptive statistics and multivariable linear models were performed.

Results: Overall, 68% of patients were discharged directly to home post-TKR. Patients discharged to SNF were older (70.8 vs. 64.6 years; $p < 0.000$), and more likely to have high school education (40% vs 28%; $p<0.012$). Women (41%; $p < 0.0001$) and patients with 2 or more medical comorbidities (50%; $p <0.003$) were twice as likely to be discharged to SNF compared to men or those with fewer comorbidities. In particular, SNF patients had greater presence of COPD, history of cancer, prior surgery, or poorer emotional health (MCS) (all $p <0.01$). Overall, patients living alone (44%) vs. those with another adult were more likely ($p< 0.046$) to use SNF. No differences in BMI, pre-operative pain, function, or musculoskeletal comorbidities were identified.

Conclusion: Living alone pre-TKR and increasing numbers of medical comorbidities are associated with discharge to SNF while severity of knee and musculoskeletal disease are not associated with SNF use. Arranging in-home family, friend, or employed assistant support may further decrease the need for SNF stays. Pre-operative identification of patients most likely to require SNF care post-TKR will ease discharge transitions, and allow hospitals to arrange safe, in-home support for the majority of patients.

POSTER #39

Knee-Specific Measures of Pain and Function after Primary Total Knee Replacement Reflect Consistent Patient Gains

Patricia D. Franklin, MD, MBA, MPH, Wenyun Yang, MS,
Celeste Lemay, RN, MPH, David C. Ayers, MD

Introduction: During the past decade, analyses of functional gain after primary total knee replacement (TKR) used global physical function measures (SF36, physical composite scores; PCS). However, new value-based payment programs will use knee-specific function measures to assess hospital and surgeon outcomes. We analyzed variation in knee function (KOOS) in a large multi-site cohort of primary TKR patients and assessed predictors of poor functional gain.

Methods: 7757 primary TKR patients with complete pre-operative demographic, medical (modified Charlson), musculoskeletal, and emotional (SF; MCS) comorbidities, and pre- and post-TKR pain and function (KOOS) and global function (SF; PCS) were identified. Descriptive statistics and multivariable linear models, adjusting for clusters within sites, were performed.

Results: Patients were 62% female, 9% non-Caucasian race, 32% with high school education, 56% Medicare, 29% living alone, 45% current/past smoker. Medical comorbidities were reported as 56% none, 22% one, 12% 2-5, and 10% with 6 or more. Musculoskeletal comorbidities included 28% with moderate/severe low back pain, 22% with moderate/severe pain in one non-operative knee/hip and 7% with 2 or 3 knee/hips affected. Mean age was 67 years, BMI was 31.4, pre MCS 52, pre PCS 33.4, KOOS pain 47.2, ADL 53.4. Post-TKR, 67% reported a pain score >80 score, 71% reported an ADL score >80 and 75% reported a PCS >40. After TKR, 9.5% report persistent poor pain (<60) and 7.3% report ADL <60. In multivariate analyses, independent, significant predictors of poor ADL scores were high school education, non-Caucasian race, >=2 medical comorbidities, moderate/severe low back pain, >=2 hip/knee joints with moderate/ severe pain, low MCS, and poorer pre-op surgical knee pain.

Conclusion: Seventy percent of primary TKR patients report excellent pain relief and knee function after TKR; fewer than 7% report persistent poor knee function. Patient and clinical predictors of post-TKR knee function are similar to predictors of global function (PCS). Tailored strategies to improve knee function for the sub-group of TKR patients with sub-optimal outcomes are needed to assure uniform surgical benefits.

POSTER #40

Different Optimal Alignment but Equivalent Functional Outcomes in Medial and Lateral Unicompartmental Knee Arthroplasty

Jelle P. van der List, MD, Harshvardhan Chawla, MD, Jordan C. Villa, MD, Andrew D. Pearle, MD

Introduction: Unicompartmental knee arthroplasty (UKA) is a reliable treatment option for unicompartmental osteoarthritis. Since several anatomical and kinematic differences exist between the medial and lateral compartment, aiming for the same postoperative lower leg alignment in medial and lateral UKA seems inaccurate. Purpose of this study was to compare short-term functional outcomes between both procedures and assess the role of postoperative alignment on short-term outcomes in both procedures.

Methods: Patients undergoing medial or lateral UKA were included when WOMAC scores and Forgotten Joint Scores were available preoperatively and at minimum two-year follow-up. A total of 143 medial UKA and 36 lateral UKA patients reported outcomes at mean 2.4-years follow-up (range: 2.0-5.0 year). Alignment was categorized in medial and lateral UKA as undercorrection (3° to 7° varus or valgus, respectively), neutral (-1° to 3° varus or valgus, respectively), or overcorrection (3° to 7° valgus or varus, respectively).

Results: No preoperative differences were seen between both treatments. Similarly, postoperatively equivalent outcomes were noted between medial and lateral UKA in overall function (89.8 ±11.7 vs. 90.2 ±12.4, respectively, p=0.855) and joint awareness (71.2 ±24.5 vs. 70.9 ±28.2, respectively, p=0.956). With neutral postoperative alignment (-1° to 3°), significantly less joint awareness was noted following medial UKA than lateral UKA (72.6 ±22.6 vs. 55.3 ±28.5, p=0.024). With undercorrection (3° to 7°), however, following lateral UKA significantly less joint awareness (85.3 ±19.5 vs. 68.2 ±26.8, p=0.020) and better functional outcomes (96.0 ±5.4 vs. 88.5 ±11.6, p=0.001) were noted when compared to medial UKA.

Conclusion: At short-term follow-up, equivalent functional outcomes were noted between medial and lateral UKA. Interestingly, it was noted that undercorrection resulted in most optimal outcomes in lateral UKA, while neutral alignment resulted in most optimal outcomes in medial UKA. The orthopaedic surgeon should be aware of this difference between medial and lateral UKA.

POSTER #41

Increased Migration of Modular Tantalum Total Knee Replacements in a Randomized Controlled Trial

Glen Richardson, MD, MSc, FRCSC, Michael Dunbar, MD, PhD, FRCSC,
Elise Laende, MSc, Gerald Reardon, MD, FRCSC,
John David Amirault, MD, FRCSC

Introduction: The purpose of this randomized controlled trial was to evaluate the effect of tibial base plate modularity on the fixation achieved with tantalum cementless base plates.

Methods: Fifty subjects (30 female) were randomly assigned to receive the uncemented tantalum monoblock or uncemented tantalum modular knee replacement. Standard uniplanar radiostereometric analysis (RSA) examinations were performed immediately post-operatively and at 6-week, 3-month, 6-month, 12-month and 24-month follow-ups. The study was approved by a Research Ethics Board.

Results: Twenty-one subjects received monoblock components and 20 received modular components. An intra-operative decision to use cemented implants occurred in 5 cases and 4 subjects did not proceed to surgery after enrollment. Implant migration at 12 months was 0.88 ± 0.64 mm (mean and standard deviation; range 0.21 -2.84 mm) for the monoblock group and 1.60 ± 1.51 mm (mean and standard deviation; range 0.27 -6.23 mm) for the modular group. Group differences in 12-month migration approached clinical significance ($p = 0.052$, Mann Whitney U-test). 24 month follow up data will be available.

Conclusion: High early implant migration is associated with an increased risk for late aseptic loosening. Although not statistically significant, the migration for the modular component was nearly twice that of the monoblock, which places it at the threshold for “unacceptable” early migration. This finding is concerning especially in light of the recent recall of a similar tantalum modular knee replacement and adds validity to the use of RSA in the introduction of new implant designs.

POSTER #42

Kinematic Alignment Does Not Put the Tibial Component in TKA at Risk for Early Aseptic Loosening: Results from a RSA RCT of Patient-Specific Cutting Blocks vs. Computer Navigation

Michael Dunbar, MD, FRCSC, PhD, Elise Laende, BEng, MSc ENG,
Glen Richardson, MD, FRCSC, MSc

Introduction: Patient-specific cutting blocks using a MRI scan to estimate the kinematic axis and subsequent patient specific alignment of the knee are of interest which can vary significantly from a neutral mechanical axis. Deviation from neutral mechanical alignment in TKA has long been considered a risk factor for aseptic loosening. The purpose of this study was to evaluate the fixation of TKA components in subjects randomized to receive shape match derived kinematic alignment or conventional neutral mechanical alignment using computer navigation.

Methods: Fifty-one patients were randomized to receive a cruciate retaining cemented total knee using computer navigation aiming for neutral mechanical axis (standard of care) or patient-specific cutting blocks utilizing a kinematic alignment strategy. Pre-operatively, all subjects had MRI scans for cutting block construction to maintain blinding. RSA exams and health outcome questionnaires were performed post-operatively at 6-week, 3, 6, 12, and 24-month follow-ups. Longitudinal data analysis using marginal models was performed to compare the groups while accounting for covariates (age, sex, BMI, post-operative alignment, smoking status and tibial component size).

Results: One patient-specific case was revised for failure of the cruciate ligament, resulting in a polyethylene liner exchange for a thicker, cruciate substituting insert. Implant migration at 2 years was 0.43±0.24 mm for the patient-specific group and 0.40±0.19 mm for the navigation group (maximum total point motions) and was not different between groups over all follow-up intervals, when controlled for the demographic covariates ($p = 0.07$). EQ-5D scores, Oxford Knee scores, satisfaction, pain, and range of motion were not different between groups.

Conclusion: There were no significant differences in implant migration, function and satisfaction between the two groups, irrespective of alignment strategy. Deviation from neutral mechanical alignment as defined by a kinematic alignment strategy does not place the tibial component at risk for early aseptic loosening.

POSTER #43

Dislocation Rates Following Anterior Approach THA: The Role of Functional Pelvic Tilt

Preetesh Patel, MD, Colin McNamara, BS, Eric Slotkin, Cecilia Calvo, Wael Barsoum, MD, Juan C. Suarez, MD

Introduction: Dislocation following total hip arthroplasty (THA) remains a leading cause for early revision. The historical safe-zone (30-50° abduction, 5-25° anteversion) has been questioned. We have published the accuracy of fluoroscopic-guidance in cup positioning during Anterior Approach (AA) THA when considering functional pelvic tilt, the pelvic orientation as measured on a standing AP radiograph. Dislocation rates using this historical safe zone in the context of functional pelvic tilt has not been studied.

Methods: The cohort included 1597 patients who underwent primary, unilateral AATHA between March 1, 2010 and March 1, 2016. The standing pelvic tilt was mimicked intraoperatively with fluoroscopy in order to target the historical safe zone for acetabular component orientation. The cup position was measured off the postoperative standing AP Pelvis radiograph as described by Barrack et al. Latest follow up was determined by phone contact or the most recent clinic visit to record dislocation episodes.

Results: Average follow-up was 13.1 months. The mean abduction angle was 37.7° and the mean anteversion angle was 16.2°. Overall, 1517 (95.0%) fell within the targeted abduction range, 1528 (95.7%) fell within the targeted anteversion range, and 1456 (91.2%) simultaneously met both criteria. There were 9 dislocations for a dislocation rate of 0.56%. 8 were within the combined safe zone. 8 occurred within the first 8 weeks and 4 required revision for instability.

Conclusion: Fluoroscopy is a useful tool for achieving a targeted cup position in AATHA. Historical safe zones within the context of functional pelvic tilt correlate with a low dislocation rate. However, dislocations still occurred, therefore, other factors beyond acetabular component orientation should be considered.

POSTER #44

Posterior Cruciate Ligament Avulsion during Cruciate-Retaining Total Knee Arthroplasty: Incidence and Outcomes

Eric G. Kim, DO, Joseph Ward, MD, Claire E. Robbins, PT, DPT, MS, GCS, Carl T. Talmo, MD, James V. Bono, MD

Introduction: During total knee replacement (TKR), the PCL may fracture at its insertion on the tibia affecting the ligament tension. The incidence and effect of avulsion fracture of the PCL insertion on the clinical outcome of TKR has not been studied. Debate regarding outcome of cruciate retaining (CR) versus cruciate sacrificing TKR has shown little difference. Other literature focused on kinematics of TKR in situ calls into question how much the PCL function is actually preserved and the clinical significance of the PCL in TKR. Our present aim is to investigate and report on the incidence and clinical performance of a select cohort of patients who underwent primary TKR and suffered intraoperative PCL avulsion at the time of surgery.

Methods: Our database was retrospectively queried for PCL avulsion occurring during a cruciate-retaining (CR) TKR implanted from 2008-present. All procedures were performed using medial parapatellar arthrotomy (MPPA) with the same postoperative rehabilitation protocol. Primary outcome measure was incidence of PCL avulsion. Patient demographics, ROM, manipulation under anesthesia (MUA), complications and revision rate were also examined.

Results: Forty-four of 2457 patients (1.7%) suffered a PCL avulsion fracture during cruciate-retaining primary TKR. No intraoperative repair was performed and no postoperative weight bearing or ROM restrictions were implemented. Three of 44 patients (6.8%) underwent MUA within 90 days. The z-statistic for manipulation was not significant at 0.05 critical alpha level, z-score=0.2212, p=.825 was similar between the 2 groups. There was one revision in the cohort for recurrent hemarthrosis at 3 years. ROM was similar between the 2 groups. Mean ROM was: 100° (preoperative), 106° (6-week postoperative) and 115° (1 year postoperative). No significant associations were found with patient demographics and incidence of PCL avulsion.

Conclusion: These results suggest that there is low incidence (1.72%) of intraoperative PCL avulsion fracture during CR TKR which does not appear to affect clinical outcomes.

POSTER #45

Is Patellar Baja Associated with Higher BMI in Patients Undergoing Primary Total Knee Arthroplasty?

Elvis L. Francois, MD, Matthew P. Abdel, MD, Paul L. Sousa, MD, Danielle M. Chapman, BS, Michael G. Miller, MD, David F. Dalury, MD, Daniel J. Berry, MD

Introduction: Obesity is associated with a host of adverse outcomes during and after primary total knee arthroplasty (TKA). The goal of this study was to determine if obese patients were at an increased risk of patellar baja before and after primary TKA.

Methods: A multicenter retrospective review of unilateral primary TKAs with a diagnosis of osteoarthritis was performed between 1998 and 2012. Pre- and post-operative TKA radiographs were assessed to determine the Insall-Salvati ratio (ISR). Patellar baja was defined as an ISR of <0.8. Patients were categorized according to the WHO classification of body mass index (BMI). An a priori power analysis determined that 500 patients (with 100 patients in each group) were needed to detect a significant ISR difference of 0.07 with an α of 0.05 and a β of 0.80. Patients were matched by age and gender for each WHO BMI category. Comparisons were analyzed using linear regression and ANOVA.

Results: Preoperatively, there was a higher incidence of patellar baja in overweight and obese patients (BMI > 25 kg/m2) when compared to normal weight patients (10% vs. 6%, respectively; p=0.02). As a continuous variable, ISR also was lower in higher BMI patients compared to normal weight patients. Postoperatively, there was no difference in the rate of patellar baja in the higher BMI groups when compared to normal weight patients (5% vs 5%; p=0.91). However, ISR was statistically, but not clinically significantly, lower in the higher BMI groups compared to normal weight patients (1.12 vs 1.14; p=0.01). Comparing postoperative ISR to preoperative ISR, the higher BMI groups demonstrated a greater change in ISR compared to normal weight patients (Δ0.10 vs Δ0.07, respectively; p=0.01).

Conclusion: Obese and overweight patients undergoing primary TKA have a higher incidence of preoperative patellar baja. However, this difference resolves postoperatively.

POSTER #46

The Effect of Implant Design on Sagittal Plane Stability: A Randomized Trial of Medial Pivot vs. Posterior Stabilized Total Knee Arthroplasty

Adam I. Edelstein, MD, Linda I. Suleiman, MD, Mia Helfrich, BS, Matthew D. Beal, MD, David W. Manning, MD

Introduction: Up to 20% of total knee arthroplasty (TKA) patients report dissatisfaction with their outcome, and sagittal plane instability may be a causative factor. We aimed to assess the impact of implant design on TKA sagittal plane stability and clinical satisfaction.

Methods: We performed a prospective, blinded, randomized trial of patients receiving either a medial pivot (MP) or posterior stabilized (PS) TKA. Sagittal plane stability was assessed by a blinded examiner using a KT-1000 arthrometer one year after surgery at 30 and 90 degrees of knee flexion. Tracked patient reported outcome measures included PROMIS, Oxford Knee Score (OKS), Knee Society Score (KSS), Forgotten Joint Score (FJS), Veterans Rand (VR-12), and a custom bank of questions targeting patient satisfaction (0-100%) with activities including weight-bearing in flexion (WBiF). Patients were followed for up to two years. Statistical analyses using Student's t-test and Fisher's exact test were performed.

Results: 60 patients were randomized and 50 were available for inclusion (25 MP, 25 PS). Demographics and comorbidities were similar between groups. The MP group had significantly less sagittal plane motion than the PS group with KT-1000 testing using 30 pounds of anterior force at 30 degrees of knee flexion (5.7mm vs 10.3 mm, $p<0.001$) but not at 90 degrees (4.2mm vs 5.5 mm, $p=0.137$). Range of motion was not significantly different (MP: 109.4 vs PS: 116.2, $p=0.069$). There were no significant differences in PROMIS, OKS, KSS, FJS, or VR-12 scores. The MP group had significantly better survey scores for WBiF activities compared to the PS group (78.8 vs 64.2, $p=0.046$).

Conclusion: A medial pivot prosthetic design is more stable in the sagittal plane in mid-flexion compared to a posterior stabilized design. There was no difference in patient reported outcomes, although custom survey data suggests improved satisfaction with medial pivot design during weight-bearing in flexion.

POSTER #47

Randomized Clinical Trial of Conventional vs. Highly Cross-Linked Polyethylenes in Total Knee Arthroplasties

Matthew P. Abdel, MD, Anthony Viste, MD, PhD, Cedric J. Ortiguera, MD, Henry D. Clarke, MD, Mark J. Spangehl, MD, Mark W. Pagnano, MD, Arlen D. Hanssen, MD, Michael J. Stuart, MD

Introduction: Highly cross-linked polyethylene (HXLPE) has demonstrated superior results in primary total hip arthroplasties. However, similar data in total knee arthroplasties (TKAs) is limited. The goals of this prospective randomized clinical trial (RCT) were to determine the 5-year clinical outcomes, survivorship, and complications of HXLPE vs. conventional PE in primary TKAs.

Methods: A multi-center prospective RCT was initiated between 2003 and 2011. Patients were included if they were undergoing a primary TKA for osteoarthritis, post-traumatic arthritis or avascular necrosis and between the ages of 21 and 85 years. Exclusion criteria included revision procedures, previous osteotomy, and diagnoses of inflammatory or infectious arthritis. A total of 396 patients were enrolled (conventional polyethylene = 194, HXLPE = 202). Preoperative demographics and alignment (p=0.4) were similar. All patients received a cemented, posterior-stabilized fixed-bearing Stryker Triathlon (Mahwah, NJ) TKA with resurfacing of the patella. Knee Society Scores (KSS) and SF-12 scores were recorded. Survivorship free of revision for aseptic loosening, revision for any reason, and reoperation for any reason were measured. Mean follow-up was 5 years (SD 2 years; range, 2 -8 years).

Results: Mean KSS improved from 39 preoperatively to 89 postoperatively for both groups (p=0.2). Physical SF-12 scores improved from 33 preoperatively to 46 (conventional) vs. 48 (HXLPE) (p=0.3), respectively. Mental SF-12 scores improved from 56 preoperatively to 55 (conventional) vs. 57 (HXLPE) (p=0.03), respectively. 5-year survivorships free of revision for aseptic loosening, revision for any reason, and reoperation for any reason were 100% (HXLPE) vs. 99% (conventional), 97% (HXLPE and conventional), and 97% (HXLPE) vs. 95% (conventional), respectively. Complication rates were similar between the two groups (p=0.2).

Conclusion: In this level 1 RCT, 5-year survivorship was similar between HXLPE and conventional PE utilized during primary TKA, with no difference in clinical outcomes or complications. Additional follow-up is essential as differences in revision rates for wear will only be apparent at later time points if present.

POSTER #48

Obstructive Sleep Apnea in Total Joint Arthroplasty Patients – Prevalence

Carlos J. Lavernia, MD, Jesus M. Villa, MD, Kishan Patel, DO,
Jose C. Alcerro, MD

Introduction: Obstructive sleep apnea (OSA) correlates with postoperative complications and inferior results in patients undergoing total joint replacement (TJA). The STOP BANG questionnaire is a highly sensitive tool to identify risk for OSA. The objectives of our study were to (1) identify the risk of OSA among patients scheduled for TJA, and (2) compare preoperative patient oriented outcomes among patients at low, intermediate, and high risk for OSA.

Methods: A consecutive series of 136 primary or revision total hip or knee arthroplasty performed by a single surgeon were reviewed. The STOP BANG questionnaire and patient oriented outcome measurements VAS, QWB-7, SF-36, and WOMAC was administered preoperatively. Based on the results of the preoperative STOP BANG questionnaire, patients were stratified into two groups: (1) low risk (LR) and (2) intermediate to high risk (I-HR) for OSA. An independent t-test was used to compare preoperative scores between groups.

Results: 50% (68/136) of the population were at low risk for OSA, and 50% were at intermediate to high risk. 17.6% (12/68) of those classified as intermediate to high risk had already been diagnosed as having OSA and were receiving treatment, as were 4.4% in the low risk group. There was a significant difference in preoperative VAS pain frequency (LR -mean 7.06, SE 0.42; I-HR -mean 8.2, SE 0.32; p=0.03), the SF-36 general health (LR -mean 78.8, SE 1.69; I-HR -mean 72.3, SE 1.78; p=0.009), and the SF-36 role emotional (LR -mean 91.1, SE 3.46; I-HR -mean, 73.5, SE 5.38; p=0.007).

Conclusion: A significant proportion of cases had either intermediate or high risk for OSA. Our data suggest worse reported patient oriented outcomes at presentation with higher risk for OSA as measured by the STOP BANG questionnaire. Further investigation on the effects of OSA on postoperative outcomes is warranted.

POSTER #49

Should Tibial Stem Extensions Be Utilized in Obese Patients Undergoing Primary Total Knee Arthroplasty?

Adolph V. Lombardi, Jr., MD, David A. Crawford, MD, Jason M. Hurst, MD, Michael J. Morris, MD, Joanne B. Adams, BFA, Keith R. Berend, MD

Introduction: High rates of tibial loosening have been reported for obese patients undergoing primary total knee arthroplasty (TKA). Recent discussion has focused on whether a stem extension should be added on the tibial side in obese patients. The purpose of this study was to examine a large cohort of obese patients, defined as having body mass index (BMI) or 35 kg/m2 or greater, undergoing cemented primary TKA using a standard tibial baseplate with fixed I-beam stem without an extension to determine frequency of tibial loosening at mid-term follow-up.

Methods: A query of our practice registry revealed 1683 obese patients (2291 knees) treated with cemented primary TKA between 2007-2012 using a standard cobalt chromium grit-blasted tibial tray with fixed 40mm I-beam stem and no additional extension. Mean age at surgery was 62.3 years (28-89), mean BMI was 42.0 kg/m2 (35-76), and 70% of knees were in females.

Results: Mean follow-up was 4.4 years with maximum 9 years. One patient was revised for tibial loosening at 1.6 years postoperative (1 of 2291, 0.04%). Reoperation requiring revision of any part was needed in 32 TKA (1.4%), with full 2-staged exchange in 9 for deep infection, femoral and tibial revision in 3 (2 periprosthetic fracture, 1 instability), 1 femoral only (failed fracture fixation with resultant aseptic loosening), 1 patellar only (aseptic loosening), 16 insert only (11 instability, 4 arthrofibrosis, 1 poly wear), and 2 tibial only (1 instability and 1 aforementioned aseptic loosening).

Conclusion: With 98.6% survival to endpoint of any component revision for all causes, and 99.96% survival to endpoint of tibial aseptic loosening at mean follow-up of 4.4 years, cemented primary TKA with this particular tibial tray design with fixed I-beam stem has been successful for use in obese patients without the need for longer intramedullary stems.

POSTER #50

Readmissions after Primary Total Knee Replacement Does it Affect Postoperative Outcomes?

Carlos J. Lavernia, MD, Jesus M. Villa, MD, Kishan Patel, DO, Michael Cronin, DO

Introduction: Hospital readmission rates are currently considered a quality indicator. The purpose of this study was to determine whether being readmitted for any reason to the hospital within 90 days after primary total knee arthroplasty (TKA) affected postoperative patient oriented outcomes and knee scores.

Methods: 856 consecutive primary TKAs (710 patients) performed for primary osteoarthritis by a single surgeon were studied. We identified those cases that were readmitted for any reason within 90 days. Nineteen readmitted primary TKAs (19 patients) were studied. A control group was created by matching for age, Charlson Comorbidity Index, BMI, and gender. Preoperative and postoperative patient oriented outcomes [pain intensity/frequency as measured by a visual analogue scale (0-10), QWB-7, SF-36, WOMAC] and knee scores (HSS knee, Knee Society knee/function scores) were compared between both groups using Student's t-test ($\alpha = 0.05$).

Results: Preoperatively, only WOMAC function was significantly different between the readmitted (worse) and non-readmitted groups (mean (SE) 45 (2) vs. 38 (2) points, respectively; $p = 0.02$). Postoperatively, those cases that underwent readmission had significantly worse WOMAC function, pain, and total scores when compared to non-readmitted cases (mean (SE) 6.8 (1.6) vs. 2.5 (0.3), 1.4 (0.5) vs. 0.1 (0.1), and 8.4 (2.1) vs. 2.6 (0.3), respectively; all $p \leq 0.015$).

Conclusion: Our data suggest that being readmitted after primary total knee arthroplasty negatively affects postoperative patient oriented scores in TKA.

POSTER #51

Leaving Residual Varus Alignment after Total Knee Arthroplasty Does Not Improve Patient Pain, Function and Outcomes

Michael Meneghini, MD, Tanner W. Grant, BS, Marshall K. Ishmael, BS, Mary Ziemba-Davis, BA

Introduction: Recent popularity of "kinematic alignment" and "constitutional varus" has caused some surgeons to leave varus limbs in moderate residual varus after total knee arthroplasty (TKA). The hypothesis of this study is patients whose limb was left in residual varus alignment would have improved outcomes compared to those fully corrected to neutral alignment after TKA.

Methods: A retrospective review of consecutive primary TKA's performed with navigation was performed. Anatomic tibiofemoral alignment was measured preoperatively and postoperatively on digital radiographs. Knees were categorized as varus, valgus or neutral based on accepted criteria. Modern Knee Society Scores, EQ5D, walking and stair pain and UCLA activity level were collected at minimum one-year. Statistical multivariate analysis was performed ($p < 0.05$ significant).

Results: 225 consecutive TKA's were included, 8% were lost to follow up, leaving 207 TKAs with clinical follow-up at a mean 24.3 months (range, 9-65). Mean age and BMI was 65.5 years and 34.2, respectively. 66.2% of patients were female. 65% of varus knees were corrected to neutral, 27% left in residual varus and 8% corrected into valgus. KSS objective score at latest follow-up was greater in knees corrected to neutral, compared to those left in residual varus ($p = 0.001$); however, the knees over-corrected to valgus improved the greatest from preoperative levels in KSS objective score ($p = 0.001$). There was no difference between groups in any other outcome measure ($p > 0.02$), nor with respect to the amount of varus correction measured in 2O increments ($p > 0.02$) with numbers available.

Conclusion: This data fails to support the notion that leaving varus knees in some residual varus and avoiding full correction to neutral alignment during TKA will improve outcome measures and pain. Until longer-term follow up is obtained, caution is advised when leaving limbs in residual varus after TKA.

POSTER #52

KT-1000 Analysis of Bicruciate-Retaining Total Knee Arthroplasty

Oliver J. Scotting, MD, Nicholas Frisch, MD, Nima Mehran, MD, Craig Silverton, DO, Christopher L. Peters, MD

Introduction: A functional anterior cruciate ligament (ACL) provides a mechanical restraint and proprioceptive feedback throughout knee range of motion. In an effort to replicate native knee kinematics and stability after total knee arthroplasty (TKA), bicruciate-retaining implants maintain an intact ACL. The purpose of this study is looking at ACL competency after implantation of a TKA in which the cruciate ligaments are preserved.

Methods: Twenty fresh, frozen cadaveric knees with intact ACLs were utilized. Each KT-1000 measurement was repeated three times using three individual examiners. Bicruciate retaining components were implanted into each knee using a medial parapatellar approach. After adequate sagittal and coronal balancing was obtained, the knee was reexamined using the KT-1000 protocol described above to assess for any changes in ACL competency. The ACL was then transected and the knee was examined for a third time with the same KT-1000 protocol. For statistical analysis, a 2-way repeated-measures ANOVA was utilized. Pairwise differences were assessed utilizing Fisher's least significant difference method.

Results: The KT-1000 measurement in millimeters of anterior tibial translation provided the primary data points. The anterior translation before insertion of the components averaged 2.2mm at 67N of force and 3.6mm at 89N of force. After insertion of the components, the anterior tibial translation averaged 3.6mm at 67N of force and 5.0mm at 89N of force. After the ACL was transected, the averaged KT-1000 measurements were 6.8mm at 67N and 9.2mm at 89N of force.

Conclusion: As younger and more active patients, with higher post-operative performance expectations pursue surgical intervention for degenerative knee osteoarthritis, bicruciate-retaining designs have re-emerged as potential alternative to traditional implants. This study demonstrates in a cadaveric model that the biomechanical function of the ACL is preserved in a bicruciate-retaining total knee.

POSTER #53

Is Orthopaedic Department Teaching Status Associated with Adverse Outcomes of Primary Total Knee Arthroplasty?

Dean C. Perfetti, BA, Matthew R. Boylan, MD, MPH, Qais Naziri, MD, Aditya V. Maheshwari, MD, Carl B. Paulino, MD, Michael A. Mont, MD

Introduction: Although resident education is necessary to maintain our healthcare system, it is believed to create potential inefficiencies in the delivery of care. Under the regional pricing component of the Comprehensive Care for Joint Replacement (CJR) model, teaching hospitals will be forced to compete on cost, outcomes and efficiency with non-teaching hospitals. We compared the following outcomes according to hospital type: (1) inpatient complications; (2) costs; and (3) unplanned 90-day readmission.

Methods: A total of 98,669 patients underwent primary total knee arthroplasty (TKA) between January 1, 2009 and September 30, 2012 in the New York Statewide Planning and Research Cooperative System. Perioperative medical and surgical complication categories were created using ICD-9-CM diagnosis codes. Costs were calculated using cost-to-charge ratios. Mixed-effects regression models accounted for hospital clustering and year of surgery and were controlled for demographics and Deyo comorbidity score.

Results: Medical complications were similar at teaching compared to non-teaching hospitals (4.9% vs. 4.7%; p=0.144) and remained insignificant in regression modeling (OR=1.09, p=0.200). Surgical complications were less common at teaching compared to non-teaching hospitals (0.5% vs. 0.8%, p<0.001), remaining borderline significant after regression modeling (OR=0.78, p=0.047). Mean costs were higher at teaching compared to non-teaching hospitals (20,875 vs. 18,500 USD; p<0.001) and this difference remained significant in adjusted models (beta: 12.8%, p<0.001). Rate of unplanned 90-day readmission for patients undergoing TKA at a teaching compared to non-teaching hospital was similar (7.1% vs. 7.4%, p=0.135), with no difference in adjusted models (OR=1.01, p=0.835).

Conclusion: Primary TKA at teaching hospitals is associated with higher costs but slightly decreased surgical complication rates. Therefore, Orthopaedic teaching hospitals may be adversely affected by regional pricing. While indirect medical education payments help defray the costs of inefficiency in US teaching hospitals, administrators and policy makers must ensure that financial incentives for efficiency are not impeding resident education.

POSTER #54

Five-Year Prospective Randomized Study of Knee Arthroplasty: Cruciate-Substituting vs. Posterior-Stabilized

David F. Scott, MD

Introduction: The CS tibial insert provides excellent clinical outcomes that are equal to or better than the PS group, with a shorter operative time, decreased blood loss, and fewer mechanical symptoms. There is no consensus whether a traditional post and cam-style PS total knee device is superior to a highly-congruent device. The purpose of this study was to compare the clinical outcomes and radiographic results obtained with the CS lipped tibial insert and the PS tibial insert.

Methods: 116 subjects ≤ 80 yrs old, with BMI ≤ 40 with osteoarthritis undergoing primary total knee arthroplasty were randomized prospectively to either the CS highly-congruent tibial insert or the PS tibial insert. Assessments occurred preoperatively, and at six weeks, six months, and annually to five years postoperatively. Clinical assessments included the Knee Society Score, SF-36, Lower Extremity Activity Scale (LEAS), radiographic evaluation including alignment, surgical data including blood loss, and adverse events.

Results: No significant differences were found between groups with respect to age at surgery, BMI, gender, Knee Society scores, SF-36 scores, range of motion/alignment, the LEAS score, adverse events, or radiographic findings. The tourniquet time was 5 minutes longer for the PS group, (T-Test, $p < 0.0008$), and there was slightly greater blood loss in the PS group (not significant). The PS group had a 21% rate of experiencing painless clicking, clunking, or catching sensations, vs 11% for the CS group (Chi-Square, $p=0.01$).

Conclusion: The CS knee provides excellent five-year clinical outcomes that are equal to the PS knee. The CS knee also provides the benefit of a shorter operative time, and a trend towards decreased blood loss. This data suggests that the PS knee does not provide better outcomes in cruciate-substituting knee arthroplasty compared to an alternative design, and may decrease efficiency, increase the degree of invasiveness, and produce patient-reported complaints of unnatural mechanical sensations.

POSTER #55

Effect of Body Surface Area on Outcomes after Total Knee Arthroplasty

Tyson C. Christensen, MD, Eric R. Wagner, MD, William S. Harmsen, MS, Cathy D. Schleck, Daniel J. Berry, MD

Introduction: The purpose of this study was to quantify implant survival and other common complications after TKA using BSA as a continuous variable.

Methods: Prospectively collected data from a single institution's total joint registry was used to analyze 22,252 consecutive knees, treated with a primary TKA from 1985-2012. The Mosteller formula was used to calculate BSA. The average BSA at the time of surgery was 2.0 m2 (range, 0.7-3.2 m2). The patient's average age was 68 years at time of surgery, and 56% of patients were female. The Kaplan-Meier survival method was used to evaluate mechanical failure, reoperations, and common complications. Smoothing spline parameterization was used on BSA in these models.

Results: Increasing BSA was associated with an increased risk of revision surgery, reoperation, mechanical failure, and infection after TKA. Revision surgery risk was directly associated with BSA (HR 2.84, $p<0.01$) per 1 unit increase in BSA. This association was especially demonstrated between increasing BSA and revision for mechanical failure (HR 2.75, $p<0.01$). Subgroups of mechanical failure were also associated with increasing BSA, including revision surgery for aseptic loosening (HR 3.91, $p<0.01$) and polyethylene wear (HR 1.96, $p<0.01$). Increasing BSA was also associated with increased risk for reoperation (HR 1.73, $p<0.01$) and infection (HR 2.67, $p<0.01$). There was no correlation between BSA and risk of venous thromboembolism or knee manipulation.

Conclusion: BSA was strongly associated with the rates of revision, reoperation, and many other common complications following total knee arthroplasty. When compared to our previously published data on BMI and outcomes after TKA, BSA appears to correlate more strongly with outcomes. A better linear association and maximum hazard ratio was found for revision for mechanical failure, and specifically for revision for aseptic loosening.

POSTER #56

Intravenous vs. Intraarticular Tranexamic Acid in Total Knee Arthroplasty with No Postoperative Suction Drains: A Randomized Controlled Trial

SM Javad Mortazavi, MD, Babak Sattartabar, MD, Babak Haghpanah, MD

Introduction: Using tranexamic acid(TXA) is becoming a routine practice in total knee arthroplasty(TKA), however, the optimal route of its administration is still unclear. We designed this randomized controlled double blinded trial to compare the effect of intravenous(IV) vs intrarticular(IA) TXA in reducing blood loss in patients undergone TKA without putting suction drainage postoperatively.

Methods: 110 patients were prospectively randomized into two groups: 55 received IA TXA and 55 received IV TXA at the end of TKA and after the closure of the capsule. The perioperative blood loss was calculated using the validated formulae based on the preoperative and postoperative day 3 hemoglobin level. We used aspirin for venous (VTE) prophylaxis and no closed suction drain postoperatively.

Results: No patients in this cohort required blood transfusion. The average blood loss for IV and IA groups was 835(SD, 155) cc and 790m(SD, 173) cc, respectively(p=0.1). The mean hemoglobin drop at day 3 in IV and IA group were -2.5(SD,0.8) and -2.3(SD,1.2), respectively(p=0.12). There were no VTE event in any patients.

Conclusion: IA TXA could be as effective as IV TXA in reducing blood loss following TKA, especially when no suction drains are used postoperatively. Therefore, patients with relative contraindication to use of systemic TXA may still benefit from the local IA.

POSTER #57

How Do Pre-Operative Medications Influence Outcomes in Total Joint Arthroplasty?

Bradley J. Zarling, MD, Jakub Sikora-Klak, MD, Christopher Bergum, BS, David C. Markel, MD

Introduction: Recent changes in reimbursement placed pressure on identifying certain patient parameters that will predict the need for a higher level of care and resources. The purpose of this study was to analyze patient pre-operative medication type and quantity as predictors of outcomes after total joint arthroplasty.

Methods: We reviewed all elective primary total joint arthroplasty (TJA) patients from 2012 through 2015. Data were collected on patient's pre-operative medications within 30 days of surgery. Medications were categorized as: antiplatelet, antimicrobial, anticoagulant, narcotic, steroid, insulin or oral diabetes medication. Outcome measures included: hospital length of stay (LOS), discharge destination and 90-day readmission to our hospital system.

Results: 3959 patients fit out inclusion/exclusion criteria. Eighty percent (3163) of our patients were discharged home after surgery while the remainder (795) went to an extended care facility. TKA and THA patients discharged to an extended care facility (ECF) were taking more medications (1.13 vs 0.80 $p<0.0001$), (1.18 vs 0.83 $P<0.001$). Patients readmitted averaged 1.0 medications while those without a readmission averaged 0.85 ($P<0.01$). Multivariable regression analysis of TKA patients showed an increased frequency of discharge to ECF in patients taking: narcotics, steroids, insulin and oral diabetes medications. Patients taking anticoagulants, narcotics and insulin had a significantly greater readmission rate. In the THA population, narcotics and oral diabetes medications again were predictors of discharge to ECF and antiplatelet users showed significantly more readmissions. Liner regression showed a significant correlation between the number of pre-op medications and an increased LOS.

Conclusion: Patients taking more preoperative medications were discharged to an extended care facility more frequently after THA or TKA and showed an increased readmission rate. Length of stay was correlated with increased number of medications. Number and type of pre-operative medications can be used as predictors of outcome after arthroplasty surgery.

POSTER #58

Proximalization of the Tibial Tubercle Osteotomy: A Solution for Patella Infera during Revision Total Knee Arthroplasty

Alex DeHaan, MD, Min Lu, MD, Erik Hansen, MD, Sanjai Shukla, MD, Martin Anderson, MD, Michael Ries, MD

Introduction: Patella infera can occur after total knee arthroplasty (TKA) and contribute to limited knee flexion and anterior knee pain. During revision of a TKA with patella infera, we have used a technique to raise the patellar position by performing a tibial tubercle osteotomy that when repaired, is recessed proximally.

Methods: We performed a retrospective review from 2004-2015 of all patients who underwent a revision TKA with tibial tubercle osteotomy, with an analysis of those whose osteotomy was recessed and secured proximally. A ratio of the distance from the tip of the fibular head to the inferior pole of the patella divided by the length of the patella was used to determine the relative amount of proximalization of the patella. All patients had a minimum of 1 year clinical and radiographic follow-up.

Results: 37 patients (mean age 64.0 +/- 9.4 years, BMI 31.0 +/- 6.1) underwent proximalization of their tibial tubercle osteotomy. The average size of the tibial tubercle osteotomy was 1.6 +/- 0.4cm in maximum thickness by 10.1 +/- 2.0cm in length. The tibial tubercle was recessed 1.2 +/- 0.7cm proximally. The knee range of motion improved from 8.5-80.8 degrees pre-operatively to 1.3-100.6 degrees at minimum 1-year follow-up. The fibular-patellar ratio increased from 0.53 pre-operatively to 0.75 at 6-week follow-up, with slight regression to 0.67 at 1-year follow-up. The distance from the tip of the fibular head to the inferior pole of the patella increased from 2.4cm pre-operatively to 3.4cm at 6 weeks post-operatively, with slight regression to 3.1cm at 1- year follow-up. There were four cases of post-operative avulsion of the proximal aspect of the tibial tubercle osteotomy. In all four cases, the anterior edge of the tibial baseplate impinged against the deep surface of the recessed osteotomy.

Conclusion: Proximalization of the tibial tubercle osteotomy of approximately 1 cm is a relatively safe procedure to treat patella infera during revision TKA, but posterior positioning of the baseplate or removal of prominent bone from the deep surface of the osteotomized bone fragment should be done to minimize risk of tibial tubercle avulsion.

POSTER #59

Significant Damage of Modular Junctions is Commonly Seen in TKR Retrievals

Philip Noble, PhD, David Doherty, MD, Hugh Jones, BE,
Jacquelynn Gonzalez, BS, Kenneth Mathis, MD

Introduction: Modularity of total knee systems is common, and recognition of modular junctions as a cause of adverse local tissue reaction (ALTR) has not been fully described. Additionally, junctions can become welded together creating significant hurdles during revision. The present study was undertaken: (i) to examine the level of damage observed in modular junctions of knee prostheses, (ii) to correlate the severity of damage to design and composition, and (iii) to associate patient demographics and comorbidities with the spectrum of corrosion and fretting.

Methods: 117 TKR components were examined from revision procedures performed at a single institution. The retrievals consisted of 57 femoral components and 60 tibial components from a diverse range of manufacturers. The implants were disassembled manually, or by servo-hydraulics if cold welded, and separated into groups based on material type. Modular junctions were then examined using stereomicroscopy (Wild) at magnifications of X6 to X31 and scored by a modified Goldberg scale. Factors associated with trunnions having damage scores of 3 or higher were evaluated using standard statistics to determine the susceptibility for corrosion of each junction type and location.

Results: Approximately 64% were found to have corrosion scores of 3 or higher. Junctions containing titanium alloys were the most susceptible to corrosion with the femoral component being the most prevalent. Scores of 5 were seen in 24% of the CoCr/TiAlV femoral junctions and 27% of the TiAlV/TiAlV tibial junctions. The most severe fretting was seen in TiAlV/TiAlV tibial junctions (73.2%). There was a 15% incidence of cold welding of TiAlV components.

Conclusion: In TKR, modular junctions formed by one or more TiAlV components are the most susceptible to corrosive attack and fretting. Moreover, the most severe corrosion and fretting cases (score of 5 or 4, respectively) were only seen in the presence of a TiAlV component.

POSTER #60

Survivorship of Metaphyseal Sleeves in Revision Total Knee Arthroplasty

Brian P. Chalmers, MD, Nicholas Desy, MD, Robert T. Trousdale, MD, Mark W. Pagnano, MD, Michael J. Taunton, MD

Introduction: Metaphyseal fixation has promising early results in revision total knee arthroplasty (TKA). However, there are limited studies on mid-term results of metaphyseal sleeves to augment fixation or address bone loss. We analyzed perioperative complications, re-revisions, and survivorship free of revision for aseptic loosening of metaphyseal sleeves in revision TKA.

Methods: Two hundred and eighty patients with 393 metaphyseal sleeves (144 femoral, 249 tibial) implanted during revision TKA from 2006 to 2014 were reviewed. Sleeves were most commonly cemented (55% femoral, 72% tibial). Mean follow-up was 3 years (range, 2-8 years), mean age was 66 years, and mean BMI was 35 kg/ m2. Indications for revision TKA included: reimplantation from a two-stage revision for prosthetic joint infection (PJI) (37%), aseptic loosening (35%), and instability (14%).

Results: In the perioperative period, there was a 12% rate of complications, most commonly intraoperative fracture during component insertion (6.5%). During follow-up, only 8 (2.5%) sleeves required removal: six (2%) during component resection for deep PJI (all were well fixed at time of removal) as well as one (0.8%) femoral sleeve and one (0.8%) tibial sleeve for aseptic loosening. The 5-year survivorship free of revision for aseptic loosening was 96% and 99.5% for femoral and tibial sleeves, respectively. Level of constraint, bone loss, sleeve and/or stem fixation, and revision indication did not significantly affect outcomes.

Conclusion: Metaphyseal sleeve fixation during revision TKA has a 5-year survivorship free of revision for aseptic loosening of 96% and 99.5% in femoral and tibial sleeves, respectively. Both cemented and cementless sleeve fixation provides reliable durability at intermediate follow-up. Metaphyseal sleeves provide durable fixation at mid-term follow-up with a 5-year survivorship free of revision for aseptic loosening of 96% and 99.5% in femoral and tibial sleeves, respectively.

POSTER #61

Mid-Term Results of Tibial Metaphyseal Sleeves Used in Revision Total Knee Arthroplasty for Aseptic Loosening in Obese Patients

Timothy S. Brown, MD, Craig M. Birch, MD, Matthew R. Landrum, MD, Richard E. Jones, MD, Michael H. Huo, MD

Introduction: Aseptic loosening remains the most common diagnosis for patients undergoing revision total knee arthroplasty (RTKA), and obese patients are at increased risk. These patients represent a clinical challenge as initial fixation was lost and tibial bone loss can create future fixation issues after RTKA. Metaphyseal sleeves are designed to address fixation issues, and we hypothesized that use of a tibial metaphyseal sleeve to improve fixation at time of revision surgery would provide good clinical outcomes in this patient population.

Methods: After local IRB approval, we retrospectively reviewed billing data from January 1, 2008 to July 31, 2011 to identify patients. Those included in the study had a preoperative BMI > 30 kg/m2, preoperative diagnosis of aspetic loosening, and underwent revision TKA using a revision implant with MBT tibial tray, tibial metaphyseal sleeve, and a rotating platform TC-3 polyethylene (DePuy, Warsaw, IN). We excluded those with less than one-year follow-up. The electronic medical record was reviewed for each patient. Statistical analysis was performed using the student's t-test in Excel software (Microsoft, Seattle, WA).

Results: We identified 17 TKA in 16 patients that met inclusion criteria. The majority of the patients were female (10/16, 62.5%). The average age was 61.3 years. The average BMI was 36.4 kg/m2 (range 30 -49.8 kg/m2). Mean follow-up was 57.5 months. There were statistically significant improvements in Knee Society score (57.8 to 83.2, $p<0.001$) and Knee Society Functional score (64.7 to 84, $p<0.001$). Although the overall reoperation rate was 23.5%, implant survival from all-cause revision was 100% at mean follow-up and there were no cases of early loosening.

Conclusion: Tibial metaphyseal sleeve implantation in revision TKA for aseptic loosening offers improved fixation and good mid-term results in an obese patient population. More follow-up is necessary to determine long-term outcomes.

POSTER #62

Regional vs. General Anesthesia in Revision Knee Arthroplasty Patients: A Risk-Stratified, Propensity-Matched Analysis

Benjamin D. Boodaie, BS, Aakash Keswani, BA, Alex Sher, BA,
Dong-Han Yao, BA, Chirag Shah, BA, Karl Koenig, MD, MS, Calin S. Moucha, MD

Introduction: The purpose of our study was to use a large, nationally-representative database to perform a propensity-matched comparison of 30-day clinical outcomes between general (GA) versus regional anesthesia (RA) in revision knee arthroplasty (RKA) patients. We also developed a risk stratification approach for identifying which subgroup of patients, if any, would benefit most from RA over GA.

Methods: Patients that underwent RKA from 2011-2014 were identified in the American College of Surgeon's National Surgical Quality Improvement Program (NSQIP) database. Propensity scores were calculated and used to create a 1:1 match between RA and GA RKA patients, giving two cohorts with similar preoperative and demographic variables. Bivariate and multivariate analysis of 30-day clinical outcomes was performed. In subanalysis, we stratified the RKA patient population into four risk groups based on number of significant preoperative risk factors for 30-day complications and performed identical analyses.

Results: After 1:1 propensity matching, two cohorts of 2,793 RA and GA patients were included for analysis. Patients who received GA were younger, more likely to be morbidly obese (BMI>40) and more often had a history of cardiac disease ($p<0.05$ for all; Table 1). Multivariate analysis controlling for patient characteristics, comorbidities, and operative variables showed that GA patients had a 1.25 times odds of suffering a 30-day severe adverse events (SAE) as compared to RA controls ($p=0.04$). When patients were stratified into four groups based on these risk factors, only among those with 4 or more (24%) did GA patients suffer significantly higher rate of 30-day SAE (OR 1.60, $p=0.01$; Table 2).

Conclusion: RA is associated with a lower risk of 30-day SAE among RKA patients. Complication rates in RA vs. GA patients differed most in the highest risk subgroup, indicating that these patients could potentially benefit most from receiving RA when feasible.

POSTER #63

Does the Tibia Component Design Affect the Need for Offset Stems in Revision Total Knee Arthroplasty?

Friedrich Boettner, MD, Tom Schmidt-Braekling, MD, Martin Faschingbauer, MD, Maximilian Kasparek, MD, Xabier Foruna Zarandona, MD

Introduction: The stem/keel location varies between anatomic and symmetric revision tibial baseplates. The current study investigates the impact of an anatomic versus symmetric stem location on the need for offset couplers in revision total knee arthroplasty.

Methods: Hip to ankle standing radiographs and lateral radiographs of 75 patients were analyzed using digital templating software. The offset in the anterior-posterior as well as medial-lateral plane between tibial diaphysis and the stem of the tibial baseplate were determined for an anatomic and symmetric tibial baseplate respectively. Measurements were repeated for four resection levels: tip of fibular head (zero), 10 mm (one), 15 mm (two) and 20 mm (three) below the tip of the fibula head.

Results: Anatomic tibial baseplates require less offset for resection levels up to the tip of the fibula: total offset 2.28mm vs. 5.44 mm ($p<0.001$). However, for defects that result in resection levels below the tip of the fibula symmetric tibial baseplates require less offset: resection level one: 3.18mm vs. 2.4mm ($p=0.008$), two: 4.81mm vs. 1.67mm ($p<0.001$) and resection level three: 1.52mm vs. 5.66mm ($P<0.001$).

Conclusion: The current study suggests that while asymmetric anatomic tibial baseplates have benefits for revisions with minimal bone loss up to the tip of the fibula, symmetric tibial baseplates require less offset when larger bone defects are encountered.

POSTER #64

Mid-Term Results of Revision Total Knee Arthroplasty Using Metaphyseal Sleeves: Minimum 5-Year Follow-Up

Donald L. Pomeroy, MD, Jan Empson, RN, ONC, Jessica S. Olson, BS

Introduction: Finding a fixation technique that provides a stable long-term solution in revision total knee arthroplasty (TKA), continues to be a challenge for orthopaedic surgeons in the face of compromised bone quality.

Methods: This is a continuation of a retrospective chart review study of patients undergoing revision TKA. An IRB approved total joint registry was used to search for patients who had undergone a revision total knee arthroplasty using a metaphyseal sleeve. Patients have regular follow-up clinic visits in which standard radiographs and Knee Society scores were obtained.

Results: There were 125 patients (127 revisions) identified between October 2007 and November 2011. Six implants were removed for infection prior to 5-year follow-up. Two patients expired prior to 5 years. Seventy-five patients were lost to follow-up prior to their 5 years. This leaves us with a total of 52 revision cases in the study. The average age of these patients was 67 years, with an average BMI of 33. There were 30 female patients and 22 male patients. Two patients had removals due to infection after 5 years. The average pre-operative, 5-year, and final function scores were 43.7, 77.4, and 79.5 respectively. One patient was revised for aseptic loosening of the metaphyseal sleeve. Revision was identified as the endpoint of this study.

Conclusion: In conjunction with the previously reported early results study, this further supports that cementless sleeves provide stable fixation over short-term and mid-term, regardless of tibial bone defects.

POSTER #65

Effect of Modular Stem Size and Fixation Method on Mechanical Failure after Revision TKA

Andrew Fleischman, MD, Ibrahim Azboy, MD, Michael Fuery, BS, Camilo Restrepo, MD, Hongyi Shao, MD, Javad Parvizi, MD, FRCS

Introduction: Studies have advocated use of both fully cemented and long diaphyseal-engaging stems. The goal of this study was to evaluate mechanical failure of revision TKA based upon stem fixation method and stem size.

Methods: We retrospectively reviewed the records of 532 revision TKA from 2003-2013. Cases using at least one stemmed component not previously reamed and with 2-year follow-up or failure prior to 2 years were included. Based on area of an ellipse, three-dimensional canal-filling ratio (CFR) was determined as the product of CFR at the stem tip in both AP and lateral planes. Radiographic failure assessment performed by two surgeons included simplified Knee Society radiographic scores. The primary endpoint, aseptic mechanical failure, was defined as either clinical failure or radiographic failure with a history of persistent symptoms. Statistical analyses were performed using a survival regression accounting for competing risk.

Results: Of 470 stems (236 femur and 234 tibia) at a mean 62.9 months follow-up, 125 were cemented with a mean length of 87.2mm and CFR of 34.7%, whereas 345 were uncemented with a mean length of 94.6mm and CFR of 53.4%. Patients receiving cemented stems were older and more commonly female. The rate of mechanical failure was 4.3% (2.3% clinical and 1.9% radiographic), which was similar for the femur and tibia (p=0.82). Fixation method (5.0% cemented vs. 4.2% uncemented; p=0.29) and stem length (p=0.75) did not impact mechanical survivorship, though increasing CFR reduced risk for mechanical failure (p=0.073). The influence of CFR was limited to uncemented stems and pronounced for the tibia (p=0.0009). Odds of failure were 5.9-fold higher for uncemented stems with CFR below 60%. Age was highly associated with a reduction in mechanical failure of cemented stems (p=0.0002); odds of failure increased 6.5-fold for patient less than 60.

Conclusion: Cemented and uncemented stems have equivalent survivorship following revision TKA. Surgeons should attempt to maximize CFR of uncemented stems. Additionally, cemented stems should be avoided whenever possible in patients younger than 60.

POSTER #66

Optimizing Mechanical Alignment with Modular Stems in Revision Total Knee Arthroplasty

Andrew Fleischman, MD, Ibrahim Azboy, MD, Camilo Restrepo, MD, Mitchell G. Maltenfort, PhD, Javad Parvizi, MD, FRCS

Introduction: Modular stems help achieve stable fixation and proper alignment in revision total knee arthroplasty (TKA). The purpose of this study was to evaluate the effect of stem size and fixation method on mechanical alignment.

Methods: We retrospectively reviewed the records of 246 patients that underwent stemmed revision of at least one TKA component that had not been previously revised and with a minimum 2-year follow-up or failure prior to 2 years. Based on area of an ellipse, three-dimensional (3D) canal-filling ratio (CFR) was determined as the product of CFR at the stem tip in both AP and lateral planes. Optimal alignment of the femur was considered to be 95° + 3° in the AP plane and from 1° of extension to 6° of flexion in the lateral plane. Optimal alignment of the tibia was considered to be 90° + 3° in the AP plane and from 0° to 5° of posterior slope in the lateral plane. Statistical analyses were performed using logistic regression.

Results: Mean AP alignment of 234 stemmed femurs was 95.0° with 17.1% of components outside of optimal alignment. Mean lateral alignment of the femoral component was 2.1° of flexion with 12.4% of components malaligned. Of 232 stemmed tibiae, mean AP alignment was 89.2° with 9.5% of components not optimally aligned. The mean tibial slope was 2.7° posterior with 12.5% considered malaligned. Even after accounting for stem length and CFR, malalignment in the AP plane had the strongest correlation with cemented fixation ($p=<0.0001$). Adjusted odds for AP malalignment were 5-fold higher with cemented stems (95% CI, 2.6-9.9). Increasing CFR of femoral and tibial uncemented stems had a strong association with a reduced risk for lateral malalignment ($p=0.0003$ and $p=0.0002$).

Conclusion: While cemented and uncemented stems have both been used successfully in revision TKA, optimal AP alignment is achieved more reliably with uncemented stems. Uncemented stems that maximize canal fill may also improve alignment, particularly along the less confined lateral plane.

POSTER #67

Dismal Reconstructive Outcomes of Concomitant Periprosthetic Joint Infection and Extensor Mechanism Disruption

Lucas A. Anderson, MD, Brian M. Culp, MD, Craig J. Della Valle, MD, Jeremy M. Gililland, MD, R. Michael Meneghini, MD, James A. Brown, MD, Bryan D Springer, MD

Introduction: Patients presenting with chronic periprosthetic infection (PJI) and extensor mechanism disruption (EMD) pose significant challenges. Historically arthrodesis was favored over allograft reconstruction due to infection risk but poor patient satisfaction with arthrodesis has promoted a resurgence of extensor mechanism reconstruction (EMR). There is little in the literature regarding patients with concomitant PJI and EMD, we proposed a multicenter study to evaluate treatment outcomes.

Methods: We performed a multi-center retrospective review of 55 patients diagnosed with periprosthetic joint infection and extensor mechanism disruption. Outcomes analyzed included presentation type, surgical management (i.e., two-stage exchange with EMR, arthrodesis, amputation) and outcomes including reoperation, recurrent infections, final surgery and ambulatory status. Presentation of PJI in relation to EMD were classified into the following groups: Group A: EMD occurred first and then PJI; Group B: Concurrent EMD and PJI; Group C: PJI first and then EMD thereafter.

Results: 54 patients (17 men) met the inclusion criteria. Mean age was 66.5 years and mean BMI was 33. Regarding presentation, 28 were from Group A, 14 in Group B and 12 were in Group C. Fusion was the final surgical outcome in 31 patients, 7 patients had an above knee amputation, and 13 patients had a successful retention or replant of implants and EMR. An additional 3 patients had a chronic spacer without EMR +/- brace. On average patients underwent 5.2 surgeries between primary TKA and final surgery (range 1-14). There is 1 death in the cohort. 15 patients are non-ambulators, 13 are homebound ambulators, and 26 are community ambulators (23/26 use walking aide).

Conclusion: Our study demonstrates that concomitant EMD and PJI is a dreaded combination with dismal outcomes regardless of treatment. Attempted retention with EMR almost frequently failed and often postponed the final surgery, which was either above the knee amputation or fusion in the vast majority of cases.

POSTER #68

High Revision Rate of the Rejuvenate Modular Neck Femoral Stem at 3-5 Years Follow-Up

Morteza Meftah, MD, Derek T. Bernstein, MD, Stephen J. Incavo, MD

Introduction: We previously reported a 28% short-term corrosion-related revision rate of recalled Rejuvenate modular stem. The purpose of this study was to assess the mid-term clinical results and survivorship of this implant.

Methods: Between June 2009 and July 2012, 73 total hip arthroplasty (THA) in 63 patients with the Rejuvenate modular neck implant were performed by a single surgeon and prospectively followed. Average age was 63.2 ± 12.6 years (28 to 86). Elevated metal ion (= 2 µg/L), pain, or positive MRI findings were indication for revision surgery. Correlation between patient factors with serum metal ion levels and revisions were analyzed.

Results: At an average follow-up of 4.2 ± 0.6 years (3.0 to 5.5), 57 hips (48 patients, 78%) were revised at mean of 3.2 ± 1 years (1 to 5.5); and 6 other have been scheduled for surgery. The Kaplan-Meier survivorship was 22% at 5.5 years. Visible corrosion was seen at the trunion-stem junction in each revision case. 51 of 57 hips undergoing revision (89%), had elevated preoperative serum Co levels, 24 (42%) had elevated preoperative Cr. The average serum Co and Cr ion levels prior to revision surgery were 10 ± 8 µg/L (0.3 to 40) and 2.3 ± 1.5 µg/L (1 to 7.4), respectively. There was a significant correlation between revision surgery and younger age (p=0.0137). 52 hips underwent MRI evaluation, 22 hips (42%) had positive findings correlated to pain (p=0.025): 11 hips demonstrated adverse local soft tissue reactions such as fluid collection, capsular thickening, osteolysis, or synovitis, and 11 hips showed evidence of pseudotumour.

Conclusion: At mid-term follow-up, 86% of the Rejuvenated modular neck stems have been revised or awaiting revision. Given these findings, all patients with a Rejuvenate modular neck stem implant should be followed closely and advised of impending failure.

POSTER #69

Dislocation of Primary Total Hip Arthroplasty is More Common in Patients with Lumbar Spinal Fusion

Jonathan M. Vigdorchik, MD, Aaron J. Buckland, MD, Ran Schwarzkopf, MD, Varun Puvanesaraj, MD

Introduction: Lumbar fusion is known to reduce the variation in pelvic tilt between standing and sitting by reducing flexibility of the lumbar spine. Flexibility of the lumbo-pelvic segment theoretically improves stability of a hip replacement during sitting by increasing anterior clearance and acetabular anteversion, thus preventing prosthetic impingement. The effect of lumbar fusion on stability of THA has not been previously investigated.

Methods: Medicare database was searched from 2005 to 2012 for patients who underwent THA and spinal fusion. PearlDiver software was used to query the database by ICD-9 procedural code for primary THA and lumbar spinal fusion. The lumbar fusion and THA patients were then divided into three groups - 1-2 levels fused, 3-7 levels, and 8+ levels. THA dislocation rates were searched within each group. Patients undergoing THA but no spinal fusion were used as the control group. Statistical significant difference between groups was tested with chi-squared test, and significance at $p<0.05$.

Results: 2912 patients were identified to have THA after lumbar spinal fusion (2420 1-2 level, 476 3-7 level) and 2-year follow-up. The control group of THA patients with no history of spinal fusion consisted of 839,004 patients. The dislocation rate in the control group was 1.55%. Higher dislocation rates were found in patients with spinal fusion of 1-2 levels (2.73%, $p<0.0001$), 3-7 levels (4.62%, $p<0.0001$). Patients with 3-7 levels fused had higher dislocation rates than patients with 1-2 levels fused ($p<0.0001$).

Conclusion: Patients with a previous history of lumbar spinal fusion have significantly higher rates of dislocation of their THA than patients without lumbar spinal fusions, and longer fusion segments also had higher dislocation rates.

POSTER #70

Risk of Total Hip Arthroplasty Dislocation after Adult Spinal Deformity Correction

Jonathan M. Vigdorchik, MD, Ran Schwarzkopf, MD, Aaron J. Buckland, MD, Virginie Lafage, PhD

Introduction: Adult spinal deformity correction results in changes in acetabular anteversion. Spinopelvic fusion reduces the protective motion of the pelvis between sitting and standing to prevent THA dislocation. Our hypothesis is that spinal deformity correction may result in dislocation of previously stable THA due to changes in acetabular orientation and fixation to the pelvis.

Methods: Patients with previously implanted THA were identified from a prospective database of spinal realignment patients if they had a THA in situ prior to spinal surgery. Only patients with at least 6 months' postoperative follow-up and visible THA prostheses were included. All postoperative imaging was reviewed. A chart review was performed to determine the indication for revision THA. Acetabular orientation and global/regional spinopelvic parameter were measured pre- and post- spinal deformity correction.

Results: 42 patients met criteria. 27 of these patients underwent a 3-column osteotomy. Four patients (7.2% of patients - 5.7% hips) required revision THA after spinal realignment procedure: all revisions were for recurrent dislocations. All had stable THAs prior to spinal realignment. All acetabular components were within Lewinnek's 'safe zone' after ASD correction. There was no difference between the revised and non-revised group in mean anteversion or inclination. All hips requiring revision were fused to the pelvis as part of their SSD correction.

Conclusion: Dislocation of a previously stable THA is a potential complication after ASD correction. Instability may be a result of a combination of change in alignment of the acetabular prosthesis, as well as reduced spinopelvic motion from spinopelvic fusion.

POSTER #71

Multi-Surgeon Assessment of THA Head-Trunnion Assembly Forces Using a Surgical Simulator

Darrin J. Trask, MD, Patrick Roney, BS, Matthew Nies, MD,
Matthew Squire, MD, MS

Introduction: Total hip arthroplasty (THA) failures due to adverse local tissue reaction (ALTR) or gross mechanical failure at the femoral head-trunnion junction are being increasingly reported. Failures can occur with ceramic or metallic heads and are not limited to specific implant types or patient groups. Surgeons are responsible for intraoperative coupling of the head -trunnion junction. If it is not coupled with enough force (≥4kN), unintended motion can occur between head and trunnion which then increases the potential for subsequent ALTR and/or gross mechanical failure. We developed three hypotheses: 1) all surgeons strike a metallic head with at least one mallet blow producing ≥4kN effective coupling force, 2) all surgeons strike a ceramic head with at least one mallet blow producing ≥4kN effective coupling force, and 3) surgeons strike metallic and ceramic heads with similar force.

Methods: A surgical simulator capable of measuring forces acting along the central femoral head bore -trunnion axis was constructed. 55 surgeons were recruited and followed a standardized simulation protocol. Surgeons were instructed to choose from five different mallets the mallet that most closely resembled their surgical mallet and to strike the simulator in a manner identical to their intraoperative head -trunnion joining routine for 36mm metallic and ceramic femoral heads.

Results: 25.9% of surgeons applied at least one mallet blow producing an effective coupling force ≥4kN for metallic heads. 16.4% of surgeons applied at least one mallet blow producing an effective coupling force of ≥4kN for ceramic heads. During the simulation, surgeons applied significantly more force to metallic (3.06kN) heads as compared to ceramic (2.62kN) heads ($p<0.001$).

Conclusion: This investigation indicates most THA surgeons do not apply enough force to optimally couple metallic or ceramic heads to the trunnion. Improved surgical coupling of this junction could decrease the incidence of trunnion related THA failure.

POSTER #72

Preoperative Fluid Administration in Total Joint Arthroplasty Patients Limits Anesthesia Interventions: A Randomized, Controlled, Blinded Study

Matthew J. Dietz, MD, Jonathan M. Karnes, MD, Victor E. Greco, BS, Jennifer L. Eicher, BS, Eric J. Lindstrom, CRNA, Ahmed F. Attaallah, MD

Introduction: Fasting preoperatively has recently been questioned due to concern that patients are dehydrated. Empiric treatment with a bolus of fluid preoperatively is practiced at many institutions. We performed a randomized, controlled, blinded study examining the impact of preoperative fluid administration and its role in intraoperative hemodynamic stability, time to discharge and complications.

Methods: Patients undergoing elective total joint arthroplasty were prospectively enrolled and randomized to receive 2L of Lactated Ringers preoperatively and were blinded to fluid administration as were the surgeon and anesthesia team. Patients were monitored intraoperatively using an infrared monitoring device to which the anesthesia team and surgeon were blinded. This device recorded hemodynamic variables. The number and type of anesthesia intraoperative interventions to maintain blood pressure, postoperative nausea and vomiting (PONV) until discharge, time to discharge, pre- and postoperative labs and postoperative complications were recorded. Evaluations were made using two-tailed student's t-test and Fisher's exact test.

Results: Eighteen subjects received preoperative fluids; 28 control patients received the standard of care. There were significantly more interventions by the anesthesia team in the control group [5.6 (95% CI 4.3-6.9) vs. 3.2 (95% CI 1.8-4.6)] $p = 0.01$. There was more hemodynamic variability in the control group with more episodes varying 10% from the baseline mean arterial pressure, Root mean squared (2.45 vs 1.6) $p = 0.03$. The experimental group demonstrated no significant change in pre- and postoperative labs compared to the controls. There was no difference in PONV, length of stay (LOS) or complications.

Conclusion: The empiric administration of preoperative fluids decreased hemodynamic variability and the number of anesthesia interventions but had no significant effect on PONV, LOS or complications. Routine administration of fluid limits anesthesia interventions and decreases hemodynamic variability. There do not appear to be any adverse effects from this low cost intervention.

POSTER #73

Total Hip Arthroplasty in the Spinal Deformity Population: How Does Deformity Impact Hip Stability?

Ran Schwarzkopf, MD, MSc, Jonathan Vigdorchik, MD, Aaron Buckland, MD, Edward Del Sole, MD, Thomas Errico, MD

Introduction: Spinal deformity has a known deleterious effect upon the outcomes of total hip arthroplasty and acetabular component positioning. This study sought to evaluate the relationship between severity of spinal deformity parameters and acetabular cup position, rate of dislocation, and rate of revision among patients with total hip arthroplasties and concomitant spinal deformity.

Methods: A prospectively collected database of patients with spinal deformity was reviewed and patients with total hip arthroplasty were identified. The full body standing stereoradiographic images (EOS) were reviewed for each patient. From these images, spinal deformity parameters and acetabular cup anteversion and inclination were measured. A chart review was performed on all patients to determine dislocation and revision arthroplasty events. Statistical analysis was performed to determine correlation of deformity with acetabular cup position. Subgroup analysis was performed for patients with spinal fusion, dislocation events, and revision THA.

Results: One-hundred and seven spinal deformity patients were identified, with 139 hips for analysis. The rate of THA dislocation in this cohort was 8.0%, with a revision rate of 5.8% for instability. Patients who sustained dislocations had significantly higher spinopelvic tilt, T1-pelvic angle, and mismatch of lumbar lordosis and pelvic incidence. Among all patients, only 68.8% met the radiographic “safe zone” for anteversion in the standing position.

Conclusion: In this cohort, patients with THA and concomitant spinal deformity have a particularly high rate of dislocation. This dislocation risk may be driven by the degree of spinal deformity and by spinopelvic compensation, which is suggested by our findings. Arthroplasty surgeons should be aware of the elevated dislocation rate and consider a surgical strategy for improved stabilization in this population.

POSTER #74

Fixation Using Alternative Implants for the Treatment of Hip Fractures: A Large, Blinded, International Multi-Centre Randomized Trial

F.A.I.T.H. Investigators, MD, Emil Schemitsch, MD, FRCSC

Introduction: Worldwide, 4.5 million persons are disabled from hip fractures yearly with an expected increase to 21 million persons living with disability in the next 40 years. The optimal fracture fixation technique for low energy femoral neck fractures remains controversial. A lack of consensus regarding the optimal approach for fixation of femoral neck fractures fueled the design and execution of the [BLINDED] randomized controlled trial. [BLINDED] evaluated the impact of cancellous screw fixation versus sliding hip screws on rates of revision surgery at 24 months in individuals with femoral neck fractures.

Methods: [BLINDED] was a large, blinded randomized trial enrolling patients across 81 centers with displaced and undisplaced femoral neck fractures requiring internal fixation. Participants were randomized to one of two fixation strategies. The first strategy involved fixation of the fracture with multiple small diameter cancellous screws (i.e., cancellous screw group). The second treatment strategy involved fixation of the fracture with a single larger diameter screw with a sideplate (i.e., sliding hip screw group). The primary outcome was revision surgery within 2 years of the initial surgery. Patients and data analysts were blinded to the treatment groups.

Results: 1,111 participants were enrolled into the [BLINDED] trial over a 6-year period from 2008 to 2014 at 81 clinical sites in the United States, Canada, Australia, the Netherlands, Norway, and India. The [BLINDED] results will be released at the meeting.

Conclusion: This study represents major international efforts to definitively resolve the treatment of low-energy femoral neck fractures. The rigor of the [BLINDED] trial, and its size, ensures that, given the current variability in use of internal fixation methods of femoral neck fracture, the results will change practice in the management of these challenging fractures.

POSTER #75

Radiographic Predictors of Loose Wedge Tapered Cementless Femoral Stems

Derek Ward, MD, Hongyi Shao, MD, Hamed Vahedi, MD,William Hozack, MD, Javad Parvizi, MD, FRCS

Introduction: Aseptic loosening is a common cause for failure in total hip arthroplasty (THA), however the diagnosis remains challenging. No study has examined radiographic signs of loosening in wedge tapered, proximally coated, cementless (WTC) stems. The purpose of this study was to investigate signs predictive of loosening for this commonly used implant.

Methods: We conducted a retrospective review of patients undergoing revision THA. Demographics (age, gender, BMI) and co-morbidities were examined. Patients were included if they had undergone a prior THA using a WTC stem, had adequate AP and lateral radiographs, and the fixation status of the femoral stem at the time of revision was clearly stated. When available, older radiographs were used to determine migration of the femoral stem. Three orthopaedic surgeons assessed radiographs for implant migration > 2mm, endosteal spot welds, proximal or distal reactive lines, pedestal formation, calcar hypertrophy, calcar atrophy, tripoint contact (lateral) and radiolucency along Gruen Zones. Reviewers were blinded regarding operative findings.

Results: Out of 1,346 revisions, 52 patients with loose stems met inclusion criteria and were compared to 43 patients with well-fixed stems. There was no difference in demographic variables or co-morbidities. Patients with loose femoral stems were significantly more likely to have implant migration (59.3% vs 0%, $p<0.001$), proximal reactive lines (65.4% vs 2.3%, $p<0.001$), distal reactive lines (42.3% vs 9.3%, $p<0.001$), pedestal formation (57.7% vs 4.7%, $p<0.001$), radiolucency along Gruen zones corresponding to the proximal coated area of the implant on the AP (90.4% vs 7%, $p<0.001$), lateral (90.4% vs 14%, $p<0.001$) and both AP and Lateral (88.5% vs 2.3%, $p<0.001$). Radiolucency in proximal Gruen zones on both the AP and lateral was both commonly present in (88.5%) and highly predictive of femoral stem loosening (97.9%, CI 88.7-99.9%, $p<0.001$).

Conclusion: Implant migration and proximaly lucency on both AP and lateral radiographs around the metaphyseal engaging area of WTC femoral stems are clear signs of loosening.

POSTER #76

Co-Infection with Hepatitis C and HIV in Total Hip Arthroplasty: An Incremental Effect of Disease Burden

Ran Schwarzkopf, MD MSc, Siddharth Mahure, MD, Jonathan Vigdorchik, MD, Richard Iorio, MD, Joseph Bosco, MD, James Slover, MD MSc

Introduction: Individuals co-infected with both Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) represent a unique and growing population of patients undergoing orthopaedic surgical procedures. Data regarding complications for HCV monoinfection or HIV monoinfection is robust, but there exists a paucity of data regarding co-infected individuals.

Methods: New York Statewide Planning and Research Cooperative System (SPARCS) database was used to identify patients undergoing total hip arthroplasty (THA) between 2010 and 2014. Patients were stratified into four groups based upon HCV/HIV status: healthy controls without disease, HCV monoinfection, HIV monoinfection, and co-infection. Differences regarding hospital LOS (days), total charges in United States Dollars ($USD), discharge disposition, in-hospital complications, in-hospital mortality, and 90-day hospital readmission were calculated.

Results: 80,722 patients underwent THA between 2010 and 2014. 98.55% of patients had neither HCV nor HIV, 0.66% had HCV monoinfection, 0.66% HIV monoinfection and 0.13% were co-infected with both HCV and HIV. Co-infected patients were more likely to be younger, male, insured by Medicaid, have a history of avascular necrosis, and be homeless. Additionally, co-infected patients had the highest rates of alcohol abuse, drug abuse, tobacco use, along with high rates of psychiatric disorders, including depression. HCV and HIV co-infection was an independent risk factor for increased LOS (OR 1.97, 1.29 -3.01, $p<0.001$) and total hospital charges in the 90th percentile (OR 1.83, 1.14 -3.02, $p<0.001$), having 2 or more in-hospital complications (OR 1.64, 1.01 -2.67, $p<0.001$), and 90-day readmission rates (OR 2.97, 1.86 -4.77, $p<0.001$).

Conclusion: As the prevalence of HCV and HIV co-infectivity continues to increase, orthopaedic surgeons will encounter a greater number of these patients. Awareness of the demographic and socioeconomic factors leading to increased complications after THA will allow physicians to consider interventions to improve patient health status in order to optimize outcomes and reduce costs.

POSTER #77

Direct Anterior Hip Replacement Does Not Pose Undue Radiation Exposure Risk

David C. McNabb, MD, Jason M. Jennings, MD, DPT, Daniel L. Levy, BS, Todd M. Miner, MD, Charlie C. Yang, MD, Douglas A. Dennis, MD, Raymond H. Kim, MD

Introduction: Fluoroscopic assisted direct anterior approach (DAA) total hip arthroplasty (THA) has gained interest in recent years. One of the perceived advantages is the use of fluoroscopy to aid in positioning of the acetabular component. The purpose of this study was to measure the radiation entrance surface dose (ESD) to anatomically important areas of both patients and surgeons during DAA THA.

Methods: Radiation dosimetry badges were placed at the sternal notch and pubic symphysis of 50 patients undergoing total hip arthroplasty via the anterior approach. Badges were also placed on the surgeon outside of their lead aprons at the level of the thyroid. Three surgeons were involved in the study. Radiation exposure of each badge was measured.

Results: One patient had a thyroid exposure detected equal to 1mrem. Nine patients had a detectable level of ESD at the pubic symphysis (range 1-7 mrem). Forty-nine and 41 patients had levels not detectable at the thyroid and pubic symphysis respectively. Surgeons did not experience a detectable radiation ESD at their thyroid level. Average fluoroscopic time was 13.76 sec. Average radiation exposure was 178 mrem.

Conclusion: Our study demonstrates that during DAA THA the average patient (ESD) at the level of the thyroid or pubic symphysis is not detectable in most patients. This is the first study we know of that addresses patient and surgeon absorbed radiation rather than only measuring radiation exposure during DAA. The average exposure during DAA THA is 178 mrem which is much less than that of a single pelvic x-ray (600mrem). None of the surgeons in our study demonstrated a detectable ESD. Our data suggest that DAA THA typically introduces negligible or very low dose of absorbed radiation exposure to the patient and the surgeon.

POSTER #78

A Perioperative Patient Management Support System was Unable to Mitigate the Risk of Hospital Readmission for THA Patients with High ASA Grades

Paul Edwards, MD, Cale Jacobs, PhD, Kristie Hadden, PhD,
C. Lowry Barnes, MD

Introduction: Age, race, socioeconomic status (SES), and the number of systemic comorbidities have been individually identified as factors related to increased risk of hospital readmissions following primary THA. However, utilization of a patient management support system in our clinical pathway has been successfully demonstrated to both reduce the length of hospital stay after primary THA, as well as reducing the number of hospital readmissions. While successful in a general patient population, the ability of a patient management support system to reduce readmissions in subsets of "high risk" THA patients has not been evaluated.

Methods: We identified all primary THAs performed at a single institution between 2013 and 2015. Patient sex, age at the time of surgery, race, ASA grade, and 120-day readmissions were retrieved from the patient's medical record. A binary regression was used to determine if a model of patient factors (age, sex, race, SES, and/or ASA grade) could accurately predict 120-day readmission after primary THA, and the individual effects of each categorical factor on readmissions were also assessed.

Results: From the identified sample of 878 primary THAs, a model containing age, sex, race, SES, and ASA grade was unable to accurately predict the need for hospital readmission (R2 = 0.02). When assessed individually, the rates of hospital readmission did not differ by sex or race; however, those with ASA grades I or II had significantly lower readmission rates than patients with ASA grades III or IV.

Conclusion: While previously reported to successfully reduce readmission in a general patient population, the use of a perioperative patient management system appears to have mitigated the risk of readmission previously associated with age, sex, race and SES. However, the risk of readmission for patients with greater comorbidity burdens was double that of patients with low ASA grades. As such, future studies are necessary to determine if additional patient optimization interventions provide cost-effective methods to reduce the risk of hospital readmission in this subset of more complicated patients.

POSTER #79

Discharge to Continued Inpatient Care after Total Hip Arthroplasty is Associated with Increased Post-Discharge Morbidity: A Propensity-Adjusted Cohort Study

Michael C. Fu, MD, MHS, Andre M. Samuel, MD, Peter K. Sculco, MD, Catherine H. MacLean, MD, PhD, Douglas E. Padgett, MD, Alexander S. McLawhorn, MD, MBA

Introduction: Patients are frequently discharged to continued inpatient care settings after elective total hip arthroplasty (THA). The associations between discharge destination and post-discharge outcomes are poorly understood. The purpose of this study was to characterize the 30-day post-discharge outcomes after primary THA relative to discharge destination.

Methods: Primary elective unilateral THA were identified in the American College of Surgeons National Surgical Quality Improvement Program database from 2011-2014. Propensity scores were used to adjust for selection bias in discharge destination. For this study, a propensity score was defined as the conditional probability of being discharged to continued inpatient care based on demographics, obesity class, preoperative functional status, modified Charlson Comorbidity Index (CCI), American Society of Anesthesiologists (ASA) class, and the presence of pre-discharge complications. Propensity-adjusted multivariable logistic regressions were used to examine associations between discharge destination and post-discharge complications, with odds ratios (OR) and 95% confidence intervals (CI).

Results: Among 54,837 THA cases identified, 40,576 were discharged home, and 14,261 were discharged to continued inpatient settings. Patients discharged home were more likely to be male, younger, had lower CCI and ASA scores, received regional anesthesia, functionally independent, and less likely to have pre-discharge complications. Propensity adjustment accounted for this selection bias with propensity-adjusted p values all > 0.05. Multivariable propensity-adjusted logistic regressions showed that patients discharged to continued inpatient care were more likely to have any post-discharge complication (OR 1.52, 95% CI 1.37-1.69) or any major complication (OR 1.64, 95% CI 1.46-1.85). Specifically, there were increased risks for septic complications, death, venous thromboembolism, readmission, wound complications, respiratory complications, and urinary complications.

Conclusion: Discharge to continued inpatient care following THA is associated with increased odds of post-discharge morbidity and unplanned readmission, after propensity score adjustment for pre-discharge characteristics. Hospitals should consider devoting resources toward facilitating discharge to home following THA whenever possible.

POSTER #80

Osteonecrosis Increases Transfusion Rate and Readmission after Primary Total Hip Replacement

Francis Lovecchio, MD, John Paul Manalo, MD, Alysen Demzik, BS, Shawn Sahota, MD, Matthew Beal, MD, David Manning, MD

Introduction: Despite some literature indicating that pre-surgical diagnoses may influence risk for complications and readmissions following THA, current risk-adjusted outcomes models do not adjust for pre-surgical diagnosis. The purpose of our study is to compare thirty-day rates of complications, readmissions, and reoperation following THA in patients with and without AVN.

Methods: All 1706 patients who underwent THA for AVN from 2011-2013 were selected from the NSQIP database and matched 1:1 to controls using a predetermined propensity score algorithm. Rates of 30-day medical and surgical complications, readmissions, and reoperations were compared between cohorts. Propensity-score adjusted logistic regression was used to determine independent associations between AVN and outcomes of interest.

Results: Baseline differences between cohorts were successfully eliminated through the propensity match algorithm. Most patients were below 59 years of age (64% AVN vs. 62% non-AVN, p=0.693), and the most common BMI class was 18.5-25 kg/m2 (37% AVN vs. 36% non-AVN, p=0.375). After matching, patients with AVN had a higher rate of medical complications (21.3% vs. 16.6%, p=0.001). Though patients were matched for bleeding disorders, platelets, and hemoglobin, bleeding transfusion was responsible for the difference in medical complications between the two cohorts (20.1% AVN vs. 15.1% non-AVN, p<0.001). Patients with AVN were twice as likely to experience a readmission after THA (OR 2.00, 95% C.I. 1.31-3.07). Surgical complications occurred at similar rates between the two cohorts (1.6% AVN vs. 1.6% non-AVN, p=1.000). Reoperation rates were also comparable (0.7% AVN vs. 0.5% non-AVN, p=0.370).

Conclusion: Patients with AVN are more likely to have readmission and bleeding requiring transfusion following THA. Patients with AVN should be appropriately counseled regarding their risk and the pre-surgical diagnosis of AVN should be included as a risk variable in outcomes models of THA.

POSTER #81

Bone Ingrowth in Retrieved Porous Coated Acetabular Components

Benjamin Ricciardi, MD, Elexis Baral, BS, Myra Trivellas, BS,
Christina Esposito, PhD, Timothy M. Wright, PhD, Douglas E. Padgett, MD

Introduction: Most designs of cementless acetabular components have been successful in THA despite differences in porous coating structure. Components with 2D titanium fiber mesh coating (FM) have demonstrated survivorships up to 97% at 20 years. 3D tantalum porous coatings (TPC) were introduced to improve osseointegration and implant fixation. Animal, clinical, and radiographic studies assessing TPC demonstrated satisfactory outcomes. However, few retrieval studies exist evaluating bone ingrowth into TPC components in humans. We compared bone ingrowth between well-fixed FM and TPC retrieved acetabular shells using backscatter scanning electron microscopy (BSEM).

Methods: 8 FM components were matched to 8 TPC components by patient gender, BMI and age; all were revised for reasons other than loosening and infection. The mean time in-situ was 42 months for TPC and 172 for FM components. Components were cleaned, embedded in PMMA, sectioned, polished, and then examined using BSEM. Cross-sectional slices were analyzed for percent bone ingrowth and depth of ingrowth. Manual segmentation and grayscale thresholding were used to calculate areas of bone, metal, and void-space. Percent bone ingrowth was determined by the area of bone compared to the void-space that had potential for ingrowth.

Results: Average bone ingrowth was 19.2% for FM and 6.9% for TPC components. Ingrowth in FM components was variable, ranging from 2.3% to 71.6%. Conversely, ingrowth seen in TPC cups ranged from 0.4% to 13%. No relation was found between bone ingrowth in the retrievals and the length of time implanted.

Conclusion: TPC retrievals showed a small percent of bone ingrowth. Factors including high coefficient of friction, effective initial fixation, and sufficient bone ongrowth may impact clinical performance. A previous study of post-mortem, well-fixed retrieved FM cups found 12±8% bone ingrowth, similar to our findings. Ongoing analysis will provide further insight into possible regional trends and material ingrowth differences.

POSTER #82

If You Live Alone, there is No Place Like Home after Total Joint Arthroplasty

Andrew N. Fleischman, MD, Matthew S. Austin, MD, James J. Purtill, MD, Javad Parvizi, MD, FRCS, William J. Hozack, MD

Introduction: This prospective study evaluated the safety and efficacy of direct home discharge for TJA patients living alone.

Methods: Data was collected for consecutive patients undergoing primary, unilateral THA or TKA for a 6-month period. Home support for two weeks after discharge was identified; patients were classified as living alone (investigational) or living with others (control). Length of stay, 30-day post-discharge complications, readmissions, ED visits, unscheduled office visits, and reoperations were recorded. Functional outcomes (HOOS/KOOS and SF12) were administered preoperatively, at 1 month, and at 6 months. Visual analog scale (VAS) pain was assessed weekly for the first month and VAS satisfaction evaluated after 3 months. Time off assistive devices, return to driving, and return to work were assessed. Statistical analysis was performed using a linear mixed-effect model.

Results: 638 patients were identified (364 THA and 274 TKA), of which 97.5% THA and 92.3% TKA were discharged directly home after hospitalization. 17.1% of THA and 16.5% of TKA patients were living alone. No significant baseline demographic differences were found. THA and TKA patients living alone did have longer hospitalizations ($p=0.05$ and $p=<0.0001$); 15.1% of patients with support at home and 37.2% of patients living alone were discharged after postoperative day one. There was no significant difference in 30-day complications, readmissions, ED visits, unscheduled office visits, reoperations, functional outcomes, weekly VAS pain, time off assistive walking devices, return to driving, and return to work. At two weeks, more patients with support at home were satisfied with their discharge and would have preferred discharge to home again. However, satisfaction scores had become equivalent at 90-days. With a mean cost of $11,402, inpatient rehab would need to prevent 1.24 readmissions or 15.9 ED visits to be considered cost-effective.

Conclusion: Patients who live alone can expect a safe and effective recovery when discharged directly home after TJA. Extending the initial hospitalization instead of automatically designating patients living alone for discharge to a rehab facility is considerably more cost-effective.

POSTER #83

Survivorship and Complications of Total Hip Arthroplasty in Dwarf Patients

Michael M. Kheir, MD, Timothy L. Tan, MD, Ronuk Modi, BS, Gregory S. Penny, BS, Chilung Chen, MD,Hongyi Shao, MD, Antonia F. Chen, MD, MBA

Introduction: Total hip arthroplasty (THA) is a common procedure for treating bony hip deformities and skeletal dysplasia involved with dwarfism. These surgeries are often more difficult than conventional THA as they require surgeons to address the possibility of malformed joints and poor bone quality, and smaller prostheses may be required. This study aims to investigate if implant survivorship and revision rates vary between dwarf and non-dwarf patients undergoing THA.

Methods: A retrospective case-control study was performed for 102 THAs completed from 1997 to 2014 in patients under the height threshold of 147.32cm. This cohort was matched 1:2 with patients of normal height with respect to age, gender, year of surgery, and Charlson comorbidities. All cases had one year of minimum follow-up. A chart review was performed to identify patient and surgical characteristics, including outcomes. Radiographs were assessed for deformity, loosening, and periprosthetic fractures among other factors.

Results: The 2-, 5-, and 10-year survivorship of THA in dwarfs was 92.9%, 92.9%, and 80.7%, respectively; and 94.4%, 86.4%, and 86.4% for the non-dwarf cohort, respectively (p=0.95). The revision rate was 13.7% in dwarfs compared to 9.3% in controls (p=0.28). Dwarfs demonstrated a trend toward more periprosthetic fractures (OR 3.81, p=0.11) and mechanical wear (OR 3.02, p=0.21).

Conclusion: THA in dwarfs achieves comparable implant survivorship to a non-dwarf population. However, dwarfs demonstrated a trend toward increased periprosthetic fractures and wear-related failures. Surgeons should be cognizant of this potential risk in dwarfs and take morphological differences into account during their surgical planning and technique.

POSTER #84

Higher Patient Expectations Predict Greater Patient Satisfaction and Patient Reported Outcomes in Total Hip Arthroplasty Patients: A Prospective Multi-Center Study

Deeptee Jain, MD, Long-Co Nguyen, BS, Ilya Bendich, MD, MBA, Courland Lewis, MD, James Huddleston, MD, Paul J. Duwelius, MD, Brian Feeley, MD, Kevin J. Bozic, MD, MBA

Introduction: The interaction between patient expectations, patient reported outcome measures (PROMs), and patient satisfaction in patients undergoing THA is not well understood.

Methods: We prospectively evaluated patients who underwent THA across four institutions. Patient demographics were collected. Preoperatively, patients completed the Hospital for Special Surgery Hip Replacement Expectations Survey (HSS-HRES), the SF-12, the UCLA activity score, and the Hip Disability and Osteoarthritis Score (HOOS). Postoperatively at 6 months, patients completed the Hospital for Special Surgery Hip Replacement Fulfillment of Expectations Survey (HSS-HRFES), a satisfaction survey, and the same PROMs. Multivariate regression models were created to predict expectations based on demographics and preoperative PROMs, and then to predict postoperative PROMs, change in PROMs, and satisfaction based on preoperative expectations.

Results: 188 patients were enrolled (age: 64.8 +/- 9.9 years; 47%F, 53%M; education: 0.5% 8th grade or less, 14.1% high school degree, 24.4% some college, 30.4% college degree, 30.4% postgraduate degree; BMI: 28.0 +/- 4.6 kg/m2; 52.4% working, 46.3% not working). At 6 months postoperatively, follow-up rate was 98.9%. Being employed and lower HOOS scores predicted higher HSS-HRES (employment status: B=-6.9 p=0.006; HOOS: B=-0.3, p=0.001). Higher preoperative HSS-HRES predicted higher postoperative absolute UCLA activity, SF-12 PCS, satisfaction, and HSS-HRFES (UCLA activity: B=0.022, p=0.005; SF-12 PCS: B=0.127, p = 0.003; satisfaction: B=0.16, p=0.003; HSS-HRFES: B=0.31, p<0.001). Furthermore, higher preoperative HSS-HRES predicted greater improvement in all PROMs, except SF-12 MCS (UCLA activity: B=0.028, p=0.003; SF-12 PCS: B=0.14, p = 0.01; HOOS B=0.28; p=0.001).

Conclusion: In patients undergoing THA, being employed and worse preoperative hip function are predictive of higher preoperative expectations of surgery. Higher expectations predict greater absolute postoperative general physical health and activity, as well as greater improvement in physical health, activity and hip function, greater patient satisfaction, and greater fulfillment of expectations. These findings have profound implications for counseling patients preoperatively.

POSTER #85

Hip and Knee Arthroplasty in the Outpatient vs. Inpatient Setting

Bryce A. Basques, MD, Matthew W. Tetreault, MD, Craig J. Della Valle, MD

Introduction: Outpatient hip and knee arthroplasty procedures have become more common, however few studies have compared morbidity following outpatient and inpatient procedures. The aims of the present study were to compare matched cohorts of hip or knee arthroplasty patients in terms of postoperative complications and 30-day readmission.

Methods: Patients who underwent primary elective total hip arthroplasty (THA), total knee arthroplasty (TKA), or unicompartmental knee arthroplasty (UKA) from 2005 to 2014 were identified from the prospectively collected National Surgical Quality Improvement Program (NSQIP) registry. A total of 1,236 patients discharged the day of surgery were matched using propensity scores to patients who had an inpatient stay. Among procedures, 49.2% were TKAs, 29.8% were THAs, and 21.0% were UKAs. The rates of 30-day adverse events and readmission were compared between matched cohorts using McNemar's tests. Risk factors for readmission following outpatient hip and knee arthroplasty were identified using multivariate regression.

Results: There were no differences in overall adverse events (p=0.106) or readmission (p=0.891) between outpatient and inpatient groups, although inpatients had a higher rate of thromboembolic events (p=0.048) and outpatients had a higher rate of return to the operating room (p=0.016). Insulin-dependent diabetes (relative risk [RR] 3.4, p=0.047), non-insulin dependent diabetes (RR 2.9, p=0.020), and age 85 years or older (RR 6.6, p=0.025) were found to be risk factors for 30-day readmission following outpatient hip or knee arthroplasty. Infection was the most common reason for reoperation and readmission following outpatient procedures.

Conclusion: No differences in overall postoperative complications or readmission were found between matched cohorts of outpatient and inpatient hip and knee arthroplasty patients. Patients with diabetes mellitus and those aged 85 years or older were at significantly increased risk of 30-day readmission following outpatient procedures.

The Clinical Relevance of Functional Pelvic Tilt: A Preoperative Analysis of 3,173 Patients

Jim W. Pierrepont, PhD, MEng, Ed Marel, MBBS, FRACS, FAOrthA, Jonathan V. Baré, MBBS, FRACS, FAOrthA, Leonard R. Walter, MBBS, FRACS, FAOrthA, Stephen McMahon, MBBS, FRACS, FAOrthA, Michael Solomon, MBChB, FRACS(Orth), Andrew J. Shimmin, MBBS, FRACS, FAOrthA

Introduction: The pelvis rotates in the sagittal plane depending upon the activity being performed. These dynamic changes in pelvic tilt have a substantial effect on the functional orientation of the acetabulum. The aim of this study was to quantify changes in sagittal pelvic position between three functional postures.

Methods: Preoperatively, 2,523 THR patients had their pelvic tilt measured in 3 functional positions -standing, supine and flexed seated (point when patients initiate rising from a seated position). Lateral radiographs were used to define the pelvic tilt in the standing and flexed seated positions. Supine pelvic tilt was measured from a computed tomography scan.

Results: Mean supine pelvic tilt was 4.2°, with a range of -20.5° to 24.5°. Mean standing pelvic tilt was -1.3°, with a range of -30.2° to 27.9°. Mean pelvic tilt in the flexed seated position was 0.6°, with a range of -42.0° to 41.3°. Mean sagittal pelvic rotation from supine to standing was -5.5°, with a range of -21.8° to 8.4°. Mean sagittal pelvic rotation from supine to the flexed seated position was -3.7°, with a range of -48.3° to 38.6°. 6% of patients rotated posteriorly by ≥13° from supine to stand, putting them at risk of excessive functional anteversion in extension. 11% of patients rotated anteriorly by ≥13° from supine to flexed seated, consequently retroverting the cup by more than 10° in flexion, and putting them at risk of posterior instability or posterior edge-loading. Factoring in an intraoperative delivery error of ± 5° extends this risk to 51% of patients.

Conclusion: The position of the pelvis in the sagittal plane changes significantly between functional activities. The extent of change is specific to each patient. Planning and measurement of cup placement in the supine position, leads to large discrepancies in orientation during more functionally relevant postures. Optimal cup orientation is likely patient-specific and requires an evaluation of functional pelvic dynamics to determine the target angles.

POSTER #87

Self-Reported Penicillin-Allergic Patients Can Safely Receive Cephalosporin Prophylaxis for TJA: An Algorithm for Management

Michael M. Kheir, MD, Justin Rock, MS, Timothy L. Tan, MD,
Antonia F. Chen, MD, MBA, Caroline Purtill, BS, William J. Hozack, MD

Introduction: Patient-reported penicillin (PCN) allergy is frequent and may result in suboptimal prophylaxis for total joint arthroplasty (TJA). The aims of this study were thus to describe the clinical characteristics of patient-reported PCN allergies in the TJA population and identify patients with a penicillin allergy that are safe to receive cephalosporins using an algorithmic risk stratification protocol.

Methods: A prospective, single-institution study was conducted on 239 consecutive TJA patients who reported a penicillin allergy. Patients were administered a screening questionnaire and risk stratified based on their likelihood of a reaction: high-risk patients included those with recent PCN anaphylaxis, severe rash due to PCN, or who required emergent medical treatment because of PCN reaction, and low-risk PCN allergy included all other patients.

Results: Based on the proposed algorithm, 10.5% were categorized as high-risk patients; this comprised 8.4% with a rash involving mucous membranes, 1.3% with an anaphylactic reaction in the past decade, and 0.8% who required emergent medical treatment. In contrast, 89.5% were considered low-risk patients; this comprised 38.1% with an anaphylactic reaction greater than 10 years ago, 34.7% with only a mild rash, 7.1% with mild reactions, 6.3% who did not recall their reaction, 2.1% who only reported a positive family history, and 1.3% who tolerated other penicillin/cephalosporin derivatives. There was no difference in age, gender, comorbidities, body mass index, and joints between high and low-risk groups.

Conclusion: With our algorithm, we found that nearly 90% of patients reporting penicillin allergies were at low-risk for developing a severe reaction to PCN prophylaxis. Considering that cross-reactivity for a cephalosporin is 0.1%, less than 1% of patients reporting a PCN allergy should be denied a cephalosporin as prophylaxis for their TJA. It is essential to establish better clinical characterization of reported PCN allergies in TJA patients so that appropriate cephalosporin prophylaxis can be administered.

POSTER #88

Quantifying Patient Activity before and after Total Hip and Knee Arthroplasty

Gregory S. Kazarian, BS, Meredith Crizer, BS, Andrew Fleischman, MD, Jess H. Lonner, MD, Antonia F. Chen, MD, MBA

Introduction: Activity levels following total joint arthroplasty (TJA) are often inferred through patient-reported surveys rather than objective measures. The goal of this study was to use daily step-counts to provide objective and quantitative measurements of preoperative activity and postoperative recovery timelines for patients undergoing primary total hip arthroplasty (THA) and total knee arthroplasty (TKA).

Methods: 197 patients undergoing THA and 183 patients undergoing TKA utilized a smartphone-based step-tracking application to record daily step-counts from 30 days prior to TJA to 90 days after. Lower Extremity Functional Score (LEFS) was prospectively attained at 1, 6, and 12 weeks after surgery. Five-day step averages were used when assessing correlations between steps and LEFS.

Results: During the month before surgery, patients undergoing THA and TKA averaged 3943 and 2934 steps per day, respectively. For patients undergoing THA, five-day step averages at 30, 60, and 90 days (with percent improvement from baseline shown in parentheses) were 4075 (103.3%), 5077 (128.8%), and 5162 (130.9%), and for patients undergoing TKA were 2086 (71.1%), 2970 (101.2%), and 3326 (113.4%). Five-day step averages surpassed preoperative step levels in the THA cohort at 30 days and in the TKA cohort at 45 days. LEFS scores at 1, 6, and 12 weeks were 31%, 68%, and 79% in the THA group, and 28%, 59%, and 72% in the TKA group. We identified statistically significant correlations between LEFS and daily step-counts. Adjusting for time, LEFS increased by one point for every 482 steps (p=0.0007).

Conclusion: Patients should expect to surpass preoperative activity levels 30 days after THA and 45 days after TKA, and should experience continued improvement through 90 days as measured through objective and patient-reported assessments. THA patients experience greater preoperative activity levels, greater 90-day activity levels, and greater activity improvements from baseline compared to patients undergoing TKA.

POSTER #89

To Cement or Not to Cement? Modern Hybrid Total Hip Replacement – Low Risks and Excellent Results with Cemented Femoral Fixation

Alexander Sah, MD, John Dearborn, MD

Introduction: With cementless femoral fixation becoming the norm in total hip replacement, the use of cemented femoral fixation is infrequent and the technique less commonly learned. However, a cemented femoral prosthesis allows immediate fixation in a variety of bone types with potentially lower fracture risk. The purpose of this study is to examine results of a modern hybrid hip arthroplasty technique performed within the context of a comprehensive joint replacement program.

Methods: From 1998 to 2012, 3378 consecutive primary total hips were performed by two surgeons with cemented femoral fixation (747, 22.1%) and cementless acetabular press-fit, while the remaining 2631 were fully cementless. The decision to use hybrid fixation was based on preoperative templating of bone type and intraoperative assessment of bone quality. Patients begin weightbearing the day of surgery.

Results: There were 5 (0.6%) intraoperative fractures in the cemented group (4 greater trochanter fractures, with two requiring plating, and one acetabular fracture requiring fixation) versus 21 (0.8%; 15 femur, 6 greater trochanter). There were no femoral shaft fractures or episodes of fat embolism in the cemented group. There were 15 (0.6%) postoperative femur fractures, 17 (0.6%) femoral aseptic loosenings, and 4 (0.2%) fat embolism complications in the cementless group. For cemented femoral fixation, only one femoral revision (0.1%) was required at latest follow-up and there are no other clinical or radiographic cases of femoral loosening.

Conclusion: Primary total hip replacement with hybrid fixation is associated with excellent clinical improvements and few associated perioperative complications, even in this older population, with challenging bone types and greater co-morbidities. In spite of selection for poorer bone quality in the cemented group, overall fracture and component subsidence/loosening risks are less with this technique than with cementless components. Hybrid fixation remains an important, and often forgotten, technique in modern hip replacement surgery.

First Report of Early Results of a Commonly Used Cementless Single Tapered Femoral Component in Primary Total Hip Arthroplasty

Alexander Sah, MD, John Dearborn, MD

Introduction: The proximally porous coated single tapered prosthesis is available from most implant companies and has gained significant popularity as it has shown reliable ingrowth and clinical results. While this type of tapered stem design has generally been reported to be successful, evaluation of individual stems are required to determine if the same results hold true. The purpose of this study is to be the first reported evaluation of a large consecutive series of patients having this particular tapered femoral component.

Methods: From 2005 to 2012, 737 primary total hips were performed by two surgeons with a cementless proximally porous coated single taper stem. Patients were evaluated for intraoperative and postoperative complications. Radiographic evaluation for prosthesis subsidence and loosening was performed. Clinical outcomes were measured by Harris Hip Scores. Stem fixation, retention, or revision was evaluated for each hip replacement at latest followup.

Results: There were 2 intraoperative complications: 1 greater trochanter fracture and one calcar fracture requiring cable fixation while maintaining the stem. There were 25 (3.8%) postoperative orthopedic and medical complications. There were a total of 13 (1.9%) episodes of postoperative periprosthetic fracture. Nine occurrences of stem subsidence and fracture had no identifiable trauma, ranging from one day to 2.5 months after surgery. There were four traumatic falls leading to periprosthetic fracture, ranging from 1 week to 8 months. Two cases of chronic infection required implant removal. One failure of prosthesis ingrowth at 3 months required revision. Survivorship for aseptic loosening was 99.8% with minimum 2 year followup. The overall survival rate for any reason of this tapered implant was 97.6% at latest followup.

Conclusion: Intraoperative risks are rare, and bone ingrowth is reliably achieved providing excellent clinical outcomes. Postoperative periprosthetic fractures occur most often in the immediate perioperative period, often without identifiable trauma. This is the first and largest series to report on this particular stem, and results are similar to excellent published outcomes for similar designs of other manufacturers.

POSTER #91

Postoperative Impact of Diabetes and Chronic Kidney Disease vs. Diabetes and Renal Transplant after Total Hip Arthroplasty

Perez Agaba, BS, Beau Kildow, MD, Herman Dhotar, MD, Samuel Wellman, MD, Thorsten Seyler, MD, Michael Bolognesi, MD

Introduction: The prevalence of diabetes (DM), chronic kidney disease (CKD), and renal transplant (RT) is increasing worldwide. The study assessed postoperative complications among diabetic patients with CKD and diabetic patients with renal transplant after Total Hip Arthroplasty (THA).

Methods: 893,247 THA patients were identified using the Nationawide Medicare Database containing records of over 50 million patients between 2005 and 2012. Four study cohorts were created; DM+THA (54,561), DM+CKD+THA (9,486), DM+CKD+hemodialysis (HD)+THA (1,475), and DM+RT+THA (219). Study cohorts were matched 1:2 to a control group by age and gender. 30-day medical complications (myocardial infarction, heart failure, stroke, pneumonia, acute renal failure, transfusion, pulmonary embolism (PE)/deep venous thrombosis (DVT)), 90-day and 2-year surgical complications were evaluated postoperatively using odds ratios and 95% confidence intervals in Stata.

Results: All 30-day medical complications were significantly higher in each cohort with the exception of transfusion (OR 0.74, 95%CI 0.70-0.78) and PE/DVT (OR 1.10, 95%CI 0.99-1.22) in the DM+THA cohort. 90-day surgical complications included; DM+CKD+HD+THA cohort: prosthetic joint infection (PJI) (OR 5.17, 95%CI 3.83-6.98), hip dislocation (OR 1.98, 95%CI 1.52-2.58), THA revision (OR 4.14, 95%CI 3.03-5.65); DM+RT+THA: PJI (OR 2.45, 95%CI 1.01-5.97), hip dislocation (OR 5.85, 95%CI 3.97-8.63), THA revision (OR 5.26, 95%CI 3.10-8.92). 2-year surgical complications included; DM+CKD+HD+THA: PJI (OR 6.44, 95%CI 5.26-7.87), hip dislocation (OR 2.32, 95%CI1.94-2.77), THA revision (OR 2.76, 95%CI2.24-3.40); DM+RT+THA: PJI (OR 0.88, 95%CI 0.36-7.87), hip dislocation (OR 3.59, 95%CI 2.56-5.05), THA revision (OR 3.03, 95%CI 2.00-4.61).

Conclusion: Our results show that the combination of diabetes and CKD, or diabetes and renal transplant increases the risk of postoperative complications after THA. Patients on hemodialysis were at a higher risk for postoperative complications than those without hemodialysis or those with renal transplant. Diabetic patients who are on hemodialysis for CKD may benefit from having a renal transplant prior to having a THA.

POSTER #92

Relevance of Intraoperative Anteroposterior Radiograph during Total Hip Arthroplasty

George W. Byram, MD, Charles L. Barnes, MD,Carey L. Guidry, MD,
Mark A. Tait, MD

Introduction: When performing a total hip arthroplasty (THA), some surgeons routinely perform an intraoperative anteroposterior (AP) pelvis radiograph to assess components. The purpose of this study was to evaluate the reliability of the intraoperative radiograph to accurately reflect acetabular inclination, leg length, and femoral offset as compared to the immediate postoperative supine AP radiograph.

Methods: The intraoperative (lateral decubitus position) and immediate postoperative (supine position) AP pelvis x-rays of 100 consecutive patients undergoing primary THA were retrospectively reviewed. Acetabular inclination, leg length, and femoral offset were measured on both radiographs. We analyzed the correlation coefficient of the recorded measurements between the two films as well as the interobserver reliability of each measurement obtained.

Results: Our data demonstrated a high positive correlation between the intraoperative and postoperative acetabular inclination measurements of both reviewers (r=.886 and .896). In addition, no significant difference was observed between the inclination measurements (p= .06 and .37). There was a moderate correlation among the leg length (r= .58 and .66) and poor correlation among the offset (r= .29 and .25) between the two radiographs. One observer generated a significant difference between leg length measurements while both reviewers generated a significant difference between offset measurements. Interobserver reliability was high for all measurements.

Conclusion: Intraoperative AP radiographs are commonly obtained during THA to aid in evaluation of component position and size, femoral neck cut, femoral canal fill, and detection of occult fractures. Results from this study suggest that this film could also be used to accurately measure acetabular inclination, but is a less reliable indicator of femoral offset and leg length when compared to the immediate postoperative film. In addition, the high interobserver correlation illustrates the high reproducibility of the measurement methods utilized.

POSTER #93

Minimum 13-year Multi-Center Study of THR with Highly Cross-Linked Polyethylene and Standard Diameter Ceramic or Cobalt Chrome Femoral Heads

Charles R. Bragdon, PhD, Christopher J. Barr, BS, Christian S. Nielsen, MD, Daniel Berry, MD, Craig Della Valle, MD, Kevin Garvin, MD, Per Eric Johanson, MD, PhD, John Clohisy, MD, Ayumi Kaneuji, MD, PhD, Henrik Malchau, MD, PhD

Introduction: The first highly crosslinked and melted polyethylene acetabular component for use in total hip arthroplasty (THA) was implanted in 1998. Numerous publications have reported reduced wear rates and a reduction in particle induced peri-prosthetic osteolysis at short to mid-term follow-up. The purpose of this study was to evaluate the radiographic and wear analysis of patients receiving this form of highly crosslinked polyethylene articulating against standard size (≤32mm) cobalt chrome or ceramic femoral heads at minimum 13-year follow-up.

Methods: Inclusion criteria for patients was a primary THA with femoral heads 32mm or less at minimum 13-year follow-up. 193 hips were enrolled with an average follow-up of 13.7 years (13-16), 130 females (67%). There were 54 26mm ceramic heads and 139 28-32mm CoCr heads. Wear analysis was performed using the Martell Hip Analysis software. Radiographic grading was performed on the longest follow-up AP hip films. The extent of radiolucency in each zone greater than 0.5mm in thickness was recorded along with the presence of sclerotic lines and osteolysis.

Results: Individual regression analysis revealed no significant difference in wear rates between the 26mm ceramic and 28-32mm CoCr groups (0.002±0.127mm/yr, 0.006±0.033mm/yr, p=0.8, Mann-Whitney). Radiographic analysis: Acetabular side: the greatest incidence of radiolucency occurred in zone 1 at 21%; sclerotic lines had a less than 2% incidence in any of the 3 zones; there was no identified osteolysis. Femoral side: the incidence of radiolucencies was limited to zone 1, 2%; sclerotic lines were rare in any zone, maximum in zone 3, 4%; there was no identified osteolysis.

Conclusion: The wear of this form of irradiated and melted highly crosslinked polyethylene remained at levels lower than the detection limit of the software at minimum 13-year follow-up in all head sizes and materials. There was no evidence of osteolysis at any time point.

POSTER #94

THA in Patients with Previous Lumbar Fusion Surgery: Are There More Dislocations and Revisions?

Arthur L. Malkani, MD, Andrew Garber, MD, Kevin Ong, PhD, Doruk Baykal, PhD, John Dimar, MD, Steven Glassman, MD, Daniel Berry, MD

Introduction: There has been a significant increase in the number of patients undergoing both spine fusion and THA over the past decade. The purpose of this study was to determine the risk of dislocation and revision in patients undergoing primary THA with history of prior lumbar spine fusion.

Methods: 62,387 patients (5% Medicare part B claims database) were identified from 1997-2014 with primary THA. From this group, 1809 patients (2.9%) were stratified to identify those with prior lumbar fusion within 5 years of primary THA to compare risk of dislocation and revision. Multivariate cox regression analysis was performed adjusting for age, socioeconomic status, race, census, region, gender, Charlson score, preexisting conditions, and type of fusion.

Results: Between years 2002-2014, there was a 293% increase in the number of patients with prior lumbar fusion undergoing THA. Prevalence of hip dislocation in patients with lumbar fusion prior to THA was 7.4% compared to 4.8% without fusion, $p<.001$. There was an 80% increase in dislocation in the fusion group at 6 months, 71% at 1 year, and 60% at 2 years. There was a 48% increased risk of failure leading to revision hip surgery in patients with fusion at 6 months, 41% at 1 year and 47% at 2 years. Type of lumbar fusion was a risk factor for revision but not dislocation. Most common etiology for revision THA in the fusion group was dislocation 16.8%, peri-prosthetic fx 16.8%, and mechanical loosening 15.2%.

Conclusion: Results of this study demonstrate that lumbar fusion prior to THA is an independent risk factor for dislocation and subsequent revision. Collaboration among spine and arthroplasty surgeons is required to determine the specific alterations which occur in spino-pelvic anatomy following lumbar spine fusion in order to determine the best position for acetabular component placement in this group of patients.

POSTER #95

Assessment of Early Subsidence, Periprosthetic Fracture, and Revision of Cementless Femoral Stems via the Direct Anterior Approach

Kenneth M. Vaz, MD, Karen Y. Cheng, MD, Ashish Mittal, BA,
Francis B. Gonzales, MD

Introduction: A drawback of the direct anterior approach (DAA) may be difficult access to the femoral canal for implant placement. This presents a challenge intraoperatively as suboptimal implant placement can lead to subsidence while efforts to ensure adequate stability can lead to perioperative fractures and need for revision, especially with cementless fixation. Incidence of early (within 2 months) subsidence, periprosthetic fracture, and early revision of cementless femoral stems utilizing the DAA were evaluated.

Methods: 400 consecutive patients of an arthroplasty surgeon trained in the DAA were evaluated as a retrospective cohort. Patients without follow up plain radiographs within 60 days of their procedure, patients with cemented femoral stems, revision arthroplasty, and patients that underwent alternate approaches were excluded leaving 307 patients. Immediate post-operative fluoroscopic images were compared to the first post-op follow up plain images. Subsidence was noted if the femoral component subsided 5 mm or more. A chart review was performed to determine if early revision was performed. A student's t-test was performed to determine statistical difference in age and body mass index (BMI) with respect to subsidence.

Results: 41 of 307 patients (13%) had at least 5 mm of subsidence (average 8 mm) on the first post-operative film (average 27 days). 6 patients (1.9%) had early post-operative fracture of which 4 (1.3%) underwent revision. Average age was 67 in the group with subsidence versus 59 in the group that did not ($p=0.004$). Average BMI in the group that subsided was 27.7 versus 28.3 in the group that did not ($p=0.58$).

Conclusion: Age was the most significant factor in determining early post-operative subsidence with the use cementless femoral fixation with DAA while BMI was not. Early subsidence with DAA may be higher than previously reported, consideration of cemented fixation may reduce subsidence without increased fracture risk.

POSTER #96

Diabetes Mellitus and Hyperglycemia and the Risk of Aseptic Loosening in THA and TKA

Hilal Maradit Kremers, MD MSc, Cathy D. Schleck, BS, Eric A. Lewallen, PhD, Dirk Larson, MS, Andre J. Van Wijnen, PhD, David G. Lewallen, MD

Introduction: Diabetes mellitus is an established risk factor for periprothetic joint infections, but evidence is conflicting to what extent diabetes mellitus modifies the long-term risk of aseptic loosening in THA and TKA. The goal of this study was to determine the association between diabetes and perioperative hyperglycemia and the risk of revisions for aseptic loosening in THA and TKA.

Methods: We studied 16,085 primary THA and TKA procedures performed at a large tertiary care hospital between 1/1/2002 and 12/31/2009. All blood glucose values around the time of surgery (within 1 week) were retrieved. Hyperglycemia was defined as cut-off value of >180 mg/dL. Multivariable Cox models were used to estimate the hazard ratios (HR) and 95% confidence intervals (CI) for aseptic loosening associated with diabetes mellitus and hyperglycemia adjusting for age, sex, body mass index and the type of surgery.

Results: A total of 2,911 (18%) surgeries had a diagnosis of diabetes mellitus at the time of surgery. A total of 3636 surgeries had at least one preoperative glucose value. Over a mean follow-up of 6.1 years, we observed a total of 579 revision surgeries out of which 157 were revisions for aseptic loosening. In age, sex, BMI and surgery type-adjusted models, the overall risk of revision was significantly elevated among diabetic patients (HR 1.27, 95% CI 1.02, 1.58), but there was no excess risk of revision for aseptic loosening (HR 0.87, 95% CI 0.55, 1.38). The association with the diabetes medications followed the same pattern. Higher preoperative glucose values on the day before surgery were significantly associated with both the overall excess risk of revisions (HR 2.80, 95% CI 1.00, 7.85), and revisions for aseptic loosening (HR 7.22, 95% CI 1.90, 27.54). There was no association with the postoperative glucose values. Data were limited to examine association with the increasing HbA1c levels.

Conclusion: High preoperative hyperglycemia is a risk factor for aseptic loosening in THA and TKA.

POSTER #97

Preoperative and Discharge Predictive Tools for 30-Day Readmission following Total Hip Arthroplasty

Jayson Zadzilka, MS, Alison Klika, MS, Kevin Chagin, MS, Nicholas Schiltz, PhD, Suparna Navale, MS, MPH, Wael Barsoum, MD, Carlos Higuera, MD

Introduction: Unplanned hospital readmission after elective total hip arthroplasty (THA) is a quality metric targeted by healthcare reform programs. Predicting readmission risk is paramount for improving outcomes and for reimbursement risk stratification. Most readmission studies only analyze preoperative factors without considering inpatient factors. We aimed to develop multivariable clinical tools for predicting 30-day readmission after primary and revision THA for use preoperatively and at discharge.

Methods: Using data from the New York and California State Inpatient Databases for years 2007-2011, a total of 182,354 primary and 25,398 revision THA admissions were identified. Comorbidities, demographic, behavioral and medical history variables were used to create a model to preoperatively predict probability of 30-day readmission. A discharge model was created using all variables from the preoperative model in combination with inpatient data. Online calculators were developed from these models to determine the readmission likelihood for each patient at the point of care.

Results: Overall 30-day readmission rates were 4.6% for primary and 9.5% for revision THA. The most common reasons for readmission among both groups included dislocation of the prosthetic joint, infection, and hematoma. Multivariate analysis identified several risk factors for readmission, of which metastatic cancer and steroid use prior to index surgery had the greatest impact on the models. The c-statistics indicate that including inpatient variables in the models (Primary THA, c = 0.679; Revision THA, c = 0.675) yielded slightly better results than using preoperative variables alone (Primary THA, c = 0.668; Revision THA, c = 0.656).

Conclusion: Comprehensive predictive models using preoperative and inpatient factors were developed to build online calculators that predict the likelihood of readmission both preoperatively and at the time of discharge. These calculators provide surgeons with a useful tool to help guide more appropriate patient selection for surgery, preoperative optimization, and postoperative interventions to prevent readmissions.

POSTER #98

Has Health Care Reform Legislation Reduced the Economic Burden of 90-Day Readmissions following Total Hip Arthroplasty?

Steven M. Kurtz, PhD, Edmund C. Lau, MS, Kevin L. Ong, PhD, Edward M. Adler, MD, Frank R. Kolisek, MD, Michael T. Manley, FRSA, PhD

Introduction: Little is known about whether the financial burden of readmissions after primary THA has decreased since the introduction of health care reform legislation and what patient, clinical, and hospital factors drive such costs.

Methods: The 100% Medicare inpatient dataset was used to identify 612,619 primary THA procedures and 100,214 (16.4%) 90d RA between 2009 and 2014 based on ICD-9-CM codes. We classified the reasons for readmissions as either procedure- or medical-related based on the primary diagnosis. Cost-to-charge ratios supplied by CMS were used to compute the individual per-patient cost of 90d RA, inflation adjusted to $2015, as a continuous variable in a general linear model in which the year of surgery, as well as patient, clinical, and hospital factors, were treated as covariates.

Results: The average (±SD) cost per readmitted patient within 90d was $16,692±$292 and was slightly lower than the cost of the primary surgery ($20,841±$136). The cost of 90d RA did not change over time. The five most important variables associated with the cost of 90-day THA readmissions (in rank order) were Surgeon TJA Volume, LOS, discharge to skilled nursing or rehabilitation facilities, hospital teaching status, and race (minority status). The overall annualized economic burden for 90d RA after THA was $279M and 25% of the burden was attributed to medical readmissions.

Conclusion: The results of this study do not support the hypothesis that the economic burden of 90-day readmissions has decreased since the introduction of health care reform legislation. Instead, we found that surgeon and clinical factors were among the most important drivers of costs. Our findings support further optimization of the delivery of care, especially to the length of stay, to reduce the economic burden of hospital readmissions.

POSTER #99

Modified Frailty Index is an Effective Risk Assessment Tool in Primary Total Hip Arthroplasty

Jaime L. Bellamy, DO, Robert P. Runner, MD, CatPhuong Le Vu, BA, Thomas L. Bradbury, MD, James R. Roberson, MD

Introduction: "Frailty" is a physiologic marker of decline of multiple organ systems and the modified frailty index (MFI) identifies patients more susceptible to postoperative complications. The purpose of this study is to validate the MFI as a predictor of postoperative complications, reoperations, and readmissions in patients who underwent primary total hip arthroplasty (THA).

Methods: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database from 2005-2014 was queried by the Current Procedural Terminology (CPT) code for primary THA (27130). A previously described MFI was utilized. In this, the presence of 11 variables in five organ systems are summated, including endocrine, cardiac, vascular, pulmonary, and neurologic systems. The MFI score was calculated, resulting in a fractional index. Bivariate analysis was performed for postoperative complications, adverse discharge, reoperation, readmission, and length of hospital stay. A multiple logistic regression model was used to determine the relationship between MFI, American Society of Anesthesiologists (ASA) score and 30-day reoperation, controlling for age, gender, and BMI.

Results: 51,582 patients underwent primary THA during the study period. As MFI score increased, 30-day mortality significantly increased ($p<0.001$). Higher rates of postoperative complications were observed with increasing MFI including: infection, wound, cardiac, pulmonary, renal, any occurrence (all $p<0.001$), and hematologic ($p=0.0035$). Frail patients had increasing odds of adverse discharge, reoperation, and readmission ($p<0.001$). Length of hospital stay increased from 3.05 to 5.80 days ($p<0.001$) while length of ICU stay increased from 3.47 to 6.06 days ($p<0.001$) between MFI score 0 and 0.36+. Analysis of 30-day reoperation showed that MFI was a significant predictor with an adjusted odds ratio of 8.78 (95% CI: 3.67-20.98, $p<0.001$). MFI was a stronger predictor of reoperation compared to ASA score, wound class, and age with adjustment for gender and BMI.

Conclusion: The MFI is a valid method to predict postoperative complications, reoperations, and readmissions after primary THA and provides a risk assessment tool for counseling and optimizing patients.

POSTER #100

In-Vivo Wear Performance of Highly Cross-Linked Polyethylene across Three Femoral Head Articulations

Colin Maclean, MD, Edward Vasarhelyi, MD, James Howard, MD, Brent Lanting, MD, Lyndsay Somerville, PhD, Douglas Naudie, MD, Matthew Teeter, PhD, Richard McCalden, MD, Steven MacDonald, MD

Introduction: The advent of highly cross-linked polyethylene has resulted in improved wear rates and reduced osteolysis with at least intermediate follow-up when compared to conventional polyethylene. However, the role of alternative femoral head bearing materials in decreasing wear is less clear. The purpose of this study was to determine in-vivo polyethylene wear rates across ceramic, oxidized zirconium, and cobalt chrome femoral head articulations.

Methods: A review of our institutional database was performed to identify patients who underwent a total hip arthroplasty using either ceramic or oxidized zirconium femoral head components on highly cross-linked polyethylene between 2008 and 2011. These patients were then matched on implant type, age, sex and BMI with patients who had a cobalt chrome bearing implant during the same time period. RSA analysis was performed using the center index method to measure femoral head penetration (polyethylene wear).

Results: A total of 75 patients underwent RSA analysis. 20 patients with a ceramic femoral head component and 16 patients with an oxidized zirconium femoral head component along with the same number of matched patients with cobalt chrome femoral head component were included in the analysis. The time in vivo for the oxidized zirconium (5.17 +/- 0.96 years), oxidized zirconium matched cohort (5.13 +/- 0.72 years), ceramic (5.15 +/- 0.76 years) and ceramic matched cohort (5.36 +/- 0.63 years) were comparable. The demographics of all bearing surface cohorts were similar. The paired comparison between the oxidized zirconium and cobalt chrome cohorts (0.32 vs. 0.28 mm/year, p=0.427) and ceramic vs cobalt chrome cohorts (0.28 vs. 0.22 mm/year, p=0.202) did not demonstrate a significant difference in wear rate.

Conclusion: Although the wear rates of the oxidized zirconium and ceramic femoral head component was greater compared to a cobalt chrome femoral head component this did not reach statistical significance.

POSTER #101

Patient Decision Aids in Routine Orthopaedic Care Improve Shared Decision Making and Reduce Surgical Rates: A Prospective Cohort Study

Karen R. Sepucha, PhD, Steven J. Atlas, MD, MPH, Yuchiao Chang, PhD, Janet Dorrwachter, MSN, DNP, Andrew Freiberg, MD, Harry Rubash, MD, Leigh H. Simmons, MD, Thomas Cha, MD, MBA

Introduction: Although efficacy has been established in randomized controlled trials, little is known about effectiveness of patient decision aids (DAs) in routine care. The purpose was to examine whether DAs in routine care increase shared decision making and lower surgical rates.

Methods: A quality improvement (QI) project focused on integrating DAs for patients with hip or knee osteoarthritis, lumbar disc herniation or spinal stenosis. A usual care cohort (UCC) was enrolled before the QI project and an intervention cohort (IC) was enrolled after. Participants were surveyed one week after the surgeon consult and treatments were collected six months later. Analyses adjusted for clustering of patients within clinicians and examined whether patients in the IC and those who received a DA had higher knowledge, more shared decision making, and lower surgery rates. With 550 surveys, the study had 80% power to detect a 20% difference in surgery rates.

Results: Response rates were 70.6% (324/459) for UCC and 70.2% (328/467) for IC. There was no significant difference on any patient characteristic between the two cohorts. More patients received DAs in the IC (27.9% UCC vs. 63.6% IC, p=0.007). DA use was associated with higher knowledge scores, mean difference 19.8% (CI12.4%, 27.1%), p<0.001 in UCC and 12.1% (CI 4.4%, 19.9%), p=0.002 in IC. Patients in IC reported more shared decision making (66.9% (SD=27.5%) IC vs. 62.5% (SD=28.5%) UCC, p=0.009) and rated their doctor higher (8.01 (SD =2.16) IC vs. 7.63 (SD=2.56) UCC, p=0.019). Surgical rates were lower in UCC (43.2% DA vs. 51.9% no DA, p=0.57) and in IC (42.3% for DA vs. 58.8% for no DA, p=0.023).

Conclusion: The QI project successfully integrated DAs into a busy orthopaedic clinic. When used in routine care, DAs are associated with increased knowledge, more shared decision making, higher provider ratings and lower surgical rates.

POSTER #102

Soft-Tissue Infiltration of an Analgesic Mixture during Primary Total Hip Arthroplasty is an Effective Strategy for Pain Control during the First 24 Hours after Surgery

Maria Bautista, MD, MSc, Meilyn Muskus, MD, Adolfo Llinás, MD, Guillermo Bonilla, MD

Introduction: The results reported in the literature regarding soft tissue infiltration with local anesthetics in hip arthroplasty are limited. The purpose of this study is to identify the effect of soft-tissue infiltration in pain intensity and opioid consumption during the first 24 hours after surgery.

Methods: This prospective cohort study was conducted between February 2015 and March 2016, in which 129 patients that received soft tissue injection with 20 ml of 0.25% bupivacaine and 2 ml of ketorolac (30 mg/1ml) in 28 ml of saline solution, were compared with 72 patients who received no infiltration. Outcomes assessed were: pain intensity in the verbal analog scale (VAS), requirement of opioid titration and opioid consumption (mg morphine equivalents) in the post anesthetic care unit (PACU) and during the first 24 hours after surgery. All patients received the same standardized multimodal analgesia protocol.

Results: The median VAS score in the PACU was 4 (IQR, 2 -7) in the infiltration group and 7 (IQR, 4 -8) in the other group ($p = 0.007$). The 55.8% of patients in the first group and 36.6% of the second group had VAS scores ≤4. Respectively, the 32.5% and 52.1% required titration with opioids in the PACU. Median opioid titration consumption was 0 mg for the infiltration group and 2.6 mg for the other ($p = 0.011$). In the first postoperative day, the difference in VAS scores between groups was statistically significant ($p=0.009$), but there was no difference in opioid consumption. There were no neurovascular injuries associated with the infiltration technique.

Conclusion: Infiltration with local anesthetic and anti-inflammatories allows adequate pain control in the immediate postoperative period and reduces the requirement for opioid titration. We recommend the application of this safe and effective strategy in postoperative pain management protocols after primary hip arthroplasty.

POSTER #103

Outcomes Associated with Same-day Discharge in Direct Anterior Total Hip Arthroplasty

Roy I. Davidovitch, MD, Aldo M. Riesgo, MD, Nicholas J. Bolz, BS, Feroz A. Osmani, BS, Savyasachi C. Thakkar, MD, Richard Iorio, MD

Introduction: Advancements in analgesia, rapid-rehabilitation protocols, and improved surgical technique have diminished length of stay with improved outcomes and decreased complications in total joint arthroplasty. Coupled with patient demand and cost considerations, same-day discharge total hip arthroplasty (THA) is becoming increasingly popular. We wish to report on our matched cohort series of same-day discharge (SDD) anterior THAs in a large urban academic medical center.

Methods: We conducted a retrospective matched-cohort study of all consecutive THA SDD patients over one year in an urban academic medical center by a single surgeon. Minimum follow-up was 3 months for all SDD patients. All surgeries were performed using fluoroscopically-assisted direct anterior approach THA. A control cohort of inpatient anterior THAs by the same surgeon was matched based on perioperative parameters and medical comorbidities. Perioperative outcomes, complications, and patient-reported outcome scores (pain, EQ-5D, VAS, and HOOS) were recorded pre-operatively and post-operatively.

Results: A total of 78 SDD and 78 control patients were identified. There were no differences between groups with respect to BMI, ASA grade, or Charlston comorbidity index. 73 out of 78 SDD patients (94%) were successfully discharged on day of surgery with the remainder of the patients discharged the following day. There were no significant differences in pain scores, VAS, HOOS, or EQ-5D scores between groups at any time point ($P<0.05$). In the SDD group, there was 1 patient who presented on post-op day #5 for treatment of persistent spinal headache. There were no reoperations or complications in the SDD group.

Conclusion: At our institution, implementation of an SDD protocol for anterior THAs was found to be safe and effective. When compared to a similar cohort of inpatient anterior THAs, there were no differences in complications, reoperations, readmissions, or patient-reported outcome scores at 3-month follow-up.

POSTER #104

Serum Metal Ions in Well-Functioning Total Hip Arthroplasty: Does Femoral Stem Metallurgy Affect Results?

Brian Barlow, MD, Philippe Ortiz, BS, Yuo-yu Lee, MS, Amar Ranawat, MD, Douglas Padgett, MD, Geoffrey Westrich, MD

Introduction: The femoral stem metallurgy is a factor not previously been considered with respect to serum metal ion levels and prompted two questions: What is the effect of the femoral stem metallurgy on the serum metal ion levels in well-functioning THA from the same manufacturer? Additionally, how does stem metallurgy affect patient reported outcome measures (PROM)?

Methods: Unilateral THA patients were recruited from 3/2014 -11/2015. Patient outcomes, demographics, and implant data were collected from a prospective IRB approved single-institution registry. Whole blood samples were collected and the serum was sent to an independent laboratory (ARUP Laboratories, Salt Lake, UT). Serum cobalt (Co) and chromium (Cr) ion levels were measured using a quantitative inductively coupled plasma-mass spectrometer.
The laboratory specific threshold values were Co >1.0ug/L and Cr >1.0ug/L. Total WOMAC score and WOMAC pain, stiffness, and function subscores and UCLA activity scores were measured for all patients.

Results: The cohort included 35 patients with a Ti-6AL-4V femoral stem vs. 60 patients with a TMZF femoral stem. Mean Co was significantly higher with TMZF stem + metal head compared to a Ti-6Al-4V stem + metal head (p=0.043) and both were above threshold values. Mean Co was significantly higher with 36mm metal head compared to 32mm metal head (p=0.049) and both were above threshold values. Total WOMAC and WOMAC function scores were better with Ti-6Al-4V stems (p=0.030 and p=0.019). Multiple linear regression analysis found no association between stem type, head material, or head size and WOMAC scores. A metal head was an independent predictor for higher serum Co levels. (p=0.0059)

Conclusion: Mean Co were significantly higher in the TMZF + metal head group compared to Ti-6Al-4V + metal head group suggesting stem metallurgy may influence serum Co levels. There was no association between stem metallurgy or serum metal ion levels and patient reported outcomes.

POSTER #105

Evaluating the Use of Intra-Articular Injections as a Treatment for Painful Hip Osteoarthritis: A Randomized, Double-Blinded, Controlled Study

Comparing Hylan G-F 20 and Saline ◊ Victoria A. Brander, MD, Nebojsa Skrepnik, MD, PhD, Robert J. Petrella, MD, Guang-Liang Jiang, MD, PhD, Beverly Accomando, MS, Anna Vardanyan, MD, PhD

Introduction: Hip osteoarthritis (OA) is difficult to treat. Steroid injections reduce pain but may cause infections. With widespread adoption of office-based, image-guided injections, hyaluronic acid is a potentially relevant therapy. In the largest clinical trial to date, we compared the safety/efficacy of hylan G-F 20 (HA) to saline in painful hip OA.

Methods: 357 patients were enrolled in a multicenter, double-blind, randomized controlled trial comparing efficacy/safety of a single, 6-ml image-guided injection of HA to saline (NCT01618708). Patients were ≥35 years with mild-to-moderate hip OA (Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC]-A1: 5.0-8.0; no contralateral hip pain ≥4; Kellgren-Lawrence Numerical Grading System: grade II/III). Outcome measures included 'pain on walking' (WOMAC A1 and -A), Patient Global Self-Assessment (PTGA), WOMAC-A1 responder rate (+≥2-point on numerical rating scale), and adverse events (AEs) over 26 weeks. A sample size of 350 (assuming 20% drop-out rate) provided 80% power to detect a 1-point difference between groups in WOMAC-A1 change from baseline over 26 weeks (assuming 2-sided significance level: 5%).

Results: 357 patients (HA: 182; saline: 175) were enrolled. Both groups demonstrated significant pain improvement from baseline over 26 weeks (P<.0001); saline-induced pain reduction was a remarkable 35%. WOMAC-A and PTGA scores also significantly improved (P<0.0001). No significant difference was observed between groups in WOMAC-A1 scores (HA: -2.19±0.16; saline: -2.26±0.17) or WOMAC-A1 responders (41%-52%). Treatment-related AE rates at target hip were similar (23 patients [12.8%] HA; 12 [7.0%] saline). Post-hoc analysis found, despite protocol requirements, many patients had psychiatric (31%) or neuropathic (27.5%) conditions.

Conclusion: Patients with painful hip OA responded similarly to intra-articular HA and saline injections, with clinically significant reductions in pain and an effect size similar to other OA treatments. No new safety signals were observed.

◊ The FDA has not cleared the pharmaceuticals and/or medical devices listed here. hylan G-F 20

POSTER #106

Smoking Increases Reoperations for Infection within 90 Days after Primary Total Joint Arthroplasty

Eric H. Tischler, BA, Laura Matsen Ko, MD, Antonia F. Chen, MD, MBA, Mitchell G. Maltenfort, PhD, Jacob Schroeder, BS, Matthew S. Austin, MD

Introduction: The relationship between smoking and complications after total joint arthroplasty (TJA) is unclear. Prior studies are limited by relatively small sample sizes or investigation of select cohorts. Large national databases such as the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) have been utilized to assess the association of smoking status and 30-day postoperative complication rates. However, these non-orthopaedic specific databases have limited datasets making adjustment for confounding variables difficult. This study utilized an institutional database, adjusting for confounding variables and using orthopaedic-specific definitions of complications.

Methods: We retrospectively identified 15,264 patients who underwent 17,394 TJA procedures between 2000-2014. Patients were stratified into three groups: current, former, and non-smokers. The association between smoking status and specific complications, readmissions, and reoperations within 90 days was investigated using both univariate and multivariate regression analyses.

Results: 1,371 (9.0%) were current smokers, 5,195 (34.0%) were former smokers, and 8,698 (57.0%) were non-smokers. Current smokers were significantly younger (mean 57.7±10.3 years vs. 63.2±11.8 years, $p<0.001$), had a higher preoperative prevalence of chronic pulmonary disease ($p<0.001$), myocardial infarction ($p=0.002$) and peripheral vascular disease (PVD) ($p=0.002$) compared to non-smokers. Using multivariate analysis, current smokers (1.2%, 18/1,531) remained significantly more likely than non-smokers (0.56%, 55/9880) to undergo septic reoperation (OR 1.76; 95% CI 1.08-2.87, $p=0.02$) but did not have significantly increased risk of reoperation for aseptic etiologies ($p=0.25$) or non-operative readmission ($p=0.39$). Former smokers were at no increased risk for 90-day non-operative readmission ($p=0.99$), septic reoperation ($p=0.21$), aseptic reoperation ($p=0.29$), and total reoperation ($p=0.87$) when compared to non-smokers.

Conclusion: This study, after controlling for confounding factors, demonstrates that current smokers have a significantly increased risk of reoperation for infection compared to non-smokers within 90 days of surgery.

POSTER #107

The Accuracy of Acetabular Component Position Using the Anterior and Posterior Approach: Clinical Value of a Novel Method to Determine Anteversion

Friedrich Boettner, MD, Matthieu Zingg, MD, Wenzel Waldstein, MD, Martin Faschingbauer, MD, Maximilian Kasparek, MD

Introduction: The current study compares the differences in acetabular component position, leg length discrepancy and hip offset between the anterior and posterior approach. A novel method is applied to determine the acetabular anteversion using the anterior approach.

Methods: 100 consecutive anterior total hip arthroplasties (THA) were matched according to gender, BMI and age to a cohort of 100 primary THAs operated on through a posterior approach. A single surgeon performed all surgeries. A novel intraoperative fluoroscopic technique was used to measure intraoperatively inclination and anteversion for the anterior approach: First step the cup is implanted in approximately 40-degree inclination with the C-arm positioned perpendicular over the center of the hip. In the next step the c-arm is tilted away from the operated side until the cup appears perfectly in plane. The acetabular ante version (CV) can be calculated utilizing the tilt angle of the C-arm (CaT) and the cup inclination (CI) by using the formula: CV = tan-1 [tan(CaT)sin(CI)]. For example, a cup with an inclination of 40 degrees and a C-arm tilt angle of 25 degrees has 17 degrees of anteversion.

Results: The mean cup inclination in the anterior group was 40.8 degree (range 33 to 48) and mean cup anteversion was 18.4 degree (range 11 to 26). In the posterior group the mean cup inclination was 45.1 degree (range 33 to 55) and mean cup anteversion was 23.6 degree (range 8 to 38). 100% cups in the anterior group and 81% in the posterior group fell within the safe zone ($p<0.001$). There was no difference in the overall hip offset between the operated side and contralateral side for the anterior ($p= 0.074$) and posterior ($p= 0.919$) group. There was no difference in leg length discrepancy between the two approaches ($p=0.259$).

Conclusion: Intraoperative c-arm images improve acetabular component placement using the anterior approach. However, the anterior approach has no benefits when it comes to restoration of overall hip offset and leg lengths.

POSTER #108

Does Acetabular, Femoral and Combined Hip Anteversion in Standing Position Reside within the Proposed Safe Zone in Most Patients after Primary Total Hip Arthroplasty?

Aidin Eslampour, MD, Christopher Robbins, PhD, Frédéric Thauront, MSc, Jean Y. Lazennec, MD, PhD

Introduction: While most hip dislocations occur either in standing position or in flexion, implant position is commonly measured in supine position with CT scan. We set to determine the preoperative and postoperative acetabular, femoral and combined hip anatomical anteversion, sacral slope, pelvic incidence in standing position in patients who undergo primary THA.

Methods: The patient functional plane, as the horizontal plane passing through both femoral heads was developed to describe the orientation of the implants in standing position in addition to anterior pelvic plane (APP). The preoperative and postoperative 3D EOS images were assessed in 66 patients who only underwent THA. None the patients had dislocation within the follow up time period (12 to 36 months). The acetabular, femoral and combined hip anatomical anteversion we measured in both anterior pelvic plane (APP) and patients functional plane (PFP).

Results: Surgeons increased the postoperative anteversion (APP plane) by 12.6°($p<0.001$). In PFP plane, the postoperative anteversion was increased by 14.3° ($p<0.001$). In the APP plane, the femoral neck anteversion was decreased by -3.2($p=0.0942$). In the PFP plane, the femoral anteversion was decreased by -6.3° ($p<0.001$). In the APP plane, the preoperative combined anteversion was increased by 9.5° ($p=0.0003$). In the PFP plane, the preoperative combined anteversion was increased by 8.1° ($p=0.0003$). The preoperative sacral slope was 42.4° (-25.9 to 24) as compared to the postoperative sacral slope (40.3°)($p=0.013$). The preoperative pelvic version was 15.2° as compared to the postoperative version (17.2)($p=0.008$). The preoperative pelvic inclination was 1.12° which was decreased postoperatively to -1.2° ($p=0.005$).

Conclusion: The acetabular, femoral and combined anteversion in standing position in both APP and PFP planes for the first time. Surgeons tend to increase the anteversion of the acetabular implant. The APP plane is not vertical in standing position in most patients. Navigation or robotic surgery can increase the accuracy of the implantation but the safe zone for combined anteversion should be customized for each patient according to the functional anatomy.

POSTER #109

Randomized Trial of the Effect of Femoral Stem Length on Subsidence and Functional Outcome following THA: An EBRA-FC Analysis

Linda I. Suleiman, MD, Adam I. Edelstein, MD, Alysen Demzik, Hasham M. Alvi, MD, Matthias Braito, MD, Matthew D. Beal, MD, Rainer Biedermann, MD, David W. Manning, MD

Introduction: Femoral component subsidence rates following total hip arthroplasty (THA) have been reported as high as 4.2mm at 2 years. It is also reported in the literature that stems with a subsidence of 1.2mm/year during the first two years were likely to fail. EBRA-FCA (Ein-Bild-Roentgen-Analyse-femoral component) is a radiographic technique with reported accuracy and reliability in assessing femoral implant subsidence. The aim of this study is to assess the impact of stem length on subsidence and outcome.

Methods: We performed a prospective, randomized blinded study comparing two femoral implants (short and standard) of the same design from a single manufacturer. 57 patients undergoing THA were randomized into two groups at the time of surgery (27 short stems, 30 standard stems) and all patients were weight bearing as tolerated immediately following surgery. Patient demographics, radiographs, VR-12 and Patient Reported Outcomes Measurement Information System (PROMIS) were prospectively collected at 6 weeks, 3 months, 6 months, 12 months and 24 months. EBRA-FCA using standard radiographs was performed by a blinded technician to measure stem subsidence.

Results: The average age of the patients were 60 (30 females, 27 males) with no statistical difference in age (p=0.77), race (p=0.12), ethnicity (p=0.12), gender (p=0.79), between the groups. There was no difference between short and standard stem groups in VR-12 mental (p=0.25-0.87) or physical component (p=0.34-0.77), PROMIS Physical Function (p=0.20-0.96), Pain Behavior (0.11-0.95) and Pain Interference (p=0.10-0.62) scores. The EBRA-FCA of 43 patients showed a mean subsidence of 0.82mm ± 2.03 for short stems and 1.90mm ±1.14 for standard stems p=0.016. No stems were revised.

Conclusion: In this randomized trial, no difference in clinical outcome was linked to stem length. Both short and standard stems had low magnitudes of subsidence but short stems were observed to be more stable from time of implantation to latest follow-up.

POSTER #110

Lateral Incision Reduces Risk of Lateral Femoral Cutaneous Nerve Palsy after Direct Anterior Total Hip Arthroplasty

Victor R. Carlson, BS, Alvin C. Ong, MD, Fabio R. Orozco, MD,
Peter R. Boyle, DO, Eric J. Buxbaum, DO, Rex W. Lutz, BS, Zachary D. Post, MD

Introduction: The lateral femoral cutaneous nerve (LFCN) is at risk of injury during direct anterior total hip arthroplasty. The complications of LFCN palsy include sensory deficits, dysesthesia, and meralgia parasthetica. No studies have evaluated the clinical relationship between skin incision location and LFCN palsy. The purpose of this study is to identify incision characteristics that confer decreased risk of LFCN palsy following direct anterior total hip arthroplasty.

Methods: Patients undergoing total hip arthroplasty by one of three fellowship trained orthopaedic surgeons at a single academic institution in the Northeast region of the United States were prospectively recruited for this study. Six weeks after surgery, subjects were screened for sensory deficits, dysesthesia, and meralgia parasthetica. LFCN palsy was defined as symptoms extending beyond the peri-incisional region in the correct distribution of the nerve. Two orthopaedic fellows evaluated anterior-posterior radiographs of the pelvis for incision starting position, length, and ending position relative to the anterior superior iliac spine using radiopaque markers. Logistic regression analysis was used to quantify the risk of each incision characteristic for LFCN palsy.

Results: In total, 80 consecutive subjects met inclusion criteria for this study. LFCN palsy was observed in 45/80 (56%) of subjects. The intra-class correlation coefficient was 0.99 (95% confidence intervals, 0.98-0.99). The distal end point of the incision was 1cm more lateral in the cohort without LFCN palsy relative to the cohort with palsy (p=0.04; odds ratio, 0.96; 95% confidence intervals, 0.92-0.99). The remaining incision characteristics did not independently influence risk of LFCN palsy.

Conclusion: This is the first study to explore the clinical relationship between incision location and LFCN palsy during direct anterior total hip arthroplasty. Placement of the skin incision 1cm more lateral relative to the anterior superior iliac spine significantly decreases risk of LFCN palsy.

POSTER #111

7-year RSA Evaluation of Vitamin E Diffused Highly Cross-Linked Polyethylene Wear and Stability of Femoral Stems

Charles R. Bragdon, PhD, Christopher J. Barr, BS, Audrey K. Nebergall, BS, Ola Rolfson, MD, PhD, Anders Troelsen, MD, PhD, Harry E. Rubash, MD, Meridith E. Greene, PhD, Henrik Malchau, MD, PhD

Introduction: In vitro studies showed that the anti-oxidative properties of vitamin E stabilize free radicals while retaining the mechanical strength of UHMWPE. The purpose was to evaluate vitamin E diffused polyethylene (VEPE) wear and stability of femoral components using RSA. Patient reported outcome measures (PROMs) were evaluated to determine the clinical outcome at 5 years.

Methods: 48 patients (52 hips) receiving THA participated in a 7 year RSA study. Each patient received a VEPE liner, a porous titanium coated shell, and an uncemented stem with a 32mm head. Tantalum beads were inserted into the VEPE and the femur to measure head penetration and stem stability using RSA. RSA and PROM follow-up was obtained postoperatively, 6 months, 1, 2, 3, 5, and 7 years after surgery. The Wilcoxon signed-ranks test determined if changes in penetration or migration were significant ($p \leq 0.05$).

Results: 43 hips were followed at 5 years, and 10 at 7 years. The median± standard error (SE) superior head penetration into the polyethylene was 0.06±0.01mm at 5 years and 0.06±0.03mm at 7 years. There was no difference after 2 years. The median± SE distal stem migration was -0.02±0.24mm at 5 years, and -0.08±0.92mm at 7 years with no significant differences over time. All PROMs improved significantly from the preoperative to all other intervals ($p<0.001$ for all).

Conclusion: VEPE liners show very low wear at 7 years. Early observed wear, likely due to poly-creep, is lower than similar liners measured using RSA. Most stems were stable, however, the high standard error results from one stem that migrated substantially by 6 months (9.4mm). It has since stabilized. This study documents the longest-term evaluation of in vivo wear performance of vitamin E stabilized UHMWPE. These results suggest VEPE will continue to demonstrate excellent clinical performance in the coming years.

POSTER #112

An Oldie but Goodie: Midterm Results of a Dual Offset Tapered Femoral Stem for Total Hip Arthroplasty

Joseph A. Karam, MD, Ritesh R. Shah, MD, Jeffrey M. Goldstein, MD, Alexander C. Gordon, MD, Matthew L. Jimenez, MD, Wayne M. Goldstein, MD

Introduction: Tapered proximally porous coated femoral stems have shown excellent results in total hip arthroplasty (THA). The aim of this study was to evaluate the mode of failure, survivorship and radiographic osseointegration signs of the largest single surgeon series to date of one such stem.

Methods: In this retrospective study, we identified 1,331 hips in 1,112 patients who received the dual offset tapered femoral stem by a single surgeon using a postero-lateral approach with over 2 years of follow-up. Patient demographics, implant characteristics, and causes of failure were identified. THA and stem survivorship were analyzed using the Kaplan-Meier method.

Results: Cemented femoral stem was used in 163 hips (12.2%), while 1,168 hips were cementless. The average follow-up was 8.03 years (range 2-18), with 406 hips having over 10 years of follow-up. Sixty hips in 58 patients (4.5%) required revision THA. Stem failure occurred in only 7 hips (0.5%), 4 due to cemented femoral stem loosening. No uncemented femoral stem experienced failure by loosening ($p<0.001$). Mean THA survival with cementless technique was 16.8 years, compared to 14.9 years for cemented THA ($p=0.270$).

Conclusion: To our knowledge, this is the largest single surgeon series to date evaluating the proximally porous coated stem in THA. Femoral stem loosening as a cause for revision was only 0.5%. Interestingly, the cementless femoral stem experienced no failures by stem loosening at a mean of 8-year followup.

POSTER #113

The Rising Use of Total Hip Arthroplasty for Femoral Neck Fractures in the United States

Benjamin M. Stronach, MS, MD, Patrick F. Bergin, MD, Jorge L. Perez, MD, Shawna Watson, BA, Gerald McGwin, PhD, Brent A. Ponce, MD

Introduction: The decision to treat displaced femoral neck fractures with hemiarthroplasty (HA) or total hip arthroplasty (THA) is controversial. The purpose of this study was to examine the trends in femoral neck fractures treated with arthroplasty in the United States.

Methods: This is a retrospective cohort study from 2004-2013 using the National Inpatient Sample database in conjunction with ICD-9 codes to identify patients receiving HA or THA for the treatment of closed femoral neck fracture (n=1,059,414). We evaluated the trend of these two treatments along with demographics, comorbidities, length of stay, cost of admission and same admission mortality.

Results: We found a 42% increase in the use of THA during the study period from 8.4% in 2004 to 12.9% in 2013 (Figure 1). Patients receiving THA were younger (mean age 74.7 THA vs. 80.4 HA, $p<0.001$) with fewer comorbidities, higher likelihood of discharge to home (24% THA vs. 10% HA, $p<0.001$) and lower same admission mortality risk (1.5 % THA vs. 2.4 % HA, $p<0.001$) in comparison to HA. The largest increase in the use of THA was seen in patients under the age of 65 (14% in 2004 to 26% in 2013).

Conclusion: Our investigation of arthroplasty for the treatment of femoral neck fracture found that HA remains the most common arthroplasty option, but THA increased during the study period in comparison to HA. This trend was most noticeable in more recent years from 2010-2013. Patients receiving THA were younger and healthier with fewer comorbidities, less likely to sustain a same admission mortality and more likely to discharge to home in comparison to HA patients.

POSTER #114

The Impact of Myasthenia Gravis and Multiple Sclerosis on Total Hip Arthroplasty

Perez Agaba, BS, Beau J. Kildow, MD, Herman S. Dhotar, MD, Thorsten M. Seyler, MD, PhD, Samuel S. Wellman, MD, Michael P. Bolognesi, MD

Introduction: There have been limited studies on how neurological deficits in patients with myasthenia gravis and multiple sclerosis affect total joint arthroplasty (TJA). This study addresses the postoperative complications among this patient population after index total hip arthroplasty (THA).

Methods: 1,293 and 2,294 patients with myasthenia gravis (MG) and multiple sclerosis (MS) respectively who underwent THA were identified from the Medicare Database containing records of over 50 million patients between 2005 and 2012. Each cohort was matched 1:5 by age and gender to a control. 90-day and 2-year surgical complications were evaluated postoperatively using Odds ratios and 95% confidence intervals in Stata.

Results: 90-day surgical complications included; MG: Prosthetic joint infection (PJI) (OR 45.11, 95%CI 30.78-66.10), hip dislocation (OR 26.65, 95%CI 19.95-35.61), periprosthetic fracture (PPFx) (OR 20.08, 95%CI 10.10-39.92), THA revision (OR 24.14, 95%CI 16.08-36.22), arthrotomy/incision and drainage (I&D;) (OR 33.11, 95%CI 20.89-52.50), MS: PJI (OR 10.08, 95%CI 7.49-13.57), hip dislocation (OR 13.88, 95%CI 11.52-16.74), PPFx (OR 14.26, 95%CI 9.21-22.07), THA revision (OR 12.69, 95%CI 9.60-16.77), arthrotomy/I&D; (OR 13.75, 95%CI 9.28-20.36). 2-year surgical complications included; MG: PJI (OR 21.89, 95%CI 16.81-28.50), hip dislocation (OR 21.68, 95%CI 17.54-26.79), PPFx (OR 16.04, 95%CI 10.16-25.32), THA revision (OR 17.68, 95%CI 13.69-22.85), arthrotomy/I&D; (OR 24.02, 95%CI 16.74-34.47), MS: PJI (OR 9.80, 95%CI 8.12-11.82), hip dislocation (OR 15.62, 95%CI 13.78-17.71), PPFx (OR 13.26, 95%CI 10.09-17.43), THA revision (OR 11.28, 95%CI 9.56-13.32), and arthrotomy/I&D; (OR 13.75, 95%CI 10.79-17.53).

Conclusion: Our results suggest that patients with MS and MG are more than 10 times and 20 times respectively, more likely to have surgical complications after THA compared to the general population. The highest individual complication was hip dislocation in the MS cohort and PJI in the MG cohort. Patients may benefit from preoperative counseling about expectations and potential postoperative complications as well as close postoperative follow up.

POSTER #115

Modified Precautions in Posterior Approach THA Does Not Increase Dislocation Risk

Peter K. Sculco, MD, Matthew P. Abdel, MD, Kaitlin M. Carroll, BS, Seth A. Jerabek, MD, Edwin P. Su, MD, Mark P. Figgie, MD, Friedrich Boettner, MD, Thomas Sculco, MD, David J. Mayman, MD

Introduction: Postoperative hip precautions that avoid hip flexion past 90 degrees for six weeks after total hip arthroplasty(THA) are utilized to decrease the risk of dislocation during the early post-operative period. The purpose of this study is to evaluate the effect of limited hip precautions on early functional recovery and on the incidence of postoperative dislocation.

Methods: Between January 2014 and December 2014,717 patients undergoing primary uncemented posterior approach THA treated with modified post-operative hip precautions with a minimum of 6-week follow-up were included for analysis. These patients were 1:1 matched with a cohort of patients who underwent a posterior approach with standard precautions. Inclusion criteria included patient undergoing a primary uncemented THA for a diagnosis of osteoarthritis with a minimum of six-week follow-up. Exclusion criteria included revision surgery, femoral neck fracture, dementia, alzheimers or neuromuscular disorders. Postoperatively patients in the modified group did not require an elevated toilet seat or chair or an abduction pillow at night, and were allowed to side-sleep. They were allowed to drive at 2 weeks for the left and 3 weeks for the right. Patients were instructed to avoid combined flexion and internal rotation of the hip (leg shaving position).

Results: 717 patients satisfied the inclusion criteria and underwent primary uncemented THA without posterior hip precautions. Mean age of 53 (range 44-83). Femoral head size was 28, 32, or 36mm. Three known dislocations occurred in our cohort of 717 patients with the first 6 weeks at a minimum of 6-week follow-up (0.42%) compared to 3 dislocations in the matched standard precautions group. No post-operative complications occurred during the study period.

Conclusion: In this multi-surgeon study involving 717 patients undergoing primary THA using the posterior approach, the removal of post-operative hip precautions did not increase the rate of early dislocation. The dislocation rate of 0.42% demonstrates that post-operative precautions in patients undergoing THA through the posterior approach without known risk factors for dislocation are unnecessary.

POSTER #116

Impact of a Rapid-Recovery Approach to Elective Total Hip Arthroplasty on Patient Outcomes and Episode Cost

Gerald Rupp, PhD, Anthony Shaia, MD, Paul Duwelius, MD, John Tessier, MD, Jim Gera, MBA, Tom Kowalik, MD, Amer Mirza, MD, Matt DeHart, MPH

Introduction: Many elective total hip arthroplasty THA patients present with a low comorbidity index (≤4) at acute-care admission (based on Healthcare Cost and Utilization Program comorbidity definitions). This study determined patient selection criteria and the impact on patient outcomes and episode costs using a Rapid-Recovery Care Pathway (RRCP).

Methods: Retrospective Medicare claims data was used in this cross-sectional study comprised of two cohorts, a historical baseline (12,200 episodes, CY2014) and a cohort of RRCP prospective THA surgical patients (570 episodes from Q1-Q3, 2015). The RRCP protocol includes a short acute-care stay (1-midnight) discharged with limited home health (HH) services (4 visits or less). Of the 570 episodes considered for RRCP study group, 84 were discharged after a 1-midnight acute-care stay, and of those 20 received limited HH services (RRCP cohort).

Results: Data from the study cohorts showed patients of all ages, <65 to >90, have quality surgical and recovery outcomes. The 90-day all cause readmission rate for RRCP patients was 0%, whereas readmission rate for patients with an extended acute-care stay (>1-midnight) but limited HH visits (partial RRCP, n=40) was 2.5%. Average episodic cost for RRCP episodes was $10,300 compared to a baseline of $21,292. No gender differences were observed in either outcomes or cost.

Conclusion: The RRCP study demonstrated that patients with a low comorbidity index could achieve quality outcomes at reduced cost. Such an optimized patient pool could have these procedures performed in an ASC setting with similar outcomes and cost savings. Analysis of 12,200 elective THA baseline episodes indicates that ~5,000 were eligible RRCP inclusion. If all 5,000 were included in an RRCP protocol, an annual savings of nearly $55M could have resulted. Because our data set represents approximately 10% of the current elective THA volume, a total annual savings of $550M could be generated nationwide.

POSTER #117

Determining Health-Related Quality-of-Life Outcomes Using the SF-6D following Total Hip Arthroplasty

Randa K. Elmallah, MD, Jaydev B. Mistry, MD, Chukwuweike U. Gwam, MD, Morad Chughtai, MD, Farshad Adib, MD, Kevin J. Bozic, MD, Steven M. Kurtz, PhD, Michael A. Mont, MD

Introduction: Following total hip arthroplasty (THA), patients' perception of their post-operative improvement and health plays a large role in satisfaction with surgery. The short form-6D (SF-6D) is a health-related quality-of-life measure that assigns numerical value to the perception of patients' own health. This allows clinicians to measure the impact of THA on a patient's overall health status, which can be used in economic modeling of cost-effectiveness. The purpose was to determine SF-6D values of patients post-THA, to determine whether score changes were clinically relevant, and to compare these with post-operative functional and physical improvements.

Methods: We evaluated 188 patients who underwent primary THAs at seven institutions, who had a mean age of 69 years (range, 47-88) and BMI of 28.8 (range, 19.8-38.9). The SF-6D values were obtained from patients' SF-36 scores, and clinical relevance of value changes was determined using effect size. Effect sizes between 0.2-0.5 were considered 'small', 0.5-0.8 'moderate', and above 0.8 'large'. Clinical correlation was assessed using Lower Extremity Activity Scale (LEAS) and Harris Hip Scores (HHS). Patients were assessed pre-operatively and post-operatively at 6 months, and 1, 2, 3, and 5 years.

Results: The SF-6D scores improved from pre-operatively and achieved statistical significance at all points. Effect size demonstrated good clinical relevance up to final follow-up (1.27, 1.30, 1.07, 1.08, and 1.05, respectively). The LEAS improved at all follow-up points from pre-operatively (+1.8, +2.0, +1.8, +1.5, +1.6 points, respectively), as well as the HHS (+38, +40, +38, +39, +41 points, respectively). The improvements in the LEAS and HHS significantly positively correlated with the SF-6D scores at all time points.

Conclusion: Post-THA SF-6D scores correlate with functional outcomes and have clinical relevance, as demonstrated by their effect size. Incorporating this straightforward and easy-to-use measurement tool when evaluating patients following THA will facilitate future cost utility analyses.

POSTER #118

Mental Health Disease and Perioperative Outcomes following Hip Surgery

Luis Grau, MD, Spencer Summers, MD, Dustin H. Massel, BS,
James J. Hutson, MD, Alvin Ong, MD, Victor Hernandez, MD

Introduction: Several studies have investigated the effect of medical comorbidities on outcomes following hip fracture surgery. However, the impact of psychiatric illness on perioperative and intraoperative outcomes following hip fracture surgery is not well understood.

Methods: A retrospective review of the National Hospital Discharge Survey (NHDS) registry between 1990-2007 was performed. All patients were identified by ICD-9-CM codes for primary diagnosis of hip fracture and selected by primary procedural codes. Patients were stratified into two cohorts; those with a diagnosis of depression, anxiety, schizophrenia, or dementia, and those without such a diagnosis. Independent sample t-tests and Pearson's Chi-squared were used to assess preoperative characteristics. Logistic regression and multivariate linear regression were used to assess predictors of adverse events across that time.

Results: A total of 4,732,165 patients were included, of which 172,659 (3.6%), 51,153 (1.1%), 30,702 (0.6%), 232,547 (4.9%) had a diagnosis of depression, anxiety, schizophrenia, or dementia, respectively. Patients with diagnosed anxiety, schizophrenia and dementia were more likely to have non-routine discharges ($p<0.001$). Patients with dementia, depression, or schizophrenia were more likely to leave against medical advice (AMA). A higher percentage of patients with dementia and schizophrenia had an associated medical comorbidity and surgically related perioperative complication ($p<0.001$ for each). Similarly, a higher percentage of patients with dementia and depression experienced a mechanical complication ($p<0.001$ for each). Each mental illness was independently associated with non-routine discharge and for leaving AMA ($p<0.001$ for each). Schizophrenia was an independent risk factor for any adverse event in the perioperative period ($p<0.001$).

Conclusion: Mental health disease patients are a unique population at significantly higher risk for perioperative complications and non-routine hospital discharges. Surgeons should understand these risks and use them to modify surgical fixation selection, perioperative decision making and discharge planning when treating patients with mental illness.

POSTER #119

Hepatitis C is an Independent Risk Factor for Perioperative Complications and Adverse Events in Patients with Hip Fractures

Dustin H. Massel, BS, Luis Grau, MD, Spencer Summers, MD, Fernando Vilella, MD, Alvin Ong, MD, Victor Hernandez, MD

Introduction: Prior studies have demonstrated the influence of medical comorbidities on outcomes following hip surgery. However, the impact of hepatitis C on perioperative and intraoperative outcomes following hip fracture surgery has not been well characterized.

Methods: A retrospective review of the National Hospital Discharge Survey (NHDS) registry between 1990-2007 was performed. All patients were identified by ICD-9-CM codes for primary diagnosis of hip fracture and selected by primary procedural codes. Patients were stratified into two cohorts; those with and without a diagnosis of Hepatitis C. Independent sample t-tests and Pearson's Chi-squared were used to assess preoperative characteristics. Logistic regression and multivariate linear regression were used to assess predictors of adverse events across that time.

Results: A total of 4,717,536 patients were included the analysis. 5,377 (0.1%) had non-cirrhotic Hepatitis C. Patients with Hepatitis C had longer hospital stays (10.0 ± 7.0 versus 8.0 ± 7.0, $p<0.05$), higher percentage of adverse events (44.6% versus 39.6%, $p<0.05$), and mechanical complications (7.7% versus 0.3%, $p<0.05$), compared to patients without Hepatitis C. Multivariate regression analysis showed that Hepatitis C was an independent risk factor for any perioperative adverse event.

Conclusion: This is the largest analysis of hip fractures in the US on perioperative outcomes in patients with hepatitis C. Our data demonstrates that although hip fracture patients with non-cirrhotic hepatitis C in general do not have a higher rate of medical comorbidities as compared to patients without, they experience prolonged lengths of stay, and are at increased risk for adverse events, including increased rates of medical, surgical, and mechanical complications. Knowledge of these risks has the potential to alter treatment strategies, medical optimization, postoperative monitoring, and discharge planning for this patient population.

POSTER #120

Direct Anterior Approach is a Viable Option for Hemiarthroplasty in Elderly Patients with Femoral Neck Fracture

SM Javad Mortazavi, MD, Navid Salehi, MD, Alireza Aminjavaheri, MD

Introduction: Femoral neck fractures in elderly patients are frequent and represent a great health care problem. Traditionally, hemiarthroplasty for these patients were associated with greater risk of dislocation and complication. The purpose of this study was to investigate if bipolar hemiarthroplasty for elderly patients with femoral neck fracture through an anterior approach was associated with better outcome and less complications comparing to standard posterior approach.

Methods: During period of January 2010 and January 2013, we did 65 bipolar hemiarthroplasty in 65 elderly patients with femoral neck fracture. We then compared these patients with 65 sex and age matched patients who underwent bipolar hemiarthroplasty through posterior approach at our institution.

Results: The mean age of patients were 73.4(62-92 years) and 72.4 (61-90) in anterior and posterior approach groups, respectively. There were 31 male and 34 female in each of the study and control groups. The operation time was significantly lower in anterior approach (p=0.001). Patients in posterior group had higher perioperative blood loss (p=0.002) and received more blood transfusion (p=0.01). In addition, dislocation rate (p=0.02) and infection (p=0.001) were significantly higher in posterior approach group. Finally, patients in anterior approach had significantly lower postoperative hospital stay (0.01) and ambulated earlier.

Conclusion: Bipolar hip arthropalsty via anterior approach is a viable option for elderly patient with femoral neck fracture. It is associated with lower complication rate, hospital stay and faster rehabilitation.

POSTER #121

Infection is Not a Risk Factor for Perioperative and Postoperative Blood Loss and Transfusion in Revision Total Hip Arthroplasty

Jaiben George, MBBS, Matthew Sikora, BS, Jessica Masch, BS, Mario Farias-Kovac, MD, Alison K. Klika, MS, Wael K. Barsoum, MD, Carlos A. Higuera, MD

Introduction: Septic hip revisions are associated with increased complications and utilize more resources compared with aseptic revisions. Blood transfusion remains a serious complication of revision total hip arthroplasty (THA) and results in increased hospital costs. It is unclear whether infected revision THA has different transfusion requirements and blood loss than non-infected.

Methods: From 2009 to 2013, 687 revision THA surgeries were identified. After excluding surgeries with incomplete data, 626 revision THAs (547 patients) were included. All surgeries were retrospectively classified as septic (n=120) or aseptic (n=506) based on Musculoskeletal Infection Society criteria for periprosthetic joint infection. Transfusion rates (including perioperative and up to 3 days postoperative) and intraoperative blood loss (calculated from pre-operative and post-operative hematocrit and body surface area) were collected. Potential confounding variables (e.g., complexity of surgery [i.e., liner exchange, single or dual component removal and/or implant], demographics, comorbidities and cell saver use) were recorded. Independent risk factors for transfusion and blood loss were analyzed using multiple regression analysis.

Results: The transfusion rate was higher in septic revisions (septic=108/120[90%], septic=370/506[73%]; $p<0.001$), as was the average amount of blood loss (septic= 2,533.29 ± 161.74 mL, aseptic =1,974.37 ± 68.57 mL; $p<0.001$). After adjusting for potential confounders, infection was not an independent risk factor for transfusion ($p=0.176$) or blood loss ($p=0.437$) (Tables 1&2). Increasing age ($p=0.004$), higher American Society of Anesthesiologists score ($p=0.047$), lower preoperative hemoglobin ($p<0.001$), cell saver use ($p<0.001$) and a complex revision surgery ($p<0.001$) were independently associated with greater risk of transfusion (Table 1).

Conclusion: While blood loss and transfusion rates were higher in septic revisions, presence of infection alone did not increase the risk of transfusion or blood loss. Blood management strategies in revision THAs should be guided by the type of surgery planned and patient's preoperative health rather than the presence of infection.

POSTER #122

Alpha-Defensin Test for Diagnosis of PJI in the Setting of Failed Metal-on-Metal Bearings or Corrosion

Kamil Okroj, BA, Erdan Kayupov, MD, Michael Kheir, MD, Joshua Bingham, MD, Christopher Beauchamp, MD, Javad Parvizi, MD, Craig J. Della Valle, MD

Introduction: Metal-on-metal (MoM) bearing surfaces pose a unique challenge in that some patients may develop adverse local tissue reactions (ALTR) that can mimic periprosthetic joint infections (PJI). Alpha-defensin has emerged as a reliable test for diagnosis of PJI, with many clinicians incorporating it into their diagnostic algorithm. The purpose of this multi-center study was to evaluate the performance of the alpha-defensin test in patients with failed MoM bearing surfaces or an ALTR secondary to corrosion.

Methods: Following IRB approval, we reviewed 26 patients from three institutions with a failed MOM hip or a corrosion reaction that had an alpha-defensin test performed. Fifteen patients had a MoM total hip arthroplasty, 10 ALTR secondary to head-neck corrosion, and 1 MoM hip resurfacing.

Results: One of the 26 patients met Musculoskeletal Infection Society (MSIS) criteria for infection. However, 8 of 26 (31%) had a false-positive (FP) alpha-defensin test, while 17 of 26 (65%) were true-negatives (TN) and 1 of 26 (4%) was true-positive, corresponding to a negative predictive value (NPV) of 100%, and a positive predictive value (PPV) of 11%. The specificity was 68% and sensitivity was 100%. The subjects with a false-positive had significantly higher synovial white blood cell (WBC) counts (2,683 vs. 649 WBC/uL, p=0.024), with a trend towards higher serum ESR (17.1 vs. 8.8 mm/hr, p=0.053) and CRP levels (17.9 vs. 10.4 mg/L, p=0.25). Serum metal levels were similar between false-positives and true negatives (Cobalt 14.7 vs. 15.7, p=0.92; Chromium 11.3 vs. 9.4, p=0.79). A higher proportion of the subjects who tested false-positive had head-neck corrosion (FP 50%, TN 29%, p=0.39), however this was not significant with the numbers available.

Conclusion: The alpha-defensin test for PJI has a high negative predictive value in the setting of a ALTR. However, not unlike the synovial fluid WBC count, it is prone to falsely positive results.

POSTER #123

Re-Revision Total Hip Arthroplasty: Epidemiology and Factors Associated with Outcomes

Stephen Yu, MD, Hesham Saleh, BS, Nicholas Bolz, BS, John Buza, MD, Parthiv Rathod, MD, Richard Iorio, MD, Ran Schwarzkopf, MD, Ajit Deshmukh, MD

Introduction: Revision total hip arthroplasty (THA) is becoming increasingly relevant and the epidemiology of re-revision THA is not yet well-understood. We aim to investigate the epidemiology and risk-factors that are associated with re-revision THA.

Methods: 288 revision THA were retrospectively analyzed between 1/2012 and 12/2013 at our institution. Patients who underwent two or greater revision THA were included. First-revisions due to periprosthetic joint infection (PJI) were excluded. Patient demographics, surgical indications, operative details, and clinical follow-up were collected. Re-revision failure was defined as any return to operating room.

Results: 51 re-revision patients were included. Mean age was 59.6(±14.2 years), with 32(67%) females, average BMI of 28.8(±5.4), and median ASA 2(23;55%). The most common re-revision indications were acetabular component loosening (15;29%), PJI (13;25%) and instability (9;18%). Among re-revisions, the most common indications of the first revision were acetabular component loosening (11;27%), polyethylene wear (8;19%) and instability (8;19%). There was an increased risk of re-revision failure if the re-revision involved exchanging only the head and polyethylene liner (RR=1.792; p=0.017), instability was the first-revision indication (RR=3.000; p<0.001), and instability was the re-revision indication (RR=1.867; p=0.038). If isolated femoral component revision was indicated during the re-revision, there was a decreased risk of failure (RR=0.268, p=0.046). 1-year re-revision survival was 54% (23/43).

Conclusion: Acetabular component loosening and PJI were the most common indications for re-revision. There was an increased risk of re-revision failure if instability was a cause for reoperation at any point during the revision history, or if only an isolated head and polyethylene liner exchange was indicated during the re-revision procedure. There was a decreased risk of re-revision failure if an isolated femoral stem revision was performed. A better understanding of the indications and patient factors that are associated with re-revision failures can help align surgeon and patient expectations in this challenging population.

POSTER #124

Sustainable Improvements in Clinical Function and Health Utility in Revision Cases with Paprosky 3A and 3B Acetabular Defects Implanted with a Porous Titanium Acetabular Component

Geoffrey Westrich, MD, Michael Masini, MD, Danielle Campbell, MS, Catherine Vanacore, MS

Introduction: Acetabular revision surgery remains a demanding procedure with higher failure rates than primary total hip arthroplasty. An acetabular component with three-dimensional porous titanium and anatomic screw holes was designed to allow the cup to be positioned anatomically and provide reliable fixation.

Methods: A prospective multicenter study of 193 cases assessed clinical outcomes of the revision shell. Radiographs, demographics, Harris Hip Score (HHS), and Short Form 36 (SF-36) were collected preoperatively, at 6 weeks, 3 months, and annually to 5 years. Short Form 6D (SF-6D) utility values were obtained by transforming SF-36 scores through the Brazier method and were analyzed for effect size.

Results: At surgery, mean age was 63.5 years and mean BMI was 28.1. 69/193 cases were Paprosky class 3A/3B. HHS improved significantly ($p < 0.001$) from a preoperative mean of 53.60 to 86.15 at 1 year. Significant gains were maintained, with a mean of 87.35 at 5 years. HHS for Paprosky 3A/3B cases improved significantly ($p < 0.001$) from a preoperative mean of 48.11 to 85.45 at 1 year. Significant gains were maintained, with a mean of 85.65 at 5 years. No cup migration/unstable cups were identified radiographically. Twelve cup re-revisions occurred, for infection (7), aseptic loosening (4) and dislocation (1). A clinically significant improvement in health utility was achieved by 3 months, with an effect size of 0.54. Clinically significant scores were maintained throughout follow-up, reaching an effect size of 0.64 at 5 years. Effect sizes were greater for 3A/3B Paprosky cases than the overall study population, reaching clinical significance at 3 months with an effect size of 0.64, and reaching 1.19 at 5 years.

Conclusion: Even in patients with severe acetabular defects, acetabular components with three-dimensional porous titanium and anatomic screw holes provide excellent stability, predictable biologic fixation, and improved clinical function/health utility.

POSTER #125

A Note to Surgeons: Biphasic Trends in Revision of ASR THA

Bayard C. Carlson, MD, Andrew J. Bryan, MD, Nazly Carrillo-Villamizar, MD, Rafael J. Sierra, MD

Introduction: The Articular Surface Replacement (ASR) metal-on-metal total hip arthroplasty (DePuy Orthopaedics, Inc, Warsaw, IN, USA) was recalled in 2010 because of higher than normal failure rates and reports of adverse reaction to metal debris (ARMD). This report summarizes one surgeon's experience with this system at an average of 5.9-year follow-up.

Methods: We retrospectively reviewed all 60 patients (70 hips) who underwent THA with the ASR system. We assessed revision rates, time to revision, and modes of failure. We reviewed cobalt (Co) and chromium (Cr) ion concentrations for these patients. Minimum follow-up was 2.2 years (mean, 5.9 years; range, 2.2-9.1 years).

Results: The overall revision rate was 35.7% (25/70). The mean time to revision was 61.5 months (range, 14.4-110.8 months). The most common reasons for revision were trunnionosis (44%), metallosis (28%), pain (12%), and infection (12%).ARMD was present in 23 of 25 revision cases (92%). No revision performed within 3 years (0/4) was performed for trunnionosis whereas 52.4% (11/21) of revisions performed after 3 years were performed with trunnionosis as the primary indication (p=0.022). As well, trunnionosis was found intraoperatively in a significantly higher proportion of revision cases performed after 3 years (71% vs. 0%, p=0.003). Overall, Co levels significantly increased over time in all patients (Co mean over first 2 years: 5.8 ng/ml vs. Co mean after 7 years: 9.4 ng/ml, p=0.014).

Conclusion: Our failure rate of 35.7% for ASR metal-on-metal implant systems at 5.9 years is higher than the 13% five-year revision rate reported by the National Joint Registry of England and Wales in 2010. We also demonstrate that, over time, trunnionosis has played a significantly increased role in the failure of these implants. The increasing incidence of trunnionosis and ARMD warrants continued close surveillance of these patients.

POSTER #126

The Utility of Metal Ion Trends in Predicting Revision in Metal-on-Metal THA

Bayard C. Carlson, MD, Andrew J. Bryan, MD, Nazly Carrillo-Villamizar, MD, Rafael J Sierra, MD

Introduction: There is a paucity of published data examining serum metal ion level trends over time. The goal of this study was to examine the clinical value of metal ion trends over time in guiding surgical intervention for failed metal-on-metal total hip arthroplasty (THA).

Methods: We retrospectively reviewed 60 patients (70 hips) who underwent THA with the ASR system (DePuy Orthopaedics, Inc, Warsaw, IN, USA). We assessed revision rates. We reviewed pre-revision cobalt (Co) and chromium (Cr) concentrations over time. At the time of revision surgery, local soft tissue destruction was assessed by the primary surgeon and reported as severe if the abductors, external rotators, or posterior joint capsule were involved. Minimum follow-up was 2.2 years (mean, 5.9 years; range, 2.2-9.1 years).

Results: The overall revision rate was 35.7% (25/70). Multivariate regression analysis showed that pain was associated with a significantly elevated risk of revision (OR= 45, $p<0.0001$). Patients who underwent a revision surgery had significantly elevated Co levels during the first 3 years following their initial surgery (Co 7.3 vs 3.1 ng/mL: $p=0.016$). Severe local soft tissue destruction was seen in 67% of patients who had pain as well as elevated Co levels during the first 3 years following their initial surgery compared to 0% of patients who did not have pain or elevated Co levels during this time period($p=0.001$).

Conclusion: In our experience, pain is a significant predictor of revision surgery. Patients who experienced pain and had elevated Co levels during the first three years following their initial surgery showed a significantly higher percentage of severe local tissue destruction at the time of revision surgery. Based on this relationship, revision surgery should be discussed and likely recommended in patients with painful implants and persistently elevated Co levels especially if these were present within 3 years of surgery.

POSTER #127

Multicenter Study of 94 Custom Acetabular Triflange Components at Mid-Term Follow-Up: Not for the Faint of Heart

Michael E. Berend, MD, John B. Meding, MD, Hal E. Cates, MD,
Keith R. Berend, MD, Adolph V. Lombardi, MD

Introduction: Four reconstructive techniques have emerged to treat complex acetabular defects: (1) large allografts, (2) “cup/cage” constructs, (3) metallic augments and uncemented hemispherical cups, and (4) custom triflange implants. The goal of triflange implants is to improve fixation on host bone, allow modular liner options, facilitate enhanced fixation surfaces, match patient complex geometries, provide an opportunity to utilize locking screws, and possibly reduce surgical operative time. The purpose of this study is to report midterm clinical results with these components, describe the implant design and generation technique, and report complications.

Methods: 94 hips underwent custom triflange component implantation at 3 regional joint replacement centers. The average age was 66 yrs., BMI 29, and 4.7 years out from the most recent of an average 1.7 prior THA. Pelvic defects included Paprosky Class 2C, 3A, 3B, and pelvic discontinuities. 29 hips had associated femoral revision.

Results: Implants utilized an average of 12 screws with 3 locking screws. Head sizes ranged from 28 to 44 mm, with 36 mm being most common. HA coating was utilized in the majority of components. Mean Follow-up was 3.5 yrs. (range 1-11 yrs.). HHS improved from 46 pre-op to 75 post-op. 20 of 94 hips (21%) experienced at least one complication; many hips had more than one. Dislocation was 10%, infection 6%, and femoral issues 3%. 10% of the hips had the implants ultimately removed. 1 hip was revised for “possible component loosening” for a survivorship, with aseptic loosening as the endpoint, of 99%.

Conclusion: This is the largest series of custom triflange acetabular components reported demonstrating that these implants provide reliable fixation in the most complex of acetabular deformities. Complications are common with 10% of implants being removed for recurrent infection, instability, and periprosthetic fracture. These implants achieve reliable fixation and offer an efficient and reliable solution for complex hip reconstruction.

POSTER #128

What Pre-Operative Risk Factors Are Associated with Poor Outcomes of Revision Surgery for Pseudotumours in Patients with Metal-on-Metal Hip Arthroplasty?

Young-Min Kwon, MD, PhD, Dimitris Dimitriou, MD, John Paul Manalo, MD, Tsung-Yuan Tsai, PhD, Lincoln Liow, MD

Introduction: Revision surgery of failed metal-on-metal (MoM) total hip arthroplasty (THA) for adverse tissue reaction (pseudotumour) can be challenging as a consequence of tissue necrosis. The aims of this study were to (1) report the revision outcomes of patients who underwent revision surgery for failed MoM hip arthroplasty due to symptomatic pseudotumour, and (2) identify pre-operative risk factors associated with revision outcomes.

Methods: Between January 2011 and January 2013, a total of 102 consecutive large head MoM hip arthroplasties in 97 patients (Male:62, Female:35), who underwent revision surgery were identified from the database of a multi-disciplinary referral center. The indications for revision surgery in the current study included elevated metal ion levels in symptomatic patients with the presence of pseudotumour on MRI. The patients were evaluated clinically and radiographically at 6 weeks, 3 months, 12 months following the revision surgery and annually thereafter.

Results: At minimum follow-up of 2 years (range:26-52 months), at least one complication had occurred in 14 out of 102 revisions (14%)(Fig. 1). Pre-revision radiographic loosening ($p=0.01$), MRI findings of solid lesions with abductor deficiency on MRI ($p<0.001$) and intra-operative grading of adverse tissue reactions ($p=0.05$) correlated with post-revision complications. The re-operation rate of revised MoM THA was 7%. Implant survivorship was 88% at 3 years. Metal ion levels declined after removal of MoM articulation (Fig 2).

Conclusion: Pre-revision radiographic loosening, the presence of solid lesions and abductor deficiency on MRI and severity of intra-operative grading were identified as pre-operative risk factors associated with poorer revision outcomes, providing clinically useful information for pre-operative planning and peri-operative counseling of MoM THA patients undergoing revision surgery. Our study highlights the importance of early systematic evaluation of at-risk patients in optimizing revision outcome of MoM hip arthroplasty patients.

POSTER #129

Mid-Term Survivorship after Revision Total Hip Arthroplasty with a Triflange Acetabular Component

Brian P. Gladnick, MD, Keith A. Fehring, MD, Susan M. Odum, PhD, Michael J. Christie, MD, David K. DeBoer, MD, Thomas K. Fehring, MD

Introduction: Custom triflange acetabular components are being increasingly utilized for the reconstruction of Paprosky type IIIB acetabular defects. However, long term survivorship data is lacking. The purpose of this study was to report the mid-term (minimum 5-year follow-up) results utilizing custom triflange acetabular reconstructions for major acetabular defects.

Methods: We retrospectively identified 55 patients who had undergone revision total hip arthroplasty utilizing a custom triflange component between 2000 and 2011. These patient's records were reviewed to determine overall implant survivorship, incidence of re-operation, clinical performance, and incidence of complications. Mean follow up was 6.7 years.

Results: Overall survivorship of the triflange component at mean follow up of 6.7 years was 90.1% (50/55). Five triflange implants were ultimately explanted and revised; four for infection and one for aseptic loosening. Overall, 17 patients (30.9%) required additional surgery: 7 patients were treated for post-operative infection (4 explanted, 3 irrigation and debridement), 4 for femoral related issues, 2 for instability, 2 for osteolysis, 1 for a dissociated liner, and 1 for aseptic loosening. In those patients whose implant survived, the mean HOOS Jr. score at final follow up was 78 (58-100).

Conclusion: Custom triflange acetabular reconstruction remains a viable option for addressing major acetabular defects with good mid-term survivorship. To our knowledge, this is the first report of mid-term (minimum 5-year) results in this challenging arthroplasty population. Our data suggests that while a high survivorship rate may be possible at mid-term follow-up, complications are common and significant challenges remain in those that fail.

POSTER #130

Revision THA for Aseptic Femoral Loosening: More Common with the Direct Anterior Approach

Shuichi Eto, MD, PhD, James I. Huddleston, III, MD, Derek F. Amanatullah, MD, PhD, Katherine Hwang, MS, William J. Maloney, MD, Stuart B. Goodman, MD, PhD

Introduction: The direct anterior approach for total hip arthroplasty (THA) has generated increased interest recently. Proposed benefits include: reduced dislocation rates, faster recovery, less pain, shorter hospital stay, and quicker cessation of ambulatory aids. Others have reported 1) no differences in functional ability or gait kinematics between the direct anterior approach and posterior approach beyond 6 weeks post-operatively and 2) higher intra-operative femoral fracture rate. In this study we compared time to failure and reasons for revision of primary THA performed elsewhere and subsequently revised at our institution after the direct anterior versus other approaches.

Methods: We retrospectively reviewed revision THAs performed by three attending surgeons from January 2005 to December 2015. Primary THAs were divided into direct anterior approach (30 cases) or non-anterior approach cohorts (100 cases, randomly selected from 453 cases) based on the original surgical approach for primary THA. Because all primary direct anterior THAs were performed after 2004, to eliminate temporal bias, we identified a subset of the non-anterior group in which the primary THA was performed after 2004 (known as recent non-anterior, 100 cases, randomly selected from 169 cases). Pertinent demographic, clinical and radiographic data were reviewed.

Results: There were no significant differences among the three cohorts with respect to demographic data, with the numbers available. Mean duration from primary to revision THA was 3.0 ± 2.7 years (direct anterior approach), 12.0 ± 8.8 years (non-anterior approach) and 3.6 ± 2.8 years (recent non-anterior approach), respectively. There was a significant difference in time to revision between direct anterior and combined non-anterior approach cohorts ($p < 0.001$). Aseptic femoral loosening was more frequent in direct anterior approach cohort (9/30, 30.0%) than non-anterior cohort (8/100, 8.0%) ($p = 0.007$), as well as recent non-anterior cohort (7/100, 7.0%) ($p = 0.002$). Osteolysis was most frequent indication for revision in non-anterior approach cohort ($p<0.001$).

Conclusion: Revision THA for aseptic femoral loosening has become more common with introduction of the direct anterior approach.

POSTER #131

Do Cemented Dual Mobility Cups Confer Stability for Complex Acetabular Revisions?

Perry J. Evangelista, MD, Darren Plummer, MD, MBA, Kamil Okroj, BA, Craig J. Della Valle, MD, Ran Schwarzkopf, MD, MSc

Introduction: Hip dislocations have been reported in up to 28% of revision total hip arthroplasty (THA) cases. Dual mobility cups have been reported to confer increased stability in patients with a history of dislocations and complex and revision THA. We report the results of a multicenter study evaluating the use of a cemented dual mobility acetabular cup as part of complex acetabular reconstructions in revision THA cases. Our hypothesis is that dual mobility cups would reduce the rates of acute dislocations after complex acetabular reconstruction in revision THA cases.

Methods: 19 patients were identified who underwent cementation of a dual mobility cup into a fully porous metal revision acetabular cup. Patients were considered candidates if they had Paprovsky acetabular defect grade 2 or 3 and were revision THA cases. Prospective data including demographic, dislocation history, reoperation, body mass index (BMI) and smoking history was collected and assessed.

Results: Nineteen patients were included in the study, average age of the patient cohort was 62 years old. Of 19 patients, there were no cases of documented instability of the dual mobility cups at an average of 14 months. No documented reoperations that required revision of the acetabular cup. One patient was lost to follow-up and another passed away from natural causes. One patient was revised for a periprosthetic femur fracture.

Conclusion: In this small, short-term follow-up case series of complex acetabular revisions there were no failures of implanted dual mobility cups due to instability. This study shows dual mobility cups confer stability in complex acetabular reconstruction cases where dislocations are a major concern.

POSTER #132

Proximal Femoral Replacement in Non-Oncologic Patients Undergoing Revision Hip Arthroplasty

Ivan De Martino, MD, Peter K. Sculco, MD, Rocco D'Apolito, MD, Allina Nocon, MPH, Mathias P. Bostrom, MD, Thomas P. Sculco, MD

Introduction: Proximal femoral replacement is commonly used as part of oncologic limb salvage procedures. Recently, these megaprostheses have been utilized in complex revision arthroplasties where proximal femoral bone is compromised. The purpose of this study is to evaluate the clinical and radiographic survivorship of proximal femoral replacements as a salvage treatment for bone loss after hip arthroplasty.

Methods: We retrospectively reviewed the clinical and radiographic outcomes of 31 proximal femoral replacements of a single design between 2004 and 2013 at a single institution. The mean age at time of index surgery was 62 years, 58% were female, and mean BMI was 28.1. The indications and complications associated with megaprosthesis implantation were collected. Average follow-up was 60 months (range 24-120 months). Kaplain-Meier survivorship assessed clinical and radiographic survivorship. Indication for revision, use of a constrained liner and construct length were assessed as risk factors for construct failure.

Results: The indications for proximal femoral replacement was periprosthetic infection (n=12, 38.7%), aseptic loosening (n=10, 32.3%), periprosthetic fracture (n=6, 19.3%), and non-union (n=3, 9.7%). A constrained liner was used in 22 hips (71%). The average length of bone resection was 148 cm (range 81-240 cm). There were nine revisions (29.2%): 3 for infection (9.7%) 2 for dislocation (6.5%), 2 for aseptic loosening (6.5%), and 2 for periprosthetic fracture (6.5%). Two of the 3 infections were in patients treated for infection. Overall survivorship was at 70.8%. There was no relation between the length of the bone resection, indication for revision and failure rate.

Conclusion: Proximal femoral replacement in non-oncologic revision hip arthroplasty demonstrated a high failure rate at 2-10-year follow-up. Despite the high failure rate, the benefits of this salvage construct are that it allows full weight-bearing and allow rapid mobilization with minimal morbidity.

POSTER #133

Cementing Constrained Liners into Secure Cementless Shells: A Minimum 15-Year Follow-Up Study

Grant Young, BS, Matt Abdel, MD, Devon Goetz, MD, Nicholas Bedard, MD, Richard Amendola, MS, Samuel Carlson, BS, Justin Greiner, MD, John Callaghan, MD

Introduction: Surgeon can be presented with the scenario of a well-fixed well-positioned shell in a low demand patient at high risk for instability. The purpose of the present study is to report the minimum 15-year results where a constrained liner was cemented into a well-fixed shell.

Methods: Prior to 2001, 31 consecutive tripolar constrained acetabular liners were cemented into secure, well positioned cementless acetabular shells at 3 institutions. 16 cases were performed for recurrent instability and 15 for intraoperative instability. The average age at surgery was 72.1 years (range 31 to 91 years). Patients were evaluated for need of revision for failure of the constrained liners as well as revision for any other reason. Radiographs were evaluated for loosening of the acetabular and femoral component and osteolysis.

Results: At minimum 15-year follow-up, 16 patients (17 hips) had died and 14 patients (14 hips) were living. 5 hips required a revision over the follow up interval. 3 were revised for failure of the constrained liner. In one case, the liner was cemented proud and it pulled out. It was re-cemented with not further dislocations. A second liner fractured at the capturing ring of the constrained device when the patient had a seizure. It was successfully treated with a second constrained liner. Finally, a third liner failed by liner loosening. There were two additional revisions. One for infection and one for femoral loosening. No other components were radiographically loose over the 15-year follow-up interval.

Conclusion: In the difficult revision population, cementing a constrained liner into a cementless acetabular shell demonstrated durable results with 9.6% of hips revised at 15 years for constrained liner failure, but all were salvaged with a second constrained liner. No case was revised for acetabular loosening and only one for femoral loosening.

POSTER #134

Cleaning the Taper in Retained Stems: 3 Methods Show What is Left and What is Taken Away

Calin S. Moucha, MD, Audrey Martin, BA, Douglas W. Van Citters, PhD

Introduction: During both primary and revision hip arthroplasty the taper must be prepared for the head. Cleaning is necessary because the existing stem taper is likely covered in proteinaceous matter/bone and may occasionally show evidence of in vivo corrosion. The objective of this work is to subject different stem taper geometries and thread-forms to a controlled cleaning process to evaluate efficacy and potential residue.

Methods: Seven stem designs revised for reasons other than taper corrosion representative of a wide range of taper geometries and thread-forms were selected. After ethanol disinfection, stems were gently cleaned under a digital microscope with an ultrasonic soft, nylon toothbrush. Male tapers were imaged using light microscopy, scanning electron microscopy and white light interferometry to set a baseline surface character and profile. An analogue proteinaceous layer was created using blue layout fluid, based on its insolubility in water, medium level of adherence, and easily imaged color. Each stem was subjected to 3 separate 1-minute cleaning steps by a single investigator: Pulsatile lavage; lap pad cleaning; or Bovie Pad buffing. The tapers were subsequently imaged with the same three modalities, then cleaned using acetone and soft nylon bristles.

Results: Pulsatile lavage failed to completely remove the protein analogue, but did not harm the taper, nor leave material behind. Scrubbing with a lap pad left residual cotton material on all the stems, ranging from the smoothest taper to the taper with the most topographic variation. Additionally, the protein analogue was only removed from the highest topographic points on the profile. In all cases, buffing with a Bovie Scratch Pad damaged the taper junction. While the protein analogue was removed from most surfaces, this cleaning modality left 4 um-deep scratches across the surface. Residual abrasive material up to 100um in diameter could be found on a number of the stems.

Conclusion: The present work demonstrates that three cleaning approaches have the potential to improperly prepare a retained stem for a new femoral head.

POSTER #135

Patient Characteristics and Surgical Factors Associated with Early Reoperation following Revision Total Hip Arthroplasty: A Case Control Study

Katharine F. Hollnagel, MD, Xing Li, BA, Nicholas Bene, BA, Sumon Nandi, MD

Introduction: Revision total joint arthroplasty has higher rates of morbidity and mortality than primary total joint arthroplasty. Failed revision surgery may have further consequences due to the limited options available for salvage. Our aim was to determine patient characteristics and surgical factors associated with early reoperation following revision total hip arthroplasty (THA).

Methods: We retrospectively reviewed the association between patient characteristics, surgical factors, and early reoperation following revision THA using a matched case-control design. The source population included all patients at our institution who underwent revision THA from 2005-2013. Case patients (n=95) were defined as those requiring reoperation within 1 year of revision THA. Controls (n=380) were matched at a ratio of 4 controls per case by surgeon, year of surgery, and reason for surgery. American Society of Anesthesiologists (ASA) score, gender, BMI, comorbidities, and duration of surgery were recorded. Chi-square test was used for categorical variables, while t-test was used for continuous variables. Univariate and multiple logistic regression analyses were performed for risk of early reoperation.

Results: History of alcohol abuse (p=0.005), seizure disorder (p=0.0493), or autoimmune conditions (p=0.0201) were risk factors for reoperation within 1 year of revision THA. ASA score, gender, BMI, and duration of surgery were not predictive of early reoperation.

Conclusion: Our study suggests patients with history of alcohol abuse, seizure disorder, or autoimmune conditions should be optimized preoperatively and closely monitored postoperatively the year following THA revision surgery due to the increased risk of early reoperation.

POSTER #136

Outcomes Following Revision of a Modular Acetabular Metal-on-Metal Total Hip Arthroplasty Implant

Lindsay Kleeman, MD, Daniel Goltz, BS, MBA, David Attarian, MD, Samuel Wellman, MD, Michael Bolognesi, MD, Thorsten Seyler, MD

Introduction: Metal-on-metal (MoM) implants for total hip arthroplasty (THA) have been associated with high complication and revision rates. We reviewed the outcomes, revision rates and metal ion levels for patients with a modular acetabular MoM THA performed at our institution to identify trends in metal ion levels and outcomes following revision.

Methods: We retrospectively reviewed patients with a MoM implant at our institution between 2002-2013 (minimum 2-years follow-up). Inclusion criteria were patients with a primary THA for degenerative arthritis or avascular necrosis with a modular cup MoM THA system (Pinnacle/ Ultamet; Depuy Orthopedics). We performed comparative analysis using Kruskal-Wallis test and calculated 5-year survival using Kaplan Meier log-rank analysis.

Results: Our institution performed 680 MoM THAs with a modular cup system (193 patients with bilaterals, 487 with unilaterals). The 5-year implant survival was 97.3% (bilaterals included) and 96.3% (unilateral only). Average cobalt and chromium metal ion levels were higher in the patients who underwent revision (cobalt 18.0, average chromium 19.4) compared to patients that were not revised (cobalt 3.47, chromium 2.93). There was no significant difference in metal ion ratio levels between groups (metal ion ratio 2.72 versus 1.28, p-value =0.151). Of the 34 patients requiring revision, 15 patients had both cup and liner revised, while 18 patients had only liner exchange. Pain levels were significantly higher in patients with revision of the cup/liner (47%) compared to those with liner revision alone (5.6%). (p-value = 0.012). Complication rates were higher in the cup/ liner revision group (13% dislocation, 7% infection) compared to the liner revision group (6% infection, 6% wound drainage) but this was not statistically significant.

Conclusion: Patients who underwent revision of a modular cup metal-on-metal implant have significantly higher metal ion levels prior to revision and higher complication rates following revision of the cup/liner compared to liner revision alone.

POSTER #137

Intraoperative Fluoroscopic Correction Highly Correlates with Postoperative Radiographic Correction in Periacetabular Osteotomy

Jeremy A. Ross, MD, James D. Wylie, MD, Jill A. Erickson, PA-C, Mike B. Anderson, MSc, Christopher L. Peters, MD

Introduction: Periacetabular osteotomy (PAO) has become an established treatment for symptomatic hip dysplasia in skeletally mature patients. Fluoroscopy is commonly used in the operating room to guide the osteotomy and judge correction of the acetabular fragment. There has been limited investigation on the concordance between intraoperative fluoroscopic correction and postoperative radiographic correction. The purpose of this study was to compare the correction obtained fluoroscopically to the radiographic correction measured postoperatively.

Methods: We retrospectively reviewed all patients that underwent PAO by the senior author from November 1, 2001 to June 21, 2015. Patients were included if they had preoperative, intraoperative, and minimum six-week postoperative imaging. Patients were excluded who underwent PAO for retroversion or had a prior history of Perthes disease. The lateral center edge angle (LCEA) and acetabular index (AI) were measured by two authors and averaged. The primary outcome, concordance between correction on intraoperative fluoroscopy and minimum 6-week postoperative measurements, was analyzed using the concordance correlation coefficient (rc) and a Bland Altman analysis.

Results: Ultimately, 141 procedures in 121 patients were available for analysis. The amount of intraoperative correction of LCEA and AI was highly correlated with postoperative radiographic measures (rc=0.79, 95% CI 0.73 -0.85, p<0.001) and (rc=0.77, 95% CI 0.70 -0.84, p<0.001). The mean corrections for LCEA on intraoperative and postoperative images were 18° (range, 6° -41°) and 19° (range, 7° -33°), respectively. The mean corrections for AI on intraoperative and postoperative images were -17° (range, -33° --6°) and -16° (range, -32° --5°), respectively. Both interrater and intrarater agreement were moderate to high for LCEA and AI (all, rc = 0.50 -0.90).

Conclusion: Intraoperative fluoroscopic correction in PAO is highly correlated to postoperative radiographic correction and can be used to reliably judge the correction of acetabular orientation.

POSTER #138

5-Year Natural History of Asymptomatic FAI: A Prospective Matched Cohort Study

Cody C. Wyles, MD, German A. Norambuena, MD, Brandon J. Yuan, MD, Benjamin M. Howe, MD, Bruce A. Levy, MD, Robert T. Trousdale, MD, Rafael J. Sierra, MD

Introduction: The purpose of this investigation was to evaluate changes in MRI and clinical examination over 5 years in a group of athletes with asymptomatic limited range of motion (LROM) of the hip compared to matched controls.

Methods: Thirteen adolescent athletes were identified during sports physicals with hip internal rotation <10° and subsequently matched to 13 controls with internal rotation >10°. All were asymptomatic and received a complete hip examination and imaging. Patients returned at 5-year follow-up and completed repeat hip examination, imaging, and the hip disability and osteoarthritis outcome score (HOOS). Twenty-one patients have completed 5-year follow-up; the other 5 will be evaluated within the next month.

Results: Upon enrollment, 16/26 hips (62%) in the LROM group had abnormal MRI findings within the acetabular labrum or cartilage compared with 8/26 hips (31%) in the control group (RR=2.0; 95% CI=0.95-4.2; P=0.068). At 5-year follow-up, 16/17 hips (94.1%) in the LROM group had abnormal MRI findings compared with 12/24 hips (50%) in the control group (RR=1.9; 95% CI=1.2-3.0; P=0.013). New or progressive findings were documented on MRI in 13/18 hips in the LROM group compared to 6/24 hips in the control group (RR=2.9; 95% CI=1.4-6.2; P=0.007). Mean HOOS score was lower in the LROM group at 5-year follow-up: 94.1 (range 86.3-100) versus 99.5 (range 97.5-100) (p<0.001). Positive anterior impingement sign was associated with progressive MRI findings (RR=2.2; 95% CI=1.3-3.6; P = 0.005). Mean HOOS score was lower for those with a CAM lesion than without (mean=95.9 versus 99.1; P=0.03).

Conclusion: At 5 years, young athletes with LROM of the hip show increased progressive degenerative changes on MRI and lower HOOS scores compared to matched controls. These findings suggest more aggressive screening and counseling of young active patients may be helpful to prevent hip osteoarthritis in those with LROM or FAI.

POSTER #139

Comparative Analysis of Radiographic Hip Joint Geometry Using Measurement Tools on Picture Archiving and Communication System: A Prospective Study of 100 Pelvic Radiographs

Seung Chan Kim, Young Wook Lim, MD, Soon Yong Kwon, MD, Woo Lam Jo, Hyung Jin Kim, MD, Yong Sik Kim, MD

Introduction: A contralateral normal hip joint has been often used as a reference standard in preoperative planning and intraoperative assessment of hip arthroplasty, with the assumption that bilateral hip joint geometries have no significant differences. However, one previous study using analogue measurements on hardcopy films reported significant bilateral variation in hip joint geometry. We therefore investigated the level of agreement between the right and left hips for each measurement; and determined index values and the range of normal bilateral variations.

Methods: We assessed 100 standard anteroposterior radiographs of the pelvis in this study. Two independent observers measured the actual value of femoral head diameter, location of the femoral head center, acetabular offset, femoral offset, hip offset, greater trochanteric height, neck-shaft angle, medullary canal diameter, and proximal femoral diameter. Intraclass correlation coefficients and values of mean difference were calculated for each measurement.

Results: The results demonstrated perfect agreement (ICC > 0.8) between the right and left hips for most parameters and substantial agreement for greater trochanteric height (ICC = 0.735) and femoral offset (ICC = 0.773). The mean difference (and standard deviation) in the measurement between the right and left hips for the location of the femoral head center and the acetabular offset were 0.60 ± 0.48 mm and 0.42 ± 0.30 mm, respectively.

Conclusion: Hip joint geometry is not influenced by side. In hip arthroplasty, a contralateral normal hip can be reliably used as a guide for preoperative planning using measurement tools on a picture archiving and communication system.

POSTER #140

Demographics and Early Functional Outcomes of Periacetabular Osteotomy after Previous Hip Arthroscopy

Benjamin F. Ricciardi, MD, Kara G. Fields, MS, Catherine S. Wentzel, BS, Bryan T. Kelly, MD, Ernest L. Sink, MD

Introduction: The incidence of hip arthroscopy is increasing in patients with acetabular dysplasia, and this may have an effect on the functional outcomes of subsequent periacetabular osteotomy (PAO). The purpose of our study is to identify preoperative demographic and radiologic characteristics, and early functional outcome scores in patients treated with PAO after previous hip arthroscopy.

Methods: Patients were enrolled from a single-center prospective hip registry from March 2010 to April 2015. Patients undergoing PAO for symptomatic acetabular dysplasia with a minimum of 1-year follow-up were divided into two cohorts (N=93 patients): patients with prior hip arthroscopy (SCOPE group; N=22 patients) versus patients without prior hip arthroscopy (NO_SCOPE group; N=71 patients). Previous hip surgery in the SCOPE group included: hip arthroscopy (N=25), sports hernia repair (N=1), iliotibial band release (N=2), and surgical hip dislocation (N=1). Mean follow-up was 24 months (range 11 -59 months). Demographic and radiologic characteristics, and functional outcome scores [mHHS, HOS, and iHOT-33] were recorded at 6 months and 1 year post-operatively.

Results: Age, sex, and incidence of bilateral PAO did not differ between SCOPE versus NO_SCOPE, with female predominance in both groups. Preoperative lateral center edge angle, alpha angle, femoral version, and acetabular version were similar between the two groups. Preoperative HOS sport trended towards being lower in the SCOPE versus NO_SCOPE group (mean[SD]: 41[21] versus 51[22]; p=0.06). Preoperative mHHS, HOS ADL, and iHOT33 were not different between the two groups. At 1-year follow-up, mHHS, HOS Sport, HOS ADL, and iHOT33 were lower in the SCOPE versus NO_SCOPE group (mHHS:73[14] versus 86[14]; p<0.001)(HOS Sport:62[25] versus 85[18];p<0.001)(HOS ADL:84[12] versus 93[11];p=0.007)(iHOT33:62[21] versus 79[20];p=0.004). Postoperative complications and reoperations were similar between the two groups (p=0.99).

Conclusion: Patients with symptomatic acetabular dysplasia undergoing PAO after prior hip arthroscopy had similar demographic and radiologic findings of patients without a prior hip arthroscopy. Postoperative functional outcome scores were lower in patients with prior hip arthroscopy up to 1-year postoperatively.

POSTER #141

The HOOS, JR and Other Osteoarthritis-Based Patient-Reported Outcome Tools Demonstrated Large Ceiling Effects following Periacetabular Osteotomy

Cale A. Jacobs, PhD, Stephen T. Duncan, MD, Ryan D. Muchow, MD, Ryan M. Nunley, MD, John C. Clohisy, MD, The ANCHOR Group

Introduction: The purpose of this study was to determine if the HOOS, JR was a valid and responsive tool following periacetabular osteotomy (PAO), and to compare these features to other commonly used hip PRO scoring systems. We hypothesized that the HOOS, JR would be less responsive to change as the other scores, and would demonstrate a marked ceiling effect.

Methods: We identified 304 PAO patients from a multicenter prospective cohort with minimum 2-year follow-up. All patients underwent PAO for development dysplasia of the hip, and with a subset having concomitant procedures to address cam (n = 16), pincer (2), or combined deformity (3). The HOOS, JR was calculated using responses to the HOOS questionnaires, and the convergent validity, responsiveness, and the presence of floor or ceiling effects were compared between the HOOS, JR and the HOOS-PS, WOMAC, UCLA Activity and Harris Hip Scores (HHS).

Results: HOOS, JR scores significantly improved at mean follow-up of 4 years after PAO (Pre = 62.3 ± 18.6, Post = 84.2 ± 17.0, $p < .001$). The HOOS, JR correlated well with the HOOS-PS ($r = 0.90$) and WOMAC ($r = .97$) but less so with the HHS ($r = .45$) and UCLA ($r = .24$). While the majority of PRO tools were responsive, dramatic ceiling effects were noted as 110/304 (36%) had perfect postoperative HOOS, JR scores, which was consistent between patients < age of 18 (41/97, 42%), between 18 and 30 (36/126, 29%), ≥ 30 years (33/81, 41%). Ceiling effects were also noted for all other PROs as 90/304 (30%) had perfect HOOS-PS, 86/304 (28%) perfect UCLA, 70/304 (23%) perfect WOMAC, and 66/304 (22%) perfect HHS.

Conclusion: Large ceilings effects were noted with the HOOS, JR, HOOS-PS, WOMAC, UCLA, and HHS after PAO. These PRO tools were initially created and validated largely in hip OA and THA patients and, as such, future studies are necessary to develop more appropriate PRO tools for younger, more active hip patient populations.

POSTER #142

What are the Risk Factors for Disease Progression in Femoroacetabular Impingement? A Prospective Analysis of the Contralateral Hip in FAI patients

Craig R. Louer, MD, Jeffrey J. Nepple, MD, John C. Clohisy, MD

Introduction: Only certain individuals with bony femoroacetabular impingement (FAI) morphology will ever develop hip symptoms. The purpose of the current study was to determine incidence and risk factors for symptom development in the contralateral hip of patients with symptomatic FAI in the other hip.

Methods: The study cohort included the contralateral hip of 179 consecutive patients presenting for surgical treatment of FAI. At initial presentation and follow-up time points, patients recorded standardized outcome questionnaires, including the presence of symptoms in the contralateral hip. Age, sex, range of motion, activity level, and radiographic parameters were compared between initially asymptomatic patients who developed symptoms and those who remained asymptomatic. A Kaplan-Meier survival curve was calculated to demonstrate the time to symptom development.

Results: A total of 148 patients (83%) were followed for at least one year after enrollment (mean 2.9 years). Thirty-four (23%) patients presented with symptoms in the contralateral hip. Twenty-seven hips (24% of the initially asymptomatic) developed symptoms at an average of 2.0 years from presentation. Patients with a UCLA activity score of 9 or 10 at presentation were less likely to develop symptoms (13% vs. 33%, p=0.032). The total arc of rotation in 90° flexion was decreased in hips developing symptoms (39.4 vs. 50.3°, p=0.012). Head-neck offset ratio on the AP pelvis radiograph was lower among hips that developed symptoms (0.163 vs. 0.153, p=0.037). Age, gender, and alpha-angle were not associated with symptom development. Kaplan-Meier analysis demonstrated 72%, 67%, 56%, and 48% symptom-free survival at 1, 2, 3, and 4 years.

Conclusion: Approximately one in four patients with FAI presents with symptoms in the contralateral hip and an additional one in four patients develops significant symptoms in the following four years. Several factors, including low activity level, less hip rotational motion, and decreased HNOR, were associated with the development of symptoms. These results provide insight into the natural history of the contralateral hip that has FAI deformity but may not yet be symptomatic.

POSTER #143

Current Practices for Treatment of Knee Osteoarthritis Are Not in Line with AAOS Guidelines

Victor R. Carlson, BS, Alvin C. Ong, MD, Fabio R. Orozco, MD,
Victor H. Hernandez, MD, MS, Rex W. Lutz, BS, Zachary D. Post, MD

Introduction: The American Academy of Orthopaedic Surgeons (AAOS) recently updated a series of evidence-based best practice guidelines for the treatment of osteoarthritis of the knee. It is unclear how effectively these recommendations have penetrated the medical community. The purpose of this study is to evaluate physician compliance to the AAOS guidelines for treating knee osteoarthritis.

Methods: Thirty non-operative orthopaedic physicians and 30 orthopaedic surgeons specialized in treating joint pathology were recruited for this study from various regions of the United States. Participants evaluated five vignettes depicting various stages of osteoarthritis and selected their preferred treatment method from a spectrum of modalities currently supported and not supported by the AAOS. The vignettes were designed to elicit two conservative responses, one conservative or invasive response, and two invasive responses according to AAOS recommendations.

Results: Among the non-operative and operative subgroups, 95/150 (63%) and 93/150 (62%) of treatment choices were recommended by the AAOS, respectively. Of note, the most common and fifth most common responses were intra-articular steroids (25%) and intra-articular hyaluronic acid injections (9.7%). These modalities are currently designated as cannot recommend for or against and cannot recommend, respectively.

Conclusion: Nearly 40% of surveyed orthopaedic physicians are not following AAOS guidelines for management of knee osteoarthritis. Excessive use of intra-articular corticosteroids and hyaluronic acid play the largest role. For corticosteroids, this likely reflects limitations in current literature. Future clinical trials must clarify the role of this important modality. The excessive use of hyaluronic acid likely reflects poor dissemination of the AAOS guidelines for knee osteoarthritis. Education of the medical community is needed to decrease use of interventions that have not been shown to benefit patients. Given the concerning implications of these findings, a broader survey of knee joint physicians is warranted.

POSTER #144

Long-Term Complications after Periacetabular Osteotomy

Joel E. Wells, MD, MPH, Jeffrey Petrie, MD, Kayla Thomason, BS,
Perry Schoenecker, MD, John Clohisy, MD

Introduction: The Bernese periacetabular osteotomy (PAO) is commonly performed to treat symptomatic acetabular dysplasia. PAO has been reported to have a 6% risk of grade III/IV complications at short-term follow-up. The purpose of this study was to evaluate the long-term complications following the Bernese PAO.

Methods: We retrospectively analyzed perioperative and long-term complications in 179 hips (153 patients) that underwent PAO at average follow up of 10 years (range 7 to 20 years). Complications were graded according to the previously validated and modified Clavien-Dindo grading scheme. Mean patient age was 25 years. There were 133 women and 20 male patients.

Results: Major complications Grade III/IV occurred in 17 cases (10%). Five were for open reduction of non-unions (two iliac, one ischial, one posterior column, and one pubis), three were I&D; of hematoma or deep infection, three for heterotopic ossification (HO) excision, three for revision PAO for loss of reduction or retroversion, one deep venous thrombosis, one for acute posterior column open reduction and internal fixation, and one for ostectomy of displaced superior pubis. There were 15 (8%) asymptomatic non-unions with pubis being the most common. Overall, 60 (33%) hips had some form of heterotopic ossification (HO) although asymptomatic (38 grade I, 20 grade II, and three hips with grade III HO). Five patients reported lateral femoral cutaneous nerve dysesthesia, one patient had chronic foot pain from sciatic dysesthesia, and one femoral nerve palsy that resolved post operatively. There were no vascular injuries, no acetabular osteonecrosis, and no complications that increased over time.

Conclusion: In this long-term follow up study, the majority of hips undergoing the Bernese PAO have minimal complications. Overall there was 10% Grade III/IV major complications with the most common being non-union (12%). In an experienced surgeon's hands, PAO is a safe and effective procedure for symptomatic acetabular dysplasia.

POSTER #145

A Less Invasive Approach to Periacetabular Osteotomy Improves Patient Reported Outcomes without Compromising Orientation

Nate Wingert, MD, Mike B. Anderson, MSc, Jill Erickson, PA-C, Christopher L. Peters, MD

Introduction: We sought to demonstrate the patient reported and radiographic outcomes of a series of patients that underwent a rectus sparing (RS) periacetabular osteotomy (PAO). Secondarily we wanted to evaluate the perioperative variables and early complications of this population.

Methods: We reviewed a consecutive series of all patients that underwent PAO by a single surgeon at an Academic Medical Center and a Community Hospital. Data from May 3rd, 1996 to May 26th, 2015 were reviewed. The RS approach was incorporated into the surgeons practice in June 2012. Data were collected via chart review. Continuous data was analyzed using a paired samples T-test and ordinal data was analyzed using a Wilcoxon Sign-Rank test.

Results: There were 104 PAO procedures performed using a RS approach. The NPS score decreased from a median preoperative NPS score of 7 (IQR, 4 -8) to a median score of 4 (IQR, 1 -6; $p<0.001$). PF CAT scores improved from a preoperative mean of 39 (95% CI 36.7 -41.3) to a mean of 43.9 (95% CI 39.9 -47.6; $p=0.008$). The postoperative AI was within goal in 80% of the cases. The postoperative LCEA was within goal in 74% of the cases. The mean EBL was 300 mL (250 -500) and the median length of stay was 3 days (IQR, 3 -4). Intraoperative complications included one delayed ischial fracture. There were no major complications such as DVT, PE, or nerve injury other than LFCN (n=5). Five patients reported painful hardware and one patient required subsequent arthroscopic femoral osteochondroplasty.

Conclusion: We have previously reported that, in our initial experience with rectus sparing PAO, positioning of the acetabular fragment was not compromised with the less invasive surgical approach. The data from this expanded population of RS PAO patients suggests the approach is safe, offers significant improvement in pain and function, and supports the previous report of accuracy of acetabular fragment positioning.

POSTER #146

6-Year Follow-up of Hip Decompression with Concentrated Bone Marrow Aspirate to Treat Femoral Head Osteonecrosis

Orlando D. Sabbag, MD, John R. Martin, MD, Rafael J. Sierra, MD

Introduction: Patients with early stages of femoral head osteonecrosis (FHON), in which femoral head collapse has not occurred (Ficat I and II), can be treated with minimally invasive salvage procedures to prevent disease progression. One such procedure is femoral head decompression with injection of concentrated autologous bone marrow aspirate (CBMA). The goal of this study is to report outcomes in patients treated with this technique.

Methods: Sixty hip decompressions with injection of CBMA were performed in 39 patients for the treatment of FHON between 2007 and 2010. After excluding those with advance stage ON and those lost to follow-up, 39 cases in 27 patients were reviewed at a minimum follow-up of 6 years. Steroids were presumed to be the underlying etiology for ON in 14 patients (52%). The main outcome measured was hip preservation at final clinical follow-up. Treatment failure was reported in patients with disease progression ultimately requiring total hip arthroplasty (THA). A postoperative questionnaire was used to assess pain relief and patient-reported disability at final clinical follow-up.

Results: Eleven of the 39 hips operated (28%) went onto treatment failure, requiring THA. Survival at 1, 2, and 5 years was 82%, 77%, and 74% respectively. There was a strong correlation between continuation of steroid treatment and treatment failure ($p < 0.001$). Excellent pain relief with no disability was attained in 61% of the preserved hips. Occasional pain with limited activity was reported for 36% of the hips. One patient (3%) reported constant low-grade pain with significant activity limitations. There were no major complications.

Conclusion: Hip decompression augmented with CBMA in the treatment of FHON successfully prevented progression to THA in 72% of patients at 6 years. Two thirds of the patients achieved significant pain relief with minimal disability. Most patients who failed treatment did so within the first year following the procedure and had a higher risk of failing with continued steroid use.

POSTER #147

Regional Variation in Promotion of Direct Anterior Approach THA and Minimally Invasive THA and TKA by Members of the American Association of Hip and Knee Surgeons

Neal B. Naveen, BS, Ademola I. Shofoluwe, BS, Avinash Inabathula, BS, Mary Ziemba-Davis, BS, R. Michael Meneghini, MD, Lucian C. Warth, MD

Introduction: The direct anterior approach (DAA) in the hip, and minimally invasive surgery (MIS) are popular in total hip and knee arthroplasty (THA, TKA). The objective of this study was to identify any regional differences in the level of promotion of these orthopaedic joint replacement techniques.

Methods: An internet search was performed to identify surgeon-specific websites for each active member of the AAHKS using the members' full name and a previously published set of criteria (1). Each website was evaluated utilizing a questionnaire to systematically identify claims made regarding proposed DAA, MIS THA, and MIS TKA benefits and risks. The United States was stratified geographically into the East, South, Midwest, and West.

Results: 1631 active AAHKS members were found to have 1807 websites. Promotion of DAA THA was found on 22.6% of all websites, with no statistically significant regional variation identified. MIS THA was referenced significantly higher than average (P<.0001) in the East region (30.2%) when compared to the South (15.9%) and West (16.5%), but not the Midwest (23.2%). MIS TKA was referenced significantly more often (P=.02) in the East (25.4%) when compared to the South (17.8%). Risks of DAA THA, MIS THA and TKA were addressed on less than 7% of the websites, with no significant variation amongst the four regions.

Conclusion: In an era of decreasing re-imbursement and looming payment bundles, patient perception is linked to fiscal solvency in orthopaedic practice. Over one fifth of AAHKS members promote DAA THA, MIS THA and MIS TKA. We identified significantly more aggressive marketing of MIS THA and TKA techniques in the Eastern region. Interestingly, aggressive internet marketing of the DAA was pervasive in all geographic regions without significant variation. An understanding of the regional marketplace and responsible promotion of validated techniques is of value to surgeons in and evolving marketplace.

POSTER #148

Beware of Periprosthetic Joint Infection in a Bundled Payment System for Total Joint Arthroplasty

Michael Rutter, MD, James Gotoff, BA, David Kolessar, MD, James Murphy, MD, Abbigail Woll, BS, Elie Ghanem, MD

Introduction: The current healthcare delivery process has manifested itself as the 'bundle payment' system, where all parties involved share a fixed dollar amount for a standard service period up to 90 days postoperatively. We hypothesize that a case of PJI can consume a portion of profit margins in a bundle payment system with heavy loses to both the surgeon and participating health system.

Methods: Medicare claims under DRG group 469 and 470 were evaluated for completed care episodes. The total cost of care was split between Inpatient/Part B and post-acute care (90 days). Our cohort included 381 patients, 141THA and 240 TKA. There were 32 readmissions (8.4%), 3 of which were surgical cases including one case of PJI requiring I&D; with polyexchange.

Results: The average cost of a surgical readmission was $32,267 compared to $5,663 for a medical complication, in which the one case of PJI constituted 17% of the total readmission expenditures. Patients with a surgical readmission generated an average loss of $63,343 compared to $20,130 for patients with a medical etiology. The case of PJI generated a net loss of $108,037 which constituted 14% of the total negative bundle margin for readmitted patients and was equivalent to approximately 5 patients with medical readmissions. Only 23% of our cohort accrued a positive net bundle margin after taking in consideration all inpatient and post-acute costs. The net loss due to PJI ($108,037) constituted 54% of the total profit margin generated by our cohort.

Conclusion: The cost of treating one case of PJI within 90 days in a bundle payment model for primary hip and knee arthroplasty poses a great economic burden. Surgeons participating in gain sharing will pay a hefty price; hence prevention, meticulous screening, and medical optimization are crucial in sustaining a viable bundle model at their institutions.

POSTER #149

I&D Prior to Resection for Treatment of Periprosthetic Hip Arthroplasty Infection May Decrease Overall Cure Rate

Joseph J. Kavolus, MD, MSCR Daniel J. Cunningham, BS,
Michael P. Bolognesi, MD, Samuel S. Wellman, MD, Thorsten M. Seyler, MD, PhD

Introduction: Infection accounts for 14.8% of revision total hip arthroplasty. Current treatment algorithms frequently utilize an incision and drainage (I&D;) procedure for the treatment of acute infection. This is the first report of the potential influence of I&D; on the success of subsequent infection-related procedures.

Methods: We identified patients who had hip arthroplasty infections treated with a resection at our institution between 2005 and 2015. These patients were split into two groups, by whether or not they had an I&D; preceding their resection. Chart were reviewed for demographics as well as treatment course. “Cure” was defined as having arthroplasty components in place without the need for further surgery or intravenous antibiotics. All patients had a minimum of 1 year of follow-up. Univariate tests of significance were performed between the covariates of interest and the binary outcome of achieving cure using JMP Pro 12.0.1 from SAS.

Results: A total of 70 prosthetic hip infections were treated with resection. 30 of these patients underwent an I&D; prior to their resection while 40 patients were resected without having had an initial I&D. Of the 30 patients that underwent an I&D; prior to their resection, 17 were successfully reimplanted for a “cure” rate of 57% (17/30). 35 of 40 patients that underwent a resection arthroplasty without a prior I&D; were successfully reimplanted for a “cure” rate of 88% (35/40). The difference in cure rates between these two groups remained statistically significant in multivariable analysis (p=0.004). Analyzing patients who had a reimplantation attempt, 97% of patients without a preceding I&D; were “cured” whereas only 85% of patients with an I&D; were “cured” this trended towards statistical significance (univariate p=0.1).

Conclusion: This study demonstrates that patients who underwent an I&D; but ultimately required a two-stage exchange arthroplasty had a lower percentage chance of successful reimplantation.

POSTER #150

Intraoperative Methylene Blue Staining Allows for Visualization of Microbial Biofilm-Associated Tissue in Periprosthetic Joint Infection ◊

Jeremy D. Shaw, MD, Steve Miller, MD, PhD, Anna Plourde, MD, Chancellor Gray, MD, Min Lu, MD, Daniel L. Shaw, BA, Erik N. Hansen, MD

Introduction: Current methods to identify and eradicate biofilm in periprosthetic joint infection (PJI) are inadequate. Methylene blue (MB) has demonstrated ability to stain bacterial glycocalyx. The purpose of the present study was to assess MB-guided surgical debridement as a novel biofilm detection and eradication strategy in PJI.

Methods: A prospective-cohort of 16 total knee arthroplasty (TKA) patients meeting Musculoskeletal Infection Society (MSIS) criteria for PJI who were undergoing the first stage of 2-stage exchange arthroplasty were included in the study. Dilute MB (10%) was instilled in the knee prior to debridement, residual dye removed and stained tissue debrided. Paired tissue samples were collected from the femur, tibia, and capsule during debridement (stained) and after debridement (unstained). Samples were analyzed by neutrophil count (neutrophils (PMNs) / high power field (HPF)), semi-quantitative culture (no growth, broth, rare, few, moderate, numerous), and qPCR for Staphylococcal-species. A priori power analysis demonstrated that 12 patients were needed to detect an effect size of 25% between paired samples for our primary outcome of quantitative PCR. A two-tailed paired t-test was used for statistical significance.

Results: The mean patient age was 64.0+/-6.0 years, mean follow-up was 10.3+/-3.4 months. Across all samples, significantly more bacteria were found in MB-stained vs unstained tissue based on semi-quantitative culture (Wilcoxon ranked-sign test, n=96, p=0.0017). qPCR for Staphylococcal-species showed a 9-fold enrichment in MB-stained tissue (n=30, p=0.0007). Tissue pathology found a mean of 53+/-66PMNs/HPF in MB-stained vs 4+/-22PMNs in unstained tissue (n=96, p<0.0001). All patient subjects cleared their primary infection and underwent reimplantation.

Conclusion: These results demonstrate that MB preferentially stains bacterial biofilm-associated tissue in the context of PJI, suggesting a role for MB in providing a visual index of surgical debridement. Early clinical outcomes are encouraging.

◊ The FDA has not cleared the pharmaceuticals and/or medical devices listed here. Methylene Blue

POSTER #151

Case Order Has an Effect on Periprosthetic Joint Infection Risk

Michael M. Kheir, MD, Antonia F. Chen, MD, MBA, Josh M. Greenbaum, BS, Camilo Restrepo, MD, Mitchell G. Maltenfort, PhD, Javad Parvizi, MD, FRCS

Introduction: Periprosthetic joint infection (PJI) after total joint arthroplasty (TJA) is a serious complication with multiple causes. A previous study in patients undergoing spine surgery demonstrated that cases performed later in the day were more likely to develop surgical site infection. However, the influence of case order on subsequent PJI after TJA is unknown. Thus, this study aims to determine: 1) if surgical case order is a risk factor for PJI, 2) if TJA patients following an infected case have a higher infection risk, and 3) if terminal cleaning after an infected case is effective in reducing risk of subsequent PJI.

Methods: A retrospective, single-institution study was conducted on 31,499 primary or revision TJAs performed from 2000-2014. Surgical case order was determined by the case start time on the day of surgery within the same operating room. PJI was defined using the Musculoskeletal Infection Society criteria. Multiple logistic regression was used to analyze risk factors.

Results: Non-infected cases followed an infected case in the same operating room in 92/31,499 cases (0.29%) and had an increased likelihood of PJI (odds ratio [OR] 3.88, $P<0.001$). Cases performed after terminal cleaning of a PJI case were not at an increased risk of subsequent PJI (OR 1.35, $P=0.110$). Case order had an OR of 1.02 ($P=0.57$) per increment in position; thus, later surgical cases did not have a higher likelihood of infection.

Conclusion: While surgical case order is not an independent risk factor for subsequent PJI, TJA patients that follow an infected case in the same operating room have a significantly higher risk for subsequent infection. Despite improved sterile technique and the use of clean air operating rooms, the risk of contaminating a primary TJA with pathogens from a prior infected case performed in the same room appears to be high. Terminal cleaning appears to be effective in reducing bioburden and infection risk for cases the following day in the same operating room.

POSTER #152

Polymicrobial Periprosthetic Joint Infections: Outcome of Treatment and Identification of Risk Factors

Timothy L. Tan, MD, Michael M. Kheir, MD, Dean D. Tan, BS, Javad Parvizi, MD, FRCS

Introduction: The treatment outcomes of periprosthetic joint infection (PJI) are frequently dependent on characteristics of the causative organism. The objective of this comparative study was to investigate the incidence of and risk factors for development of polymicrobial PJI, and the outcome of surgical treatment of these patients.

Methods: All patients with polymicrobial, monomicrobial, or culture-negative PJI treated between 2000 and 2014 were identified at a single institution. Ninety-five patients with polymicrobial PJI had a minimum follow-up of 12 months. We matched polymicrobial PJI patients with the other cohorts using propensity score matching for several important parameters. Treatment success was defined according to the Delphi criteria; Kaplan-Meier survivorship curves were generated to demonstrate this. A multiple logistic regression analysis was performed to determine risk factors for polymicrobial PJI.

Results: Overall, 10.3% of PJIs treated at our institution were polymicrobial in nature. Patients with polymicrobial PJI had a higher failure rate (50.5%) compared with monomicrobial (31.5%) and culture-negative (30.2%) PJI cohorts (p=0.003). Survivorship of polymicrobial PJI was 52.2%, 49.3%, and 46.8% at 2-year, 5-year, and 10-year follow-up, respectively. Patients with polymicrobial PJI had a higher rate of amputation (odds ratio [OR] 3.80, 95%CI: 1.34-10.80), arthrodesis (OR 11.06, 95%CI: 1.27-96.00), and PJI-related mortality (OR 7.88, 95%CI: 1.60-38.67) compared with patients with monomicrobial PJI. Isolation of Gram-negative (p<0.01), Enterococci (p<0.01), E. coli (p<0.01), and atypical (p<0.01) organisms were associated with polymicrobial PJI. The presence of a sinus tract (OR 2.13, 95%CI: 1.31-3.47) or malignancy (OR 3.54, 95%CI: 1.17-10.75) were significant risk factors for polymicrobial PJI.

Conclusion: This study reveals that polymicrobial PJI, occurring at a relatively low rate, is associated with poor outcomes when compared with monomicrobial and culture-negative PJI. These patients are more likely to require a salvage operation or have PJI-related mortality. Polymicrobial PJI is associated with soft tissue defects such as a sinus tract and certain types of organisms, which should be considered when administering antibiotics to these patients.

POSTER #153

Assessment of Musculoskeletal Infection Society (MSIS) Diagnostic Criteria as Prognostic Markers for Implant Retention in Patients with Prosthetic Joint Infection

Andy O. Miller, MD, Michael W. Henry, MD, Devin M. Williams, MPH, Allian Nocon, MPH, Barry D. Brause, MD, Geoffrey H. Westrich, MD

Introduction: Prosthetic joint infection (PJI) is a grave complication of total knee arthroplasty (TKA). Predicting outcome after debridement, antibiotics, and implant retention (DAIR) is difficult. Musculoskeletal Infection Society (MSIS) criteria are sensitive and specific for the diagnosis of PJI. We systematically studied the value of each MSIS criterion as a prognostic marker among a large cohort of patients with infected hip and knee arthroplasty treated with DAIR at our specialized orthopedic hospital.

Methods: A retrospective cohort of PJI treated with DAIR was identified by query of hospital coding records between the years of 2007-2014. Primary endpoint was defined as 2-year implant retention. Data from multiple sources included comorbidities, joint, duration of symptoms, implant age, pathogen, surgical details, and treatment outcomes. Continuous variables were assessed using the Mann Whitney-U tests and categorical variables using the Chi-square test and Fisher's exact test when appropriate. The association between 2-year implant retention and previously mentioned variables of interest were assessed using a multivariable logistic regression model.

Results: 173 patients with 181 hip or knee PJI meeting MSIS criteria were identified. 64% of TJA were retained at 2 years. In univariate analysis, presence of sinus drainage (MSIS criterion 1) and two positive cultures (criterion 2) significantly increased risk of explantation within 2 years (RR 0.61 [0.39-0.93], p=0.005 and RR 0.62 [0.53-0.74], p<0.001 respectively). However, neither criterion 3 nor its component minor subcriteria significantly predicted outcome. In a multivariable regression model, similar findings persisted: presence of sinus drainage and two positive cultures significantly increased risk of explantation within 2 years (OR 2.5 [1.1-5.8], p=0.039 and OR 8.3 [1.9-38], p=0.006 respectively), but neither criterion 3 nor infected joint (hip vs knee) affected prognosis.

Conclusion: Among the MSIS diagnostic criteria, sinus tract drainage and two positive cultures predict explantation within two years of DAIR; the minor criteria of inflammatory marker elevation, elevations in synovial fluid leukocyte count and differential, intraoperative purulence, and histopathology were not predictive. MSIS diagnostic criteria have prognostic utility.

POSTER #154

An Evidence-Based Clinical Prediction Algorithm for the Musculoskeletal Infection Society (MSIS) Minor Criteria

Joshua S. Bingham, MD, Karan Patel, MD, Kelly Scott, MD, Kade McQuivey, BS, M'Hamed Temkit, PhD, Mark J. Spangehl, MD

Introduction: The diagnosis of a periprosthetic joint infection (PJI) remains a challenge. The Musculoskeletal Infection Society (MSIS) created a standardized definition for a PJI. Based on the MSIS criteria, the diagnosis of a PJI can be made by one major criteria, or three of five minor criteria. The purpose of this study was to determine the likelihood of having a PJI based on the number of positive MSIS minor criteria and to develop a prediction algorithm for differentiating between a chronic PJI and a non PJI.

Methods: We retrospectively reviewed 297 patients between 2004 and 2014. Patients were divided into two groups: a PJI group and non PJI group. Patients that had a positive PJI workup and underwent a two-stage revision were included in the PJI group. Patients that had a negative workup were included in the non PJI group. Univariate analysis and multiple logistic regression analyses were used to evaluate 20 independent variables including the MSIS minor criteria. A prediction algorithm for differentiating between a PJI and non PJI based on these independent variables was created.

Results: 182 (91 PJI, 91 non PJI) patients met criteria for inclusion. PJI patients differed significantly ($P<0.05$) from the non PJI group with regards to 10 of the independent variables. Five of these variables were identified to differentiate between the two groups: positive cultures, elevated synovial WBC, elevated synovial PMN%, elevated ESR, and elevated CRP. The predictive probability of a PJI for all 32 combinations of these variables was calculated: 3.6% for one positive variable, 19.3% for two, 58.7% for three, 83.8% for four, and 97.8% for five. The chi-squared test for trend and the area under the ROC curve (0.977) suggest that the model is highly predictive.

Conclusion: The diagnostic prediction algorithm constructed to determine the likelihood of a PJI based on the five independent multivariate variables indicated excellent diagnostic performance and confirmed that all the MSIS minor criteria were significantly associated with a chronic PJI.

POSTER #155

Interpretation of Leukocyte Esterase for the Detection of PJI Stratified Based Upon ESR and CRP

Majd Tarabichi, MD, Andrew N. Fleischman, MD, Alisina Shahi, MD, Shaoqi Tian, MD, Javad Parvizi, MD, FRCS

Introduction: Leukocyte esterase (LE) is as a valuable test for diagnosing PJI. Studies have done little to assist with interpretation of an individual test result. Interpretation of a diagnostic test varies greatly based upon the preceding likelihood of infection (LOI). ESR and CRP are commonly used for initial screening, and thus serve as the logical standard for pre-test stratification.

Methods: We reviewed 252 patients who had ESR and CRP screening prior to hip or knee aspiration. Patients were stratified based upon ESR and CRP: 98 had elevated ESR and CRP, 51 had elevated ESR or CRP, and 103 were normal. LE was performed either preoperatively or intra-operatively. Cases without an adequate infection work-up were excluded. LOI was calculated before (pre-test) and after (post-test) LE testing. PJI was defined using the ICM criteria.

Results: For elevated ESR and CRP, pre-test LOI was 80.6%. A positive LE result increased LOI to 95.7% or 95.8% depending upon threshold (2+ or 1+, respectively). While a negative LE result decreased the LOI to 20%, post-test LOI was 38.5% when also considering trace to be a negative result. For elevated ESR or CRP, the pre-test LOI was 23.5%. A 2+ positive LE test result increased the LOI to 88.9%, whereas post-test LOI was 50% when using 1+ LE as the positive threshold. A negative LE result decreased the LOI to 0% and 6.5% depending upon threshold (- or trace/-, respectively). Finally, pre-test LOI for patients a normal ESR and CRP was 3.9%. While a 2+ positive LE result increased LOI to 75%, the post-test LOI was only 13% when also considering 1+ to be a positive result. A negative LE result decreased LOI to 0% and 1.3% (- or trace/-, respectively).

Conclusion: When used in conjunction with ESR and CRP, leukocyte esterase is a powerful point-of-care test for PJI. However, only the stricter thresholds should be considered adequately diagnostic when LE results are discordant from ESR and CRP.

POSTER #156

Risk Factors for Repeat Debridement, Spacer Retention, Amputation, Arthrodesis, and Mortality after Removal of an Infected TKA with Spacer Placement

Jourdan M. Cancienne, MD, Brian C. Werner, MD, James A. Browne, MD

Introduction: Two-stage exchange arthroplasty is the preferred management of periprosthetic joint infection (PJI) following total knee arthroplasty (TKA). A recent series reported that a considerable number of patients undergoing the first stage of the procedure do not undergo subsequent re-implantation. The objective of the present study is to investigate the fate of spacers placed for PJI after TKA on a national scale and evaluate risk factors for outcomes other than reimplantation.

Methods: A national patient record database was queried for Medicare patients who underwent removal of an infected knee prosthesis and placement of an antibiotic spacer. Patients with a study endpoint within one year postoperatively were included in the study. Patients undergoing prosthesis removal for aseptic indications were excluded. Study endpoints included: 1) in-hospital mortality, 2) repeat stage 1 knee arthroplasty, 3) above knee amputation, 4) knee arthrodesis and 5) re-implantation of a knee arthroplasty. Independent patient-related risk factors for these endpoints were evaluated with a multivariate binomial logistic regression analysis.

Results: 17,723 patients who underwent prosthesis removal and spacer placement for infection met inclusion and exclusion criteria. Within 1 year postoperatively, 686 patients (3.9%) died, 2,570 patients (14.5%) had a repeat debridement procedure, 835 patients (4.7%) had a knee arthrodesis, 617 patients (3.5%) had an amputation, 3,187 patients (18.0%) retained their spacers, and the remaining 10,445 patients (58.9%) underwent re-implantation. Numerous independent risk factors for outcomes other than re-implantation within 1 year postoperatively were identified.

Conclusion: At one year following knee arthroplasty removal and spacer placement for PJI, only approximately 60% of patients undergo re-implantation. Approximately one sixth of patients retain their spacer and another one sixth require repeat debridement procedures. Above knee amputation, arthrodesis, and in-hospital death are uncommon. Numerous independent risk factors exist for outcomes other than re-implantation within one year of removal of an infected TKA.

POSTER #157

The Old Dog but a New Trick! At Last a Serum Marker for Diagnosis of Periprosthetic Joint Infection

Alisina Shahi, MD, Michael M. Kheir, MD, Majd Tarabichi, MD, Timothy L. Tan, MD, Antonia F. Chen, MD, MBA, Javad Parvizi, MD, FRCS

Introduction: While synovial fluid markers have shown a promising role in diagnosing periprosthetic joint infection(PJI), obtaining synovial fluid sample is troublesome. Joint aspiration carries risk of introducing infection to the joint. Aspiration of the joint is invasive and sometimes the aspiration may not yield any or adequate joint fluid for analyses. There is a dire need for a more accurate serum biomarker for PJI. D-dimer is a widely available serum biomarker that detects fibrinolytic activities. Recent studies have shown that in the settings of an inflamed synovium, serum D-dimer increases. We sought to investigate if serum D-dimer is increased in patients with PJI.

Methods: We conducted a prospective study that began in March 2015 to measure the preoperative D-dimer(ng/mL), erythrocyte sedimentation(ESR)(mm/hr), and serum C-reactive protein(CRP)(mg/dL) levels of consecutive primary and revision total joint arthroplasties at our institution. PJI was defined using the Musculoskeletal Infection Society criteria. Patients with active ulcer, history of recent trauma (within two weeks), and hypercoagulation disorders were excluded. Our cohort consists of 154 patients in four groups; primaries(N=22), aseptic revisions(N=65), septic revisions(N=44), and reimplantations(N=23).

Results: The median of D-dimer was significantly higher in PJI patients: 1,069 ng/mL (range:770-8,487) compared to aseptic cases: 302 ng/mL(range:110-6,381) [$p<0.0001$]. Using the Youden's index, 850 ng/mL was determined as the D-dimer threshold for diagnosing PJI. D-dimer out performed both ESR and CRP with a sensitivity of 97.7% and a specificity of 93.6%. ESR and CRP had a sensitivity of 73.8% and 83.3% and a specificity of 78.5% and 83.8% respectively.

Conclusion: Based on the data from this ongoing study, it appears that the serum D-dimer could be a promising marker for diagnosing PJI. It may also have a great utility for determining the optimal timing of reimplantation and infection eradication. Serum D-dimer may also be utilized as a very sensitive test for screening PJI.

POSTER #158

Diagnosing Periprosthetic Joint Infection: And the Winner is?

Alisina Shahi, MD, Michael M. Kheir, MD, Dean D. Tan, BS, Timothy L. Tan, MD, Javad Parvizi, MD, FRCS

Introduction: Diagnosis of periprosthetic joint infection (PJI) remains a challenge. There is no single best diagnostic test; hence a clinician who encounters a suspected PJI case has to use a combination of tests, all of which can be invasive and expensive. Even with the use of multiple diagnostic tests, reaching a definitive diagnosis can be difficult. The question that arises is which of these tests has a better performance for diagnosing PJI. Diagnostic odds ratio(DOR) has been described as the best indicator for test performance. The purpose of this study was to compare the performance of the traditional diagnostic tests for PJI i.e. serum erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), synovial fluid (SF) white blood cell (WBC) count, SF polymorphonuclear (PMN%), and leukocyte esterase (LE) using DOR.

Methods: We conducted a retrospective study and reviewed 4,662 revision arthroplasties that were performed between 2000-2015. Musculoskeletal Infection Society (MSIS) diagnostic criteria were used to define the thresholds of the diagnostic tests and reach diagnosis of PJI. The revision database was electronically queried for serum ESR and CRP, SFWBC count, SFPMN%, and LE strip test results. DOR was calculated for each test.

Results: In total we obtained 4,662 ESRs, 4,392 CRPs, 836 SF WBC, 804 SF PMN%, and 659 LE results. LE had the highest DOR: 30.06 (95% confidence interval (CI): 17.8-50.7). The rest of the DORs in the descending order were SFWBC: 29.4 (95%CI: 20.2-42.8), CRP: 25.6 (95%CI: 19.5-33.7), SFPMN%: 25.5 (95%CI: 17.5-37.0), and ESR: 14.6 (95%CI: 11.5-18.6).

Conclusion: It appears that among the minor diagnostic criteria for PJI, LE has the best performance. These results demonstrated that LE is an accurate and effective synovial fluid marker for diagnosing PJI. The leukocyte esterase strip test is a valuable tool that can be used in conjunction with the current battery of the available diagnostic tests.

POSTER #159

Dislocation Following Two-Stage Revision Total Hip Arthroplasty: Alarming Concern is Warranted

Ian P. McAlister, MD, Kevin I. Perry, MD, Arlen D. Hanssen, MD, Matthew P. Abdel, MD

Introduction: While two-stage exchange total hip arthroplasty (THA) is an effective eradication treatment for periprosthetic hip infections, hip dislocations continue to be a major concern. In 2016, there remains a paucity of literature on risk factors for dislocation after hip reimplantation. As such, we sought to examine the incidence of, and associated risk factors for, hip instability following two-stage exchange arthroplasty for periprosthetic hip infections, as well the fate of reimplanted hips that dislocate.

Methods: 516 two-stage exchange THAs (503 patients) performed between 2000-2014 were retrospectively reviewed at a single institution. Risk factors assessed included patient demographics and surgical factors. Postoperative complications, reoperations, and revisions were analyzed as time-to-event outcomes utilizing survivorship methodology, including Kaplan-Meier estimation and Cox proportional hazards regression. Mean age at the time of reimplantation was 65 years, with a mean follow-up of 4 years.

Results: Dislocations occurred in 50 hips following reimplantation (9.3% at 1 year). There was a trend toward a higher risk of instability in females (HR 1.7, p=0.07). Younger age (p=0.19), BMI (p=0.48), and number of previous surgeries (p=0.09) were not significant risk factors. Hips reconstructed with a dual-mobility construct demonstrated a trend toward a lower risk of dislocation (HR 0.31, p=0.25). Surgical approach, head size, spacer type, and the use of a constrained liner did not significantly impact the risk of instability ($p > 0.05$ for all). Risk of additional complications (HR 3, p=0.0007), reoperations (HR 33, $p<0.0001$), and revision surgery (HR 27, $p<0.0001$) were all significantly higher in patients who experienced a dislocation compared to those who did not dislocate after their reimplantation.

Conclusion: Dislocation after two-stage exchange THA continues to be a major concern with the incidence approaching 10%. While no definitive patient or surgical risk factors were identified, the fate of this difficult cohort is poor.

POSTER #160

Why are Some Synovial Fluid Samples Alpha-Defensin-Negative but Culture-Positive? ◊

Carl Deirmengian, MD, Keith Kardos, PhD

Introduction: The purpose of this study was to determine the underlying reasons for alpha-defensin-negative, culture-positive (AD-CX+) results.

Methods: We retrospectively reviewed 5,661 synovial fluid samples from a hip or knee arthroplasty, which had a complete set of laboratory data. We identified 697 culture-positive synovial fluid samples, of which 63 formed a cohort that was AD-CX+. Each AD-CX+ sample was placed into one of three categories based on consideration of the complete set of laboratory data: Group1) False-positive culture result; Group2) Fluid sample of very poor quality (most consistent with saline or blood); or Group3) False-negative AD result. A modified MSIS minor criteria was utilized to diagnose PJI.

Results: Of 63 AD-CX+ samples, 28.6%(N=18) appeared to be most consistent with blood or saline. This high percentage of poor quality synovial fluid samples, among AD-CX+ samples, was 5.3-fold greater than that generally observed in our laboratory (28.6% vs. 5.4%; $p<0.0001$). Of the remaining AD-CX+ samples that were actually constituted of synovial fluid, 15(23.8%) represented a false-negative AD test and 30(47.6%) represented a false-positive culture result. This proportion is consistent with a false-positive culture rate <1% and an AD sensitivity > 97% in this study.

Conclusion: The observation of alpha-defensin-negative but culture-positive synovial fluid results are rare (1.1% of all samples) but confusing. These samples are 5.3-fold more likely to be constituted primarily of blood or saline, underscoring the importance of evaluating the aspirate quality and confirming that a saline lavage was not conducted whenever an AD-CX+ sample is observed. Of the remaining AD-CX+ samples, constituted of synovial fluid, 33% represented a false-negative AD test and 66% represented a false-positive culture result. Surgeons must be aware that even though the alpha-defensin test has the highest sensitivity of any test for PJI in the literature, false-negative results are still possible.

◊ The FDA has not cleared the pharmaceuticals and/or medical devices listed here.Synovial fluid CRP

POSTER #161

Do Multiple Pre-Operative Intra-Articular Steroid Hip Injections Have Increased Risk of Periprosthetic Joint Infection Compared to Single Injections?

Andrew Chambers, MD, Kyle Lacy, MD, John Paul Manalo, MD, Lincoln Liow, MD, Andrew Freiberg, MD, Harry Rubash, MD, Young-Min Kwon, MD, PhD

Introduction: With an increase number of total hip arthroplasty (THA) procedures being performed, a thorough understanding of ways to mitigate complications such as periprosthetic joint infection (PJI) is paramount. There is recent evidence to suggest that Intra-articular Steroid Hip Injections (IASHI) can lead to an increased risk of future PJI, however there have been no studies evaluating the potential cumulative risk of PJI after multiple IASHI compared to single IASHI. Therefore, the aim of this study was to evaluate whether multiple IASHI are associated with increased risk of PJI compared to single IASHI in THA patients.

Methods: We performed a retrospective review of patients in our hospital medical registry that underwent THA between 2002 and 2011. A total of 100 patients who received two or more IASHI in the year prior to THA were carefully matched with a control group of 350 patients.

Results: The single and multiply injected patient cohorts had an infection rate of 2% and 6% (7/350; 6/100), respectively (p= 0.04, relative risk 3.04, 95% CI 1.1, 8.9) and average follow-up of 28.9 and 24.2 months (p=0.11, range= 6 - 127.5 and 6 - 118.9, respectively). The two cohorts did not differ with regard to age, sex, ASA score, presence of diabetes mellitus, or body mass index (Table 1).

Conclusion: In comparison to patients with single IASHI, the results of the current study suggest that there is a cumulative risk of future PJI in patients who receive multiple IASHI prior to THA. Although the increased risk of PJI after single IASHI has been reported in several recent studies, the current study findings would be clinically useful in counseling patients who are candidates for THA surgery but considering temporizing their symptoms with multiple IASHI prior to undergoing THA.

POSTER #162

Antibiotic Loaded Cement Spacers Can Result in Rapid Changes in Antibiotic Susceptibility

Jaiben George, MBBS, Jared M. Newman, MD, Alison K. Klika, MS, Wael K. Barsoum, MD, Carlos A. Higuera, MD

Introduction: Antibiotic resistance is a major global health issue. Two-stage revision arthroplasty is considered as the gold standard for treatment of periprosthetic joint infection (PJI). Staphylococcus aureus (SA) is the predominant cause of PJI and is known to persist despite antibiotic cement spacer insertion. The purpose of this study was to test whether the antibiotic susceptibility patterns change after spacer insertion.

Methods: 1,411 two-stage revision hip/knee arthroplasties performed from 2000-2015 at a single institution were identified. SA (methicillin susceptible/resistant) was isolated at the time of spacer insertion (first stage) in 572/1,411 (41%) of these procedures. These revisions were screened to identify those in which SA persisted at the time of spacer removal (i.e., second stage), which identified N=26 (Knees=16, Hips=10) revisions to be included in the study. Minimum inhibitory concentrations (MIC), demographics, spacer content, parenteral antibiotic therapy and surgical history were collected. MICs at the time of first and second stages were compared.

Results: Cement spacers were composed of tobramycin-vancomycin (N=19), tobramycin alone (N=4), vancomycin alone (N=2) or tobramycin-daptomycin (N=1). In N=11/26 (42%) revisions, MIC of at least one antibiotic was higher at the second stage. Vancomycin (N=8/11, 73%) and daptomycin (N=3/11, 27%) were the most common antibiotics to be affected by spacer insertion (Table 1). Increase in vancomycin MIC was associated with increased daptomycin MIC (p=0.022) and lower BMI (p=0.030) (Table 2). In six revisions, SA developed resistance to at least one antibiotic after spacer insertion. Gentamycin (N=2/6, 33%) and oxacillin (N=2/6, 33%) were the two common antibiotics to which resistance was developed.

Conclusion: Increase in the MICs were predominantly observed for vancomycin and daptomycin, an antibiotic known to exhibit cross-resistance with vancomycin, suggesting that spacers are directly linked to the observed increase in MICs. Further research is required to understand emergence of antibiotic resistance and take preventive steps.

POSTER #163

Malnutrition Increases the Risk of Failure of a Two-Stage Revision for a Periprosthetic Joint Infection

Kaitlin Carroll, BS, Erick Yuen, Michael B. Cross, MD

Introduction: Malnutrition has recently been shown to increase post-operative complications including infection following primary total joint arthroplasty (TJA); however, little is known about the impact of malnutrition in septic revisions. The purpose of this retrospective study was to determine the effect that malnutrition has on the success of a two stage revision TJA for managing a deep periprosthetic joint infection (PJI).

Methods: Between 2012 and 2014, 511 patients underwent a septic revision TJA for PJI at a single institution. Laboratory values suggestive of malnutrition were defined as preoperative albumin concentration <3.5 g/dl and/or total lymphocyte count less than 1500/mm3. Complete laboratory results were available for 310/511 patients. Of the 310 patients with complete lab analysis, 229 patients underwent a two stage revision for deep PJI and these patients were retrospectively reviewed. An odds ratio and two tailed t-test were performed to determine whether malnutrition was a risk factor for failure of a two stage revision for deep infection, defined as a septic reoperation of any type within a minimum of one year follow up; significance was set at $p<0.05$.

Results: Of the 229 patients undergoing two-stage revision, 64/229 patients were malnourished. Further, 21/229 (9%) had a failed two stage revision. Of the 21 failed two stage revisions, 9/21 (43%) were found to be malnourished. Conversely of the 208 patients who had a successful two stage revision, only 55/208 (26%) had laboratory evidence of malnutrition. Thus, the presence of malnutrition contributed to an increased risk of failure of a two stage revision (OR= 1.62, $p=0.0257$).

Conclusion: In patients undergoing a two stage revision THA or TKA, malnutrition defined as albumin concentration <3.5 g/dl and total lymphocyte count less than 1500/mm3 carries a 1.6 times increased risk of failing a two stage revision TJA.

POSTER #164

Risk of Reinfection after Irrigation and Debridement for Treatment of Acute Periprosthetic Joint Infection following TKA

Brian Dilworth, MD, Samrath Bhimani, MS, Paul Buzhardt, MD, Kevin Ong, PhD, Edmund Lau, MS, Arthur L. Malkani, MD

Introduction: Periprosthetic joint infection (PJI) is a devastating complication following total knee arthroplasty (TKA) that is associated with marked patient morbidity and increased risk of mortality. Irrigation and debridement (I&D;) with or without liner exchange is a common treatment option in patients with acute PJI. The purpose of this study was to determine factors associated with an increased risk of reinfection within one year in patients treated with I&D; (± liner exchange) for acute PJI following primary TKA.

Methods: Five percent Medicare claims data (2010-2014) was utilized to identify 241 patients who underwent primary TKA followed by I&D; with or without liner exchange for PJI within 3 months of index procedure. Exclusion criteria included age <65 years and less than one year of claims history prior to TKA. Variables analyzed included age, sex, diabetes, obesity, Charlson comorbidity score, and time between TKA and I&D; ± liner exchange.

Results: The average time to I&D; and I&D; with liner exchange following primary TKA was 39.3 days ± 21.7 days and 26.9 days ± 14.1 days, respectively. Multivariate Cox regression analysis showed a significantly higher risk of reinfection within one year in patients with age greater than 85 years ($p<.001$) or diabetes ($p<.02$). The incidence of reinfection was 223% greater if I&D; ± liner exchange was performed 2-4 weeks ($p<.03$) after primary TKA and up to 277% higher in those procedures performed at greater than 6 weeks compared to those performed within 2 weeks of index procedure.

Conclusion: I&D; is a common mode of treatment for acute PJI. Patients greater than the age of 85, with diabetes, or more than 14 days post primary TKA treated with I&D; ± liner exchange for acute PJI have a significantly higher risk of reinfection within one year. Based on our findings, we recommend prompt diagnosis of acute PJI and if I&D; ± liner exchange is the treatment modality of choice, it should be performed within 2 weeks of the index procedure.

POSTER #165

Survival Improves with Increased Antibiotic Duration after Total Knee Arthroplasty Irrigation and Debridement

Nicholas C. Bene, BA, Xing Li, BA, Sumon Nandi, MD

Introduction: The optimal duration of antibiotic therapy following total joint arthroplasty irrigation and debridement (I&D;) with modular component exchange has not yet been established. Our aim was to determine if antibiotic duration affects infection-free survival following total knee arthroplasty (TKA) I&D; with liner exchange.

Methods: We retrospectively reviewed patients at our institution who underwent TKA I&D; with liner exchange for acute hematogenous infection from 2007 to 2012 with minimum 2-year follow-up. Infecting organism, duration of antibiotic therapy, reoperation for infection recurrence, patient demographics, co-morbidities, and surgical factors were recorded. Fisher's exact test, Chi-square test, and Student's t-Test were utilized to compare factors between patients with and without infection recurrence. Multivariate survival analysis using Cox regression was built to examine association between duration of antibiotics and infection-free survival. Variables significant in univariate analysis, as well as demographic and clinical factors, were controlled in the Cox model. With a hazard ratio of 0.50, the power to detect an effect of antibiotic duration on infection-free survival was 0.80.

Results: From 2007 to 2012, there were 76 patients who underwent TKA I&D; with liner exchange. 21 patients (28%) required reoperation for infection recurrence. Longer duration of antibiotics was associated with infection-free survival [hazard ratio 0.99, 95%CI 0.981-0.998, p=0.0214]. Patients with s. aureus infection were more likely to have recurrent infection than with other infecting organisms [hazard ratio 4.009, 95%CI 1.399-11.485, p=0.0097]. Chronic inflammation on intraoperative pathology decreased likelihood of recurrent infection [hazard ratio 0.119, 95%CI 0.020-0.717, p=0.0202], while atrial fibrillation increased likelihood of recurrent infection [hazard ratio 3.942, 95%CI 1.338-11.616, p=0.0128].

Conclusion: Our study suggests infection-free survival following TKA I&D; with liner exchange improves with longer antibiotic duration. Chronic antibiotic suppression should be considered in appropriate patients. Two-stage exchange may be favored in patients with s. aureus infection or history of atrial fibrillation.

POSTER #166

Do Conversion Total Hip Arthroplasty Yield Comparable Results to Primary Total Hip Arthroplasty?

Ran Schwarzkopf, MD MSc, Garwin Chin, Bcc, Kelvin Kim, Bcc, Dermot Murphy, Bcc, Antonia Chen, MD

Introduction: The incidence of hip fractures is growing with the increasing elderly population. Typically, hip fractures are treated with open reduction internal fixation, hemiarthroplasty, or total hip arthroplasty (THA). Failed hip fracture fixation is often salvaged by conversion THA. The total number of conversion THA procedures is also supplemented by its use in treating different failed surgical hip treatments such as acetabular fracture fixation, Perthes disease, slipped capital femoral epiphysis (SCFE), and developmental dysplasia of the hip (DDH). As the incidence of conversion THA rises, it is important to understand the perioperative characteristics of conversion THA. Some studies have demonstrated higher complication rates in conversion THAs than primary THAs, but research distinguishing the two groups is still limited.

Methods: Perioperative data for 119 conversion THAs and 251 primary THAs was collected at two centers. Multi-variable linear regression was performed for continuous variables, multi-variable logistic regression for dichotomous variables, and chi-square test for categorical variables.

Results: Outcomes for conversion THAs were significantly different ($p<0.05$) compared to primary THA and had longer hospital length of stay (average 3.8 days for conversion THA, average 2.8 days for primary THA), longer operative time (168 min conversion THA, 129 min primary THA), greater likelihood of requiring metaphysis/diaphysis fixation, and greater likelihood of requiring revision type implant components.

Conclusion: Our findings suggest that conversion THAs require more resources than primary THAs, as well as advanced revision type components. Based on these findings, conversion THAs should be reclassified to reflect the greater burden borne by treatment centers.

POSTER #167

Health Literacy is Associated with Use of Inpatient Rehabilitation Services after Total Joint Arthroplasty

Mariano E. Menendez, MD, Charles S. Schumacher, MD, David Ring, MD, PhD, Young-MIn Kwon, MD, PhD, Andrew A. Freiberg, MD,

Harry E. Rubash, MD, Hany Bedair, MD

Introduction: The use of inpatient rehabilitation services after total joint arthroplasty is an important driver of episode-of-care costs. This prospective observational study aimed to identify predictors of discharge to an inpatient rehabilitation facility after total joint arthroplasty.

Methods: On the first postoperative day (POD), a cohort of 111 primary total hip (n=62) and knee (n=49) arthroplasty inpatients completed a sociodemographic survey, the Newest Vital Sign health literacy test, the Patient Health Questionnaire-2 depression instrument, and the Pain Catastrophizing Scale. We also recorded the American Society of Anesthesiologists (ASA) score, body mass index (BMI), operative time, anesthesia type, POD 1 pain intensity (numeric rating scale), opioid consumption (converted to oral morphine equivalents), and mobility as assessed with the Activity Measure for Post-Acute Care (AM-PAC) Mobility score. Multivariable logistic regression models were used to identify factors independently associated with discharge to an inpatient rehabilitation facility (29%).

Results: Factors independently associated with discharge to an inpatient rehabilitation facility included low levels of health literacy (odds ratio [OR] 4.0, 95% confidence interval [CI] 1.1-16, p=0.049; vs. high levels), greater operative time (OR 1.3 per 10-minute increase, 95% CI 1.02-1.6, p=0.033), greater BMI (OR 1.1 per 1-unit increase, 95% CI 1.01-1.3, p=0.031), and TKA rather than THA (OR 3.1, 95% CI 1.1-8.8, p=0.040).

Conclusion: The utilization of inpatient rehabilitation services after total joint arthroplasty is influenced by health literacy and potentially modifiable factors such as operative time and BMI. Whether the increased use of postacute rehabilitation care among patients with limited health literacy is attributable to less involvement in decision-making, patient preference, or the surgeon or care team's sense that these patients may not understand or be compliant with postoperative instructions should be investigated further.

POSTER #168

Patient Education Reduces Both Discharge to Post-Acute Care Facilities and Postoperative Complications

Christopher E. Pelt, MD, Jeremy M. Gililland, MD, Mike B. Anderson, MSc, Dory Trimble, BA, Christopher L. Peters, MD

Introduction: We hypothesized that 1) implementation of a preoperative patient education program would result in fewer patients discharged to post-acute care centers (PACs). 2) The program would also result in fewer thirty-day readmissions and 90-day reoperations. 3) PACs is an independent risk factor for 30-day readmissions and 90-day reoperations.

Methods: We performed a retrospective cohort study on patients who underwent primary THA or TKA (CPT 27130 or 27447). The patient education program was implemented in March 2015 with an emphasis on discharge to home. The 12 months before and after implementation were evaluated. A multivariable modified Poisson regression was used to determine the relative risk for the outcomes of interest controlling for age, sex, BMI, ASA score, Medicare as the primary payor, diabetes and smoking.

Results: 927 TJA patients were evaluated. Pathway changes resulted in a 59% relative reduction in discharges to PACs (<0.001), with 34% (156/465) going to a PACs prior the program and 14% (64/462) afterwards. Patients who underwent surgery before the program were more likely to be discharged to PACs (IRR 2.56, 95% CI 2.00 -3.28, p<0.001). The frequency of 30-day readmissions (IRR 1.93, 95% CI 1.01 -3.69, p=0.047) and 90-day reoperations (IRR 1.67, 95% CI 1.12 -2.53, p=0.014) was greater in patients that underwent TJA prior to the program. Patients discharged to PACs were more likely to experience a 30-day readmission (IRR 2.4, 95% CI, 1.28 -4.56, p=0.007) and a 90-day reoperation (IRR 1.75, 95% CI 1.12 -2.73, p=0.013).

Conclusion: A patient education program emphasizing discharge to home, resulted in a reduction in the number of patients being discharged to PACs by 59%. There were fewer 30-day readmissions and less 90-day reoperations after the program was implemented. Admission to PACs was an independent risk factor for increased readmissions and reoperations.

POSTER #169

Validity and Responsiveness of the Knee Injury and Osteoarthritis Outcome Score and KOOS, JR.: A Comparative Study among U.S. Total Knee Replacement Patients

Barbara Gandek, PhD; John E. Ware, Jr., PhD; Patricia Franklin, MD, MBA, MPH

Introduction: While the patient-reported outcomes (PRO) component of the CJR Payment Model allows submission of the Knee injury and Osteoarthritis Outcome Score (KOOS) or KOOS, JR., evaluation of their validity and responsiveness in U.S. total knee replacement (TKR) patients is limited.

Methods: Pre-TKR and 6-month post-TKR data from 1,143 patients in a U.S. joint replacement cohort was used to compare the validity and responsiveness of KOOS, KOOS, JR., WOMAC and SF-36. ANOVA methods compared the relative validity (RV) of scales in discriminating between pre-TKR groups differing in knee pain and in assistive device use, and between groups differing in change in overall capability to do physical activities (improved, same, declined) at 6 months. Responsiveness was evaluated with effect sizes (ES).

Results: In support of validity, all scale scores were worse with increasing knee pain and assistive device use. While all scales discriminated between post-TKR change groups, the 4-item KOOS QOL scale (best scale, RV=1.0) was significantly ($p<0.05$) better at discriminating between change groups than the 9-item KOOS Pain (RV=0.58), 17-item KOOS ADL (RV=0.51) and WOMAC scales (RV=0.29-0.51) and marginally better than the 7-item KOOS, JR. (RV=0.79) and SF-36 Physical Component Summary (RV=0.89). Responsiveness was highest for KOOS QOL (ES=1.99), followed by KOOS, JR. (ES=1.81), KOOS Pain (ES=1.80), WOMAC Pain (ES=1.63) and KOOS ADL/WOMAC Function (ES=1.53). The SF-36 PCS had a lower ES (1.08) but was better than KOOS, KOOS, JR. and WOMAC at distinguishing between groups whose physical capabilities declined versus improved/stayed the same at 6 months.

Conclusion: Two short knee-specific scales with broad content representation (KOOS QOL, KOOS, JR.) had strong performance in capturing aggregate patient outcomes, although both lack the ability to distinguish knee pain from knee function. Additional research is needed to define the ideal knee outcome score(s) that balance brevity, precision and interpretation of TKR impact.

POSTER #170

Moving the Needle: Less Cost, Improved Care from a Gainsharing Supported Integrated Rehab Network

William J. Robb III, MD, Ritesh R. Shah, MD, Jeffrey M. Goldstein, MD, Andre Blom, PT, STC, Matthew S. Fletcher, BA, Jill J. Branson, RN, BSN

Introduction: A Model 3 Bundled Payments for Care Improvement (BPCI) program was implemented in 2014 by an orthopedic practice affiliated with 18 hospitals and 6 health care systems. The program included all post-acute care for patients undergoing elective primary unilateral hip, knee and ankle replacements and non-elective hip fractures surgery. The program initiates with post-hospital discharge services and terminates 90 days later.

Methods: We investigated the change in cost and quality of care from baseline years 2009-2012 to 2014 after initiating the program. 4,254 elective and 499 fracture episodes from baseline years were compared to 1,594 elective and 180 fracture episodes in 2014. Elective patients underwent a preoperative assessment with an outpatient physical therapist (OP PT) to identify recovery needs and to obtain an evaluation score. Proprietary software was developed to track patient rehabilitation progress for 90 days. A network of "partner" Skilled Nursing Facilities (SNFs), Home Health Agencies (HHAs), and OP PTs was established. Care progression was based on functional markers. Quality outcomes data was analyzed for differences in post-acute care partners.

Results: After initiating the program, there was a statistically significant reduction in total episode cost for both elective patients ($p<0.001$) and fracture patients ($p<0.05$). Elective patients had a decrease in SNF initiation ($p<0.05$) and increase in HHA initiation ($p<0.001$). Total episode costs were significantly reduced with partner SNFs and HHAs compared to non-partner SNFs and HHAs for both elective and fracture patients ($p<0.05$). When SNF was utilized, the average length of stay was significantly reduced from 17.6 days to 13.9 days and hospital readmissions were reduced. There was a negative linear correlation between the evaluation score and episode cost ($p<0.001$).

Conclusion: Using a unique surgeon-led Model 3 BPCI program across 6 health care systems, 18 hospitals, and 46 post-acute rehabilitation providers, we demonstrated a statistically significant reduction in cost, length of stay, and readmissions for elective surgical patients and a significant reduction in length of stay and cost for non-elective surgical patients.

POSTER #171

What Factors Drive Inpatient Satisfaction after Total Joint Arthroplasty?

Ashwin B. Peres-da-Silva, BS, Lindsay Kleeman, MD, Perez Agaba, BS, Cindy L Green, PhD, Cindy L. Green, PhD, David E. Attarian, MD, Michael P. Bolognesi, MD, Thorsten M. Seyler, MD, PhD

Introduction: The HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) Survey, developed by the Centers for Medicare & Medicaid Services, is the first national, standardized, publicly reported survey of patients' perspectives of hospital care. It is well established that surgical patients' perception of inpatient care has a significant effect on choice of healthcare provider. The purpose of this study was to analyze survey responses from patients who underwent primary total hip arthroplasty (THA) and total knee arthroplasty (TKA) in order to identify factors that drive patient satisfaction in the inpatient setting.

Methods: HCAHPS responses received at our institution between January 1, 2013 and January 1, 2016 were obtained and expressed as a percentage of overall satisfaction. Patient demographics, insurance type, prior narcotic use, preoperative pain score, length of stay, and distance to surgical center were recorded. Categorical variables were correlated to overall satisfaction with the Kruskall-Wallis test.

Results: Overall, responses from 1125 patients were obtained (543 THA, 582 TKA). Males reported a higher satisfaction than females (78.5% vs 75.7%, $p=0.016$). Patients in the 1st quartile of socioeconomic status reported a higher satisfaction than those in the 4th quartile (80.6% vs 73.3%, $p<0.001$). African American patients reported a higher satisfaction than Caucasian (81.8% vs 76.5%, $p=0.006$). There was an inverse relationship between increased length of stay and reported satisfaction ($R=-0.157$, $p<0.001$). There was no significant correlation between satisfaction and insurance type, smoking status, marital status, pain score, narcotic use, age, or distance to surgical center.

Conclusion: Our data indicate that patients who are likely to report higher levels of inpatient satisfaction after total joint arthroplasty are male, African American, of higher socioeconomic status, and with shorter length of stay. To our knowledge this is the first reported analysis of the HCAHPS survey in relation to total joint arthroplasty.

POSTER #172

Predictors of Same-Day Discharge in Primary Total Joint Arthroplasty Patients and Risk Factors for Post-Discharge Complications

Alex Sher, Aakash Keswani, Dong-han Yao, BA, Benjamin Boodaie, Chirag K. Shah, BA, Karl Koenig, MD, Kevin Bozic, MD, Calin S. Moucha, MD

Introduction: Same-day (<24-hour) discharge total joint arthroplasty (TJA) can be a safe and effective option for certain patients with end-stage osteoarthritis. Given the growing pressure to improve quality and lower TJA episode costs, surgeons must identify which TJA patients can be appropriately discharged home quickly and safely. The purpose of this study was to identify characteristics associated with same-day discharge post-TJA as well as assess risk factors for complications in this select patient population.

Methods: Patients that underwent primary total hip or knee arthroplasty and were discharged within 24 hours of surgery were identified in the 2011-2014 National Surgical Quality Improvement Program (NSQIP) database. Bivariate and multivariate analyses were performed using pre-, intra-, and post-operative variables.

Results: 7,474 primary TJAs (4,771 hips and 2,703 knees) among 120,847 (6.2%) TJA patients were discharged within 24 hours post-surgery. From bivariate and multivariate analysis, these patients were more likely to be younger (<50y), male or ASA class 1 or 2, and less likely to be obese or taking steroids for chronic conditions ($p<0.05$ for all). They were also less likely to have diabetes, cardiac disease, hypertension, stroke, bleeding-causing disorder, and hypoalbuminia ($p<0.05$ for all). In this cohort, rates of severe adverse event (SAE) or unplanned readmission post-discharge were 1.3% and 1.9%, respectively. Multivariate analysis identified age>80 (OR 4.16, $p=0.001$), smoking (OR 1.61, $p=0.03$), bleeding causing disorders (OR 2.56, $p=0.01$), ASA class 3 or 4 (OR 1.42, $p < 0.05$), and SAE pre-discharge (OR 13.13, $p < 0.0001$) as independent predictors for adverse events or readmission in this population.

Conclusion: As there appears to be a trend towards offering same-day TJA to a wider group of patients, appropriate selection will be crucial to patient safety. The patient characteristics, comorbidities, and pre-discharge SAEs identified in our analysis may be used to assess readiness for same-day TJA and risk stratify these patients.

POSTER #173

Home Discharge After Primary Elective Total Hip Arthroplasty: Post-Discharge Complication Timing and Risk Factor Analysis

Dong-han Yao, BA, Aakash Keswani, BA, Benjamin Boodaie, BS, Chirag Shah, BS, Alex Sher, BS, Kevin Bozic, MD, MBA, Karl Koenig, MD, MS, Calin Moucha, MD

Introduction: Post-discharge services have been identified as a primary driver of 90-day episode-of-care costs for total hip arthroplasty (THA). Hospitals and home-health agencies must therefore identify, risk-stratify, and appropriately care for home-discharged THA patients. This study aimed to 1) analyze risk factors and timing of post-discharge complications among home-discharged THA patients, and 2) risk-stratify patients to identify those who would benefit from higher level care.

Methods: Patients discharged home after elective primary THA from 2011-2014 were identified in the American College of Surgeon's National Surgical Quality Improvement Program database. Bivariate and multivariate analyses were performed using perioperative variables.

Results: 50,376 home-discharged THA patients were included for analysis, of which 1,575 patients (3.1%) suffered a post-discharge severe complication or unplanned readmission. Patients who suffered post-discharge complications were older, smokers, obese, functionally dependent, and likely to have diabetes and congestive heart failure (CHF) (Table 1, $p<0.001$ for all). In multivariate analysis, severe adverse event (SAE) pre-discharge, avascular necrosis (AVN) / fracture diagnoses, age, functional status, BMI>40, smoking, diabetes, pulmonary disease, CHF, hypertension, steroid use, bleeding-causing disorders, and ASA class 3-4 were all associated with ≥1.22 odds of post-discharge SAE or unplanned readmission ($p<0.05$). THA patients with 2, 3, or ≥4 risk factors had 1.90-5.06 times odds of complications within 14 days post-discharge, and 2.11-3.68 times odds beyond 14 days compared to those with 0 risk factors (Table 2, $p<0.001$ for all). Across all risk levels, complication rate within 14 days post-discharge was at least two times greater than the rate for beyond 14 days post-discharge.

Conclusion: Modifiable and non-modifiable risk factors can be used to predict which home-discharged THA patients are at greatest risk of post-discharge complications. Given that the population of patients going directly home after THA is rising, we recommend the development of formal risk-stratification protocols for home-discharged THA patients.

POSTER #174

Analysis of Outcomes Following THA: Do All Databases Produce Similar Findings?

Nicholas A. Bedard, MD, Andrew J. Pugely, MD, Nathan Lux, BS, Michael McHugh, BS, Jesse E. Otero, MD, PhD, Yubo Gao, PhD, Kevin J. Bozic, MD, MBA, John J. Callaghan, MD

Introduction: Use of large database for orthopaedic research has increased exponentially. Each database represents unique patient populations and vary in methodology of data acquisition. The purpose of this study was to evaluate differences in reported demographics, comorbidities and complications following total hip arthroplasty (THA) amongst four commonly used databases.

Methods: Patients who underwent primary THA during 2010-2012 were identified within National Surgical Quality Improvement Programs (NSQIP), Nationwide Inpatient Sample (NIS), Medicare Standard Analytic Files (SAF) and Humana Claims Database (HCD). NSQIP definitions for comorbidities and surgical complications were matched to corresponding ICD-9 and CPT codes and these coding algorithms were used to query NIS, SAF and HCD. Age, sex, comorbidities, inpatient and 30-day postoperative complications were compared (NIS has inpatient data only) using standard statistical techniques.

Results: The number of primary THA patients from each database was 22,644 in HAC, 371,715 in SAF, 188,779 in NIS and 27,818 in NSQIP. All databases were similar in their gender (1.3-1.6:1 female to male) and age distribution; however, patients in HCD and SAF were slightly older. Overall there was variation in prevalence of comorbidities and rates of postoperative complications between databases. As an example, NSQIP had more than twice the obesity than NIS. HCD and SAF had more than two times the diabetics than NSQIP. Rates of deep infection and stroke 30-days after THA had more than twofold difference between all databases. HCD had more than twice the rate of 30-day deep infections and deep vein thrombosis (DVT) than SAF.

Conclusion: Amongst databases commonly used in orthopaedic research, there is considerable variation in complication rates following THA depending upon the database used for analysis. It will be important to consider these differences when critically evaluating database research. Additionally, with the advent of bundled payments, these differences must be considered in risk adjustment models.

POSTER #175

Electronic Medical Record Implementation Results in Less Efficient Delivery of Care

Daniel Scott, MD, MBA, Eva Labro, PhD, Colin Penrose, MD,
Michael P. Bolognesi, MD, Samuel S. Wellman, MD,
Richard C. Mather III, MD, MBA

Introduction: Adoption of medical record (EMR) systems is a pillar of the Affordable Care Act. Implementation of these systems can be costly. Objective assessment of the longer term cost of EMR implementation and effect on patient-provider interaction is critical to evaluating their evolving use.

Methods: A new method of cost accounting, Time Driven-Activity Based Costing (TD-ABC) was to determine the effect of EMR implementation in an outpatient adult reconstruction clinic. 143 total knee arthroplasty patients were prospectively timed throughout their visit to one of two attending surgeon's academic TKA clinics, before implementation of hospital system wide EMR system and then 2 months, 6 months, and 2 years after implementation. Data was analyzed to investigate the effects of different patient characteristics, as well as the new EMR implementation, on labor cost and provider time.

Results: Almost 1.5 times more total clinic staff time was required after EMR implementation than at other time points prior to EMR implementation (35.18 min vs 51.65 at 2 months, 50.97 at 6 months and 52.30 min at 2 years, $p<0.001$). More time was required to see each patient and get them through a clinic visit. However, total clinic labor cost increased significantly at 2 months ($46.04) vs. pre-implementation ($36.88) but there was no statistically significant difference at 6 months ($38.67) and 2 years ($37.73). Additionally, providers spent more time documenting encounters after EMR implementation (3.28 min vs 7.63 min at 2 months, 8.43 min at 6 months, and 5.34 min at 2 years, $p<0.001$).

Conclusion: EMR implementation led to increases in the total amount of staff time per patient at all time points after implementation and increased documentation time. This affect does not improve at 2 years following EMR implementation. Providers should be aware that EMR implementation could lead to long term decreased clinic efficiency.

POSTER #176

No Correlation Between Press Ganey Survey Responses and Outcomes in Post-Total Hip Arthroplasty Patients

Anton Khlopas, MD, Osman Ali, BS, Chukwuweike Gwam, MD, Morad Chughtai, MD, Sabahat Khan, MD Jaydev B. Mistry, MD, Randa Elmallah, MD, Ronald Delanois, MD, Michael A. Mont, MD

Introduction: The Center for Medicare and Medicaid services (CMS) has recently modified the medical services reimbursement strategy from pay-for-service to pay-for-quality design. This is achieved by the use of patient-administered surveys such as Press Ganey. To our knowledge, this questionnaire has not been correlated with any commonly used total hip arthroplasty (THA) patient outcome assessment tools. In this study we assessed the correlation of Press Ganey overall hospital rating score with the following THA assessment tools: 1) Harris Hip Score (HHS); 2) Hip Western Ontario and McMaster Universities Osteoarthritis Index (Hip WOMAC); 3) Short Form-12 (SF-12) physical score; 4) SF-12 mental score; 5) University of California Los Angeles (UCLA) score; and 6) Visual Analog Scale (VAS).

Methods: We performed a query of our institution Press Ganey database from November 2009 to January 2015 to identify patients who had a THA. This yielded 711 patients who had a mean age of 62 years (range, 15 to 91 years) including 287 men and 424 women. A bivariate correlation analysis was performed in order to determine correlation between Press Ganey overall hospital rating and long term outcome assessment tools.

Results: Pearson correlation analysis revealed no correlation between Press Ganey survey overall hospital rating score and the various outcome assessment tools: Harris Hip score Knee had the highest correlation coefficient (r=.120; p=0.316) (Table 1).

Conclusion: Based on the results of this study, the Press Ganey surveys may not be a suitable means to determine outcomes or reimbursements for orthopaedists who perform THA. The findings revealed that no statistically significant relationship is present between commonly used THA arthroplasty assessment tools and the Press Ganey overall hospital rating. These results are of importance in necessitating a review of Press Ganey Surveys as a tool for a determination of reimbursements for services provided.

POSTER #177

ID Badges in the Operating Room Environment: Is Reconsideration Warranted?

Matthew Hogue, MD, Kris Heilmann, BS, Daniel Diekema, MD,
John J. Callaghan, MD

Introduction: Numerous studies have documented bacterial contamination of personal items such as cell phones, beepers, ties and pens in the hospital setting. JCAHO requires all personnel to wear an identification badge at all times. The purpose of this study was to evaluate the bacterial contamination of ID badges worn in the operating room. The authors hypothesized a high incidence of bacterial contamination would be present on the badges of operating room personnel.

Methods: Badges, lanyards and pagers from operating room personnel were swabbed and cultured using the same protocol used for surgical specimens in the operating rooms. Personnel included orthopaedic attendings (14), orthopaedic residents (20), nurses (19) and anesthesia personnel (11).

Results: A total of 64 badges were sampled, with no MSSA or MRSA cultured on any of the badges. Only 2/64 had enterococcus (3%), and 1 of those was vancomycin resistant. Pagers had similar results, with only 1/42 growing MSSA or enterococcus (2.4%), and no MRSA. Lanyards, however showed slightly higher rates of contamination. There were 11% with MSSA or MRSA out of 27 sampled. Highest contamination rates were with orthopaedic staff and resident lanyards, with 3/22 (13.6%) growing MSSA or MRSA. No lanyards grew enterococcus. When comparing rates of MSSA/MRSA between groups, lanyards had a statistically significant higher rate ($p < 0.01$) of contamination.

Conclusion: Relatively few bacteria (especially staph pathogens) were cultured from the badges (8.5%, no staph organisms) and pagers (18.6%, only one staph organism) of operating room personnel, however 20.6% of lanyards cultured positive and 60% of these were staphlyococcal organisms. At a minimum, operating room personnel should probably not use lanyards to display their ID badges.

POSTER #178

Short-term Morbidity and Readmissions Are Increased with Skilled Nursing Facility Discharge Following TJA

Jesse Otero, MD, PhD, Kyle Duchman, MD, Nicholas Bedard, MD, James Gholson, MD, Yubo Gao, PhD, John J. Callaghan, MD

Introduction: Medicare policy requires a minimum three-day hospital stay for patients discharging to SNF. We sought to determine short-term complication and readmission rates for SNF versus home discharge in a cohort of patients 65 and older who were discharged after post-operative day 3.

Methods: Patients who underwent total hip or knee arthroplasty between 2012 and 2013 were identified in the National Surgical Quality Improvement Project (NSQIP) database. Patients younger than 65, and those over 65 who were discharged prior to post-operative day 3, and thus not SNF eligible by Medicare rule, were excluded from the analysis in order to create a Medicare and SNF eligible cohort. Patients were classified according to discharge disposition, categorically defined as home or SNF. Patient demographics and comorbidities as well as short term complications were compared between cohorts.

Results: Overall 34,610 Medicare and SNF eligible TJA patients were identified. 54.8% of patients discharged home. Patients who discharged to SNF compared with home were older, had higher rates comorbidities, and were more frequently ASA class 3 or 4. Patients discharging to SNF had a higher rate of any complication (7.9% v. 4.7%) and readmission (5.3% vs. 3.3%). Discharge to SNF (OR 1.9), ASA class 3 or 4 (OR 1.5), age >80 (OR 1.2), COPD (OR 1.4,), and dependent functional status (OR 1.5) were independent risk factors for a 30-day complications. These same variables were also significant predictors of 30-day readmission.

Conclusion: In a cohort of Medicare and SNF eligible patients, discharge to a SNF was the strongest predictor of 30-day complication following TJA. Additionally, SNF discharge was an independent predictor of readmission following TJA. Given these findings, concerted efforts from institutions and surgeons to promote discharge to home are warranted. More frequent short-term follow-up and surveillance of patients discharged to SNF's may be warranted.

POSTER #179

Navigating the Bundle: Total Hip vs. Hemiarthroplasty in Patients with Displaced Femoral Neck Fractures

Matthew S. Hepinstall, MD, Andrew D. Olswing, MD, Zachary P. Berliner, MD, Zenobia Brown, MD, MPH, Giles R. Scuderi, MD, José A Rodriguez, MD, H. John Cooper, MD

Introduction: Medicare bundled payment initiatives demand cost-effective care of hip fractures requiring prosthetic replacement. Total hip arthroplasty (THA) is associated with superior outcomes compared to hemiarthroplasty (HA) in properly selected hip fracture patients, but does increase implant costs. We asked whether choice of THA versus HA influence length of stay (LOS), discharge disposition, and 30-day readmission in the setting of hip fracture.

Methods: We retrospectively examined the experience of a large hospital system managing hip fractures with prosthetic replacement. We identified 1182 cases coded DRG 469 or 470 in the setting of hip fracture from 2014-2015. Patients managed with THA were compared to those managed with HA with regard to the outcomes of interest. Outcomes were stratified by surgeon arthroplasty fellowship training status.

Results: Across the cohort, 22% of patients were treated with THA while 78% were treated with HA. 27% of patients were treated by surgeons with arthroplasty fellowship training. Utilization of THA was significantly higher amongst arthroplasty fellowship-trained surgeons than amongst those without this subspecialty training (43% vs. 12%; $p<0.001$). Treatment with THA was associated with a significantly shorter LOS (6.4 vs. 7.0 days; $p=0.037$), higher incidence of discharge home (26% vs. 5%; $p<0.001$) and lower 30-day readmission rates (6% vs. 14%; $p<0.001$) when compared to HA. Furthermore, these differences remained significant in the hands of both arthroplasty and non-arthroplasty surgeons.

Conclusion: Institutions seeking to control costs related to managing displaced femoral neck fractures need not discourage the use of THA, as reduced LOS and readmissions along with increased discharge home result in cost-effective care. While a portion of the observed differences in outcomes between THA and HA may be the result of unmeasured differences between patients, the choice to provide THA to appropriate-selected hip fracture patients is not expected to drive failure of a bundled payment program.

POSTER #180

Variation in Patient Cost Risk Scores for Total Joint Arthroplasties

Derek A. Haas, MBA, Charles M. Davis, MD, PhD, Ali Oliashirazi, MD, Harpal S. Khanuja, MD, Jay D. Mabrey, MD, Lila E. Kelso, MSc, Jerome Genser, BA, Meridith E. Greene, PhD, Robert S. Kaplan, PhD

Introduction: The study examined to what extent expected costs vary across patients, surgeons, and hospitals based on patient characteristics for Total Joint Arthroplasties without complicating conditions (DRG = 470). As surgeons become accountable for costs, it is important for them to understand cost drivers.

Methods: First, the wage rate adjusted direct cost of inpatient care was calculated using time-driven activity-based costing for 14,000 patients that received either a primary Total Knee Arthroplasty (TKA) or Total Hip Arthroplasty (THA) during 2014-2015 at one of ten U.S. hospitals. Second, a Generalized Linear Model regression was used to model patient cost based on patient age, BMI, gender, insurance type, and ASA score. Third, the regression coefficients were used to calculate the expected cost for each patient. Fourth, the average expected cost of the patients seen by each surgeon and hospital was calculated. Fifth, the variation in cost across patients, surgeons, and hospitals was examined.

Results: The standard deviation in the expected costs for TKA [THA] patients was 6% [8%]. For both procedure types the average patient risk scores were similar for surgeons who performed over 100 (“high volume”) and under 100 (“low volume”) procedures. The standard deviation in expected average patient cost across high and low volume TKA [THA] surgeons was 4% [7%]. The standard deviation in expected patient cost across hospitals for TKAs [THAs] was 2% [7%]. The hospital with the highest average expected patient cost for TKAs [THAs] had a 7% [23%] greater expected cost than the hospital with the lowest.

Conclusion: Except at the extremes, patient risk scores are not a large driver of variation in expected cost across patients, surgeons, and hospitals. This implies that at least from an inpatient cost perspective, surgeons do not need to be overly sensitive to selection of patients based on the characteristics examined.

POSTER #181

ABO Blood Group is a Predictor for the Development of Venous Thromboembolism following Total Joint Arthroplasty

Jared M. Newman, MD, Matthew V. Abola, BA, Alexandra Macpherson, BA, Alison K. Klika, MS, Wael K. Barsoum, MD, Carlos A. Higuera, MD

Introduction: The current ability to predict which patients will suffer from a venous thromboembolism (VTE) following total joint arthroplasty (TJA) is relatively inadequate. The ABO blood group has been associated with development of VTE, but has not been specifically studied in the setting of TJA. This study's purpose was to test whether there is an association between patient's ABO blood group and the development of symptomatic VTE within 90 days following TJA.

Methods: All primary TJA patients from a single healthcare system between 2000- 2014 (n=37,549) were retrospectively reviewed. Of these, 28,025 patients had a recorded ABO blood group. Patient demographics, comorbidities, and perioperative data were collected from the electronic medical records and compared, stratified by symptomatic VTE development and then by ABO blood groups. Patients who experienced a symptomatic VTE confirmed by ultrasound or CT scan within 90 days of surgery were identified. Multivariable regression models were adjusted for other potential risk factors, including age, sex, BMI, surgery type, previous VTE, smoking status, rheumatologic diseases, malignancy, hypercoagulable state, and VTE prophylaxis in order to test the association of ABO blood groups and development of a postoperative VTE.

Results: Multivariable regression analysis found that the AB blood group significantly increased the odds for developing a symptomatic VTE following TJA (odds ratio[OR]=1.4, p=0.03). Additional risk factors for symptomatic VTE following TJA were age (OR=1.02, p<0.001), BMI (OR=1.02, p<0.001), history of VTE (OR=4.87, p<0.001), malignancy (OR=1.46, p<0.001), hypercoagulable state (OR=3.01, p<0.001), non-aspirin anticoagulant (OR=1.54, p=0.002), and TKA (OR=1.3, p=0.001) (Table 1).

Conclusion: The AB blood group was associated with a significantly increased risk for developing a VTE following primary TJA. A patient's ABO blood group should be considered in terms of risk stratification and selection of appropriate postoperative VTE prophylaxis.

POSTER #182

Primary Total Hip Arthroplasty with 4th Generation Ceramic on Ceramic: Analysis of Complications in 939 Consecutive Cases Followed for 2 to 10 Years

Martin Buttaro, MD, Gerardo Zanotti, MD, Fernando Comba, MD,
Pablo Slullitel, MD, Francisco Piccaluga, MD

Introduction: Delta ceramics may be the bearing of choice for younger and active patients due to its improved toughness and wear characteristics, provided there is no risk of fracture. However, ceramic fracture is the most serious complication related to this type of bearing. Although millions of Delta ceramics have been implanted worldwide, short to midterm results have been scarcely reported in the literature. The purpose of this study was to report the complication rate at short to midterm follow up associated with the bearing surface used in a series of primary THAs with Delta ceramic on ceramic bearings performed in a single institution.

Methods: A total of 939 cases (880 patients) undergoing primary THA with fourth-generation Delta ceramic-on-ceramic bearings (BIOLOX® Delta, CeramTec AG, Plochingen, Germany) were retrospectively reviewed. They were followed for an average of 5.3 years (2 to 10 years).

Results: One hip experienced a liner fracture, 2 cups presented early loosening due to friction between the acetabular screw and the backside of the liner, one femoral ball head had a fracture; one case of squeaking was reported, which is impending revision. Considering revision or impending revision in relationship with the bearing surface as the end point, the mean survival rate was 99.3% (IC 95% 98.3% - 99.7%) at 2 to 10 years.

Conclusion: This study showed a low rate of ceramic fracture compared with others; however, it was much higher than the complication rate presented by the manufacturers. The complications observed were directly related to technical errors that surgeons should avoid when using this type of surface.

POSTER #183

Reproducibility of the Postoperative Glycemic Response and 90-Day Complications in Staged Bilateral Total Joint Arthroplasty: Learning from the First Stage

David P. Brigati, MD, Basem B. Abdelmalak, MD, Christian Nasr, MD, Jared M. Newman, MD, Alexandra MacPherson, BA, Carlos A. Higuera, MD

Introduction: Robust prognostic models of total joint arthroplasty (TJA) outcomes are elusive to develop, but critical to pay for performance implementation that incentivizes risk reduction. Reproducibility is necessary, but not sufficient for predictability to exist. The purpose of this study is to report the intra-patient reproducibility of postoperative complications and modifiable risk factors like perioperative hyperglycemia after staged bilateral TJA (sbTJA). We hypothesized that there are lower 90-day complication rates after a stage with controlled glycemia compared to one with hyperglycemia.

Methods: We retrospectively reviewed 386 patients with sbTJA between 9/2013-6/2015 with documented preoperative and postoperative glycemic measurements during each stage. We calculated the odds ratio (OR) for second stage (TJA2) complications given first stage (TJA1) complications adjusting for glycemic control. We reported correlation coefficients (r) and paired t-tests among various perioperative glycemic measurements. We analyzed the subgroup with clinically important differences in glycemic control between stages using McNemar testing.

Results: Patients with TJA1 complications (N=34) had higher odds of having TJA2 complications (OR 3.0, p=0.019) requiring emergency room visits (OR 4.1, p=0.019) and readmissions (OR 7.0, p=0.006) for medical (OR 3.8, p=0.048), but not surgical (OR 2.8, p=0.200) reasons. All perioperative glycemic measurements exhibited positive correlations between stages (eg. maximum postoperative glucose r=0.73). There were no significant differences in rates of complications between stages with clinically important differences in glycemic control.

Conclusion: Both postoperative complications and glycemic responses exhibit reproducible patterns after sbTJA. This raises hope for the eventual development of strong prognostic models and should be carefully considered by providers and sbTJA patients during the interval between stages when planning medical and surgical care strategies for TJA2. Improving perioperative glycemic control between stages did not appear to reduce the risk of 90-day complications requiring hospital services. Prospective randomized trials are needed to answer this specific question definitively.

POSTER #184

Incidence, Risk Factors, and Clinical Implications of Pneumonia following Surgery for Geriatric Hip Fracture

Daniel D. Bohl, MD, MPH, Robert A. Sershon, MD, Bryan M. Saltzman, MD, Brian Darrith, BS, Craig J. Della Valle, MD

Introduction: The purpose of this study is to determine the incidence, risk factors, and clinical implications of pneumonia following surgery for geriatric hip fracture.

Methods: The American College of Surgeons National Surgical Quality Improvement Program was used to conduct a retrospective cohort study of geriatric patients undergoing surgery for hip fracture. Independent risk factors for the development of pneumonia within 30 days of surgery were identified using multivariate regression. Mortality, sepsis, and readmission rates were compared between patients who did and did not develop pneumonia using multivariate regression that adjusted for all demographic, comorbidity, and procedural characteristics.

Results: 29,377 Patients met inclusion criteria. Of these, 13,736 underwent hemiarthroplasty, 1,299 total joint arthroplasty, 580 percutaneous fixation, 4,294 plate/screw fixation, and 9,468 intramedullary fixation. In total, 1,191 patients developed pneumonia, yielding an estimated incidence of 4.1% (95% confidence interval = 3.8-4.3%). Independent risk factors for pneumonia were older age, male sex, lower body mass index, chronic obstructive pulmonary disease, congestive heart failure, preoperative dyspnea on exertion, and preoperative anemia. Patients who developed pneumonia following discharge had a higher readmission rate (79.1% versus 8.2%, adjusted relative risk [RR]=8.7, 95% confidence interval [CI]=8.1-9.5, $p<0.001$) and a higher mortality rate (29.2% versus 5.7%, adjusted RR=3.7, 95% CI=3.3-4.1, $p<0.001$). Among 1,602 total mortalities, 348 (17.9%) occurred in patients who had developed pneumonia.

Conclusion: Pneumonia is a serious complication following geriatric hip fracture surgery that occurs in approximately 1 in 25 patients. Approximately 4 in 5 patients who develop pneumonia are subsequently readmitted, and approximately 1 in 3 die. Given the serious implications of this complication, evidence-based pneumonia prevention programs including oral hygiene with chlorhexidine, sitting upright for meals, elevation of the head of the bed to at least 30 degrees, aggressive incentive spirometry, and early ambulation should be implemented for patients at greatest risk.

POSTER #185

Cachexia Significantly Increases the Risk of Major Peri-Operative Complications and In-Hospital Mortality in Total Joint Replacement Patients: Results of a Matched Cohort Study

Bryce A. Van Doren, MPA, MPH, Susan M. Odum, PhD,
J. Bohannon Mason, MD, Susan T. Arthur, PhD

Introduction: Cachexia, a complex wasting syndrome, is a serious sequela of many chronic diseases. Cachexia is associated with higher inpatient mortality and longer length of stay. Little is known about the effects of cachexia in orthopedic surgical patients. The purpose of this study was to compare the perioperative outcomes of primary total joint arthroplasty (TJA) between patients with and without cachexia.

Methods: Patients undergoing TJA were identified in the 2002-2013 Nationwide Inpatient Samples using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) procedure codes. Patients with cachexia (ICD-9-CM diagnosis code 799.4) were greedy matched to TJA patients without any weight or nutritional deficiencies (i.e., without ICD-9-CM diagnosis codes 262, 263.0, 263.1, 263.9, 269.8, 269.9, or 783.22). Incidence of in-hospital mortality, major perioperative complications, and minor perioperative complications were then compared between patient groups. A total of 479 patients with cachexia undergoing TJA were identified (median age 76 years [IQR 62-83]).

Results: Exact matches were identified for 308 cachexia patients (64%) (median age 76 years [IQR: 62.5-83]). The risk of major complications in cachexia patients was nearly 2.6 times higher than patients without cachexia (11.7% versus 4.6%; unadjusted Relative Risk (uRR): 2.57 [95% CI: 1.42-4.67], p=0.002). There was not a statistically significant difference in the risk of minor complications between patient groups (8.1% versus 11.4%; uRR: 0.71 [95% CI: 0.44-1.16], p=0.22). There was an over five-fold increase in the risk of in-hospital death for cachexia patients (uRR: 5.50 [1.23-24.61], p=0.02). When adjusted for patient characteristics, the risks of major complications and in-hospital mortality in cachexia patients were 167% and 659% higher, respectively (Major: adjusted Relative Risk (aRR): 2.67 [95% CI: 1.36-5.27], p=0.004; Mortality: aRR: 6.59 [95% CI: 1.16=37.42], p=0.33).

Conclusion: Cachexia significantly increases the risk of major surgical complications and in-hospital mortality in patients undergoing TJA. Providers can use this information for patient consultation and pre-operative patient education and informed consent.

POSTER #186

Patient-Related Risk Factors for Early Failure after CRPP of Femoral Neck Fractures Requiring Conversion to Hip Arthroplasty

Jourdan M. Cancienne, MD, Thomas E. Shuler, MD, Cody L. Evans, MD, Seth Yarboro, MD, David B. Weiss, MD, James A. Browne, MD, Brian C. Werner, MD

Introduction: Even with strict indications and precise technique, rates of conversion arthroplasty procedures after failed closed reduction and percutaneous pinning (CRPP) have been reported to be as high as 30%. Current literature has focused on fracture characteristics and technique associated with failure, with less literature on patient-related factors. The purpose of the present study is to utilize a national database to identify patient demographics and comorbidities that are associated with an increased risk of early conversion to arthroplasty following CRPP of femoral neck fractures.

Methods: A national private-payer insurance database was queried for patients who underwent CRPP of a femoral neck fracture using CPT coding. Only patients with a minimum of 3 years follow up in the database were included in the study. Patients who underwent subsequent ipsilateral conversion to a hemi or total hip arthroplasty within three years CRPP were then identified. Independent patient-related risk factors for conversion arthroplasty were evaluated using a multivariate binomial logistic regression analysis.

Results: 905 patients who underwent CRPP with 3 years of follow-up were included. 223 of these patients (24.6%) subsequently underwent ipsilateral conversion arthroplasty within three years postoperatively. Significant independent demographic risk factors for early conversion to hip arthroplasty included: male gender (OR 1.8, $P = 0.001$), age < 50 years (OR 1.9, $P = 0.015$), morbid obesity (OR 4.3, $P < 0.0001$), tobacco use (OR 1.5, $P = 0.028$), hip osteoarthritis prior to CRPP (OR 20.1, $P < 0.0001$), inflammatory arthritis (OR 2.2, $P = 0.001$), diabetes mellitus (OR 1.4, $P = 0.045$) current hemodialysis use (OR 1.9, $P = 0.01$), and chronic anemia (O.R. 1.8, $P = 0.001$).

Conclusion: Approximately 25% of patients who undergo CRPP of femoral neck fractures will require conversion to hip arthroplasty within 3 years postoperatively. There are several significant, independent patient-related risk factors for early conversion hip arthroplasty.

POSTER #187

Do Mortality and Complication Rates Differ Between Periprosthetic and Native Hip Fractures?

Bryan D. Haughom, MD, Bryce A. Basques, MD, Nicholas M. Brown, MD, Michael D. Hellman, MD, Brett R. Levine, MD, MS, Craig J. Della Valle, MD

Introduction: Epidemiological estimates indicate a rising incidence of periprosthetic hip fractures. While native hip fractures are known to be a highly morbid condition, a significant body of research has led to improved outcomes and decreased complications following these injuries. Comparatively little research has evaluated the relative morbidity and mortality of periprosthetic hip fractures. The purpose of this study was to compare the morbidity and mortality of periprosthetic versus native hip fractures.

Methods: Using the prospectively collected National Surgical Quality Improvement Program (NSQIP) database, 523 periprosthetic hip fractures were matched to native hip fractures using propensity scores. The 30-day rates of complications were compared using McNemar's test. A multivariate regression was then used to determine independent risk factors for mortality following periprosthetic fracture.

Results: Mortality was similar between groups (periprosthietic: 2.7% vs. native: 3.4%; p=0.49). Periprosthetic fractures exhibited a greater rate of overall (63.1% vs. 38.6%; p<0.001), severe (14.5% vs. 10.3%; p=0.04), and minor complications (59.1% vs. 34.4%; p<0.001). There was an increased rate of return to the OR (7.8% vs. 3.1%; p<0.001) and blood transfusion in the periprosthetic group (54.9% vs. 30.2%; p=0.001). Age greater than 85 (OR 9.21) and dependent functional status (OR 5.38) were both independent risk factors for mortality following periprosthetic fracture.

Conclusion: While native hip fractures are known to be highly morbid, our findings suggest that periprosthetic hip fractures have a similar mortality with significantly higher short-term morbidity. Future research is warranted to better understand risk factors and prevention strategies for complications in this subset of patients.

POSTER #188

Patient Perceptions of Sleep Quality before and after Primary Total Joint Replacement

Blaine T. Manning, BS, Sean Kearns, BS, Daniel D. Bohl, MD, MPH, Tori Edmiston, MD, Robert Medairos, BS, Scott Sporer, MD, Brett R Levine, MD, MS

Introduction: The impact of sleep disruption on patient perspective and clinical outcomes following total joint arthroplasty (TJA) has rarely been investigated. The purpose of this study is to assess patient perspectives and expectations regarding sleep quality before and after primary TJA.

Methods: 117 patients who underwent primary total hip (THA) or knee (TKA) arthroplasty completed questionnaires during the preoperative, early postoperative, and late postoperative periods. Exclusion criteria were previous THA, TKA, or spine surgery. Questionnaires regarded demographics and medical history, current sleeping habits, and perspectives on the association between sleep quality, joint replacement, and daily activities. The Epworth Scale, a validated 8-question survey assessing daytime sleepiness, was also used. Responses from early and late postoperative periods were compared to preoperative responses.

Results: Demographic data are shown in Table 1. Responses from early (4.8+/- 2.0 wks) and late (46.8+/-20.2 wks) postoperative periods are shown in Table 2. Patients reported significant increases in length of time to fall asleep during the early postoperative period (p=0.030). Mean nightly awakenings increased early postoperatively (p=0.002) and decreased late postoperatively compared to preoperative baseline (p=0.048). Patients expressing desire for better sleep quality decreased from 72.4% at preoperative baseline to 54.9% late postoperatively (p=0.023). Approximately 40% of patients tried a new sleeping method postoperatively, the most common being new pillow placement (33% of all patients) (Table 3). New postoperative sleeping methods did not differ significantly between THA or TKA patients (p=0.814).

Conclusion: Our findings suggest transient sleep disturbance in the early postoperative period with subsequent improvement. Despite late postoperative improvements, approximately half of primary TJA patients still desired better sleep quality and longer sleep duration. Nearly 40% of patients tried a new sleeping method postoperatively. Given the increasing role of patient satisfaction in quality metrics and reimbursement, it is important to manage patient expectations while working with them to optimize sleep quality after TJA. A multimodal approach with preoperative counselling and early postoperative sleep modifications may improve transient sleep disturbance following TJA.

POSTER #189

Preoperative Anemia Independently Predicts 30-Day Complications after Aseptic and Septic Revision Total Joint Arthroplasty

Min Lu, MD, David Sing, BS, Alfred Kuo, MD, Erik Hansen, MD

Introduction: Preoperative anemia is a common, important risk factor for adverse events after joint replacement surgery. No large-scale study has been performed to examine anemia as an independent risk factor for early complication after revision total joint arthroplasty.

Methods: The American College of Surgeons National Surgical Quality Improvement Program database was used to identify patients who underwent revision total joint arthroplasty from 2006 to 2014. Patients were stratified by aseptic and septic revisions into two cohorts. In each cohort, patients were propensity score-matched 1:1 by the presence of preoperative anemia. Multivariate regression was performed to evaluate the independent contribution of anemia on 30-day postoperative complication rates.

Results: We matched 6,830 patients undergoing aseptic revision (3,415 anemic vs 3,415 not anemic) and 2,650 patients undergoing septic revision (1,325 anemic vs 1,325 not anemic). Propensity score matching balanced comorbidity burden well in the aseptic cohort (ASA 4: 7% vs 6%, p=0.179), but among patients undergoing septic revision, anemic patients had a greater comorbidity burden compared to non-anemic patients (ASA 4: 10% vs 4%, p<0.001). After adjusting for comorbidities via multivariate regression, anemia was associated with increased risk of overall complications (aseptic: odds ratio [95%CI]: 1.45 [1.24-1.70], p<0.001; septic: 2.16 [1.83-2.56],p <0.001), deep infection (aseptic: 1.68[1.19-2.38], p=0.003; septic: 1.44[1.06-1.94],p=0.018), mortality (aseptic: 2.18[1.09-4.36], p=0.028; septic: 3.16[1.03-9.74], p=0.045), and increased hospital length of stay (aseptic: adjusted coefficient [95%CI]: 1.02 days [0.73,1.31],p<0.001; septic: 2.04 days [1.53,2.55],p <0.001).

Conclusion: Preoperative anemia is independently associated with postoperative complications, mortality, and increased length of stay in revision total joint arthroplasty. Further studies are needed to evaluate if preoperative treatment of anemia may modify this risk.

POSTER #190

Serum Albumin Predicts Survival and Postoperative Course following Surgery for Geriatric Hip Fracture

Daniel D. Bohl, MD, MPH, Mary R. Shen, BS, Charles P. Hannon, MD, Yale A. Fillingham, MD, Brian Darrith, BS, Craig J. Della Valle, MD

Introduction: Malnutrition is a potentially modifiable risk factor that may contribute to complications following geriatric hip fracture surgery. The purpose of this study was to investigate the association between preoperative hypoalbuminemia, a marker for malnutrition, and complications during the thirty days following surgery for geriatric hip fracture.

Methods: The American College of Surgeons National Surgical Quality Improvement Program was used to conduct a retrospective cohort study of geriatric patients (>65 years) undergoing surgery for hip fracture. Patients without preoperative serum albumin concentration were excluded. Outcomes were compared between patients with and without hypoalbuminemia (defined as serum albumin concentration <3.5g/dL). All comparisons were adjusted for baseline differences between populations.

Results: 17,651 Patients were identified. Of these, 8,272 (46.9%) underwent hemiarthroplasty, 759 (4.3%) total joint arthroplasty, 324 (1.9%) percutaneous fixation, 2,445 (13.9%) plate/screw fixation, and 5,833 (33.1%) intramedullary fixation. The prevalence of hypoalbuminemia was 45.9%. The risk for death was strongly associated with serum albumin concentration, with a linear increase in risk observed as albumin fell below 3.5 g/dL ($p<0.001$). Following adjustment for all demographic, comorbidity, and procedural characteristics, patients with hypoalbuminemia had higher rates of death (9.94% versus 5.53%, adjusted relative risk [RR]=1.54, $p<0.001$), pneumonia (5.30% versus 3.77%, adjusted RR=1.20, $p=0.012$), sepsis (1.19% versus 0.53%, adjusted RR=1.90, $p<0.001$), and hospital readmission (10.91% versus 9.03%, adjusted RR=1.11, $p<0.036$).

Conclusion: The present study suggests that hypoalbuminemia is a powerful independent risk factor for death following surgery for geriatric hip fracture. This association persists over-and-above any associations of death with age, sex, body mass index, and comorbidities. Based on these data, we propose that the nutritional status of hip fracture patients should receive greater attention, and that randomized trials testing for efficacy of aggressive postoperative nutritional interventions may be warranted.

POSTER #191

Neurocognitive Dysfunction in Patients Undergoing Total Joint Arthroplasty

Stephen Yu, MD, Emmanuel Edusei, BS, Kelvin Kim, BS, Raj Karia, MPH, David Steiger, MD, James Slover, MD

Introduction: Although neurocognitive dysfunction (NCD) may negatively impact total joint arthroplasty (TJA) outcomes, the prevalence of NCD is not well characterized in this population.

Methods: 103 patients were assessed for NCD using three validated cognitive tests prior to total hip or knee arthroplasty. A grooved-pegboard test was used to assess dexterity/coordination for both dominant (PEGD) and non-dominant hands (PEGN), and the Rey Auditory-Verbal Learning Test (RAVLT) was used to assess memory function. 99 patients completed screening with at least 1-year follow-up. Significant in-patient events, such as ICU admission and emergent medical response (MRT) consults, participation in physical therapy (PT), discharge disposition, and 30-day and 1-year readmissions were recorded.

Results: 53% (53/99) were identified as neurocognitively deficient on at least one of the three tests [31% by RAVLT, 21% by PEGD, and 30% by PEGN]. There was a higher prevalence of NCD in ages 50-59 ($p=0.004$), though the highest proportion of NCD was in ages 70+ (62%, 13/21). There was a higher proportion of depressed patients testing positive for NCD versus non-depressed patients (77% (13/17) vs 48% (38/79); $p=0.033$). Post-operatively, patients identified to have NCD had more ICU admissions and MRT consults (48% vs 14%; OR=5.54; 95%CI: 1.98-15.47; $p=0.001$), and had more failures to progress in PT (64% vs 17%; OR=8.89; 95%CI: 3.28-24.07; $p<0.001$). NCD patients were discharged to acute-care facilities more often, had longer lengths of stay, and had higher thirty-day and one-year readmission rates, but these findings did not reach statistical significance.

Conclusion: Neurocognitive dysfunction is highly prevalent in TJA patients, and significantly impacted their post-operative course. Patients with NCD had increased ICU admissions, delays in rehabilitation, and increased resource utilization when compared to patients who did not have pre-operative NCD. Further work is needed to develop strategies to identify and support patients with NCD who undergo TJA.

POSTER #192

A Comparison of Two Dosing Regimens of ASA following Total Hip and Knee Arthroplasty

Michael J. Feldstein, MD, MS, Sara Low, BS, Antonia F. Chen, MD, MBA, Laura Woodward, DNP, ANP-C, William J. Hozack, MD

Introduction: Aspirin (ASA) is accepted as a safe, cost-effective alternative for thromboembolic prophylaxis following THA or TKA, but has potential side effects that may be dose dependent. The purpose of this study is to compare side effects of ASA 325mg versus ASA 81mg PO BID when used as thromboembolic prophylaxis following primary TJA.

Methods: A one-year prospective cohort study was performed on 564 primary unilateral TJA patients operated on by a single surgeon. 205 patients were administered ASA 325mg PO BID and 359 patients were administered ASA 81mg PO BID prophylaxis for one month. A questionnaire assessing the side effects of ASA was administered 1-month postoperatively by a Nurse Practitioner. Outcomes were analyzed comparing different dosages using Fisher's exact test.

Results: ASA 325mg had a significantly higher rate of GI distress and nausea (7/205, 3.4%) compared to ASA 81mg (3/359, 0.8%, p=0.04). GI bleeding was low, but similar between groups (p=0.66), 1/205 (0.5%) in the ASA 325mg group, versus 4/359 (1.1%) in the ASA 81mg group. 1 patient (0.5%) in the ASA 81 group developed a pulmonary embolism. No patient developed deep vein thrombosis, periprosthetic joint infection, tinnitus, wheezing/shortness of breath, chest pain or headaches. In the ASA 325mg group, 5/205 (2.4%) discontinued ASA and 3/205(1.5%) changed to the ASA 81mg BID dosage. In the ASA 81mg group, 8/359 (2.2%) discontinued ASA.

Conclusion: For short-term thromboembolic prophylaxis following primary TJA, ASA 81mg is associated with significantly less gastrointestinal distress and nausea compared to ASA 325mg. GI bleeding was equally prevalent between the two dosing regimens, so patients need to be informed about that risk regardless of the ASA dose. Ongoing trials are being conducted to evaluate if ASA 81mg PO BID is as efficacious for preventing thromboembolic events as ASA 325mg PO BID with less gastrointestinal side effects.

POSTER #193

Radiographic Outcomes of Cable-Plate vs. Cable-Grip Fixation in Periprosthetic Fractures of the Proximal Femur

Benjamin F. Ricciardi, MD, Kathryn K. Oi, BS, Scott Nodzo, MD, Yuo-Yu Lee, MS, Geoffrey H. Westrich, MD

Introduction: Newer generation cable-plates are commonly used for periprosthetic proximal femur fractures; however, comparisons relative to older generation cable-grips remain limited. The purpose of this study is to compare radiographic healing rates of cable-plate versus cable-grips for periprosthetic proximal femur fractures.

Methods: This retrospective cohort used consecutive patients undergoing fixation of Vancouver A or B periprosthetic proximal femur fracture with a cable-grip or cable-plate system were identified from a single center database (N=75 patients, 78 hips). Exclusion criteria included fixation of osteotomies (N=7 patients, 8 hips). There were two cohorts: cable-grip (N=24 patients, 24 hips) versus cable-plate fixation (N=44 patients, 46 hips). Vancouver Ag occurred in 88% of cable-grip versus 61% of cable-plate (p=0.02). Vancouver B1 occurred in 8% of cable-grip versus 28% of cable-plate (p=0.05). Vancouver B2 occurred in 4% of cable-grip versus 11% of cable-plate (p=0.42). Mean follow-up was 28 months [range 6-89 months]). Statistical analysis included multiple logistic regression to examine the association between cable-plate versus cable-grip fixation and radiographic union, adjusting for age, sex, BMI, primary versus revision stem, number of cables, length of plate, and radiographic survival.

Results: Radiographic union at most recent follow-up was not different between the cable-grip versus cable-plates (67% versus 76%; p=0.4). For Vancouver Ag, union rates were similar between the cable-plate versus cable-grip groups (75% versus 71%; p=0.38). Increased number of cables was associated with radiographic healing (odds ratio 14 [95% CI 2 -64]), and body mass index negatively correlated with healing (odds ratio -0.4 [95% CI 0.5-0.9]. The implant group (cable-plate versus cable-grip) was not associated with radiographic healing (p=0.12).

Conclusion: Similar rates of healing were seen using a cable-grip versus cable-plate system, however, the cable-plate system could be used for more diverse fracture patterns. Increasing number of cables and lower BMI were significantly associated with radiographic healing.

POSTER #194

Genetic Predilections in a Group of Metal on Metal THR Revisions

William M. Mihalko, MD, PhD, Anita Kerkhof, MS, Justin Hallock, MD, Yan Jiao, PhD, Jian Yan, PhD, Weikuan Gu, PhD

Introduction: This study investigates the genetic commonalities of a group of patients (Disease Cohort) who were revised after MoM THR surgery for pain, high Co/Cr levels and ALTR, compared to a group who have a Metal on Metal (MoM) THR and are asymptomatic (Control Cohort).

Methods: We have analyzed 19 controls (MoM THR > 6 years asymptomic) and 19 disease (revised MoM THR for high metal ions and evidence of adverse local tissue reaction) patients. The resulting 38 samples with genotype calls were analyzed using the Association Workflow in Partek Genomics Suite 6.6 (Partek, Missouri). Hardy-Weinberg equilibrium test was performed on the single nucleotide polymorphism (SNP) level. The difference between the observed and expected frequencies of each allele at each locus (or SNP) were tested by Fisher's exact test and Ï‡2 test. To get the working SNP list, two filters were used: (1) a SNP no-call rate should be less than 5%, and (2) minor allele frequency of a SNP should be greater than 5%.

Results: Several SNPs were linked to the disease cohort. Among them, a strong association was found in an SNP we designate as MS1. In the disease group 17/19 patients were either heterozygous or recessive homozygous for The MS1 gene, and 17/19 asymptomatic control patients were of the homozygous dominant isoform. Based on the Linkage Disequilibrum results, several other SNPs were highly correlated in the revision disease cohort. The control group had a Co level of 2.4+2.3 and Cr level of 1.3+0.9 while the disease group a Co level of 18+24 and Cr of 10.4+15.

Conclusion: This study found a genetic relationship in one gene where the recessive and heterozygous isoforms were detected in 90% of the revision MoM THR disease cohort which may serve as a screening test in the future.

POSTER #195

Intra-Ocular Pressure Changes Associated with Intra-Articular Knee Injections of Kenalog for the Treatment of Knee Arthritis

Kevin M. Taliaferro, MD, Alexander Crawford, BS, Jonathan Lynch, MD, Edward Jung, MD, Justin Jabara, BS, Raimonds Zvirbulis, MD, Trevor Banka, MD

Introduction: Intra-articular steroid injections are a common 1st line therapy for inflammation associated with severe osteoarthritis. It has been well documented that intraocular pressure (IOP) elevation can occur as an adverse effect of corticosteroid therapy, regardless of delivery method. If the ocular hypertensive effect is of sufficient magnitude and duration, damage to the optic nerve (steroid-induced glaucoma) can occur. There have been no published studies to date investigating the change in IOP following an intra-articular steroid injection.

Methods: We prospectively collected data from 31 patients who underwent injection of 40 mg of Kenalog into their knee from December 2015 to March 2016. Intraocular pressures were taken using a handheld tonometer, Tonopen (Reichert, Technology, Depew, NY) at time of enrollment, 1 week, and 1 month. Patients were considered steroid responders if they had >7mm Hg increase in their IOP from baseline.

Results: Mean IOP at baseline was 18.1±5.7 mm Hg for the right eye and 21.4±7.1 mm Hg for the left. Mean IOP for all patients at 1 week was 22.7±10.2 and 23.6±10.9 for right and left eyes, respectively. This increase was not significant as a group. However, in the steroid responder group, nine patients (29%) had a significant increase in IOP at 1 week, to 33.3±11.2 mm Hg in the right eye ($p<0.004$) and 35.3±10.7 mm Hg in the left ($p<0.0007$). This was an average individual increase of 18.7 mm Hg or 99%($p<.005$). At 1 month, 4 of the 5 patients (13% overall, 80% in group) in the steroid responder group had a sustained mean IOP elevation of 16mm Hg from baseline ($p<0.0004$).

Conclusion: 29% of patients had a significant intraocular pressure elevation at 1 week following a knee injection of Kenalog. This IOP elevation was sustained at 1 month in 80% of those steroid-responders.

POSTER #196

Surgical Approach and BMI Can Influence Effectiveness of TXA Administration in Total Hip Arthroplasty

Phillip A. Bostian, MD, Ross P. Smith, MD, Adam E. Klein, MD, Benjamin Frye, MD, Brock A. Lindsey, MD, Matthew J. Dietz, MD

Introduction: Total hip arthroplasty is associated with significant blood loss that results in increased transfusions, morbidity, and mortality. Administration of tranexamic acid (TXA) has significantly decreased the blood loss associated with these procedures, but uncertainty regarding the optimal route of administration persists. The purpose of this study was to determine the influence that surgical approach and obesity have on the effectiveness of intravenous (IV) and topical TXA in limiting blood loss.

Methods: We retrospectively reviewed the charts of patients who received IV or topical tranexamic acid during a total hip arthroplasty at our university based hospital between August 2013 and September 2014. Surgical approach, route of TXA administration, calculated blood loss, and body mass index were recorded. ANOVA was used to compare blood loss between surgical approach groups. Pearson correlation coefficient was calculated for BMI and route of TXA administration.

Results: Inclusion criteria returned 156 patients. Patients undergoing a posterior surgical approach lost nearly 600 ml less blood when TXA was administered intravenously as opposed to topically (1057.70 ml versus 1642.75 ml, p=0.0054). No significant differences were noted in calculated blood loss with regard to IV versus topical administration in lateral and anterior approaches. A significant correlation between BMI and calculated blood loss was observed (r=0.23, p=0.0057). A significant correlation between calculated blood loss and BMI in patients receiving IV TXA was noted (r=0.29, p=0.0044), but no correlation was observed in patients receiving topical TXA (r=0.12, p=0.43).

Conclusion: This study supports the use of IV TXA over topical in patients undergoing total hip arthroplasty from a posterior approach. Additionally, our findings indicate that blood loss in total hip arthroplasty patients increases linearly with BMI, and that topical administration of TXA is more effective at curbing this increase.

POSTER #197

Patient Preferences Regarding Anticoagulation for Venous Thromboembolism Prophylaxis after Total Hip and Knee Replacement

Vincent D. Pellegrini, MD, Robert Holmes, MD, Jacob Drew, MD, Harry A. Demos, MD, Leland Stoddard, BA, Lee R. Leddy, MD, Langdon A. Hartsock, MD, Richard J. Friedman, MD

Introduction: Thromboprophylaxis of venous thromboembolic disease (VTED) after total hip (THA) and knee (TKA) replacement is controversial and without clear recommendations for "best practice". We sought to assess patient understanding of VTED prophylaxis choices and understand their relative risk tolerance of thromboembolism compared to adverse bleeding events.

Methods: An IRB-approved 8 item questionnaire was administered to 291 patients prior to undergoing THA or TKA. The questions stratified risk aversion related to death from pulmonary embolism, bleeding into the wound requiring reoperation, and bleeding that led to deep infection. Relative risk aversion for PE compared to bleeding was interrogated by offering various drug tradeoffs of reduced risk of PE with increased risk of bleeding. Patients were also asked about shared decision-making with their surgeon, and their willingness to be randomized into a clinical trial.

Results: Nearly 87% of patients most feared PE that resulted in readmission and possible death. Consistent with that sentiment, 61% of patients preferred an agent associated with a 1 in 2000 PE risk and a 5% bleeding risk over an agent with a 1 in 1000 PE risk and a 1% bleeding risk. Yet, 40% chose aspirin, 15% warfarin, 15% rivaroxaban, and 30% were unsure. Nearly 60% of patients wished to be involved in the decision with their surgeon, and 50% were willing to be randomized in a clinical trial.

Conclusion: Patients appear more fearful of PE than their surgeons, and willing to choose potent anticoagulants more often than most surgeons. Despite this, the largest number of patients chose aspirin and, although they seem willing to accept a higher bleeding risk than their surgeons, they are equally unsure as to which agent they prefer. A majority of patients wish to be included in a shared decision-making model about VTE prophylaxis with their surgeon.

POSTER #198

The Effect of Implant Used for Fixation of Intertrochanteric Femur Fracture on the Outcomes of Subsequent Conversion Total Hip Arthroplasty (THA)

Peter T. Moskal, MD, Scott M. Eskildsen, MD, Daniel J. Del Gaizo, MD, Christopher W. Olcott, MD

Introduction: The effect of the implant used for fixation of an intertrochanteric femur fracture of the outcome of a subsequent conversion THA remains controversial.

Methods: Using PearlDiver, Inc. Database, Medicare claims data from 2005-2012 were queried for patients undergoing conversion THA after a previous intertrochanteric fracture. Study groups consisted of patients undergoing conversion from either sliding hip screw and side plate (SHS Group) or cephalomedullary nail constructs (CMN Group). Demographic, admissions, and comorbidity data were extracted for each cohort. Outcomes were assessed by calculating individual and pooled rates of local and systemic complications. Odds ratios (OR), p-values, and 95% confidence intervals (CI) were reported.

Results: Conversion THA was performed in 325 patients after previous CMN, and 230 patients after previous SHS. Demographics and comorbidities were similar between cohorts. Local complications occurred in 16.92% of CMN and 15.62% of SHS patients (OR = 1.1, 95% CI 0.69 to 1.74). Systemic complications occurred in 52.92% of CMN and 41.74% of SHS patients (OR = 1.57, 95% CI 1.12 to 2.21). Previous CMN was associated with higher rates of transfusion (OR =1.71, 95% CI =1.20 to 2.45), renal failure (OR =1.95, 95% CI =1.05 to 3.64) and respiratory complications (OR =2.19, 95% CI =1.18 to 4.04).

Conclusion: Conversion of previous CMN to THA is associated with higher systemic complication rates and greater transfusion need than previous SHS. Local complication rates are similar between implant types.

POSTER #199

Normalization of Metal Ion Levels after Revising Metal on Polyethylene Bearings in Total Hip Arthroplasty

Jaime L. Bellamy, DO, Abidemi Adenikinju, MS, Adam Sunderland, MD, Michael B. Gottschalk, MD, James R. Roberson, MD

Introduction: Modularity at the head and neck junction in total hip arthroplasty (THA) can cause trunnionosis. There is limited evidence in the literature describing serum metal ion levels in symptomatic patients with metal on polyethylene (MOP) THA who develop trunnionosis. The purpose of this study is to describe normalization of serum cobalt and chromium ion levels in symptomatic MOP THA patients who had revision THA due to trunnionosis.

Methods: Patients who had unexplained pain after primary MOP THA, elevated serum cobalt and chromium ion levels, and subsequently underwent revision THA at our institution were included. Demographic information including age, sex, and body mass index; operative notes for implant manufacturer, serum cobalt and chromium ion levels pre-revision and post-revision THA, and radiographs were reviewed. Serum metal ion levels were compared using Student's t-test. Significance was determined at alpha=0.05.

Results: Thirty patients who had a primary MOP THA with cobalt chrome femoral head on polyethylene revised to ceramic femoral head on polyethylene were included in the study group. Average time to revision THA after primary THA was 4.7 years (Range: 1.5-13 years). Serum cobalt ion levels showed a significant decrease after revision THA from a mean of 4.7 mcg/L (Range: 2.1-9.2 mcg/L) to a mean of 1.0 mcg/L (Range: <1-5.5 mcg/L), $p<0.001$. Serum chromium ion levels showed a decrease from a mean of 1.7 mcg/L (Range: <1-3.2 mcg/L) to a mean of 1.1 mcg/L (Range: <1-9.4 mcg/L), but did not reach significance, $p=0.19$. Average time after revision THA to repeat serum metal ion levels was 8 months (Range: 4-20 months).

Conclusion: Unexplained pain after primary MOP THA could be caused by trunnionosis. Normalization of serum metal ions occurs after revision THA from metal to ceramic on polyethylene bearing.

POSTER #200

Pharmacological Hemostatic Agents in Total Joint Arthroplasty – A Cost Effectiveness Analysis

Dipak B. Ramkumar, MD, MS, Niveditta Ramkumar, BA, MPH,
Stephanie J. Tapp, PhD, Wayne E. Moschetti, MD, MS

Introduction: Total knee and total hip arthroplasties are associated with significant blood loss. The resulting post-operative anemia can impart significant morbidity and even mortality onto patients. Two pharmacological antifibrinolytics, ε-aminocaproic acid (EACA) and tranexemic acid (TXA) have been utilized in an attempt to minimize intraoperative blood loss. Although these agents have shown success in multiple clinical studies, they too can impart significant morbidity. Given the expense associated with these adverse reactions, a cost-effectiveness analysis was undertaken to ascertain the most cost-effective blood-loss minimizing strategy: no pharmacologic hemostatic, EACA, or TXA.

Methods: A cost-effectiveness model was constructed utilizing the payoffs of cost (in US dollars) and effectiveness (in quality-adjusted life expectancy in days, QALE). The model structure was developed utilizing the medical literature to ascertain the various complications and their probabilities as well as utility values and direct medical costs associated for the various health states. A time horizon of 10 years and a willingness to pay threshold of $100,000 was utilized.

Results: The total cost and effectiveness (QALE in days) was $1114.66, $1909.71, and $6076.83 and 3445.09, 3292.87, and 3247.34 for TXA, no pharmacologic hemostatic, and EACA respectively. Since TXA is less expensive and more effective than the competing alternatives, the latter two strategies were dominated, making the TXA the winning strategy. A sensitivity analysis on the probability of post-operative transfusion with TXA shows that at a threshold probability of 62.6%, the winning strategy changes from TXA to no pharmacologic hemostatic. Similarly, a sensitivity analysis on the probability of post-operative transfusion with no hemostatic shows that at a threshold value of 16.2%, the winning strategy changes from no pharmacologic hemostatic to TXA.

Conclusion: TXA is the most cost-effective strategy to minimize intraoperative blood loss in TJA. These findings are robust to sensitivity analyses using clinically plausible probabilities for transfusion.

POSTER #201

Is Loading Pattern Restored After TKR in Deformed Knees? Pedobarographic Analysis in Varus Knees

Praveen Kumar Reddy Pakeer, MBBS, Dhanasekararaja Palanisami, MBBS, Rajasekaran Shanmuganathan, MBBS

Introduction: The purpose of this study was to analyse the effectiveness of total knee replacement (TKR) surgery in restoring the loading pattern of lower limb with pedobarography in knees with severe varus deformity.

Methods: From December 2014 to December 2015, 91 patients (121 knees) with varus osteoarthritis who underwent TKR were included in the study. Out of these 75 were males and 46 were females. Average age was 63.4 years (45-84). All the patients had full-length hip, knee and ankle, hind foot alignment x-rays and pedobarographic analysis done pre operatively and six weeeks post operatively. Hip Knee Ankle (HKA) angle, Tibio-Calcaneal Angle (TCA), Line of Pressure (LOP) and Peak Pressure (PP) in the feet were measured using x-rays and foot platform.

Results: Average preoperative varus deformity was 170.02 degrees and hind foot alignment was 9.91 degrees valgus. Pedobarography showed lateral loading in 113 (93.38%) knees. Post operatively, the average HKA angle was 178.87. The outliers were 12 (9.91%) knees, of which 10 (8.26%) had under correction and 2 (1.6%) had over correction. The hind foot alignment was corrected to normal (3-7 valgus) in 94 (77.68%) knees, less than 30 in 20 (16.52%) knees and persistent valgus > 70 was seen in 7 (5.78%) knees. Pedobarography showed normal loading in 117 (96.7%) knees and persistent lateral loading with the LOP laterally in 4 (3.3%) knees. One of these knees had persistent varus deformity of 174.2 degrees but the remaining 3 knees had normal HKA angle and hind foot alignment. PP's were mostly in the lateral areas of the feet pre operatively (M6 - 28.1%, M7 - 10.7%, M8 - 31.4%) which significantly changed onto the medial side (M1 - 21.5%, M5 - 10.7%, M8 - 57.02%) after the correction of deformity.

Conclusion: Pedobarographic analysis shows successful realignment and normal loading pattern after TKR in varus knees.

Prevalence of Radiographic Morphology of Femoroacetabular Impingement: A Multi-Centric Study

Chaitanya Waghchoure, MBBS, Javahir Pachore, MBBS

Introduction: Femoroacetabular impingement is an overlooked entity in India, as primary osteoarthritis of hip is less common in Indian population. Underlying abnormal morphology on femoral or acetabular side is the predisposing factor for symptomatic presentation. The purpose of this study was to find out the prevalence of radiographic morphology of FAI in young asymptomatic population in India.

Methods: This was a multi-centric cross-sectional study. Radiographs of 500 asymptomatic volunteers were taken from 10 centers across India (mean age 29.9yr), after excluding hip pain/ pathology. Improper imaging lead to exclusion of 48 radiographs. Measurements were done in OsiriX by two independent orthopaedic surgeons. Crossover sign, ischial spine sign and posterior wall sign were included in acetabular rotation abnormalities(R), lateral center edge angle and acetabular index were included in acetabular over-coverage abnormalities (O) while pistol grip deformity and alpha angle in femoral head neck junction abnormalities(C). Further, all the hips were divided into four types: Normal hips (N) with no abnormalities; Type I hip with single abnormality (R, O, C); type II with combination of any two(RO, RC, OC) and type III with all three abnormalities. Inter-observer reliability was moderate to better for each of the parameters (0.63 to 0.85). Power of study was 0.98.

Results: Sixty-eight percent of 904 hips included, had at least one type of abnormality with 47.5% having signs for pincer impingement, 7.9% with signs of CAM impingement and 10.8% with mixed signs. Type I.R hips (32%) were the most common hips followed by type I.O hips (18%) and type I.C (8%). Males had higher percentage of abnormalities (1.5 times) compared to females.

Conclusion: Radiographic morphology of FAI exists with high prevalence in young Indian population, in contrast with that of primary osteoarthritis of hip. Long term follow up of this cohort will reveal the natural history of these morphologies.

POSTER #203

Patient Satisfaction after Total Knee Arthroplasty

Mahavir Dugad, MBBS, Parag Sancheti, MBBS, Rajeev Joshi, MBBS, Kailash Patil, MBBS, Ashok Shyam, MBBS

Introduction: The outcome measures differ for clinician and patients, making patient satisfaction as an important outcome measure. Patient satisfaction can be assessed by assessing clinical parameters and patient reported outcome tools. We believe that factors like activities of daily living play important role in determining the patient satisfaction. Patient satisfaction after total knee replacement depends on factors like range of motion, stability and pain relief. This study would be able assess the patient satisfaction in terms of activities which are required in day-to-day activities. Aims of study: To analyse the patient satisfaction after TKA and assess the specific reasons of dissatisfaction among the patients.

Methods: We studied 920 eligible patients who underwent primary TKA from June 2009 to March 2013. We excluded patients with revision arthroplasties and those with an old intra-articular fracture. Patient satisfaction was assessed with a satisfaction questionnaire. Responses of expectations were graded on a 5-point Likert scale. Unsatisfied patients were analyzed by studying their WOMAC scores.

Results: Overall satisfaction revealed that 77.71 % (n=375+340) of patients claimed that they were satisfied or very satisfied, 9.78 % (n=90) were dissatisfied while 12.5 % (n=115) were neutral. Majority of unsatisfied patients were those who had difficulty in performing routine activities of daily living (ADL). 90 percent patients had pain mainly while climbing up and down the stairs while only 15-20 percent patients had pain while walking on flat Surface, sitting or lying on bed, or in standing positions. Around 10-12 percent patient had stiffness i.e. lower ranges of motion than they had expected.

Conclusion: There are multiple reasons which cause dissatisfaction among the patients being operated for TKA, most important of which are related to pain, stiffness and difficulty in performing daily activities. Patients and surgeons are ultimately seeking the same goal, predictable satisfaction following total knee arthroplasty.

POSTER #204

Lateralization of Femoral Entry Point to Improve the Coronal Alignment during Total Knee Arthroplasty in Patients with Bowed Femur

Dr. Rajshekhar K.T., Dr. M.N.Kumar, Dr. Thomas Chandy

Introduction: Intramedullary jigs are most often used for distal femoral bone cuts in total knee arthroplasty. However, the accuracy of bone cuts in the distal femur may be affected by the presence of diaphyseal deformities of the femur.

Methods: 63 patients (88 knees) with lateral bowing of the femur underwent primary total knee arthroplasty using a lateralized femoral entry point for intramedullary femoral guide. The following measurements were obtained on the preoperative and postoperative scanograms – mechanical axis deviation, degree of femoral bowing, femoral entry point from the inter-condylar sulcus, distance from the centre of the knee to the mechanical axis and coronal alignment of femoral and tibial components.

Results: In 48.8% of cases, the femoral entry point was 3 to 5mm lateral to the intercondylar notch, 44.4% of cases it was 6 to 10mm lateral to the notch and in 6.8 percent of cases it was 10 to 15mm lateral to the intercondylar notch. Post-operatively the tibio-femoral angle was 6 to 10 degrees of valgus in 96 percent of cases. The postoperative mechanical axis was within 3 mm from the center of the knee in 80 of the 88 knees (90.9%). For every one-degree increase in femoral bowing the entry point was lateralized by an average of 1.04mm.

Conclusion: The location of femoral entry point is important in total knee arthroplasty in patients with coronal plane deformity of the femur. In patients with lateral femoral bowing of 5 degrees or more, a lateralized femoral entry point is useful in allowing straighter passage of long intramedullary femoral rod and this resulted in good mechanical axis alignment and femoro-tibial component alignment in over 90% of patients in our series.

POSTER #205

Ninety Days Morbidity and Mortality in Patients undergoing Primary Elective Total Knee Arthroplasty in a Multispecialty High Volume Center

Pravin Nandwana, MBBS, Javahir Pachore, MBBS

Introduction: TKA has proved its effectiveness and safety in improving quality of life in arthritic patients. Various factors preoperatively determine ninety days mortality and morbidity. Ninety day mortality reported in the literature is 0.4% .

Methods: Prospectively, 2000 patients from November 2014 to August 2015 undergoing primary elective Total knee arthroplasty are included in study. Pre op ASA grade and Deyo-Charlson co-morbidity score were given to each patient as a measure of surgical risk and functional outcome. Functional outcomes were measured by Oxford Knee Score and KSS. Both local and systemic complications and mortality with its cause were assessed within 90 days.

Results: Average age of patient in our study is 68.7years. 1327(66.3%) were female and 673(33.7%) were male. Most common diagnosis was osteoarthritis(98%). Average BMI was 28.9 kg/m2. Mean Deyo-Charlson score was 3.27. Average pre op and 90 day oxford score were 50.9 and 24.9. Knee score were 31.9 and 56.5 respectively. Vascular complication occured in two patients (0.1%). Our rates of superficial and deep infection and pulmonary embolism were 0.8%, 0.3% and 0.1%. 2 male patients(0.1%) having ASA grade IIb and III died within 3 months period, one from multi-organ failure and the other from pulmonary embolism. In 28 patients in whom post op complications had occured,18 patients (64%%) were in ASA Grade III. Average Charlson score was 4.64. Average BMI is 32.9 with 13 patients (46.4%) had BMI more than 35. Females were 15 (53.5%) and 15 patients (53.5%) were of age more than 70. 2 patients who died were male.

Conclusion: Predictors for 90 mortality and morbidity are multivariable. In our study older age, male gender, ASA grade IIb and III, higher Deyo-Charlson index are associated with higher 90 morbidity and mortality. Operating these patients in multispeciality center, following fixed institutional protocol, can optimize disease management which can reduce post operative morbidity and mortality following TKA

The Unsuspected Periprosthetic Joint Infection: The Consequence of Unexpected Positive Intraoperative Cultures during Revision Arthroplasty

Anouk M.E. Jacobs, MD, Menno Bénard, Jacques F. Meis, Gijs van Hellemondt, MD, Jon H.M. Goosen

Introduction: Despite a preoperative workup with no evidence to suspect a prosthetic joint infection (PJI) before revision surgery, routinely obtained intraoperative cultures still can be unexpectedly positive. The purpose of this study was (1) to assess the incidence of unexpected positive intraoperative cultures in presumed aseptic hip and knee revisions and (2) to determine whether a difference exists between the infection-free implant survival rate of patients with and without unexpected positive intraoperative cultures.

Methods: We selected patients who underwent a one-stage revision total hip arthroplasty (THA) or total knee arthroplasty (TKA) for different reasons. Three or more separate intraoperative cultures were obtained during each procedure. A negative result was defined as less than two positive cultures with the same microorganism. An unsuspected PJI was defined as having two or more positive cultures with the same microorganism. Patients' medical records were reviewed to collect demographics, preoperative laboratory results, culture results, and the occurrence of infection during follow-up.

Results: A total of 339 and 340 patients with a presumed aseptic hip and knee revision, respectively, were analyzed. The incidence of unsuspected PJIs was 12.1% and 7.9% in the hips and knees, respectively. The infection-free implant survival rate at 2 year follow-up was 92% (95%CI 73-98) and 88% (95%CI 59-97) in hips and knees which were unsuspected positive for infection, respectively. In the knee group, the infection-free prosthetic survival rate of patients with an unsuspected PJI was significantly lower compared to that of patients with negative intraoperative culture results (88% (95%CI 59-97) versus 97% (95%CI 93-99) with p=0.01). In the hip group, there was no such a difference (92% (95%CI 73-98) versus 93% (95%CI 88-96) with p=0.41).

Conclusion: We found incidences of unexpected positive intraoperative cultures and infection-free prosthetic survival rates that are comparable with previous studies. During follow-up after one-stage revision TKA, a higher incidence of infection was observed in patients with an unsuspected PJI. This difference was not observed in the hip revisions.

POSTER #207

In Vitro Kinematics of a Bicruciate Retaining Total Knee Arthroplasty

Thomas J. Heyse, MD, Geert Peersman, Joshua Slane, Margo Dirckx, Arne van de Vyver, Philipp Dworschak, Susanne Fuchs-Winkelmann, Lennart Scheys

Introduction: The recently reintroduced bicruciate retaining Total Knee Arthroplasty (BCR TKA) is an interesting approach in the quest for close replication of knee joint biomechanics and kinematics closer to the native knee. Therefore, this study aimed at providing a detailed biomechanical view on the functional resemblance of BCR to the native knee joint. It was hypothesized that BCR TKA would feature kinematics resembling those of the native knee.

Methods: Seven fresh-frozen full leg cadaver specimens were mounted in a kinematic rig that applied two motion patterns pre- and post-implantation of a BCR TKA: passive flexion-extension and squatting. An infrared camera system tracked the location of reflective markers attached to the tibia and femur, which allowed for calculation of kinematics based on prior CT scanning. Additionally, specimen laxity was assessed.

Results: Overall, differences in tibiofemoral kinematics between native knee and BCR TKA were small. Following BCR TKA there was less tibial internal rotation during squats. The AP position of the femoral medial condyle showed a paradoxical anterior translation during early and mid-flexion. No significant differences were observed in femoral lateral condyle AP position during squats. Knee laxity was not significantly influenced by BCR TKA implantation.

Conclusion: As both cruciate ligaments are preserved with BCR TKA the unloaded knee closely resembles native knee kinematics. Importantly, the lateral condyle was found to translate posteriorly on the tibial plateau during flexion, thus preserving the rollback mechanism of the knee. In contrast to conventional TKA knee ap laxity was not affected by BCR implantation. Changes in kinematics partially reproduced findings made earlier with fixed bearing unicondylar knee arthroplasty.

POSTER #208

Effect of Referencing Technique for the Tibial Slope in Cruciate-Retaining Total Knee Arthroplasty

N. Verdonschot, M.A. Marra, P. Heesterbeek, S. van de Groes, D. Janssen, B. Koopman, A. Wymenga

Introduction: More slope of the tibial component could help releasing a too tight flexion gap in cruciate-retaining (CR) TKA but could also jeopardize knee stability in flexion. The aim of this study was to investigate the effect of tibial slope (either referenced from the anterior cortex (AC) or center of the tibia plateau (CP)) on the position of tibiofemoral (TF) contact point, knee ligament forces, quadriceps muscle forces, and TF and patellofemoral (PF) joint contact forces during squat activity in CR-TKA.

Methods: A previously validated musculoskeletal model of CR-TKA was used to simulate a squat activity. Muscle and joint forces and moments were calculated from an inverse-dynamic analysis. The tibial slope in the postoperative case was 0 degree and eight additional cases were simulated with -3, +3, +6, +9 degrees of tibial slope, four of them simulating an AC referencing technique and four a CP technique.

Results: Total excursion of the contact points increased with slope in the AC referencing technique and remained unchanged for the CP technique. In both AC and CP techniques the quadriceps forces, TF and PF contact forces slightly decreased with more slope. Medial and lateral collateral ligament became slack in flexion already with +6 degrees of slope when AC technique was used, whereas they always maintained some residual tension using the CP technique even at the highest slope.

Conclusion: The CP technique retained a better knee stability. Increasing slope reduced quadriceps and subsequent PF contact forces which could potential reduce pain in TKA patients.

POSTER #209

An Economic Evaluation of Unicompartmental Compared to Total Knee Replacement: Analysis Using Large, Matched, Routinely-Collected Observational Data from the UK

David W. Murray, MD, FRCS

Introduction: Some patients eligible for TKR could receive UKR instead. While UKR is less invasive with fewer complications and reduced post-operative mortality, UKR is associated with increased reoperation and revision. Many economic evaluations comparing the procedures were undertaken, however these have limited follow-up or haven't controlled for differences in characteristics of those receiving UKR or TKR.

Methods: Routinely-collected data from the NHS were used to inform analysis. Propensity score matching used to identify comparable patients who received UKR or TKR; 25,334 UKRs matched to 75,996 TKRs to estimate transition probabilities and hospital costs, 3,519 UKRs matched to 10,557 TKRs to inform quality-of-life estimates, 1,005 UKRs matched to 335 TKRs to estimate primary care costs. Outcomes, measured in terms of QALYs, and hospital and primary care costs to the health system were estimated and compared for subgroups based on age and gender, and two subgroups based on usage of UKR.

Results: For age and gender subgroups, the provision of UKR is expected to lead to a gain in QALYs compared to TKR (Male <60years: 0.11QALYs, 60-75: 0.27, 75+: 0.19, Female <60: 0.06, 60-75: 0.26, 75+: 0.39) and a reduction in costs (Male <60years: -£1,070, 60-75: -£1,676, 75+: -£1,903, Female <60: -£804, 60-75: -£1,249, 75+: -£1,215 per patient over the lifetime). UKR is expected to lead to a QALYs reduction compared to TKR when performed by surgeons with low UKR utilisation but an increase among those with high utilisation (<10%: -0.19QALYs, ≥10%: 0.17).

Conclusion: UKR is expected to generate better health outcomes and lower lifetime costs than TKR. Health outcomes are worse for UKRs when performed by surgeons who use UKR for <10% of knee replacements; these surgeons should consider broadening their indications. For patients who are eligible to receive one, UKR is a highly cost-effective use of health care resources.

No Benefit of Computer-Assisted TKA: 10-Year Results of a Prospective Randomized Study

Matthieu Ollivier, MD, Sebastien Parratte, MD, Ludovic Lino, MD, Alexandre Lunebourg, MD, Xavier Flecher, MD, Jean-Noel Argenson, MD

Introduction: Computer-assisted surgery (CAS) in TKA was developed to improve implant positioning and restore a neutral mechanical axis and consecutively improve function and implant survivorship. We hypothesized that TKA performed with CAS would improve 10-year function and patient-reported outcomes measured by validated scoring tools and increase survivorship.

Methods: Eighty patients operated on for TKA, 01/04 to 12/05, were randomized into two groups, CT-free CAS technique or conventional technique for TKA. All patients for TKA with primary arthritis or AVN were eligible for CAS and randomly assigned to CAS or conventional technique group; they were operated on according to the same technique using the same cemented implant. In the CAS group, a specific surgical procedure using an imageless computer-based navigation system was performed. 21 women, 19 men in each group; mean age 66 years; mean BMI was 27 ± 4 kg/m2. Post-operatively, the implant positioning were respectively in the CAS group and the conventional technique group: mean HKA: 179±2 ° versus 177±4° (p=0.031), femoral angle: 90±3° versus 90±4° (p=0.8), Teta angle: 6±2° versus 6±3° (p=0.6), Tibial angle: 89±2° versus 87±3° (p=0.044), Tibial slope: 4±3° versus 3±3° (p=0.2).

Results: With the numbers available, there was no difference between the CAS group and the conventional TKA groups in terms of survivorship free from aseptic loosening (97%, 95% CI 95% to 99%, versus 97%, 95% CI 95% to 99%; p=0.98).

Conclusions: CAS used for TKA placement with restoration of a neutral mechanical axis as the target did not confer substantial advantage in function, quality of life, or survivorship at 10 years. The target used in this study was maybe also the wrong target.

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Abdelmalak, Basem B., MD: (n)

Abola, Matthew V., BA: (n)

Accomando, Beverly, MS: Genzyme: Employee

Adams, Joanne B., BFA: Biomet: Research support; Journal of Arthroplasty: Editorial or governing board; OrthoSensor: Research support; Pacira Pharmaceuticals, Inc.: Research support; SPR Therapeutics, LLC: Research support

Adenikinju, Abidemi, MS: (n)

Adib, Farshad, MD: (n)

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

Agaba, Perez, BS: (n)

Alcerro, Jose C., MD: (n)

Ali, Osman, BS: (n)

Alvi, Hasham M., MD: (n)

Amanatullah, Derek F., MD, PhD: AAOS: Board or committee member; Acumed, LLC: Research support; BlueJay Mobile Health: Paid consultant, Research support; Exactech, Inc: Paid consultant; Omni: Paid consultant; Sanofi: Paid consultant; Stryker: Research support; WebMD: Publishing royalties, financial or material support

Amendola, Richard, MS:
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Anderson, Lucas A., MD: (n)

Anderson, Martin, MD: (n)

Anderson, Mike B., MSc: Orthogrid Systems, Inc.: Paid consultant

Anseth, Scott D., MD: Biomet: Paid consultant; Smith & Nephew: Paid consultant; Stryker: Paid consultant

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Azboy, Ibrahim, MD: (n)

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Barlow, Brian, MD: (n)

Barnes, C. Lowry, MD: American Association of Hip and Knee Surgeons: Board or committee member; AR Orthopaedic Society: Board or committee member; Clinical Orthopaedics and Related Research: Editorial or governing board; ConforMIS: Research support; DJO: IP royalties; HealthTrust: Paid consultant; HipKnee Arkansas FounAmerican Association of Hip and Knee Surgeons: Board or committee member; AR Orthopaedic Society: Board or committee member; Clinical Orthopaedics and Related Research: Editorial or governing board; ConforMIS: Research support; DJO: IP royalties; HealthTrust: Paid consultant; HipKnee Arkansas Foundation: Board or committee member; Journal of Arthroplasty: Editorial or governing board; JSOA: Editorial or governing board; Liventa: Stock or stock Options; Medtronic: IP royalties, Paid consultant; Mid American Orthopaedic Association: Board or committee member;
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Barr, Christopher J., BS: Journal of Bone and Joint Surgery - American: Editorial or governing board; Spine: Editorial or governing board; Zimmer: Other financial or material support

Barsoum, Wael K., MD: Active Implants: Research support; Cool Systems: Research support; Custom Orthopaedic Solutions: Stock or stock Options; DJO, Inc.: Research support; Exactech, Inc: IP royalties; IOTied: Other financial or material support; iVHR: Stock or stock Options; KEF Healthcare (Board Member): Other financial or material support; Orthosensor: Research support; Orthovita: Research support; Otismed: Stock or stock Options; Stryker: IP royalties, Paid consultant, Paid presenter or speaker, Research support; Zimmer: IP royalties, Research support

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Beal, Matthew D., MD: AAOS: Board or committee member; Medacta: IP royalties, Paid consultant, Research support; National Institutes of Health (NIAMS & NICHD), Zimmer, Stryker, Mako Surgical: Research support; Zimmer: Paid consultant

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Bendich, Ilya, MD, MBA: (n)

Bene, Nicholas C., BA: (n)

Berend, Keith R., MD: AAOS Board of Specialty Societies (Knee Education Representative): Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Knee Society: Board or committee member; Orthopedics: Editorial or governing board; Orthosensor: Research support; Pacira: Research support; Reconstructive Review: Editorial or governing board; SPR Therapeutics, LLC: Research support, Stock or stock Options; Zimmer Biomet: IP royalties, Paid consultant; Research support

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Bergum, Christopher, BS: (n)

Berkowitz, Richard, MD: Cempra: Research support; Debiopharm: Research support; Durect: Stock or stock Options; Halozyme: Stock or stock Options; Iovera: Research support; Malinkrodt: Paid presenter or speaker, Research support; Medicine Company: Research support; Pacira: Stock or stock Options; Pfizer: Research support; Recro: Research support; Regeneron: Research support; Sanofi Pasteur: Research support; Seikagaku: Research support; Trevena: Research support; Zimmer: Research support

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Bernardoni, Eamon D., MS: (n)

Bernstein, Derek T., MD: (n)

Berry, Daniel J., MD: American Joint Replacement Registry: Board or committee member; DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant, Research support; Elsevier: Publishing royalties, financial or material support; Hip Society: Board or committee member; International Hip Society: Board or committee member; Journal of Bone and Joint Surgery - American: Editorial or governing board; Mayo Clinic Board of Governors: Board or committee member; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

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Bingham, Joshua, MD: (n)

Birch, Craig M., MD: (n)

Blom, Andre, PT, STC: (n)

Boettner, Friedrich, MD: DePuy, A Johnson & Johnson Company: Paid consultant; DJO Surgical: Paid presenter or speaker; OrthoDevelopment: IP royalties, Paid consultant; OrthoForum GmbH: Editorial or governing board; Smith & Nephew: Paid consultant, Research support

Bohl, Daniel D., MD, MPH: (n)

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

Bolz, Nicholas J., BS: (n)

Bonilla, Guillermo, MD: Bristol-Myers Squibb: Paid presenter or speaker; DePuy, A Johnson & Johnson Company: Other financial or material support, Paid presenter or speaker; Pfizer: Paid presenter or speaker; Sanofi-Aventis: Paid presenter or speaker

Bono, James V., MD: Springer: Publishing royalties, financial or material support; Stryker: Paid consultant, Paid presenter or speaker; StrykerSectra: IP royalties

Boocock, Mark, PhD: (n)

Boodaie, Benjamin: (n)

Bosco, Joseph, MD: Association of Professionals in Infection Control (APIC): Board or committee member; Bulletin of The Hospital for Joint Diseases: Editorial or governing Board; Genovel: IP royalties, Paid consultant, Stock or stock Options; Journal of Bone and Joint Surgery - American: Editorial or governing board; labrador healthcare: Paid consultant; Medtronic: Paid consultant; Pacira: Paid presenter or speaker; surgical directions consulting: Paid consultant; the orthopedic learning center: Board or committee member

Bostian, Phillip A., MD: West Virginia Orthopaedic Society Board Member: Board or committee member

Bostrom, Mathias P., MD: Bone Support: Research support; Orthopaedic Research Society: Board or committee member; Smith & Nephew: Paid consultant, Research support; Springer: Editorial or governing board

Boylan, Matthew R., MD MPH: (n)

Boyle, Peter R., DO: (n)

Bozic, Kevin J., MD., MBA:
AAOS: Board or committee member; American Joint Replacement Registry: Board or committee member; Centers for Medicare and Medicaid Services: Paid consultant; Harvard Business School: Paid consultant; Orthopaedic Research and Education Foundation: Board or committee member; Yale-New Haven Center for Outcomes Research: Paid consultant

Bradbury, Thomas L., MD: OrthoSensor: Research support; TJO, Inc: IP royalties, Paid consultant; Zimmer: IP royalties, Paid consultant

Bragdon, Charles R., PhD: MAKO Surgical: Research support; Zimmer: IP royalties, Research support

Braito, Matthias, MD: (n)

Branson, Jill J., RN, BSN: Johnson & Johnson: Stock or stock Options

Brause, Barry D., MD: (n)

Bravin, Lindsey N., MD: (n)

Brigati, David P., MD: AAOS: Board or committee member

Browne, James A., MD: American Journal of Orthopedics: Editorial or governing board; Biocomposites Ltd: Paid consultant; DJ Orthopaedics: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board; Radlink: Stock or stock Options; Radlink/DePuy: Paid consultant; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support; Southern Orthopaedic Association: Board or committee member

Brown, Matthew L., MD: (n)

Brown, Nicholas M., MD: (n)

Brown, Timothy S., MD: American Association of Hip and Knee Surgeons: Board or committee member; American Journal of Orthopedics: Editorial or governing board

Browne, James A., MD: American Journal of Orthopedics: Editorial or governing board; Biocomposites Ltd: Paid consultant; DJ Orthopaedics: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board; Radlink: Stock or stock Options; Radlink/DePuy: Paid consultant; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support; Southern Orthopaedic Association: Board or committee member

Bryan, Andrew J., MD: (n)

Bryan, Sara M., MPT: (n)

Buckland, Aaron, FRACS: (n)

Buttaro, Martin, MD: (n)

Buxbaum, Eric J., DO: (n)

Buza, John, MD: Stryker: Employee

Buzhardt, Paul, MD: (n)

Byram, George W., MD: (n)

Callaghan, John, MD: DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant; International Hip Society: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Journal of Arthroplasty (Deputy Editor): Publishing royalties, financial or material support; Knee Society: Board or committee member; Orthopaedic Research and Education Foundation: Board or committee member; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Calvo, Cecilia: (n)

Campbell, Danielle, MS: Stryker: Employee; Stock or stock Options

Cancienne, Jourdan M., MD: (n)

Canseco, Jose, MD: (n)

Carlson, Bayard C., MD: (n)

Carlson, Samuel, BS: Pfizer: Stock or stock Options

Carlson, Victor R., BS: (n)

Carrillo Villamizar, Nazly T., MD: (n)

Carroll, Kaitlin M., BS: (n)

Cates, Hal E., MD: ConforMIS: Paid presenter or speaker, Research support; Institutional Retrieval Grant - Drexel/NIH: Other financial or material support; Smith & Nephew: Paid consultant, Paid presenter or speaker, Research support; Stryker: Paid consultant, Research support; Zimmer: Paid consultant, Paid presenter or speaker, Research support

Cha, Thomas D., MD, MBA:
Bio2: Paid consultant; GE Healthcare: Paid consultant;Institutional Fellowship Support: Globus, AO Spine, OREF: Other financial or material support; K2M: Paid consultant; Nuvasive: Paid consultant

Chagin, Kevin, MS: (n)

Chalmers, Brian P., MD: (n)

Chambers, Andrew, MD: (n)

Chapman, Danielle M., BS: (n)

Charles, Ryan, MD: (n)

Chawla, Harshvardhan, MD: (n)

Chen, Antonia F., MD, MBA: 3M: Research support; AAOS: Board or committee member; ACI: Paid consultant; DJ Orthopaedics: IP royalties; European Knee Association: Board or committee member; Joint Purification System: Unpaid consultant;
Musculoskeletal Infection Society: Board or committee member; Myoscience: Research support; SLACK Incorporated: Publishing royalties, financial or material support; Smith & Nephew: Research support; Stryker: IP royalties

Cheng, Karen Y., MD: (n)

Chin, Garwin, Bcc: (n)

Christensen, Tyson C., MD: (n)

Christie, Michael J., MD: DePuy, A Johnson & Johnson Company: IP royalties; Exactech, Inc: Stock or stock Options; Zimmer: IP royalties

Chughtai, Morad, MD: (n)

Clarke, Henry D., MD: AAOS: Board or committee member; Association of Bone and Joint Surgeons: Board or committee member; ConforMIS: IP royalties, Paid consultant, Unpaid consultant; ICJR: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Journal of Knee Surgery: Editorial or governing board; Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board, Publishing royalties, financial or material support; Knee: Editorial or governing board; Smith & Nephew: Paid consultant, Paid presenter or speaker; Stryker: Research support; VIDACARE: Research support

Clohisy, John C., MD: Microport Orthopedics, Inc.: Paid consultant; Pivot Medical: Research support; Smith & Nephew: Research support; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support; Zimmer: Research support

Comba, Fernando, MD: (n)

Cooper, Herbert John, MD: AAOS: Board or committee member; Corin U.S.A.: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; KCI: Paid consultant, Paid presenter or speaker, Research support; Medacta USA: Paid consultant; Zimmer-Biomet: Paid consultant

Crawford, Alexander, BS: (n)

Crawford, David A., MD: (n)

Cronin, Michael, DO: (n)

Cross, Michael B., MD: Acelity: Paid consultant; Acelity Surgical Advisory Board: Paid consultant; Bone and Joint Journal 360: Editorial or governing board; Exactech, Inc: Paid consultant; Intellijoint: Paid consultant, Stock or stock Options; Journal of Orthopaedics and Traumatology: Editorial or governing board; Link Orthopaedics: Paid consultant; Smith & Nephew: Paid consultant, Research support; Techniques in Orthopaedics: Editorial or governing board; Theravance Biopharma: Paid consultant; Zimmer: Paid consultant

Culp, Brian M., MD: (n)

Cunningham, Daniel, BS: (n)

Curry, Emily, BS: (n)

Curtin, Brian M., MS, MD: American Association of Hip and Knee Surgeons: Board or committee member; American Joint Replacement Registry Review Commission: Board or committee member; CareStream: Paid consultant; Clinical Orthopaedics and Related Research: Editorial or governing board; DePuy, A Johnson & Johnson Company: Paid presenter or speaker; European Journal of Orthopaedic Surgery and Traumatology: Editorial or governing board; International Congress for Joint Reconstruction: Board or committee member; Iroko Pharmaceuticals: Paid consultant; Johnson & Johnson: Paid consultant; Journal of Arthroplasty: Editorial or governing board; Orthopedics: Editorial or governing board; Springer: Publishing royalties, financial or material support

Dalury, David F., MD: DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant, Paid presenter or speaker, Research support; Johnson & Johnson: Stock or stock Options; Journal of Arthroplasty: Editorial or governing board

D'Apolito, Rocco, MD: (n)

Darrith, Brian, BS: (n)

Dasa, Vinod, MD: Bioventus: Paid consultant, Paid presenter or speaker; Cropper Medical: Research support; Myoscience: Paid consultant, Stock or stock Options;

Seikagaku: Paid consultant; Vector Medical: Stock or stock Options

Davidovitch, Roy I., MD: Pacira: Paid consultant; Stryker: Paid consultant

Davis, Charles M., III, MD, PhD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Journal of Arthroplasty: Editorial or governing board

De Martino, Ivan, MD: (n)

Dearborn, John, MD: (n)

DeBoer, David K., MD: DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant; Microport Orthopedics: IP royalties, Paid consultant

DeFrancesco, Christopher J., BS: (n)

DeHaan, Alex, MD: (n)

DeHart, Matt, MPH: (n)

Deirmengian, Carl, MD: Biomet: Paid consultant; Biostar Venture Fund partner, CD Diagnostics, Trice, Domain: Stock or stock Options; Journal of Bone and Joint Surgery - American: Publishing royalties, financial or material support; Synthes: Paid consultant; Zimmer: Paid consultant, Paid presenter or speaker; Zimmer, CD Diagnostics: Research support

Del Gaizo, Daniel J., MD: Biomup: Research support; Cadence Pharmaceuticals: Paid presenter or speaker; Journal of Arthroplasty: Editorial or governing board; Orthalign: Paid consultant; Pacira: Research support; SPR Therapeutics: Paid consultant; Stryker: Research support; Zimmer: Research support

Delsole, Edward M., MD: (n)

Delanois, Ronald, MD: Cayenne Medical: Paid consultant, Paid presenter or speaker; Corin U.S.A.: Paid consultant; Maryland Orthopedic association: Board or committee member

Della Valle, Craig J., MD: American Association of Hip and Knee Surgeons: Board or committee member; Arthritis Foundation: Board or committee member; Biomet: IP royalties, Paid consultant, Research support; CD Diagnostics: Stock or stock Options; DePuy, A Johnson & Johnson Company: Paid consultant; Hip Society: Board or committee member; Knee Society: Board or committee member; Mid America Orthopaedic Association: Board or committee member; Orthopedics Today: Editorial or governing board; SLACK Incorporated: Editorial or governing board, Publishing royalties, financial or material support; Smith & Nephew: Paid consultant, Research support; Stryker: Research support; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Demos, Harry A., MD: AAOS: Board or committee member; Think, Surgical, Inc.: Paid consultant

Demzik, Alysen, BS: (n)

Dennis, Douglas A., MD: Clinical Orthopaedics and Related Research: Editorial or governing board; DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant, Paid presenter or speaker; DePuy, A Johnson & Johnson Company, Porter Adventist Hospital: Research support; Innomed: IP royalties; Joint Vue: Stock or stock Options;Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Orthopedics Today: Editorial or governing board; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Deshmukh, Ajit, MD: (n)

Desy, Nicholas, MD: (n)

Dhotar, Herman S., MD: (n)

Diekema, Daniel, MD: BioMeriuex: Research support

Dietz, Matthew J., MD: (n)

Dilworth, Brian, MD: (n)

Dimar, John, MD: Journal of Bone and Joint Surgery - American: Editorial or governing board, Publishing royalties, financial or material support; Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board; Medtronic Sofamor Danek: IP royalties, Paid consultant, Norton Healthcare: Research support; Scoliosis Research Society: Board or committee member; Spine: Editorial or governing board; Spine, Journal of Spinal Deformity, Global Spine Journal: Editorial or governing board

Dimitriou, Dimitris, MD: (n)

Disegna, Steven, MD: (n)

Doherty, David, MD: (n)

Dominick, Nicholas, PhD: (n)

Dorrwachter, Janet, MSN, DNP: (n)

Drew, Jacob, MD: DePuy, A Johnson & Johnson Company: Paid presenter or speaker

Drinkwater, Christopher, MD: Omni Life Science: Paid consultant, Paid presenter or speaker; Smith & Nephew: Research support

Duchman, Kyle, MD: (n)

Dunbar, Michael J., MD FRCSC PhD: Arthropaedia: Editorial or governing board; Canadian Joint Replacement Registry - Co-chair: Board or committee member; Canadian Orthopaedic Association: Board or committee member; Canadian RSA Network - Chair: Board or committee member; DePuy: Research support; EMOVI: Research support; Journal of Bone and Joint Surgery - British: Editorial or governing board; Kinduct: Research support; Knee: Editorial or governing board; Knee Society: Board or committee member; Stryker: IP royalties, Paid consultant, Research support; Zimmer: Research support

Duncan, Stephen T., MD: American Association of Hip and Knee Surgeons: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Kentucky Orthopaedic Society: Board or committee member; Mitek: Paid consultant; Morph: Unpaid consultant; Smith & Nephew: Paid consultant; Stryker: Research support

Duwelius, Paul J., MD: AAOS: Board or committee member; Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Bone and Joint Surgery - American: Publishing royalties, financial or material support; Operation Walk-Freedom to Move CEO: Board or committee member; Providence Orthopedic Foundation & Director of Providence Orthopedic Institute: Research support; Signature Health Care: Paid presenter or speaker; UniteOR: Stock or stock Options; Zimmer: IP royalties; Paid consultant; Research support

Edelstein, Adam I., MD: (n)

Edmiston, Tori, MD: (n)

Edusei, Emmanuel, BS: (n)

Edwards, Paul K., MD: DJO: Paid consultant

Eicher, Jennifer L., BS: (n)

Elmallah, Randa K., MD: (n)

Empson, Jan, RN, ONC: (n)

Erickson, Jill, PA-C: Orthogrid Systems: Stock or stock Options

Ernest, Emily P., BS: (n)

Errico, Thomas, MD: Fastenetix: IP royalties; Harms Study Group: Board or committee member; International Spine Study Group (ISSG): Board or committee member; K2M: Other financial or material support, Paid consultant, Paid presenter or speaker; OMEGA: Research support; Pfizer: Research support

Eskildsen, Scott M., MD: (n)

Eslampour, Aidin, MD: (n)

Esposito, Christina, PhD: EOS Imaging Inc.: Research support

Eto, Shuichi, MD, PhD: (n)

Evangelista, Perry J., MD: (n)

Evans, Cody L., MD: (n)

FAITH Investigators: Acumed, LLC: Paid consultant; Canadian Institutes of Health Research (CIHR): Other financial or material support; Canadian Orthopaedic Association: Board or committee member; Celgene: Paid consultant; Journal of Orthopaedic Trauma: Editorial or governing board; OMEGA: Other financial or material support; Orthopaedic Trauma Association: Board or committee member; Osteosynthesis and Trauma Care Foundation: Board or committee member; Sanofi-Aventis: Paid consultant; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support; Smith & Nephew: Other financial or material support; Paid consultant, Research support; Stryker: IP royalties, Other financial or material support, Paid consultant; Synthes: Other financial or material support; Zimmer: Other financial or material support

Farias-Kovac, Mario, MD: (n)

Farrington, Bill, FRCS: LIMA: Other financial or material support; Stryker: Paid presenter or speaker, Research support

Faschingbauer, Martin, MD: (n)

Feeley, Brian, MD: AAOS: Board or committee member; American Orthopaedic Society for Sports Medicine: Board or committee member; Knee: Editorial or governing board

Fehring, Keith A., MD: American Association of Hip and Knee Surgeons: Board or committee member; DePuy, A Johnson & Johnson Company: IP royalties, Other financial or material support, Paid consultant, Paid presenter or speaker; Resea
Knee Society: Board or committee member

Fehring, Thomas K., MD: American Association of Hip and Knee Surgeons: Board or committee member; DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant, Paid presenter or speaker, Research support; Knee Society: Board or committee member

Feldstein, Michael J., MD, MS: Ceterix: Paid consultant; Muvr: Stock or stock Options; Pfizer: Employee, Stock or stock Options

Fernandes, Julio C., MD: Amgen Co: Research support; DePuy, A Johnson & Johnson Company: Research support; Eli Lilly: Research support; Quebec Orthopedic Association: Board or committee member; Sanofi-Aventis: Research support; Smith & Nephew: Paid presenter or speaker, Research support

Fields, Kara G., MS: Arthritis & Rheumatism: Editorial or governing board; AstraZeneca: Paid presenter or speaker; Crealta: Paid presenter or speaker; Takeda: Paid consultant, Paid presenter or speaker

Figgie, Mark P., MD: Knee Society: Board or committee member; Lima: IP royalties; Mekanika: Stock or stock Options

Fillingham, Yale A., MD: (n)

Fleischman, Andrew N., MD: (n)

Fletcher, Matthew S., BA: (n)

Francois, Elvis L., MD: (n)

Franklin, Patricia D., MD, MBA, MPH: Zimmer: Research support

Freiberg, Andrew A., MD: ArthroSurface: Stock or stock Options; Biomet: IP royalties, Paid consultant; CeramTec: Paid consultant; Orthopaedic Technology Group: Stock or stock Options; Zimmer: IP royalties, Paid consultant

Friedman, Richard J., MD: AAOS: Board or committee member; American Orthopaedic Association: Board or committee member; Association of Bone and Joint Surgeons: Board or committee member; Clinical Orthopaedics and Related Research: Editorial or governing board; Exactech, Inc: Paid consultant, Paid presenter or speaker, Research support; Johnson & Johnson: Paid consultant; Journal of Knee Surgery: Editorial or governing board

Frisch, Nicholas B., MD: (n)

Frye, Benjamin M., MD: Biomet: Paid consultant, Paid presenter or speaker

Fu, Michael C., MD: (n)

Fuentes, Alexandre, PhD: Emovi Inc.: Employee, Stock or stock Options

Fuery, Michael, BS: (n)

Gandek, Barbara, PhD: (n)

Gao, Yubo, PhD: (n)

Garber, Andrew, MD: (n)

Garvin, Kevin, MD: AAOS: Board or committee member; American Orthopaedic Association: Board or committee member; Hip Society: Board or committee member; Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board

Genser, Jerome, BA: (n)

George, Jaiben, MBBS: (n)

Gera, Jim, MBA: (n)

Ghanem, Elie, MD: Stryker: Research support

Gholson, James, MD: Stryker: Research support

Gililland, Jeremy M., MD: Biomet: Research support; CoNextions: Stock or stock Options; Orthogrid: Paid consultant, Stock or stock Options, Unpaid consultant; Zimmer: Research support

Ginnetti, John G., MD: (n)

Giveans, M. Russell, PhD: Ortholink Pty Ltd: Paid consultant

Gladnick, Brian P., MD: (n)

Glassman, Steven D., MD: Medtronic: IP royalties, Paid consultant; Nuvasive - Institutional research support paid directly to database company: Research support; Scoliosis Research Society: Board or committee member

Goetz, Devon, MD: Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Society for Arthritic Joint Surgery: Board or committee member

Goldstein, Jeffrey M., MD: DePuy, A Johnson & Johnson Company: Paid presenter or speaker; Journal of Arthroplasty: Editorial or governing board

Goldstein, Wayne M., MD: DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board; Smith & Nephew,

Innomed: IP royalties

Goltz, Daniel, BS, MBA: (n)

Gonzales, Francis B., MD: Biomet: Paid consultant; Zimmer: Paid consultant, Research support

Gonzalez, Jacquelynn, BS: (n)

Goodman, Stuart B., MD, PhD: AAOS: Board or committee member; ABJS:Clinical Orthopaedics and Related Research: Publishing royalties, financial or material support; Accelalox: Stock or stock Options, Unpaid consultant; Baxter: Research support; Biological Implants Committee AAOS: Board or committee member; Biomaterials: Editorial or governing board, Publishing royalties, financial or material support; Biomimedica: Stock or stock Options, Unpaid consultant, Clinical Orthopaedics and Related Research: Editorial or governing board; DePuy, A Johnson & Johnson Company: Paid consultant; DJ Orthopaedics: Research support; Integra: Paid consultant; J Biomed Mater Res: Editorial or governing board; Journal of Orthopaedic Research: Editorial or governing board, Publishing royalties, financial or material support; Open Orthopaedics Journal: Editorial or governing board; Orthopedics: Editorial or governing board; Regenerative Engineering and Translational Medicine: Editorial or governing board; Society For Biomaterials: Board or committee member; StemCor: Stock or stock Options

Gordon, Alexander C., MD: DePuy, A Johnson & Johnson Company: Paid consultant;
OrthoSensor: Paid consultant, Stock or stock Options

Gotoff, James, BA: (n)

Gottschalk, Michael B., MD: Biogen Idec: Employee, Stock or stock Options; HAND: Editorial or governing board

Grant, Tanner W., BS: (n)

Grau, Luis, MD: (n)

Gray, Chancellor, MD: American Association of Hip and Knee Surgeons: Board or committee member; University of Pennsylvania Orthopaedic Journal: Editorial or governing board

Greco, Victor E., BS: (n)

Green, Cynthia L., PhD: (n)

Greenbaum, Josh M., BS: (n)

Greene, Meridith E., PhD: (n)

Greiner, Justin, MD: (n)

Grimard, Guy, MD: EMOVI: Stock or stock Options; Quebec Orthopedic Association: Board or committee member

Gu, Weikuan, PhD: (n)

Guidry, Carey L., MD: (n)

Gwam, Chukwuweike, MD: (n)

Haas, Derek A., MBA: (n)

Haas, Steven B., MD: APOS Medical & Sports Technologies Ltd.: Other financial or material support; Innovative Medical Products, Inc: IP royalties; Ortho.Secure: Stock or stock Options; Smith & Nephew: IP royalties, Paid consultant, Paid presenter or speaker, Research support

Hadden, Kristie, PhD: (n)

Hagemeister, Nicola, PhD: Emovi Inc: Research support; Sanofi-Aventis: Research support

Haghpanah, Babak, MD: (n)

Hallock, Justin, MD: (n)

Hallstrom, Brian, MD: AAOS: Board or committee member; AJRR: Board or committee member

Hannon, Charles P., MD: (n)

Hansen, Erik Nathan, MD: (n)

Hansen, Heather, JD: (n)

Hanssen, Arlen D., MD: Elsevier: Publishing royalties, financial or material support; International Congress for Joint Reconstruction (ICJR): Board or committee member; Stryker: IP royalties

Harmsen, William S., MS: (n)

Hartsock, Langdon A., MD: American College of Surgeons: Board or committee member; AO Trauma North America: Board or committee member; South Carolina Orthopaedic Association: Board or committee member; Southeastern Fracture Symposium: Board or committee member; Southern Orthopaedic Association: Board or committee member

Haughom, Bryan D., MD: (n)

Heilmann, Kris, BS: (n)

Helfrich, Mia, BS: (n)

Hellman, Michael D., MD: (n)

Henry, Michael W., MD: Johnson & Johnson: Stock or stock Options; Teva pharmaceutical: Stock or stock Options

Hepinstall, Matthew S., MD: Acelity: Paid consultant; Corin U.S.A.: Paid consultant; Smith & Nephew: Paid consultant; Stryker: Paid consultant

Hernandez, Victor H., MD, MS: Consensus orthopedics: Paid consultant; Mallinckrodt Pharmaceuticals: Paid presenter or speaker; Smith & Nephew: Paid consultant

Hetzel, Scott J., MS: (n)

Higuera, Carlos A., MD: American Association of Hip and Knee Surgeons: Board or committee member; American Journal of Orthopedics: Editorial or governing board; CD Diagnostics: Research support; Cempra: Research support; Convatec: Paid presenter or speaker; KCI: Paid consultant, Research support; Myoscience: Research support; OREF: Research support; Pfizer: Paid consultant Stryker: Research support; The Academy of Medicine of Cleveland & Northern Ohio (AMCNO): Board or committee member; Zimmer: Paid consultant

Ho, Bryant, MD: (n)

Hoang, Melinda, Bcc: (n)

Hogue, Matthew, MD: (n)

Hollnagel, Katharine F., MD: (n)

Holmes, Robert, MD: (n)

Howard, James L., MD: DePuy, A Johnson & Johnson Company: Other financial or material support, Paid consultant, Paid presenter or speaker, Research support; Microport: Other financial or material support; Smith & Nephew: Other financial or material support; Stryker: Other financial or material support, Paid consultant, Paid presenter or speaker; Zimmer: Other financial or material support

Howe, Benjamin M., MD: (n)

Hozack, William J., MD: Journal of Arthroplasty: Editorial or governing board; Stryker: IP royalties, Paid consultant, Research support

Hwang, Katherine, MS: (n)

Huddleston, James, MD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; American Knee Society: Research support; Biomet: Paid consultant, Research support; California Joint Replacement Registry: Board or committee member, Paid consultant; Exactech, Inc: IP royalties, Paid consultant, Paid presenter or speaker; Journal of Arthroplasty: Editorial or governing board; Knee Society: Board or committee member; Porosteon: Paid consultant, Stock or stock Options; Robert Wood Johnson Foundation: Research support; Zimmer: Paid consultant, Paid presenter or speaker

Huo, Michael H., MD: American Academy of Orthopedic Surgeons (Committee on Evaluation: self-assessment examination): Board or committee member; Current Orthopedic Practice: Editorial or governing board; DePuy, A Johnson & Johnson Company: Paid consultant; Elsevier: Paid consultant; Stryker: Paid consultant

Hurst, Jason M., MD: Orthosensor: Research support; Pacira Pharmaceuticals: Research support; SPR Therapeutics, LLC: Research support, Stock or stock Options; Zimmer Biomet: Paid consultant, Research support

Hutson, James J., MD: Journal of Orthopaedic Trauma: Editorial or governing board

Illgen II, Richard L., MD: Ketai medical: Paid consultant; Orthosensor: IP royalties, Paid consultant; OrtrhoSensor: Stock or stock Options; Stryker: Paid consultant

Inabathula, Avinash, BS: (n)

Incavo, Stephen J., MD: Biomet: IP royalties; Innomed: IP royalties; Journal of Arthroplasty: Editorial or governing board; Knee Society: Board or committee member; Smith & Nephew: IP royalties; Wright Medical Technology, Inc.: IP royalties; Zimmer: IP royalties, Paid consultant, Stock or stock Options

Iorio, Richard, MD: American Association of Hip and Knee Surgeons: Board or committee member; Bioventis: Research support; Clinical Orthopaedics and Related Research: Editorial or governing board; DJ Orthopaedics: Paid consultant; Ferring Pharmaceuticals: Research support; Hip Society: Board or committee member; JBJS Reviews: Editorial or governing board; Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board; Knee Society: Board or committee member; MCS ActiveCare: Paid consultant, Stock or stock Options; Medtronic: Paid consultant; Orthofix, Inc.: Research support; Orthosensor: Research support; Pacira: Paid consultant, Research support; Vericel: Research support; Wellbe: Stock or stock Options

Ishmael, Marshall K., BS: (n)

Israelite, Craig L., MD: Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Arthroplasty: Editorial or governing board; Zimmer: Paid consultant

Jabara, Justin, BS: (n)

Jacobs, Cale, PhD: Biomet: Research support; Stryker: Research support; Zimmer: Research support

Jain, Deeptee, MD: (n)

Jennings, Jason M., MD, DPT: (n)

Jerabek, Seth A., MD: Stryker: Paid consultant, Paid presenter or speaker

Jennings, Jason M., MD, DPT: (n)

Jiao, Yan, PhD: (n)

Jimenez, Matthew L., MD: (n)

Jo, Woo Lam: (n)

Johanson, Per Eric, MD, PhD: Biomet, Link, Smith & Nephew, Stryker, Zimmer: Research support; DePuy, A Johnson & Johnson Company: Research support; Lima: Research support

Jones, Hugh, BE: (n)

Jones, Richard E., MD: DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant, Paid presenter or speaker, Stock or stock Options; Innomed: IP royalties; Kinamed: Stock or stock Options; Omni Scientific: Stock or stock Options

Jung, Edward, MD: (n)

Kakish, Samer, FRCS (Tr and Orth): (n)

Kamath, Atul F., MD: AAOS: Board or committee member; BMC Musculoskeletal Disorders: Editorial or governing board; DePuy, A Johnson & Johnson Company: Paid consultant, Paid presenter or speaker; Innomed: IP royalties; Procter & Gamble: Stock or stock Options; Zimmer: Paid consultant, Paid presenter or speaker, Research support

Kaneuji, Ayumi, MD, PhD: DePuy, A Johnson & Johnson Company: Paid presenter or speaker; Stryker: Paid presenter or speaker; Zimmer: Paid presenter or speaker

Kaplan, Nathan, MD: (n)

Kaplan, Robert S., PhD: Avant-garde Health: Paid consultant; Medtronic: Paid presenter or speaker

Karam, Joseph A., MD: (n)

Kardos, Keith, PhD: CD Diagnostics: Employee, Stock or stock Options

Karia, Raj, MPH: (n)

Karnes, Jonathan M., MD: Amniox Medical, Inc: Research support

Kasparek, Maximilian, MD: (n)

Kavolus, Joseph, MD, MSCR: Pacira: Stock or stock Options

Kayupov, Erdan, MD: (n)

Kazarian, Gregory, BA: (n)

Kearns, Sean, BS: (n)

Keeney, Benjamin J., PhD: Spine: Editorial or governing board

Kelly, Richard, MBChB: (n)

Kelly, Bryan T., MD: A-3 Surgical: Stock or stock Options; A3 Surgical: Unpaid consultant; Arthrex, Inc: Paid consultant

Kelso, Lila E., MSc: (n)

Kerkhof, Anita, MS, RN: (n)

Khan, Sabahat, MD: (n)

Khanuja, Harpal P., MD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Journal of Arthroplasty: Editorial or governing board

Kheir, Michael M., MD: (n)

Khlopas, Anton, MD: (n)

Kildow, Beau J., MD: (n)

Kim, Eric G., DO: (n)

Kim, Hyung Jin: (n)

Kim, Kelvin, BS: (n)

Kim, Raymond H., MD: Ceramtec: Paid presenter or speaker; Convatec: Paid presenter or speaker; DJ Orthopaedics: IP royalties, Paid consultant; ICJR: Board or committee member; Innomed: IP royalties

Kim, Seung Chan: (n)

Kim, Yong Sik, MD: Corentec: Stock or stock Options

Kleeman, Lindsay, MD: Arthrex, Inc: Employee

Klein, Adam E., MD: (n)

Klika, Alison K., MS: (n)

Koenig, Karl, MD, MS: (n)

Kolessar, David, MD: (n)

Kolisek, Frank R., MD: DJ Orthopaedics: Paid consultant, Research support; Ortho Tech Review: Editorial or governing board; Orthopaedic Knowledge Online Journal: Editorial or governing board; Orthopedics: Editorial or governing board; Stryker: IP royalties, Paid consultant, Research support

Konsin, Zachary B., BS: Allen Medical Systems: Employee

Kowalik, Thomas D., MD: (n)

Krackow, Kenneth A., MD: (n)

Krych, Aaron J., MD: Arthrex, Inc: Paid consultant; Arthritis Foundation: Research support; Ceterix: Research support; Histogenics: Research support

Kuo, Alfred Chung, MD: HamboLab: Stock or stock Options

Kurtz, Steven M., PhD: Active Implants: Research support; Aesculap/B.Braun: Research support; Celanese: Research support; Ceramtec: Research support; DePuy Synthes: Research support; DJO: Research support; Elsevier: Publishing royalties, financial or material support; Exponent: Employee, Paid consultant, Paid presenter or speaker; Other financial or material support; Ferring Pharmaceuticals: Research support; Formae: Research support; Invibio: Research support; Kyocera Medical: Research support; Medtronic: Research support; Simplify Medical: Research support; Smith & Nephew: Research support; Stelkast: Research support; Stryker: Research support; Wright Medical Technology: Research support; Zimmer Biomet: Research support

Kwon, Soon Yong, MD: (n)

Kwon, Young-Min, MD, PhD: Biomet: Research support; Stryker: Research support; Zimmer, Research support

Labro, Eva, PhD: (n)

Lacelle, Marc, Pht: (n)

Lacy, Kyle, MD: (n)

Laende, Elise, BEng, MSc ENG: Canadian RSA Network: Board or committee member

Lafage, Virginie, PhD: DePuy, A Johnson & Johnson Company: Paid presenter or speaker, Research support; Medicrea: Paid presenter or speaker; Nemaris INC: Board or committee member, Stock or stock Options; Nuvasive: Paid presenter or speaker

Landrum, Matthew R., MD: (n)

Lang, Jason E., MD: Smith & Nephew: Paid consultant, Research support

Lange, Jeffrey, MD: (n)

Langfitt, Maxwell K., MD: (n)

Lanting, Brent, MD: DePuy, A Johnson & Johnson Company: Other financial or material support, Paid consultant, Research support; IntelliJoint: Paid consultant; Smith & Nephew: Other financial or material support, Paid consultant, Research support; Stryker: Other financial or material support, Paid consultant, Paid presenter or speaker, Research support; Wright Medical Technology, Inc.: Research support; Zimmer: Research support

Larose, Gabriel, MD: (n)

Larson, Dirk R., MS: (n)

Lau, Edmund, MS: Alcon Corp.: Paid consultant; Boston Scientific: Paid consultant; Medtronic: Paid consultant; Stryker: Paid consultant

Lavernia, Carlos J., MD: Biomet: Paid consultant; Florida Orthopaedic Society: Board or committee member; Johnson & Johnson: Stock or stock Options; Journal of Arthroplasty: Editorial or governing board; MAKO SURGICAL/STRYKER: IP royalties; Stryker: Stock or stock Options; Symmetry Medical (Telcomet): Stock or stock Options; Wright Medical Technology, Inc.: Stock or stock Options; Zimmer: Paid consultant, Stock or stock Options

Law, Tsun Yee, MD: (n)

Lazennec, Jean Y., MD, PhD: (n)

Leddy, Lee R., MD: AAOS: Board or committee member; American Journal of Orthopedics: Editorial or governing board; KCI: Research support; Musculoskeletal Tumor Society: Board or committee member

Lee, Yuo-yu, MS: (n)

Lemay, Celeste, RN, MPH: (n)

Leone, William A., MD: OrthoSensor: Paid consultant, Paid presenter or speaker; Stryker: IP royalties, Paid consultant, Paid presenter or speaker

Levine, Brett R., MD, MS: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Artelon: Research support; Biomet: Research support; CORD: Board or committee member; Human kinetics: Editorial or governing board; Link Orthopaedics: Paid consultant; McGraw-Hill: Paid consultant; Orthoview: Paid consultant; SLACK Incorporated: Editorial or governing board; Zimmer: Paid consultant, Research support

Levy, Bruce A., MD: Arthrex, Inc: IP royalties, Paid consultant, Research support; Arthroscopy Association of North America (ISAKOS Representative): Board or committee member; Arthroscopy,Journal of Arthroscopic and related research: Editorial or governing board; Biomet: Research support; CORR: Editorial or governing board Journal of Knee Surgery: Editorial or governing board; Knee Surgery, Sports Traumatology, Arthroscopy: Editorial or governing board; Stryker: Research support; VOT Solutions: IP royalties

Levy, Daniel L., BS: (n)

Lewallen, David G., MD: Acuitive: Stock or stock Options; American Joint Replacement Registry: Board or committee member; Ketai Medical Devices: Stock or stock Options, Unpaid consultant; Link Orthopaedics: Paid consultant; Mako/Stryker: IP royalties; Orthopaedic Research and Education Foundation: Board or committee member; Pipeline: IP royalties; Zimmer: IP royalties, Paid consultant

Lewallen, Eric A., PhD: (n)

Lewis, Courtland, MD: Biomet: Research support

Li, Xing, BA: (n)

Li, Xinning, MD: Journal of Medical Insight (JOMI): Editorial or governing board, Stock or stock Options; Mitek: Paid consultant; Orthopedic Reviews: Editorial or governing board; Tornier: Paid consultant; World Journal of Orthopaedics: Editorial or governing board

Lim, Young Wook, MD: (n)

Lindsey, Brock A., MD: Biomet: Research support; Highmark Insurance and Provider PPI: Paid consultant; Zimmer: Paid consultant

Lindstrom, Eric J., CRNA: Edwards Lifesciences: Paid consultant; Paid presenter or speaker

Liow, Ming Han Lincoln, MD: (n)

Llinás, Adolfo M., MD: 3M: Paid presenter or speaker; Bayer: Paid presenter or speaker; Ethicon: Paid presenter or speaker; Innnomed: Publishing royalties, financial or material support; Innomed: IP royalties; None: Research support; NovoNordisk: Paid presenter or speaker; Pfizer: Paid presenter or speaker; Zimmer: Paid presenter or speaker

Lombardi, Jr., Adolph V., MD: Clinical Orthopaedics and Related Research: Editorial or governing board; Hip Society: Board or committee member; Innomed: IP royalties; Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Journal of Orthopaedics and Traumatology: Editorial or governing board; Journal of the American Academy of Orthopaedic Surgeons: Editorial or governing board; Knee: Editorial or governing board; Knee Society: Board or committee member; Mount Carmel Education Center at New Albany: Board or committee member; Operation Walk USA: Board or committee member; Orthosensor: IP royalties, Paid consultant, Research support; Pacira Pharmaceuticals, Inc.: Paid consultant, Research support; SPR Therapeutics, LLC: Research support, Stock or stock Options; Surgical Technology International: Editorial or governing board Zimmer Biomet: IP royalties, Paid consultant, Research support

Lonner, Jess H., MD: American Journal of Orthopedics: Editorial or governing board; Biomet: IP royalties, Paid consultant, Paid presenter or speaker, Research support; Blue Belt Technologies: Stock or stock Options; CD Diagnostics: Paid consultant, Stock or stock Options; Healthpoint Capital: Stock or stock Options; Journal of Arthroplasty: Editorial or governing board; Knee Society: Board or committee member; Saunders/Mosby-Elsevier: Editorial or governing board, Publishing royalties, financial or material support; Smith & Nephew: IP royalties, Paid consultant, Paid presenter or speaker, Research support; Wolters Kluwer Health - Lippincott Williams & Wilkins: Editorial or governing board; Publishing royalties, financial or material support; Zimmer: IP royalties, Paid consultant, Paid presenter or speaker, Research support

Louer, Craig R., MD: (n)

Lovecchio, Francis, MD: (n)

Low, Sara L., MD: (n)

Lu, Min, MD: (n)

Lutz, Rex W., BS: (n)

Lux, Nathan, BS: (n)

Lynch, Jonathan, MD: (n)

Mabrey, Jay D., MD: Exactech, Inc: IP royalties, Paid consultant

Mabry, Tad M., MD: Mid-America Orthopaedic Association: Board or committee member

Macdonald, Hilary, PT: (n)

MacDonald, Steven J., MD: DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant, Research support; Hip Innovations Technology, JointVue: Stock or stock Options; Smith & Nephew: Research support; Stryker: Research support

Maclean, Colin J., MD: DePuy, A Johnson & Johnson Company: Research support; Smith & Nephew: Research support; Stryker: Research support

MacLean, Catherine H., MD, PhD: American College of Physicians: Board or committee member

MacPherson, Alexandra, BA: (n)

Maheshwari, Aditya V., MD: World Journal of Orthopedics: Editorial or governing board

Malchau, Henrik, MD, PhD: Biomet: Research support; Ceramtec: Paid consultant; DePuy: Research support; International Hip Society: Board or committee member; ISAR (International Society for Arthroplasty Registries): Board or committee member; MAKO: Research support; RSA Biomedical: Board or committee member; RSA Biomedical Inc: Stock or stock Options; Scientific advisor for Biomet in northern Europe: Board or committee member; Smith & Nephew: Research support; Stryker: IP royalties; Zimmer: Paid consultant, Research support

Malkani, Arthur L., MD: AAOS: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Stryker: IP royalties, Paid consultant, Paid presenter or speaker, Research support

Maloney, William J., MD: AAOS: Board or committee member
Abbott: Stock or stock Options; AJRR: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Flexion Therapeutics, Inc.: Board or committee member; Flexion Therapeutics, Inc. - Scientific Advisory Board: Paid consultant; Flexion Therapeutics, Inc.: Stock or stock Options; Gillead: Stock or stock Options; ISTO Technologies: Stock or stock Options; ISTO Technologies, Inc - Board of Directors: Paid consultant; ISTO Technologies, Inc.: Board or committee member; Johnson & Johnson: Stock or stock Options; Journal of Orthopaedic Research: Editorial or governing board; Journal of Orthopaedic Science: Editorial or governing board; Merck: Stock or stock Options; Moximed: Stock or stock Options; Pfizer: Stock or stock Options; Pipeline Orthopaedics: Stock or stock Options; Stemedica: Board or committee member; Stemedica: Stock or stock Options; Stryker: IP royalties; TJO: Stock or stock Options; Western Orthopaedic Association: Board or committee member; Zimmer: IP royalties

Maltenfort, Mitchell, PhD: (n)

Manalo, John Paul, MD: (n)

Mangla, Mahima, MPH: (n)

Manley, Michael T., FRSA, PhD: Stryker: Employee; Stock or stock Options

Manning, Blaine T., BS: (n)

Manning, David W., MD: AAOS: Program Committee-Subcommittee Adult Hip: Board or committee member; Biomet: IP royalties; Biomet, Medacta: Paid consultant; Iconacy: Stock or stock Options; Medacta: Paid presenter or speaker

Maradit-Kremers, Hilal, MD MSc: (n)

Maratt, Joseph, MD: Alexion Pharmaceuticals: Employee; Stock or stock Options; Biogen: Employee, Stock or stock Options; Dimension Therapeutics: Employee, Stock or stock Options; Merck: Stock or stock Options; Sanofi-Aventis: Stock or stock Options

Marel, Ed, MBBS, FRACS, FAOrthA: Optimized Ortho: Paid consultant, Paid presenter or speaker, Stock or stock Options

Markel, David C., MD: Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Michigan Orthopaedic Society, AAHKS, Mid America Ortho Assoc: Board or committee member; OREF: Research support; Osteoarthritis and Cartilage: Editorial or governing board; Stryker: IP royalties, Paid consultant, Paid presenter or speaker, Research support; The CORE institute: Stock or stock Options

Martin, Audrey, BS: Conformis: Other financial or material support; DePuy, A Johnson & Johnson Company: Other financial or material support

Martin, John Ryan, MD: Biomet: Paid consultant; Paid presenter or speaker

Masch, Jessica, BS, MA: (n)

Masini, Michael, MD: DePuy, A Johnson & Johnson Company: IP royalties; Stryker: IP royalties, Paid consultant, Paid presenter or speaker, Research support; The Journal of Knee Surgery: Editorial or governing board

Mason, J. Bohannon, MD: American Association of Hip and Knee Surgeons: Board or committee member; DePuy, A Johnson & Johnson Company: IP royalties, Other financial or material support, Paid consultant; Journal of Arthroplasty: Publishing royalties, financial or material support

Massel, Dustin H., BS: (n)

Mather III, Richard C., MD, MBA: Arthroscopy Association of North America: Board or committee member; KNG Health Consulting: Paid consultant; North Carolina Orthopaedic Association: Board or committee member; Stryker: Paid consultant; Zimmer: Research support

Mathis, Kenneth, MD: Zimmer: IP royalties

Matsen Ko, Laura, MD: (n)

Mahure, Siddharth, MD: (n)

Mayman, David J., MD: Knee Society: Board or committee member; OrthAlign: Stock or stock Options; Smith & Nephew: Paid consultant, Paid presenter or speaker

McAlister, Ian P., MD: This individual reported nothing to disclose)

McCalden, Richard W., MD: Smith & Nephew: Paid consultant, Paid presenter or speaker; Smith & Nephew, J&J, Depuy, Stryker: Research support

McGrath, Brian E., MD: Ampio Pharmaceuticals: Paid consultant, Research support;
Biomet: Research support; Biomet, Stryker: Paid consultant; Biomet, Stryker, Ampio Pharmaceutical: Stock or stock Options; Stryker: Paid presenter or speaker

McGwin, Gerald, PhD: (n)

McHugh, Michael, BS: (n)

McLawhorn, Alexander S., MD, MBA: American Association of Hip and Knee Surgeons: Board or committee member; American Journal of Orthopedics: Editorial or governing board; HSS Journal: Editorial or governing board

McMahon, Stephen, MBBS, FRACS, FAOrthA: Corin U.S.A.: Paid consultant; Smith & Nephew: Paid consultant, Research support; Stryker: Paid consultant

McNabb, David C., MD: ConvaTec: Paid presenter or speaker

McNair, Peter, PhD, PT: Clinical BiomechanicsPhysical Therapy in SportsArthritis: Editorial or governing board

McNamara, Colin, BS, MBA: (n)

McQuivey, Kade, BS: (n)

Medairos, Robert, BS: (n)

Meding, John B., MD: Biomet: IP royalties, Paid consultant; Stryker: IP royalties, Paid consultant

Meftah, Morteza, MD: (n)

Mehran, Nima, MD: (n)

Meneghini, R. Michael, MD: DJ Orthopaedics: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board; Knee Society: Board or committee member; Stryker: IP royalties; Paid consultant

Menendez, Mariano E., MD: (n)

Merkow, David, BS: (n)

Mezghani, Neila, PhD: Emovi inc.: Research support

Mihalko, William M., MD, PhD: AAOS: Board or committee member; Aesculap/B.Braun: IP royalties, Paid consultant, Paid presenter or speaker, Research support; American Orthopaedic Association: Board or committee member; CeramTec: Paid presenter or speaker; Department of Defense: Research support; Journal of Arthroplasty: Editorial or governing board; Journal of Orthopaedic Research: Editorial or governing board; Knee: Editorial or governing board; MicroPort: Research support; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support; Springer: Publishing royalties, financial or material support; Stryker: Research support; The Journal of Long Term Effects of Medical Implants: Editorial or governing board; Zimmer: Paid consultant

Miller, Andy O., MD: (n)

Miller, Michael G., MD: (n)

Miller, Steve, MD, PhD: (n)

Miner, Todd M., MD: DePuy: Research support; DePuy, A Johnson & Johnson Company: Unpaid consultant; Operation Walk Denver- I am Board Chairman: Board or committee member; Porter Adventist Hospital: Research support; Zimmer: Paid consultant, Paid presenter or speaker, Research support

Mirza, Amer J., MD: Acumed, LLC: Unpaid consultant; Seattle Information Systems: Unpaid consultant

Mistry, Jaydev B., MD: (n)

Mittal, Ashish, BA: (n)

Modi, Ronuk, BS: (n)

Mont, Michael A., MD: AAOS: Board or committee member; American Journal of Orthopedics: Editorial or governing board; DJ Orthopaedics: Paid consultant, Research support; Johnson & Johnson: Paid consultant, Research support; Journal of Arthroplasty: Editorial or governing board; Journal of Knee Surgery: Editorial or governing board; Merz: Paid consultant; Microport: IP royalties; National Institutes of Health (NIAMS & NICHD): Research support; Ongoing Care Solutions: Research support; Orthopedics: Editorial or governing board; Orthosensor: Paid consultant, Research support; Pacira: Paid consultant; Sage Products, Inc.: Paid consultant; Stryker: IP royalties; Paid consultant, Research support; Surgical Techniques International: Editorial or governing board; TissueGene: Paid consultant, Research support; U S Medical Innovations: Paid consultant

Morris, Michael J., MD: Journal of Arthroplasty: Editorial or governing board; Orthosensor: Research support, Pacira Pharmaceuticals: Research support; SPR Therapeutics, LLC: Research support, Stock or stock Options; Zimmer Biomet: Paid consultant, Research support

Mortazavi, S. M. Javad, MD: (n)

Moschetti, Wayne E., MD, MS: (n)

Moskal, Peter T., MD: (n)

Moucha, Calin S., MD: 3M: Paid presenter or speaker; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support

Muchow, Ryan D., MD: (n)

Muratoglu, Orhun K., PhD: Alchimist, LLC.: Stock or stock Options; Arthrex, Inc: IP royalties; Aston Medical: IP royalties; Biomet: Other financial or material support; Cambridge Polymer Group: Stock or stock Options; Conformis: IP royalties; Corin U.S.A.: IP royalties, Paid presenter or speaker; DePuy, A Johnson & Johnson Company: Research support; Iconacy: IP royalties; Meril Healthcare: IP royalties; Orthopedic Technology Group: Stock or stock Options; Renovis: IP royalties; Stryker: IP royalties, Research support; Zimmer Biomet: IP royalties

Murphy, Dermot, BA: (n)

Murphy, James E., MD: (n)

Muskus, Meilyn, MD: (n)

Nandi, Sumon, MD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Journal of Arthroplasty: Editorial or governing board

Nasr, Christian, MD: (n)

Naudie, Douglas, MD: DePuy, A Johnson & Johnson Company: Other financial or material support; Smith & Nephew: IP royalties, Other financial or material support, Paid consultant, Paid presenter or speaker; Stryker: Other financial or material support, Paid consultant, Paid presenter or speaker

Navale, Suparna, MS, MPH: (n)

Naveen, Neal B., BS: (n)

Naziri, Qais, MD: (n)

Nebergall, Audrey K., BS: (n)

Nelson, Charles L., MD: American Association of Hip and Knee Surgeons: Board or committee member; American Orthopaedic Association: Board or committee member; Zimmer: Paid consultant

Nepple, Jeffrey, MD: Smith & Nephew: Paid consultant, Paid presenter or speaker;
Zimmer: Research support

Newman, Jared M., MD: (n)

Nguyen, Hai, MD: Smith & Nephew: Paid consultant

Nguyen, Long-Co, BS: (n)

Nies, Matthew, MD: (n)

Noble, Philip, PhD: CeramTech: Research support; International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine: Board or committee member; Joint View, LLC: Stock or stock Options; Journal of Arthroplasty: Editorial or governing board; Journal of Hip Preservation Surgery: Editorial or governing board; Knee Society: Board or committee member; Musculoskeletal

Transplant Foundation: Other financial or material support; Smith & Nephew: Research support; Springer: Publishing royalties, financial or material support; Stryker: IP royalties; Zimmer: IP royalties, Paid consultant, Research support

Nocon, Allina, MPH: (n)

Nodzo, Scott R., MD: NanoAxis, LLC: Unpaid consultant

Norambuena, German A., MD: (n)

Nunley, Ryan M., MD: American Association of Hip and Knee Surgeons: Board or committee member; Biocomposites: Paid consultant; Biomet: Research support; Blue Belt Technology: Paid consultant; Cardinal Health: Paid consultant; DePuy, A Johnson & Johnson Company: Paid consultant, Research support; Halyard: Paid consultant; Medical Compression System Inc: Paid consultant; Medical Compression Systems, Inc.: Research support; Medtronic: Paid consultant; Microport: IP royalties, Paid consultant; Mirus: Paid consultant; Missouri State Orthopaedic Association Board Member: Board or committee member; Smith & Nephew: Paid consultant, Research support; Southern Orthopaedic Association Board Member: Board or committee member; Stryker: Research support

O'Neill, Owen R., MD: Medtronic: Paid consultant, Paid presenter or speaker;
Responsive Orthopedics: IP royalties

Odum, Susan, PhD: American Association of Hip and Knee Surgeons: Board or committee member; Ceramtec: Paid presenter or speaker; Journal of Arthroplasty: Editorial or governing board

Oi, Kathryn K., BA: (n)

Okafor, Richard, MD: (n)

Okroj, Kamil, BA: (n)

Olcott, Christopher W., MD: (n)

Oliashirazi, Ali, MD: DePuy, A Johnson & Johnson Company: Paid consultant, Paid presenter or speaker, Research support

Olson, Jessica S., BS: (n)

Olswing, Andrew D., DO: (n)

Ong, Alvin C., MD: Journal of Arthroplasty, Journal of Orthopedic Surgery and Research: Editorial or governing board; Smith & Nephew: Paid consultant; Stryker: Paid consultant; Zimmer: Research support

Ong, Kevin, PhD: DJ Orthopaedics: Research support; Ethicon: Research support; Ferring Pharmaceuticals: Research support; Journal of Arthroplasty: Editorial or governing board; Medtronic: Research support; Ossur: Research support; Pacira Pharmaceuticals: Research support; Paradigm Spine: Research support; Stryker: Research support; Taylor & Francis: Publishing royalties, financial or material support; Zimmer: Research support

Orozco, Fabio R., MD: Corentec: Paid consultant; Journal of arthroplasty: Editorial or governing board; Stryker: Paid consultant

Ortiguera, Cedric J., MD: (n)

Ortiz, Philippe, BA: (n)

Osmani, Feroz A., BS: (n)

Osmon, Douglas R., MD: Musculskeletal infection society: Board or committee member

Otero, Jesse, MD, PhD: (n)

Ouakrim, Youssef, MSc: (n)

Paddock, Nicholas G., BS: (n)

Padgett, Douglas E., MD: American Joint Replacement Registry: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Mako: Paid consultant; Medical Compression Systems: Paid consultant; Stryker: Paid consultant, Paid presenter or speaker; The Hip Society: Board or committee member

Pagnano, Mark W., MD: DePuy, A Johnson & Johnson Company: IP royalties; Hip Society: Board or committee member; Knee Society: Board or committee member; Pacira: Paid consultant; Stryker: IP royalties

Parisien, Robert L., MD: (n)

Parvizi, Javad, MD, FRCS: 3M: Research support; CD Diagnostics: Stock or stock Options; Cempra: Research support; CeramTec: Research support; Datatrace: Publishing royalties, financial or material support; DePuy, A Johnson & Johnson Company: Research support; Eastern Orthopaedic Association: Board or committee member; Elsevier: Publishing royalties, financial or material support; Hip Innovation Technology: Stock or stock Options; Jaypee Publishing: Publishing royalties, financial or material support; Journal of Arthroplasty: Editorial or governing board; Journal of Bone and Joint Surgery - American: Editorial or governing board; Journal of Bone and Joint Surgery - British: Editorial or governing board; Muller Foundation: Board or committee member; National Institutes of Health (NIAMS & NICHD): Research support; OREF: Research support; PRN: Stock or stock Options; SLACK Incorporated: Publishing royalties, financial or material support; Smith & Nephew: Paid consultant, Research support; StelKast: Research support; Stryker: Research support; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support; Zimmer: Paid consultant, Research support

Patel, Karan, MD: (n)

Patel, Kishan, DO: (n)

Patel, Preetesh, MD: Medtronic: Paid consultant; Pacira: Paid consultant; Stryker: Paid consultant

Paulino, Carl B., MD: DePuy, A Johnson & Johnson Company; Ethicon: Paid presenter or speaker

Pavlesen, Sonja, MD, MS: (n)

Pearle, Andrew D., MD: Arthrex, Inc: Paid consultant; Stryker: Paid consultant; Zimmer: IP royalties, Paid consultant

Pellegrini, Vincent D., MD: American Orthopaedic Association: Board or committee member; Association of American Medical Colleges, Board of Directors: Board or committee member; Chair, Council of Faculty and Academic Societies, AAMC: Board or committee member; DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant; Health Volunteers Overseas/Orthopaedics Overseas, Board of Directors: Board or committee member; Hip Society: Board or committee member; South Carolina Orthopaedic Association, Board of Directors: Board or committee member; Synthes: Research support

Pelt, Christopher E., MD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Biomet: Paid consultant, Paid presenter or speaker, Research support; Pacira: Research support, Unpaid consultant

Penny, Gregory S., BS: (n)

Penrose, Colin, MD: (n)

Peres-da-Silva, Ashwin B., BS: (n)

Perez, Jorge L., MD: (n)

Perfetti, Dean C., BA: (n)

Perry, Kevin I., MD: (n)

Peters, Christopher L., MD: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Biomet: IP royalties, Paid consultant, Paid presenter or speaker, Research support; CoNextions Medical: Stock or stock Options; Hip Society: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Journal of Hip Preservation: Editorial or governing board; Knee Society: Board or committee member

Petrie, Jeffrey, MD: (n)

Phillips, Matthew J., MD: Biomet: Research support; Greatbatch: Paid consultant; Stryker: Paid consultant, Research support

Piccaluga, Francisco, MD: (n)

Pierrepont, Jim W., PhD, MEng: Corin Group: Employee, Stock or stock Options

Planckaert, Celia, MSc: (n)

Plate, Johannes F., MD, PhD: (n)

Plourde, Anna, MD: (n)

Plummer, Darren, MD, MBA: (n)

Pomeroy, Donald L., MD: DePuy, A Johnson & Johnson Company: Paid consultant, Research support

Ponce, Brent A., MD: Arthrex, Inc: Research support; Help Lightning: Stock or stock Options; Tornier: Paid consultant, Paid presenter or speaker, Research support

Post, Zachary D., MD: DePuy, A Johnson & Johnson Company: Paid consultant; Journal of Bone and Joint Surgery - American: Publishing royalties, financial or material support; Orthodevelopment: Paid consultant; Smith & Nephew: Paid consultant; Research support; Stryker: Paid consultant

Pugely, Andrew, MD: AAOS: Board or committee member
Clinical Orthopaedics and Related Research: Editorial or governing board

Purtill, James J., MD: Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Arthroplasty: Editorial or governing board; Knee: Editorial or governing board; Omega Medical Grants: Board or committee member

Puvanesaraj, Varun, MD: (n)

Ramkumar, Dipak B., MD, MS: (n)

Ranawat, Amar, MD: AAHKS: Board or committee member; AAOS: Board or committee member; Arthrex, Inc: Paid consultant; Ceramtec: Paid consultant; Research support; ConforMIS: Stock or stock Options; DePuy, A Johnson & Johnson Company: IP royalties; Other financial or material support, Paid consultant, Paid presenter or speaker, Research; EOA: Board or committee member; Journal of Arthroplasty, CORR, JBJS: Editorial or governing board; Mako, ConforMIS, Pipeline: IP royalties; Mako, Convatec: Paid presenter or speaker; NA: Publishing royalties, financial or material support; Strathspey Crown: Stock or stock Options; Stryker: IP royalties, Other financial or material support, Paid presenter or speaker, Research support; The Hip Society: Board or committee member; The Knee Society: Board or committee member

Ranger, Pierre, FRCS (Ortho), MD, MSc: Bioventus: Paid consultant; Corin: Paid consultant; Eli Lilly: Other financial or material support; Horizon Pharma: Other financial or material support; Johnson & Johnson: Other financial or material support; Sanofi-Aventis: Paid consultant; Smith & Nephew: Paid consultant

Rathod, Parthiv, MD: (n)

Reardon, Gerald, MD, FRCSC: (n)

Restrepo, Camilo, MD: (n)

Ricciardi, Benjamin, MD: (n)

Richardson, Christopher Glen, MD, FRCSC, MSc: Canadian Orthopaedic Association: Board or committee member; Canadian RSA Network: Board or committee member; DePuy, A Johnson & Johnson Company: Research support; Stryker: Paid consultant, Paid presenter or speaker, Research support

Ries, Michael, MD: Foundation for the Advancement of Research in Medicine: Board or committee member; OrthAlign: Stock or stock Options; Smith & Nephew: IP royalties, Paid consultant; Stryker: IP royalties, Paid consultant

Riesgo, Aldo M., MD: (n)

Ring, David, MD, PhD: AAOS: Board or committee member; Clinical Orthopaedics and Related Research: Editorial or governing board; Journal of Orthopaedic Trauma: Editorial or governing board; Orthopaedic Trauma Association: Board or committee member; Skeletal Dynamics: IP royalties; Wright Medical Technology, Inc.: IP royalties

Robb III, William J., MD: Innomed: IP royalties; Orthopaedic Research and Education Foundation: Board or committee member; Stryker: Stock or stock Options

Robbins, Christopher, PhD: (n)

Robbins, Claire E., PT, DPT, MS, GCS: (n)

Roberson, James R., MD: American Board of Orthopaedic Surgery, Inc.: Board or committee member; Stryker: Research support

Roche, Martin W., MD: Mako - Stryker: Paid consultant; Mako- Stryker, Orthosensor: IP royalties, Paid presenter or speaker; Makosurgical-Stryker: Research support; Orthosensor: Paid consultant; Orthosensor, Cayenne: Stock or stock Options

Rock, Justin, MS: Merck: Employee

Rodriguez, José A., MD: American Association of Hip and Knee Surgeons: Board or committee member; Clinical Orthopaedics and Related Research, HSS Journal: Editorial or governing board; Conformis: Paid consultant; DePuy, A Johnson & Johnson Company: Research support; Eastern Orthopaedic Association – Nomination; Committee: Board or committee member; Exactech, Inc: IP royalties; Paid consultant; Research support; Journal of Arthroplasty: Editorial or governing board; Medacta: IP royalties; Paid consultant; Smith & Nephew: Paid consultant; Research support

Rolfson, Ola, MD, PhD: International Society of Arthroplasty Registers: Board or committee member; Swedish Hip Arthroplasty Register: Board or committee member

Roney, Patrick, BS: (n)

Ross, Jeremy A., MD: (n)

Rubash, Harry E., MD: Ceramtec: IP royalties; Flexion: Paid consultant; Hip Society: Board or committee member; Orthopaedic Technology Group: Stock or stock Options; Pacira: Paid consultant; Stryker: IP royalties; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Runner, Robert P., MD: (n)

Rupp, Gerald R., PhD: (n)

Russell, Robert D., MD: (n)

Rutter, Michael, MD: (n)

Sabbag, Orlando D., MD: (n)

Sah, Alexander P., MD: Angiotech: Paid presenter or speaker; Convatec: Paid presenter or speaker; Mallinckrodt: Paid presenter or speaker; Medtronic: Paid presenter or speaker; Pacira: Paid presenter or speaker; Zimmer: Research support

Sahota, Shawn, MD: (n)

Saleh, Hesham, BS: (n)

Saltzman, Bryan M., MD: Clinical Medical Reviews and Case Reports: Editorial or governing board; International Journal of Sports and Exercise Medicine: Editorial or governing board; International Journal of Surgery Research and Practice: Editorial or governing board; Nova Science Publishers: Publishing royalties, financial or material support; Postgraduate Institute for Medicine: Publishing royalties, financial or material support

Samuel, Andre M., MD: (n)

Schemitsch, Emil H., MD, FRCSC: Acumed, LLC: Paid consultant; Canadian Institutes of Health Research (CIHR): Other financial or material support; Canadian Orthopaedic Association: Board or committee member; Journal of Orthopaedic Trauma: Editorial or governing board; OMEGA: Other financial or material support; Orthopaedic Trauma Association: Board or committee member; Osteosynthesis and Trauma Care Foundation: Board or committee member; Sanofi-Aventis: Paid consultant; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support; Smith & Nephew: Other financial or material support, Paid consultant, Research support; Stryker: IP royalties; Other financial or material support; Paid consultant
Synthes: Other financial or material support; Zimmer: Other financial or material support, Paid consultant

Schiltz, Nicholas K., PhD: (n)

Schleck, Cathy D., BS: (n)

Schmidt-Braekling, Tom, MD: (n)

Schoenecker, Perry L., MD: Journal of Children's Orthopaedics: Editorial or governing board; Journal of Pediatric Orthopedics: Editorial or governing board; Pediatric Orthopaedic Society of North America: Board or committee member

Schroder, David T., MD: Pacira: Stock or stock Options; Pfizer: Stock or stock Options

Schroeder, Jacob, BS: (n)

Schumacher, Charles S., MD: (n)

Schwarzkopf, Ran, MD, MSc: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Arthroplasty Today: Editorial or governing board; Gauss surgical: Stock or stock Options; Intelijoint: Paid consultant; Journal of Arthroplasty: Editorial or governing board; Pristine: Stock or stock Options; Smith & Nephew: Paid consultant; Stryker: Paid consultant

Scott, Daniel J., MD, MBA: (n)

Scott, David F., MD: Medacta International: Paid consultant, Paid presenter or speaker, Research support; Microport Orthopedics: Paid consultant, Paid presenter or speaker; OMNI Life Science: Paid consultant, Paid presenter or speaker, Stock or stock Options; Stryker: Paid consultant, Paid presenter or speaker; Stryker, OMNI life science, Novartis, Proctor & Gamble: Research support

Scott, Kelly, MD: (n)

Scotting, Oliver J., MD: (n)

Scuderi, Giles R., MD: Convatec: Paid presenter or speaker; Medtronic: Paid consultant, Paid presenter or speaker; MERZ Pharmaceutical: Paid consultant; Operation Walk USA: Board or committee member; Pacira: Paid consultant, Paid presenter or speaker, Research support; Springer ElsevierThiemeWorld Scientific: Publishing royalties, financial or material support; Zimmer: IP royalties, Paid consultant, Paid presenter or speaker

Sculco, Peter K., MD: (n)

Sculco, Thomas P., MD: American Journal of Orthopedics: Editorial or governing board; Exactech, Inc: IP royalties; Knee Society: Board or committee member

Sepucha, Karen R., PhD: (n)

Sershon, Robert A., MD: (n)

Seyler, Thorsten M., MD, PhD: Editorial Board Member, Bone & Joint Research: Editorial or governing board; Total Joint Orthopedics, Inc.: Paid consultant

Shah, Chirag K., BA: (n)

Shah, Ritesh R., MD: Smith & Nephew: Paid consultant, Paid presenter or speaker; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support; Wright Medical Technology, Inc.: Research support; Zimmer: Research support

Shahi, Alisina, MD: (n)

Shaia, Anthony J., MD: (n)

Shao, Hongyi, MD: (n)

Shaw, Daniel L., BA: (n)

Shaw, Jeremy D., MD: (n)

Shen, Mary R., BS: (n)

Sher, Alex, BS: Merck: Stock or stock Options

Shimmin, Andrew J., MBBS, FRACS, FAOrthA: American Association of Hip and Knee Surgeons: Board or committee member; Corin UK: Research support; corin ukmatortho: IP royalties; corin ukmatortho uk: Paid consultant; matortho UK: Research support; optimized orthopedics: Unpaid consultant; Smith & Nephew: Paid consultant

Shofoluwe, Ademola I., BA, MS: (n)

Shukla, Sanjai K., MD: (n)

Shuler, Thomas E., MD: Tornier: Paid consultant, Paid presenter or speaker; Zimmer: Paid consultant

Sierra, Rafael J., MD: American Association of Hip and Knee Surgeons: Board or committee member; Biomet: IP royalties, Paid consultant, Paid presenter or speaker; DePuy, A Johnson & Johnson Company: Research support; Journal of Arthroplasty: Editorial or governing board; Link Orthopaedics: Paid consultant; Stryker, Biomet: Research support; Zimmer: Research support

Sikora, Matthew K., BS: (n)

Sikora-Klak, Jakub, MD: (n)

Silverton, Craig, DO: Biomet: IP royalties; MOAOS: Board or committee member

Simmons, Leigh H., MD: (n)

Sing, David, BS: (n)

Sink, Ernest L., MD: Pediatric Orthopaedic Society of North America: Board or committee member

Sisko, Zachary W., MD: (n)

Skrepnik, Nebojsa V., MD, PhD: Biomimetic: Research support; Genzyme: Research support; Johnson & Johnson: Research support; Medtronic Sofamor Danek: Research support; Orthofix, Inc.: Paid consultant; Q-med: Paid consultant; Regeneration Technologies, Inc.: Research support; SamuMed: Paid consultant; Sanofi-Aventis: Research support; Smith & Nephew: Research support; Stryker: Research support; Wright Medical Technology, Inc.: Research support

Slotkin, Eric, DO: DePuy, A Johnson & Johnson Company: Paid consultant, Paid presenter or speaker; Pfizer: Paid presenter or speaker; Radlink: Stock or stock Options

Slover, James, MD, MSc: AAOS: Board or committee member; American Association of Hip and Knee Surgeons: Board or committee member; Biomet: Research support

Slullitel, Pablo A., MD: (n)

Smith, Eric L., MD: Arthrocare: Paid consultant; Conformis: Research support; DePuy, A Johnson & Johnson Company: Paid consultant, Research support; OMNI: Paid consultant, Research support, Unpaid consultant; Pfizer: Research support; Stryker: Research support

Smith, Ross P., MD: (n)

Solomon, Michael, MBChB, FRACS(Orth): Medacta: Paid consultant

Somerville, Lyndsay, PhD: (n)

Sousa, Paul L., MD: (n)

Spangehl, Mark J., MD: Arthroplasty Today: Editorial or governing board; DePuy, A Johnson & Johnson Company: Research support; Journal of Arthroplasty: Editorial or governing board; Stryker: Research support; Vidacare: Research support

Sparks, Michael B., MD: (n)

Spiro, Sara, BS: (n)

Sporer, Scott M., MD: American Joint Replacement Registry: Board or committee member; Central Dupage Hospital: Research support; DJ Orthopaedics: Paid consultant; Hip Society: Board or committee member; Paciria: Paid consultant; SLACK Incorporated: Publishing royalties, financial or material support; Smith & Nephew: Paid consultant; Stryker: Research support; Zimmer: Paid consultant, Research support

Springer, Bryan D., MD: AJRR: Board or committee member; Arthroplasty Today: Editorial or governing board; Convatec: Paid consultant; Joint purifications systems: Other financial or material support; Journal of Arthroplasty: Editorial or governing board; Knee Society: Board or committee member; Stryker: IP royalties, Paid consultant

Squire, Matthew, MD, MS: American Journal of Roentgenology: Editorial or governing board; Biomet: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board

Steiger, David, MD: (n)

Stoddard, Leland, BA: (n)

Stronach, Benjamin M., MD, MS: Mississippi Orthopaedic Society: Board or committee member

Strong, Benjamin, MD: (n)

Stuart, Michael J., MD: American Journal of Sports Medicine: Editorial or governing board; Arthrex, Inc: IP royalties, Paid consultant; Stryker: Research support

Su, Edwin P., MD: American Journal of Orthopedics: Editorial or governing board; Orthoalign, Inc: Stock or stock Options; Smith & Nephew: Paid consultant, Research support; Techniques in Orthopedics: Editorial or governing board

Su, Sherwin L., MD: Smith & Nephew: Research support

Suarez, Juan C., MD: Corin U.S.A.: IP royalties; DePuy, A Johnson & Johnson Company: Paid presenter or speaker; Iovera: Research support; OrthoGrid: Research support; Pacira: Research support

Suleiman, Linda I., MD: (n)

Summers, Spencer, MD: (n)

Sunderland, Adam, MD: (n)

Swenson, Eric R., PhD: (n)

Tait, Mark A., MD: (n)

Taliaferro, Kevin M., MD: (n)

Talmo, Carl T., MD: Astra-Zeneca: Employee; Journal of Arthroplasty: Editorial or governing board

Tan, Dean D., BS: (n)

Tan, Timothy L., MD: (n)

Tapp, Stephanie J., PhD: (n)

Tarabichi, Majd, MD: (n)

Taunton, Michael J., MD: AAOS: Board or committee member; DJ Orthopaedics: IP royalties, Paid consultant; Journal of Arthroplasty: Editorial or governing board Minnesota Orthopedic Society: Board or committee member; Stryker: Research support

Teeter, Matthew G., PhD: Smith & Nephew: Research support

Temkit, M'Hamed, PhD: (n)

Tessier, John, E., MD: Smith & Nephew: Other financial or material support

Tetreault, Matthew W., MD: (n)

Thakkar, Savyasachi C., MD: (n)

Thauront, Frédéric, MSc: Zimmer: Employee

Thomason, Kayla, BS: (n)

Tian, Shaoqi, MD: (n)

Tischler, Eric H., BA: (n)

Trask, Darrin J., MD: (n)

Trimble, Dory, BA: (n)

Trivellas, Myra, BS: (n)

Troelsen, Anders, MD, PhD: Biomet: Other financial or material support; Paid consultant, Paid presenter or speaker, Research support; EKS - European Knee Society (Board member): Board or committee member; Zimmer: Research support

Trousdale, Robert T., MD: American Association of Hip and Knee Surgeons: Board or committee member; DePuy, A Johnson & Johnson Company: IP royalties, Paid consultant; Hip Society: Board or committee member; Journal of Arthroplasty: Editorial or governing board; Knee Society: Board or committee member; Medtronic: IP royalties

Tsai, Tsung-Yuan, PhD: (n)

Vahedi Kafshgari, Hamed, MD: (n)

Van Citters, Douglas W., PhD: ConforMIS: Other financial or material support; DePuy, A Johnson & Johnson Company: Other financial or material support, Research support; Orthosensor: Research support

van der List, Jelle P., MD: (n)

Van Doren, Bryce A., MPA, MPH: (n)

van Wijnen, Andre J., PhD: (n)

Vanacore, Catherine, MS: Stryker: Employee; Stock or stock Options

Vasarhelyi, Edward M., MD: DePuy, A Johnson & Johnson Company: Paid consultant, Research support; Smith & Nephew: Research support; Stryker: Research support

Vaz, Kenneth M., MD: (n)

Vigdorchik, Jonathan M., MD: (n)

Vilella, Fernando E., MD: Smith & Nephew: Paid consultant

Villa, Jesus M., MD: (n)

Villa, Jordan C., MD: (n)

Viste, Anthony, MD, PhD: (n)

Vu, CatPhuong Le, BA: (n)

Wagner, Eric R., MD: (n)

Waldstein, Wenzel, MD: (n)

Walter, Leonard R., MBBS, FRACS, FAOrthA: Corin, UK: IP royalties; Optimized Ortho: Paid consultant

Wang, Kevin, MD: (n)

Wannomae, Keith K., BS: (n)

Ward, Derek, MD: (n)

Ward, Joseph P., MD: (n)

Ware, Jr., John E., PhD: (n)

Warth, Lucian C., MD: (n)

Watson, Shawna, BA: (n)

Watters, Tyler S., MD: (n)

Watts, Chad D., MD: (n)

Weiss, David B., MD: Orthopaedic Trauma Association: Board or committee member; Saunders/Mosby-Elsevier: Publishing royalties, financial or material support; Synthes: Paid presenter or speaker

Wellman, Samuel S., MD: Biomet: Research support; DePuy, A Johnson & Johnson Company: Research support; Journal of Arthroplasty: Editorial or governing board; Stryker: Research support; Total Joint Orthopaedics: Paid consultant; Zimmer: Research support

Wells, Joel E., MD, MPH: (n)

Wentzel, Catherine S., BS: (n)

Werner, Brian C., MD: (n)

Weston, John T., MD: (n)

Westrich, Geoffrey H., MD: DJ Orthopaedics: Paid consultant, Paid presenter or speaker, Research support; Eastern Orthopedic Association: Board or committee member; Exactech, Inc: Paid consultant, Paid presenter or speaker, Research support
Knee Society: Board or committee member; Mallinckrodt Pharmaceuticals: Paid presenter or speaker; Stryker: Paid consultant, Paid presenter or speaker, Research support

Westrich, Geoffrey H., MD: DJ Orthopaedics: Paid consultant, Paid presenter or speaker, Research support; Eastern Orthopedic Association: Board or committee member; Exactech, Inc: Paid consultant, Paid presenter or speaker, Research support; Knee Society: Board or committee member; Mallinckrodt Pharmaceuticals: Paid presenter or speaker; Stryker: Paid consultant, Paid presenter or speaker, Research support

Whynot, Sara, MLT dHSA: (n)

Williams, Devin, MPH: (n)

Wingert, Nathaniel C. H., MD: (n)

Wohler, Andrew D., MD: (n)

Woll, Abbigail K., BS: (n)

Woodward, Laura A., DNP, ONP-C: (n)

Woolsey, Alexandra, BA: (n)

Wright, David John, MS: (n)

Wright, Timothy M., PhD: Exactech, Inc: IP royalties; Stock or stock Options; Knee Society: Board or committee member; Lima: IP royalties; Mathys Ltd: IP royalties; Orthobond: Stock or stock Options; Stryker: Research support; Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support

Wyles, Cody C., MD: (n)

Wylie, James D., MD: (n)

Yan, Jian, MD, PhD: (n)

Yang, Charlie C., MD: DePuy, A Johnson & Johnson Company: Paid consultant, Paid presenter or speaker

Yang, Wenyun, MS: (n)

Yao, Dong-han, BA: (n)

Yarboro, Seth R., MD: (n)

Yin, Jonathan, MD: (n)

Young, Grant H., BS: (n)

Young, Simon W., FRACS: Arthrex, Inc: Paid presenter or speaker; Stryker: Paid presenter or speaker, Research support; Surgical Solutions: Stock or stock Options; Vidacare: Research support

Yu, Stephen, MD: (n)

Yuan, Brandon J., MD: (n)

Yuen, Erick: (n)

Zadzilka, Jayson, MS: (n)

Zarandona, Xabier Foruna, MD: (n)

Zarling, Bradley J., MD: (n)

Zhen, Yuan Sr., MD: (n)

Zheng, Hua, PhD: (n)

Ziemba-Davis, Mary, BS: (n)

Zingg, Matthieu, MD: (n)

Zvirbulis, Raimonds, MD: (n)

Notes

Notes

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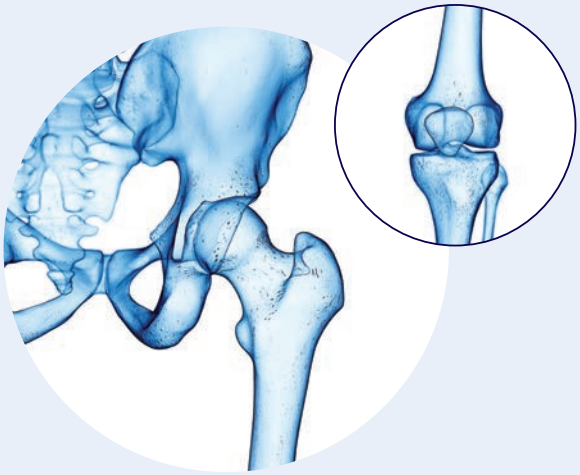

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