FINAL

PROGRAM

AAHKS 25TH ANNIVERSARY
AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS

ANNUAL MEETING | 2015

NOV 5-8 2015 • SHERATON DALLAS HOTEL

NEW MEETING SITE IN 2016: HILTON ANATOLE, DALLAS, TX

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American Association of Hip and Knee Surgeons
25th Annual Meeting
November 5-8, 2015
Sheraton Dallas Hotel, Dallas, Texas

The AAHKS 25th Annual Meeting is designed to provide practicing orthopaedic surgeons with state of-the-art information about the surgical applications and treatment protocols for the diagnosis and management of total hip and knee replacement, and to enhance the care of patients with arthritis and degenerative diseases. Both free paper presentations and interactive symposia will be utilized.

Upon completion of this activity, participants should be able to:

- Update clinical skills and basic knowledge through research findings and biomechanical studies.
- Discuss the various surgical and non-surgical treatments and management of conditions related to the hip and knee joints.
- Determine indications and complications in total hip and knee arthroplasty.
- Critique presentations of surgical techniques and demonstrations of treatment options.
- Evaluate the efficacy of new treatment options through evidence-based data.

The Scientific Sessions will include the most current research in joint arthroplasty. Clinical papers will focus on:

- Health Policy
- Primary Total Hip Arthroplasty
- Primary Total Knee Arthroplasty
- Revision Total Hip Arthroplasty
- Revision Total Knee Arthroplasty
- Non-Arthroplasty
- Complications
- Infection

Symposia Topics include:

- State of the Art Management of Tough and Unsolved Problems in Hip and Knee Arthroplasty
- Patient Reported Outcome Measures: This is your New Reality
- Femoroacetabular Impingement: From Preservation to Total Joint Arthroplasty
- Practice Management—Audience Response
- The Future is Here: Bundled Payments and ICD-10
- Modifying Risk Factors: Strategies that Work
- Outpatient Arthroplasty
- Corrosion at the Head-neck Junction: Why is this Happening Now?

FINAL PROGRAM

Please note that the Thursday/Friday pre-meeting industry symposia are not part of the official program as planned by the AAHKS Annual Meeting Program Committee and do not offer AMA PRA Category 1 credits unless noted.

WEDNESDAY, NOVEMBER 4, 2015

10:00 a.m. - 5:00 p.m.		**Exhibit Set Up**	

THURSDAY, NOVEMBER 5, 2015

10:00 a.m. - 8:00 p.m.	Lone Star Foyer	**Registration**	
10:00 a.m. - 5:00 p.m.		**Exhibit Set Up**	
12:00 - 2:00 p.m.	Austin 1	Value Through Precision in Revision Hip and Knee Arthroplasty	*DJO Global*
12:00 - 2:00 p.m.	Austin 2	What Should We Be Using to Close Our Incisions in Total Knee and Hip Arthroplasty?	*Ethicon, Inc.*
2:30 - 4:30 p.m.	Austin 1	ERAS Principles in Multimodal Approach to Pain Management: Bridge to Outpatient Total Joints	*Halyard Health*
2:30 - 4:30 p.m.	Austin 2	Optimizing Your Total Joint Episode Under the Bundled Payment for Care Improvement (BPCI) Program	*Stryker Performance Solutions*
2:30 - 4:30 p.m.	Austin 3	Advances in Total Knee Arthroplasty: Reducing or Eliminating the Tourniquet	*Medtronic*
6:00 - 8:00 p.m.	Austin 1	Patient Centered Surgical Strategies in TKA	*Aesculap Implant Systems*
6:00 - 8:00 p.m.	Austin 2	Addressing Patient Satisfaction with Innovative Solutions for the Knee	*Zimmer Biomet*

FRIDAY, NOVEMBER 6, 2015

6:00 a.m. - 8:00 p.m.	Lone Star Foyer	**Registration**	
6:00 a.m. - 2:00 p.m.	Grand Hall/ Dallas Ballroom	**Exhibit Hall Open**	
6:00 a.m. - NOON	Lone Star Foyer	**Poster Set up**	
6:00 - 8:00 a.m.	Dallas Ballroom	**Breakfast**	
6:55 a.m. - 2:30 p.m.	Austin 2-3	**Orthopaedic Team Member Course**	
7:00 a.m. - 2:30 p.m.	Remington	**The Business of Total Joint Replacement: Surviving and Thriving**	*Supported by Pacira Pharmaceuticals*
7:00 a.m. - 3:00 p.m.	Houston Ballroom	**7th Annual Resident Course**	Supported by Biomet, DePuy, Pacira, Smith & Nephew, Stryker and Zimmer

7:00 - 9:00 a.m.	Dallas A1	Clinical and Economic Benefits of Robotic Assisted TKA: A Hands-On Experience	*OMNI*
7:00 - 9:00 a.m.	Dallas A3	Same-day Surgery: The Road to Outpatient Total Joint Replacement	*Medtronic*
7:00 - 9:00 a.m.	Dallas D2	Customized Total Knee Replacements in an Outpatient Setting	*ConforMIS*
7:00 - 9:00 a.m.	Dallas D3	Effective Functional Postsurgical Pain Control with an Opioid-reducing Regimen	*Pacira Pharmaceuticals, Inc.*
9:30 - 11:30 a.m.	Dallas A2	Ceramic Components in Total Joint Arthroplasty: Today and in the Future	*CeramTec Medical Products*
9:30 - 11:30 a.m.	Dallas A3	Enabling Technologies to Achieve the Triple Aim: Intraoperative Verification of Component Positioning	*DePuy Synthes*
9:30 - 11:30 a.m.	Dallas D2	OFIRMEV (acetaminophen) Injection: A Non-opioid Foundation for Multimodal Analgesia in the Perioperative Patient	*Mallinckrodt Pharmaceuticals*
9:30 - 11:30 a.m.	Dallas D3	Clinical-based Outcomes with Robotic-arm Assisted Surgical Solutions in Joint Arthroplasty	*Stryker*
10:00 a.m. - 3:00 p.m.	State Room 1 State Room 2 State Room 3 State Room 4 San Antonio A San Antonio B	Resident Course Breakout 1 Resident Course Breakout 2 Resident Course Breakout 3 Resident Course Breakout 4 Resident Course Breakout 5 Resident Course Breakout 6	
11:45 a.m. - 12:45 p.m.	Dallas Ballroom	**Attendee/Exhibitor Lunch**	
11:30 a.m. - 12:30 p.m.	Austin 2-3	**Orthopaedic Team Member Lunch**	
NOON - 1:00 p.m.	Houston Ballroom	**Resident Lunch**	
NOON - 5:30 p.m.	Lone Star Ballroom	**Speaker Ready Room**	
NOON - 9:00 p.m.	Lone Star Foyer	**Poster Exhibition**	
12:45 - 2:00 p.m.	Dallas A2	**Ask the Experts Case Sessions** Primary Hip	*Panelists:* *John J. Callaghan, MD* *William J. Hozack, MD* *Mark W. Pagnano, MD*
12:45 - 2:00 p.m.	Dallas A3	**Ask the Experts Case Sessions** Primary Knee	*Panelists:* *Douglas A. Dennis, MD* *William G. Hamilton, MD* *Giles R. Scuderi, MD*
12:45 - 2:00 p.m.	Dallas D2	**Ask the Experts Case Sessions** Revision Hip	*Panelists:* *David G. Lewallen, MD* *Wayne G. Paprosky, MD* *Scott M. Sporer, MD*
12:45 - 2:00 p.m.	Dallas D3	**Ask the Experts Case Sessions** Revision Knee	*Panelists:* *Robert L. Barrack, MD* *Thomas K. Fehring, MD* *Michael D. Ries, MD*
2:00 - 2:45 p.m.	Lone Star Foyer	**Poster Hall Coffee Break**	

25TH ANNUAL MEETING PROGRAM

2:55 p.m.	Lone Star Ballroom	**PRESIDENT'S WELCOME**	
SESSION ONE	3:00 - 4:08 p.m.	**REVISION**	*Moderators: David G. Lewallen, MD and James A. Browne, MD*
3:00 p.m.	Paper #1	Alarming National Obesity Trends in Revision Total Knee Arthroplasty	*Susan M. Odum, PhD, Charlotte, NC*
3:06 p.m.	Paper #2	Patients Improve Substantially Less after Revision Total Knee Arthroplasty for Flexion Instability vs. Failures Related to Infection or Wear-related Osteolysis	*Christopher W. Grayson, MD, Indianapolis, IN*
3:12 p.m.	Paper #3	A Novel System for Determining Clinically Relevant Loosening of Total Knee Arthroplasty Components	*Brian P. Chalmers, MD, Rochester, MN*
3:18 p.m.	Paper #4	Contribution of Surface Polishing and Sterilization Method to Backside Wear in Total Knee Replacement	*Edward M. Vasarhelyi, MD, MSc, FRCSC, London, ON, Canada*
3:24 p.m.		Discussion	
3:34 p.m.	Paper #5	Long Term Outcomes of 925 Extensively Porous-coated Stems in Revision Total Hip Arthroplasty	*Peter Keyes Sculco, MD, New York, NY*
3:40 p.m.	Paper #6	Frequency and Treatment Trends for Periprosthetic Fractures about Total Hip Arthroplasty in the United States	*John S. Cox, MD, Portland, OR*
3:46 p.m.	Paper #7	Obesity is a Risk Factor for Early Aseptic Loosening and Osteolysis of Hip Replacements	*Ali J. Electricwala, Maharashtra, India*
3:52 p.m.	Paper #8	Revision of Monoblock MoM Total Hip Arthroplasty – Is There a Place for Dual Mobility without Cup Extraction?	*Clint J. Wooten, MD, Charlotte, NC*
3:58 p.m.		Discussion	
4:08 - 4:12 p.m.		**Guest Society Recognition** **Chilean Hip Society (CHS)** **Japanese Society for Replacement Arthroplasty (JSRA)**	
SYMPOSIUM I	4:12 - 5:12 p.m.	**STATE OF THE ART MANAGEMENT OF TOUGH AND UNSOLVED PROBLEMS IN HIP AND KNEE ARTHROPLASTY**	*Moderator: Daniel J. Berry, MD*
		Established Stiffness after TKA: Is It Worth Re-operating and What Should be Done?	*Mark W. Pagnano, MD*
		Abductor Deficiency after THA: What are the Options?	*Rafael J. Sierra, MD*
		Extensor Mechanism Deficiency: What are the Best Methods to Restore Active Knee Extension?	*Craig J. Della Valle, MD*
		Recurrent Infection after 2 Stage Reimplantation: Another 2-Stage Exchange or is a Salvage Procedure Best?	*Arlen D. Hanssen, MD*
		Pelvic Discontinuity: Plate, Distract or Span?	*Wayne G. Paprosky, MD*
5:12-5:16 p.m.		**AAHKS Humanitarian Award**	*Presented by: Paul S. Khanuja, MD*

SYMPOSIUM II	5:16 - 6:16 p.m.	**PATIENT REPORTED OUTCOME MEASURES: THIS IS YOUR NEW REALITY**	*Moderator: Jay R. Lieberman, MD*
		What Quality Metrics Is My Hospital Being Evaluated on and What are the Consequences?	*Kevin J. Bozic, MD, MBA*
		PROMs - What Data Do We Really Need?	*Stephen Lyman, PhD*
		Risk Adjustment: Why Is It Important?	*Thomas K. Fehring, MD*
		Building a PROMs Database: One Hospital's Experience	*Adam J. Rana, MD*
6:16 - 7:00 p.m.	Lone Star Ballroom	**AAHKS BUSINESS MEETING**	*(Members only)*
7:00 - 9:00 p.m.	Grand Hall/ Dallas Ballroom	**WELCOME RECEPTION - EXHIBIT HALL**	*(All Attendees Invited)*
7:00 - 9:00 p.m.	Grand Hall/ Dallas Ballroom	**Exhibit Hall Open**	

SATURDAY, NOVEMBER 7, 2015

6:00 a.m. - 6:00 p.m.	Lone Star Foyer	**Registration**	
6:00 a.m. - 6:00 p.m.	Lone Star Ballroom	**Speaker Ready Room**	
6:00 - 7:00 a.m.	Dallas Ballroom	**Breakfast**	
6:00 a.m. - 8:30 p.m.	Lone Star Foyer	**Poster Hall**	
6:00 a.m. - 7:00 a.m.	Grand Hall/ Dallas Ballroom	**Exhibit Hall Open**	
6:55 - 7:00 a.m.	Lone Star Ballroom	**PROGRAM CHAIR WELCOME**	
SESSION TWO	7:00 - 7:56 a.m.	**PRIMARY KNEE**	*Moderators: David F. Dalury, MD and R. Michael Meneghini, MD*
7:00 a.m.	Paper #9	10-Year Results of a Randomized Clinical Trial of Mobile-bearing vs. Fixed-bearing TKA	*Matthew P. Abdel, MD, Rochester, MN*
7:06 a.m.	Paper #10	Total Knee Outcomes Correlate Strongly with Spine Disability	*William C. Schroer, MD, St. Louis, MO*
7:12 a.m.	Paper #11	Does Pain and Function Differ after Primary TKR with Cemented vs. Cementless Fixation?	*David C. Ayers, MD, Worcester, MA*
7:18 a.m.		Discussion	
7:28 a.m.	Paper #12	Does Use of a Variable Distal Femur Resection Angle Improve Radiographic Alignment in Total Knee Arthroplasty?	*Denis Nam, MD, MSc, St. Louis, MO*
7:34 a.m.	Paper #13	No Improvement in Two-Year Functional Outcomes Using Kinematic vs. Mechanical Alignment in TKA – A Randomized Controlled Clinical Trial	*Simon W. Young, MBChB, FRACS, Auckland, New Zealand*
7:40 a.m.	Paper #14	Differential Effect of Total Knee Arthroplasty on Valgus and Varus Knee Biomechanics During Gait	*Jose A. Rodriguez, MD, New York, NY*
7:46 a.m.		Discussion	

SYMPOSIUM III	7:56 - 8:56 a.m.	**FEMOROACETABULAR IMPINGEMENT: FROM PRESERVATION TO TOTAL JOINT ARTHROPLASTY** Pathomechanics of FAI: Understanding the Disease Indications and Goals for Arthroscopic Versus Open Management Contraindications to Hip Arthroscopy Total Hip Arthroplasty after Hip Preservation Surgery: When and How	*Moderator: Christopher L. Peters, MD* *Christopher L. Peters, MD* *Paul E. Beaule, MD, FRCS* *Asheesh Bedi, MD* *John C. Clohisy, MD*
SESSION THREE	8:56 - 9:52 a.m.	**COMPLICATIONS: MANAGEMENT AND AVOIDANCE**	*Moderators: Adolph J. Yates, Jr., MD, and Ryan M. Nunley, MD*
8:56 a.m.	Paper #15	Prior Lumbar Spinal Arthrodesis Increases Risk of Prosthetic-related Complication and Revision Surgery in Primary Total Hip Arthroplasty	*David C. Sing, BA, San Francisco, CA*
9:02 a.m.	Paper #16	Validated Risk Stratification System for Pulmonary Embolism Following Primary Total Joint Arthroplasty	*Daniel D. Bohl, MD, New Haven, CT*
9:08 a.m.	Paper #17	Individualized Risk Model for VTE Following TJA	*Ronald Huang, MD, Philadelphia, PA*
9:14 a.m.		Discussion	
9:24 a.m.	Paper #18	The Interaction of Obesity and Metabolic Syndrome in Determining Risk of Complication Following Total Joint Arthroplasty	*Adam I. Edelstein, MD, Chicago, IL*
9:30 a.m.	Paper #19	Pre-operative Reduction of Opioid Use Prior to Total Joint Arthroplasty	*Long-Co Nguyen, BS*
9:36 a.m.	Paper #20	Long-acting Opioid Use Independently Predicts Perioperative Complication in Total Joint Arthroplasty	*Erik N. Hansen, MD, San Francisco, CA*
9:42 a.m.		Discussion	
9:52 - 10:20 a.m.	Lone Star Foyer	**Break**	
SESSION FOUR	10:20 - 11:16 a.m.	**PRIMARY HIP**	*Moderators: Thomas P. Vail, MD and A. Seth Greenwald, D.Phil. (Oxon)*
10:20 a.m.	Paper #21	Formal Physical Therapy After Primary Total Hip Arthroplasty May Not Be Necessary	*Richard H. Rothman, MD, Philadelphia, PA*
10:26 a.m.	Paper #22	Direct Anterior Approach Does Not Reduce Dislocation Risk	*Joseph D. Maratt, MD, Ann Arbor, MI*
10:32 a.m.	Paper #23	Assessment of the Impact of Anterior vs. Posterior Surgical Approach for Total Hip Arthroplasty on Post-acute Care Service Utilization	*Coles E. L'Hommedieu, MD, St. Louis, MO*
10:38 a.m.		Discussion	
10:48 a.m.	Paper #24	13-year Evaluation of Highly Cross-linked Polyethylene Articulating with 28mm and 36mm Heads Using Radiostereometric Analysis (RSA)	*Harry E. Rubash, MD, Boston, MA*

10:54 a.m.	Paper #25	Minimum 10 year Multi-center Study of THR with Highly Cross-linked Polyethylene and Large Diameter Femoral Heads	*Charles R. Bragdon PhD, Boston, MA*
11:00 a.m.	Paper #26	A Multi-center, Prospective, Randomized Study of Outpatient vs. Inpatient Total Hip Arthroplasty	*Nitin Goyal, MD, Alexandria, VA*
11:06 a.m.		Discussion	
SESSION FIVE	11:16 a.m.-12:07 p.m.	**INFECTION**	*Moderators: Bryan D. Springer, MD and Charles M. Davis III, MD, PhD*
11:16 a.m.	Paper #27	Oral Antibiotics Reduce Reinfection Following 2-stage Exchange: A Multi-center, Randomized Controlled Trial	*Craig J. Della Valle, MD, Chicago, IL*
11:22 a.m.	Paper #28	The Alpha-defensin Test for PJI is Not Affected by Prior Antibiotic Administration	*Carl A. Deirmengian, MD, Philadelphia, PA*
11:28 a.m.	Paper #29	Articulating vs. Static Spacers in the Management of Periprosthetic Knee Infection: A Randomized Clinical Trial	*Peter N. Chalmers, MD, Chicago, IL*
11:34 a.m.		Discussion	
11:44 a.m.	Paper #30	What is the Benefit of Staphylococcal Screening and Treatment Prior to Elective Hip/Knee Arthroplasty?	*Scott M. Sporer, MD, MS, Winfield, IL*
11:50 a.m.	Paper #31	Do Injections Increase the Risk of Infection Following TKA?	*Nicholas A. Bedard, MD, Iowa City, IA*
11:56 a.m.	Paper #32	The Timing of THA after Intra-articular Hip Injection affects Postoperative Infection Risk	*Jourdan M. Cancienne, MD, Charlottesville, VA*
12:02 p.m.		Discussion	
12:12 - 1:10 p.m.	Grand Hall/ Dallas Ballroom	**LUNCH - EXHIBIT HALL**	
1:10 - 1:15 p.m.		**AAHKS HEALTH POLICY FELLOW REPORT**	*Stephen T. Duncan, MD*
SYMPOSIUM IV	1:15 - 1:45 p.m.	**AUDIENCE RESPONSE - PRACTICE MANAGEMENT**	*Jay R. Lieberman, MD*
1:45 - 1:50 p.m.		**AMERICAN JOINT REPLACEMENT REGISTRY ANNUAL REPORT**	*Daniel J. Berry, MD*
SPECIAL EVENT	1:50 - 2:30 p.m.	**25TH ANNIVERSARY CELEBRATION**	*Jay R. Lieberman, MD*
AWARDS	2:30 - 2:54 p.m.	AAHKS Award Papers	
2:30 p.m.		**JAMES A. RAND AWARD** Presentation of Award: James A. Rand, MD A Randomized Controlled Trial of Oral and IV Tranexamic Acid: The Same Efficacy at Lower Cost?	*Yale A. Fillingham, MD, Chicago, IL*
2:36 p.m.		Discussion	
2:40 p.m.		**LAWRENCE D. DORR AWARD** Presentation of Award: Lawrence D. Dorr, MD Conversion Total Hip Arthroplasty: Is it a Primary or Revision Hip Arthroplasty	*Ran Schwarzkopf, MD, MSc, Scarsdale, NY*
2:46 p.m.		Discussion	

2:50 p.m.		**AAHKS CLINICAL AWARD** Presentation of Award: Brian S. Parsley, MD Liposomal Bupivacaine and Peri-articular Injection are not Superior to Single Shot Intra-articular Injection for Pain Control in Total Knee Arthroplasty	*Rajesh K. Jain, MD, MPH, Marlton, NJ*
2:56 p.m.		Discussion	
3:00 - 3:15 p.m.		**Break**	
SYMPOSIUM V	3:15 - 4:35 p.m.	**THE FUTURE IS HERE: BUNDLED PAYMENTS AND ICD-10**	*Moderator: Richard Iorio, MD*
		Bundled Payments: Our Experience at an Academic Medical Center	*Richard Iorio, MD*
		You Want a Successful Bundle: What about Post-Discharge Care?	*James D. Slover, MD*
		The Physician as the Provider at Risk: Rolling the Dice	*Stephen B. Murphy, MD*
		ICD10 and Clinical Documentation: How to Do It Successfully in Your Practice?	*Joseph C. Nichols, MD*
SESSION SIX	4:35 - 5:31 p.m.	**PERIOPERATIVE MANAGEMENT**	*Moderators: Daniel A. Oakes, MD, and Michael J. Taunton, MD*
4:35 p.m.	Paper #33	Prospective Comparison of Tranexamic Acid vs. a Bipolar Sealer in Reducing Blood Loss in Primary Total Knee Arthroplasty	*Stephen M. Walsh, MD, Bangor, ME*
4:41 p.m.	Paper #34	Tranexamic Acid Reduced Blood Loss but not Transfusion after Hip Arthroplasty for Femoral Neck Fracture: A Randomized Clinical Trial of 138 Patients	*Chad D. Watts, MD, Rochester, MN*
4:47 p.m.	Paper #35	Hypoalbuminemia Predicts Joint Infection, Pneumonia, and Readmission after Total Joint Arthroplasty	*Erdan Kayupov, MSE, Chicago, IL*
4:53 p.m.		Discussion	
5:03 p.m.	Paper #36	Peri-articular Liposomal Bupivacaine Offers No Benefit over Bupivacaine in Total Knee Arthroplasty	*Matthew S. Austin, MD, Philadelphia, PA*
5:09 p.m.	Paper #37	A Randomized Controlled Trial Comparing Adductor Canal and Intra-articular Catheters for Pain Management after Primary Total Knee Arthroplasty	*Antonia F. Chen, MD, MBA, Philadelphia, PA*
5:15 p.m.	Paper #38	Can Short but Reliable Measures of Knee-specific Function be Constructed Using Item Response Theory?	*Barbara Gandek, PhD, Worcester, MA*
5:21 p.m.		Discussion	
SYMPOSIUM VI	5:31 - 6:30 p.m.	**MODIFYING RISK FACTORS: STRATEGIES THAT WORK**	*Moderator: William A. Jiranek, MD*
		Obesity	*William M. Mihalko, MD, PhD*
		Diabetes	*Louis S. Stryker, MD*
		Nicotine	*Bryan D. Springer, MD*
		Malnutrition	*Gregory J. Golladay, MD*
6:30 - 8:30 p.m.	Grand Hall/ Dallas Ballroom	**Exhibit Hall Open**	

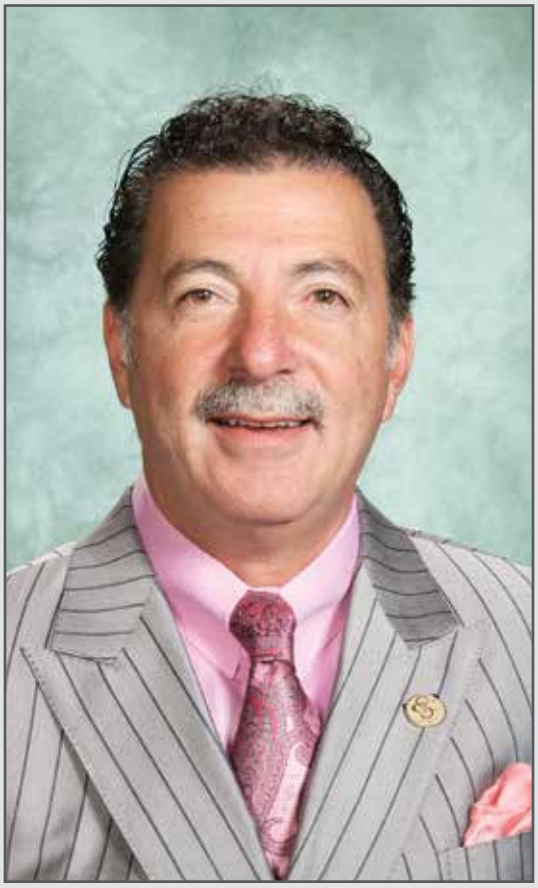
6:30 - 8:30 p.m.	Grand Hall/ Dallas Ballroom	**PRESIDENT'S RECEPTION - EXHIBIT HALL**	*Sponsored by Mallinckrodt Pharmaceuticals*

SUNDAY, NOVEMBER 8, 2015

6:00 - 10:00 a.m.	Lone Star Foyer	**Registration**	
6:00 a.m.- NOON	Lone Star Ballroom	**Speaker Ready Room**	
6:00 - 7:00 a.m.	Lone Star Foyer	**Breakfast**	
SESSION SEVEN	7:00 - 7:56 a.m.	**NON-ARTHROPLASTY**	*Moderators: Richard F. Santore, MD and Gregory G. Polkowski II, MD, MSc*
7:00 a.m.	Paper #39	Is Avascular Necrosis a Genetic Disease? A Genome-wide Association Study	*Cody C. Wyles, BS, Rochester, MN*
7:06 a.m.	Paper #40	Economic Impact of Ketorolac vs. Corticosteroid Intra-articular Knee Injections for Osteoarthritis	*Siraj A. Sayeed, MD, Fort Sam Houston, TX*
7:12 a.m.	Paper #41	Average 10 Year Results of the Bernese Periacetabular Osteotomy for Severe Acetabular Dysplasia	*Stephen T. Duncan, MD, Lexington, KY*
7:18 a.m.		Discussion	
7:28 a.m.	Paper #42	Femoral Morphology in Acetabular Dysplasia: Are Cam-Lesions Common?	*Russell P. Swann, MD, Indianapolis, IN*
7:34 a.m.	Paper #43	When Hip Scopes Fail, They Do So Quickly	*John J. Callaghan, MD, Iowa City, IA*
7:40 a.m.	Paper #44	Hip Arthroscopy Failure in the Setting of Acetabular Dysplasia: A Concerning Trend?	*Jacob A. Haynes, MD, St. Louis, MO*
7:46 a.m.		Discussion	
SYMPOSIUM VII	7:56 - 8:56 a.m.	**OUTPATIENT ARTHROPLASTY** Outpatient Arthroplasty: Patient Selection and Optimization is the Key Pain Management and Outpatient Arthroplasty Perioperative and Postoperative Management: Anesthesia, Blood Management and Medical Issues How Do You Get the Patients Home Safely? A Team Approach	*Moderator: Michael P. Bolognesi, MD Michael E. Berend, MD* *Michael P. Bolognesi, MD* *William G. Hamilton, MD* *Jason M. Hurst, MD*
SESSION EIGHT	8:56 - 9:52 a.m.	**HEALTH POLICY AND OUTCOMES**	*Moderators: David A. Halsey, MD and Mark I. Froimson, MD, MBA*
8:56 a.m.	Paper #45	Safe Selection of Outpatient Joint Replacement Patients with Medical Risk Stratification: The "OARA Score"	*R. Michael Meneghini, MD, Fishers, IN*
9:02 a.m.	Paper #46	Comparing Primary Total Hip Arthroplasty Post-discharge Care Duration, Costs, and Outcomes	*Karthikeyan E. Ponnusamy, MD, Baltimore, MD*
9:08 a.m.	Paper #47	We Can Safely Reduce the Utilization of Home Visiting Nurse Services Following Primary Total Joint Arthroplasty	*James J. Purtill, MD, Philadelphia, PA*

9:14 a.m.		Discussion	
9:24 a.m.	Paper #48	Risk Reduction Efforts Do Not Decrease 30-day Primary Hip and Knee Readmissions for Disadvantaged CMS Patients	*James A. Keeney, MD, Columbia, MD*
9:30 a.m.	Paper #49	Medicare's Hospital Acquired Conditions Policy: A Problem of Non-Payment After Total Joint Arthroplasty	*Kyle R. Duchman, MD, Iowa City, IA*
9:36 a.m.	Paper #50	Differences in Hospital Billing for Total Joint Arthroplasty Based on Hospital Profit Status	*Brett M. Hall, MD, San Antonio, TX*
9:42 a.m.		Discussion	
SYMPOSIUM VIII	9:52 - 10:52 a.m.	**CORROSION AT THE HEAD-NECK JUNCTION: WHY IS THIS HAPPENING NOW?**	*Moderator: Joshua J. Jacobs, MD*
		Corrosion at the Head-Neck Junction: Why Is This Happening Now?	*Joshua J. Jacobs, MD*
		Diagnosis and Treatment of Adverse Tissue Reactions at the Head-neck Junction	*H. John Cooper, MD*
		Evaluation of the Painful Modular Neck Stem: Do They All Require Revision?	*Young-Min Kwon, MD*
		Treatment of the Failed Modular Neck Stem: Tips and Tricks	*Adolph V. Lombardi Jr., MD*
SESSION NINE	10:52 - 11:48 a.m.	**PRIMARY HIP**	*Moderators: Brian S. Parsley, MD and Stefano A. Bini, MD*
10:52 a.m.	Paper #51	The Effect of the Medicare 3-Day Rule on Patient Length of Stay and Disposition after Total Hip Arthroplasty	*Victor H. Hernandez, MD, Miami, FL*
10:58 a.m.	Paper #52	What is the Natural History of 'Asymptomatic' Pseudotumours in MoM THA? Minimum 4-year MARS MRI Longitudinal Study	*Young-Min Kwon, MD, PhD, Boston, MA*
11:04 a.m.	Paper #53	National Trends in Bearing Surface Usage of Primary Total Hip Arthroplasty in Extremely Young Patients From 2009-2012	*Eric L. Smith, MD, Boston, MA*
11:10 a.m.		Discussion	
11:20 a.m.	Paper #54	The Effect of Flexural Rigidity, Taper Angle, and Contact Length on Fretting and Corrosion at the Head-neck Junction	*Y. Julia Kao, MD, Atlanta, GA*
11:26 a.m.	Paper #55	Effect of Contamination on Torque Testing of the Taper Junction in Total Hip Arthroplasty	*Ryan M. Palmer, DO, Dublin, OH*
11:32 a.m.	Paper #56	Does Taper Design Have an Effect on Taper Damage in Retrieved Total Hip Devices?	*Genymphas Higgs, Philadelphia, PA*
11:38 a.m.		Discussion	
11:48 a.m.		Concluding Remarks	
NOON		**Adjourn**	

AAHKS is proud to award Adolph V. Lombardi Jr., MD, FACS, with the 2015 AAHKS Humanitarian Award for his humanitarian efforts as the co-founder and president of the Executive Committee of Operation Walk USA. Dr. Lombardi is president of Joint Implant Surgeons, Inc. where he actively practices joint replacement surgery in New Albany, Ohio.



In 2010, Dr. Lombardi co-founded Operation Walk USA after participating in mission trips through Operation Walk, an international volunteer medical service organization that provides treatment for patients with arthritis and joint conditions in developing countries.

Operation Walk USA, entering its 6th year this December, has already helped nearly 600 patients regain mobility and quality of life. It provides all aspects of treatment - surgery, hospitalization, and pre-and post-operative care - at no cost to participating patients who may not qualify for government health coverage, have insurance or afford surgery on their own. Since its inception, Operation Walk USA knee and hip replacement surgeries and related care are valued at more than $15.5 million.

"We help those patients who are suffering from crippling arthritis of the hip and knee and who need a surgical procedure to relieve their pain and help them become gainfully employed. There are no words that can describe the joy you feel as orthopaedic surgeon, when after hours in the operating room you have given a patient a new lease on life. I am so honored to be recognized by AAHKS for these contributions and the work that so many of us do to improve quality of life," said Dr. Lombardi.

Nominations for the 2016 AAHKS Humanitarian Award are now being accepted through April 15, 2016 at www.AAHKS.org/Humanitarian.

Please join us in congratulating Dr. Lombardi, and stop by the Humanitarian Booth D in the Exhibit Hall.

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

Alarming National Obesity Trends in Revision Total Knee Arthroplasty

Susan M. Odum, PhD, Bryce A. Van Doren, MPH, MPA,
Joshua L. Carter, MD, Bryan D. Springer, MD

Introduction: The utilization of primary TKA in obese patients has increased significantly over the past decade despite overwhelming data that suggests higher failure rates. As such, it is reasonable to expect a parallel increase in obesity rates among revision total TKA (rTKA) patients. The purpose of this study was to analyze longitudinal trends in obesity rates among rTKA patients.

Methods: We identified 451,982 rTKA patients using 2002-2012 Nationwide Inpatient Sample discharge data. The obesity comorbidity indicator was to identify 70,470 obese patients (BMI > 30) and 335,257 non-obese patients. We evaluated trends in obesity rates over time using chi-square tests and a multivariate logistic regression model. Several covariates were included in the analysis, patient demographics (age, gender, and race), payer type, hospital type and patient health status.

Results: The obesity rate among rTKA patients increased significantly from 9.74% in 2002 to 24.57% in 2012 ($p<0.0001$). After adjusting for all factors, patients treated in 2011 (OR: 4.1 [3.7-4.6], $p<0.0001$) or 2012 (OR: 4.5 [4.0-5.0], $p<0.0001$) were over four times as likely to be obese, compared to patients treated in 2002. Other independent factors that were significantly associated with higher obesity rates include female patients (OR 1.5 95% CI 1.5-1.6) and patients between the ages of 45 and 64 years (OR 3.2, 95% CI 3.1-3.3).

Conclusions: The more than four-fold increase in the obesity rate among patients undergoing rTKA, particularly the young age group, over the past decade is an alarming trend. Improved clinical care pathways are needed to manage the obese total knee patient.

Patients Improve Less after Revision Total Knee Arthroplasty for Flexion Instability vs. Failures Related to Infection or Wear-Related Osteolysis

Christopher W. Grayson, MD, Mary Ziemba-Davis, BA,
R. Michael Meneghini, MD

Introduction: Instability has emerged as the most common non-infectious cause necessitating early revision total knee arthroplasty. While studies have documented improvement in outcomes with revision for flexion instability, it remains unknown how these patient outcomes compare to patients revised for other failure etiologies. The purpose of this study was to compare functional outcomes after revision TKA based on the cause of failure.

Methods: A retrospective review of our prospectively collected revision TKA database was performed on all patients who underwent revision TKA from 10/01/2010 to 11/19/2014. Demographic data and etiology of failure, along with preoperative and minimum 1-year Knee Society Scores (KSS) and UCLA Activity Level scores were obtained. Patients were grouped according to failure etiology and comparatively assessed for improvement in outcomes scores and patient satisfaction between groups.

Results: 177 consecutive revision TKAs were evaluated. To minimize confounding variables, knees revised with hingetype prostheses, isolated patella revisions or with polypropylene-mesh extensor mechanism reconstruction were excluded, leaving 114 revision TKAs. Most common categories of failure etiology were flexion instability (32.5%), global instability (3.5%), infection (23.7%), aseptic loosening (25.4%) and wear-related osteolysis (8.8%). The greatest mean improvement in satisfaction (≥ 30 points) was associated with revisions for wear/osteolysis, compared to flexion instability and the other failure etiologies (< 16 points) ($p = 0.001$). The greatest mean improvement in UCLA activity level was associated with revision for wear/osteolysis and infection (≥ 2 levels); the least improvement was associated with global instability and loosening (< 0 levels); with moderate improvement for flexion instability (1.6 levels) ($p = 0.018$). The KSS objective, function, and expectation scores did not differ based on failure etiology.

Conclusion: Patients and surgeons can expect improvement in satisfaction and activity levels after revision TKA for most diagnoses; however, revision for isolated flexion instability may only obtain modest improvement compared to wearrelated osteolysis and infection. Significance: Surgeons performing revision for isolated flexion instability should inform their patients that their degree of improvement measured with modern outcome metrics may be modest compared to their counterparts revised for infection and wear-related osteolysis.

A Novel System for Determining Clinically Relevant Loosening of Total Knee Arthroplasty Components

Brian P. Chalmers, MD, Peter K. Sculco, MD, Keith Fehring, MD, Robert T. Trousdale, MD, Michael Taunton, MD

Introduction: There is limited data on evaluating loosening in total knee arthroplasty (TKA) and the significance of radiolucent lines on radiographs. The Knee Society's Roetgenographic Evaluation System (KSRES) was developed when osteolysis, rather than implant debonding, was the most common mechanism for aseptic loosening. We sought to determine the sensitivity, specificity, and reliability of the KSRES system compared to a novel rating system to evaluate loosening in contemporary TKA.

Methods: We retrospectively reviewed fluoroscopically enhanced images of 48 patients that underwent revision TKA. 21 patients were revised for aseptic loosening and 27 patients for other indications. Images were randomized and 2 reviewers independently used the KSRES to calculate a numerical score based on millimeters of radiolucent lines at implant interfaces; each tibial implant was non-concerning, concerning, or impending failure. Images were again randomized and reviewers analyzed the images with a new system. Evaluating both the AP and Lateral radiograph, the percent involvement of the tibial implant interface of any lucent line was determined and categorized as non-concerning (<10%), concerning (10-25%), impending failure (>25%). We compared the specificity, sensitivity, and interobserver reliability.

Results: For the KSRES, the mean sensitivity for determining tibial component impending failure was 6% and mean specificity for identifying non-concerning implants was 96%. The interobserver reliability of grouping tibial components into each category was 73% (kappa=0.50). The new system significantly increased the sensitivity to 88% (p=0.005) while maintaining a specificity of 95% (p =0.9). Interobserver reliability increased to 90% (kappa=0.79).

Conclusions: In the modern era of debonding as a primary cause of TKA aseptic loosening, the KSRES significantly underestimates implant loosening. The new system described here demonstrated excellent sensitivity, specificity, and reliability for determining clinical loosening of tibial implants. Radiolucent lines involving 25% of the implant interface is a strong predictor for identifying implants at risk for failure.

Contribution of Surface Polishing and Sterilization Method to Backside Wear in Total Knee Replacement

Edward Vasarhelyi, MD, FRCSC, Kush Shrestha, MD, FRCSC, Brent Lanting, MD, FRCSC, James Howard, MD, FRCSC, Matthew Teeter, PhD, MS

Introduction: Polyethylene wear is a well-established detriment to the longevity of total knee replacement. While most wear occurs at the condylar surface of the polyethylene tibial insert, the backside surface has also been identified as a potential source of debris. Modern gas-plasma polyethylene sterilization is known to reduce polyethylene wear compared to historical gamma-air sterilization. The purpose of this study was to compare the relative contributions of backside wear from polished and roughened tibial baseplates and the difference between sterilization methods.

Methods: From a total of 79 retrieved implants, three groups of tibial inserts of the same design were matched based on tibial baseplate design and polyethylene sterilization: roughened gamma-air, polished gamma-air, and polished gas- plasma. Damage scoring was used to establish the presence of seven common damage modes. Each insert was also scanned with micro-CT to generate deviation maps, from which the maximum penetration was measured.

Results: Total backside damage was higher ($p=0.045$) in the roughened gamma-air group (13.8 ± 3.4) compared to the polished gamma-air group (8.7 ± 3.4) and the polished gas-plasma group (8.2 ± 4.8). Backside wear rates were greatest ($p=0.02$) in the roughened gamma-air group (0.038 mm/year), followed by the polished gamma-air group (0.012 mm/year), and lowest in the polished gas-plasma group (0.009 mm/year).

Conclusion: Sterilization with gas plasma improved wear resistance compared to sterilization with gamma air, consistent with previous findings. With this knee system, use of a roughened tibial baseplate over a polished tibial baseplate had an even greater effect on wear magnitude than sterilization method. The effect of implant locking mechanisms was not investigated but could also contribute to wear. Use of a TKR implant with a polished tibial baseplate is preferable for preventing backside wear debris generation.

Long Term Outcomes of 925 Extensively Porous-coated Stems in Revision Total Hip Arthroplasty

Peter Sculco, MD, Holly Haight, MD, James Howard, MD, Matthew Abdel, MD, Daniel J. Berry, MD

Introduction: Extensively porous-coated cylindrical stems have demonstrated excellent results in revision total hip arthroplasty (THA). However, few studies have reported the long-term outcome and none have been of sufficient size to sub-analyze factors associated with success and failure.

Methods: 925 extensively porous-coated stems of the one design were utilized in aseptic revision THAs. We evaluated clinical outcomes (Harris hip scores [HHS]), radiographic results (Engh criteria), Kaplan Meier survivorship and complications. Risk factors for femoral revision for aseptic loosening, femoral revision for any reason, reoperation for any reason, were assessed using the Cox proportional Hazards method. Mean clinical and radiographic follow-up was 10 years.

Results: Overall, 40 femoral stems (4%) were revised: 17 for aseptic loosening, 10 for femoral component fracture, 11 for infection, and 2 for periprosthetic fracture. 9 of 10 stem fractures occurred in stems 13.5-mm and below. Survivorship free of revision for aseptic femoral loosening or femoral component fracture was 97% at 15 years. Patient age, gender, operation diagnosis, stem diameter, and stem length were not associated with risk of femoral re-revision. Complications included intra-operative femur fracture in 15% (149): 8 inch stems had a significantly higher risk of fracture ($p=0.03$). In unrevised patients, mean HHS improved from 56 preoperatively to 80 at last follow-up ($p<0.001$). Radiographic review found 94% of stems to be bone-ingrown, 3% fibrous stable, and 3% loose at most recent follow-up.

Conclusions: In this very large series, extensively porous-coated stems in revision total hip arthroplasty had excellent long-term survivorship validating the common practice of uncemented diaphyseal fixation in revision THA. Patients had a significant and sustained improvement in clinical outcomes.

Frequency and Treatment Trends for Periprosthetic Fractures About Total Hip Arthroplasty in the United States

Matthew DeHart, MPH, Blake Obrock, DO,
Amer Mirza, MD, Paul Duwelius, MD, Paxton Gehling, BS,
Jacob Coleman, BS, Thomas Kowalik, MD, **John Cox, MD**

Introduction: Periprosthetic proximal hip fractures (PPHFx) are a challenging complication with variability in the quality and size of prior epidemiologic studies. We aim to augment this literature using the largest publicly available sampled database in the US.

Methods: The HCUP-NIS was used to analyze trends related to the frequency, mortality, treatment, patient demographics, length of stay, and cost of care of PPHFx from 2006-2010.

Results: Over the study period, the rate of PPHFx, ORIF and revision rates, length of stay (8 days, p<.0001), mortality (3%), and time to procedure (1.98 days, P<.0001) all remained stable. Demographic and regional characteristics appear to be remaining constant with a higher proportion of females suffering PPHFx, more fractures in the South (p<.0001), and most fractures being treated at urban non-teaching hospitals (p<.0001). Disposition similarly was stable with 74% discharging to skilled nursing facility. Despite these consistencies, hospital charges increased by $32,705 over the study period (p<.0001).

Conclusion: As the number of arthroplasty procedures increases, improved understanding of the epidemiology of PPHFx will be key to reducing the morbidity and cost associated with periprosthetic fractures.

Obesity is a Risk Factor for Early Aseptic Loosening and Osteolysis of Hip Replacements

Ali J. Electricwala, MS, Derek F. Amanatullah, MD, PhD, James I. Huddleston, MD, William J. Maloney, MD, PhD, Stuart B. Goodman, MD, PhD, Rapeepat I. Narkbunnam, MD

Introduction: Obesity poses a higher rate of post-operative complications after total hip Arthroplasty (THA). However, little is known about the time to presentation for each of these complications prior to revision THA. The purpose of this study was to correlate pre-operative BMI and the time to revision THA for aseptic loosening/osteolysis, infection, instability, adverse reaction to metal debris (ARMD), and peri-prosthetic fracture.

Methods: Using the total joint registry of our institute, we retrospectively reviewed the medical records of 257 revision THA-patients who underwent surgery from January 2011-December 2013. Patients were stratified according to age, gender, ASA scale, reason for revision THA (aseptic loosening/osteolysis, infection, instability, ARMD, periprosthetic fracture, and miscellaneous), preoperative BMI, and time to revision THA.

Results: Of 257 hip revisions, 124 (49%) were performed for aseptic loosening/osteolysis, 51 (20%) for infection, 36 (14%) for instability, 20 (7.5%) for ARMD, 10 (4%) for peri-prosthetic fracture, and 16 (6%) for miscellaneous causes. 112 (44%) revision THAs were performed before 5 years (early), 65 (25%) revision THAs were performed between 5 to 10 years (mid-term), and 80 (31%) revision THAs were performed after 10 years (late). Increasing BMI adversely affected the mean time to revision THA. The mean survivorship of the primary implant at 5 years was 75% for a BMI of 18-25, 62% for a BMI of 25-30, 44% for a BMI of 30-35, 27% for a BMI of 35-40 and 25% for a BMI of over 40 ($P<0.001$). The mean survivorship of the primary implant at 15 years was 30%, 18%, 13%, 6% and 0%, respectively ($P<0.001$). There was a significant increase in early revision THA for aseptic loosening/osteolysis in obese patients ($P<0.001$).

Conclusions: Obesity poses a higher risk of early revision THA following primary THA due to aseptic loosening/osteolysis. Preoperative BMI influences the survivorship of patients undergoing revision THA.

Revision of Monoblock MoM Total Hip Arthroplasty – Is There a Place for Dual Mobility Without Cup Extraction?

Clint J. Wooten, MD, Brian K. Park, MD, Bryan D. Springer, MD, Jeffrey G. Mokris, MD, Scott E. Marwin, MD, Thomas K. Fehring, MD, John L. Masonis, MD

Introduction: High complication rates have been reported when monoblock metal on metal (MoM) hips are revised. Complications include aseptic loosening of the revised cup, extraction induced acetabular fracture and dissociation as well as instability and infection. One strategy in monoblock MoM hips requiring revision is conversion to a dual mobility polyethylene bearing without cup extraction. We asked whether this strategy had a lower complication rate then formal acetabular revision.

Methods: Review of our institution's TJR identified 34 patients who underwent revisions of monoblock MoM THAs to a dual mobility construct between January 2012 and December 2014. Mean patient age was 64 (range, 27-86), and 65% were women. No hips were lost to follow-up. All hips met inclusion criteria which included a cementless, non-modular MoM implant with revision to a dual mobility construct. Major complications including instability, infection, aseptic loosening, and wound complication were documented and compared to a group of patients who had formal acetabular revision of a monoblock MoM component.

Results: Of 34 patients undergoing dual mobility revision, there was 1 early complication – instability requiring formal acetabular revision (3%). Of the 114 patients who underwent formal acetabular revision, there were 28 early complications (20%). Complications included aseptic loosening, deep infection, dislocation, acetabular fracture, superficial infection, infected hematoma, hematoma, and delayed wound healing.

Conclusion: Dual mobility is a viable option for treatment of failed monoblock metal on metal THA. Early complications are significantly lower (3% vs 20%) when compared with complete acetabular revision. Longer follow up is needed to demonstrate the effectiveness of these articulations. This technique is only appropriate in fully hemispheric monoblock cups. This technique should not be used in cups that are less than a hemisphere with a sharp inner rim or in cups in poor position that could lead to edge loading.

State-of-the-Art Management of Tough and Unsolved Problems in Hip and Knee Arthroplasty

Moderator: Daniel J. Berry, MD
Panelists: Mark Pagnano, MD, William Jiranek, MD,
Craig Della Valle, MD, Arlen Hanssen, MD, Wayne Paprosky, MD

This symposium will focus on 5 incompletely solved and challenging problems in hip and knee arthroplasty that confront hip and knee specialists on a regular basis. For each topic the moderator will begin by showing a brief illustrative case. Next a speaker with expertise on the topic will provide a perspective on the main options for management. Finally the author will poll the panel of all speakers for areas of consensus and areas of disagreement on current best practices and most effective techniques and approaches. The goal will be to help AAHKS members gain state-of-the-art information about some of the most difficult problems they face on a regular basis.

Topic #1: Established stiffness after TKA

The speakers and panel will discuss two main topics: (1) Under what circumstances is reoperation worthwhile undertaking for established stiffness after TKA? (2) If reoperation is undertaken, what are the key technical issues that should be emphasized for success?

Topic #2: Abductor deficiency after THA

The speaker and panel will discuss the main options available for abductor mechanism reconstruction including primary repair, allograft augmented repair, and gluteus maximus transfer. Pros and cons of each method and indications for each method will be considered.

Topic #3: Extensor mechanism deficiency after TKA

The speaker and panel will discuss the main reconstructive options—including allograft reconstruction and artificial mesh. The pros and cons, indications, and key technical points for each method will be explored.

Topic #4: Recurrent infection after two-stage reimplantation for infection after THA and TKA

The speaker and panel will discuss when it is worth understanding another two-stage reimplantation procedure and when a salvage procedure is preferred for the patient who has already failed one two-stage procedure. If a second two-stage procedure is undertaken, medical and surgical strategies that may increase success will be discussed.

Topic #5: Pelvic discontinuity after THA

The speaker will discuss the main treatment options (plating, cup-cage, distraction, triflange custom implants) and pros and cons and indications for each. For preferred methods, key technical points will be discussed

Patient Reported Outcomes: This is Your New Reality

Moderator: Jay R. Lieberman, MD
Speakers: Kevin Bozic, MD, MBA, Stephen Lyman, PhD,
Thomas K. Fehring, MD, Adam J. Rana, MD

An essential aspect of the Affordable Care Act is the transition from a fee for service system to a new paradigm where demonstrating value is critical. Patient reported outcome measures (PROMs) are going to be required to evaluate the results of both total hip and knee replacement patients. The purpose of this symposium is to focus on the following issues: to provide the latest information on the quality metrics that may be used to assess clinician performance; delineate the PROMs that will need to be collected on patients; the importance of risk adjustment in patient evaluations, and what the arthroplasty surgeon needs to know to collect patient outcomes data in a cost-effective fashion.

Topic #1: What Quality Metrics Is My Hospital Being Evaluated on and What Are the Consequences?
Kevin Bozic, MD, MBA

Topic #2: PROMs - What Data Do We Really Need?
Stephen Lyman, PhD

Topic #3: Risk Adjustment: Why Is It Important?
Thomas K. Fehring, MD

Topic #4: Building a PROMs Database: One Hospital's Experience
Adam J. Rana, MD

10-year Results of a Randomized Clinical Trial of Mobile-bearing vs. Fixed-bearing TKA

Matthew P. Abdel, MD, Meagan E. Tibbo, BA, Robert T. Trousdale, MD, Arlen D. Hanssen, MD, Mark W. Pagnano, MD

Introduction: It has been suggested that mobile-bearing total knee arthroplasty (TKA) might lead to better durability, ROM, and patient function. We conducted a large randomized clinical trial (RCT) to specifically determine if there were differences in durability (as measured by survival free of all-cause revision), ROM (as measured by mean maximal flexion), or function (as measured by Knee Society [KS] scores and prevalence of patellar complications) at 10 years between the mobile- and fixed-bearing versions of a contemporary TKA.

Methods: 235 patients who were enrolled in this RCT underwent a primary cemented TKA with a single femoral component and one of three tibial components (all-polyethylene fixed-bearing, modular metal-backed fixed-bearing, or mobile-bearing). Median follow-up was 10 years. Mean age was 67 years.

Results: There was no difference in durability at 10 years as measured by survivorship free of revision for any reason: 95% in the all-polyethylene, 97% in the modular-metal-backed, and 97% in the mobile-bearing. Males were more likely to undergo revisions (HR=5; p=0.05). The risk of revision increased 1.3-fold per unit BMI in the mobile-bearing group (p=0.04).There was no difference in mean maximal ROM at 10 years: 110°, 110°, and 109° for the all-polyethylene, modular-metal-backed, and mobile-bearing groups, respectively (p=0.91).There was no difference in patient function at 10 years as measured by KS function scores: 90 in the all-polyethylene, 82 in the modular-metal-backed, and 83 in the mobile-bearing groups (p=0.63). There was no difference in patient function as measured by the prevalence of patellar tilt: 2%, 4% and 13% in the all-polyethylene, modular-metal-backed, and mobile-bearing groups, respectively (p=0.11).

Conclusions: At 10 years in this 235-patient randomized clinical trial, the theoretical advantages ascribed to mobile- bearing TKAs were not demonstrated as the mobile- and fixed-bearing versions of this cemented TKA design had similar durability, ROM, and function.

Total Knee Outcomes Correlate Strongly with Spine Disability

William C. Schroer, MD, Paul G. Diesfeld, PA-C, Angela R. LeMarr, RN, Diane J. Morton, MS, Mary E. Reedy, RN

Introduction: As many as 20% of patients are dissatisfied after total knee arthroplasty (TKA), and persistent functional deficits are directly associated with TKA dissatisfaction. Spinal stenosis is a leading cause of functional disability. This study investigates the association of spine disability with poor TKA outcomes and patient dissatisfaction.

Methods: Prospective demographic, health and knee-specific data were collected for 1200 consecutive TKAs between 7/2010 and 7/2012. From this series, a spine questionnaire and the Oswestry Disability Index (ODI) score were obtained for 691 knees. Preoperative and two-year postoperative Knee Society (KS) pain and function scores and Oxford Knee Scores (OKS) were compared for presence of back problems, ODI scores, and demographic data.

Results: 371/691 (54%) TKAs had daily back pain or back pain that limited activity. OKS was significantly worse in patients with vs. without back problems both preop 36.9/34.8 ($p=0.0006$) and postop 20.2/17.0 ($p<0.0001$), but not for improvement 16.7/17.8 ($p=0.10$). KS pain scores were similar for patients with and without back problems both preop and postop. KS function scores were lower in patients with vs. without back problems preop 42.3/47.0 ($p=0.0005$), postop 68.0/79.8 ($p<0.0001$), and for improvement, 25.8/32.9 ($p<0.0001$). Lower KS function was associated with female gender, age, health, and ODI. ODI was associated with OKS ($R=0.57$) and KS function ($R=0.54$).

Conclusion: A majority of TKA patients reported lumbar spine problems. Routine TKA outcome measures were significantly worse in patients with history of back problems and directly associated with ODI, the standard spine disability measure. KS function scores indicated that TKA patients with back problems had worse function before and after TKA with less functional improvement. Poor TKA outcomes and dissatisfaction therefore may reflect poor knee function, spine disability or both. Awareness of coexisting spine disability should guide patient expectations, critical evaluation of registry data, and evaluation of TKA outcomes.

Does Pain and Function Differ after Primary TKR with Cemented vs. Cementless Fixation?

David C. Ayers, MD, Wenjun Li, PhD, Patricia D. Franklin, MD, MBA, MPH

Introduction: Both cemented and cementless implants are used broadly in the US in primary total knee replacement (TKR) procedures. Implant selection and fixation is largely based on surgeon training and preference. We evaluated functional gain and pain relief at 6 months after TKR in a contemporary national patient cohort to determine if patient- reported pain and function differ between cemented and cementless fixation.

Methods: Pre-TKR demographic, medical (Charlson), musculoskeletal, and emotional (SF; MCS) comorbidity data, and pre-TKR pain and function (KOOS) and global function (SF; PCS) and 6 month post-TKR KOOS and SF pain and function for patients with cemented and cementless fixation were identified in a cohort of patients from over 150 surgeons practicing in 22 states. Descriptive statistics and multivariable linear models, adjusting for clusters within sites, were performed.

Results: Many more cemented than cementless TKR fixations were performed (3081 vs 111). Compared to cemented, cementless fixation patients were younger (66 vs 63.7 years), had greater BMI (31.4 vs 33.9), poorer pre-op knee function (KOOS ADL 54 vs 49), and poorer emotional health (MCS 52 vs 49); all $p<0.001$. No differences in comorbidities or pre- post gain in knee function were observed (KOOS ADL 28.6 vs 27.8). In multivariable models adjusting for covariates, cementless fixation was associated with more pain and poorer KOOS function at 6 months after surgery than cemented ($p<0.016$).

Conclusions: US surgeons have adopted cemented fixation as the preferred technique in TKR and these patients report less pain and greater knee function at 6 months after TKR than patients with cementless procedures.

Does Use of a Variable Distal Femur Resection Angle Improve Radiographic Alignment in Total Knee Arthroplasty?

Denis Nam, MD, MSc, Sravya Vajapeyajula, BA, Jacob Haynes, MD, Robert L. Barrack, MD, Ryan M. Nunley, MD

Introduction: The distal femur resection in total knee arthroplasty (TKA) is commonly made using a fixed angle relative to an intramedullary (IM) rod. However, the angle between the femoral mechanical and anatomic axes is variable and up to 35% of femoral components fail to achieve a neutral alignment. This study's purpose was to assess if a variable distal femur resection angle technique improves femoral component alignment in TKA.

Methods: This was a review of primary TKAs performed by two surgeons. One surgeon used a fixed resection angle of 5° for varus and 3° for valgus knees ("fixed" cohort). The second used hip-knee-ankle (HKA) radiographs to measure the angle between the femoral anatomic axis and a line perpendicular to the femoral mechanical axis, which was used as the resection angle for each patient ("variable" cohort). Femoral component and HKA alignment were measured from standing HKA radiographs by two, independent, blinded observers. 290 patients were needed for power to detect a 15% difference in femoral component "outliers" (target of 0° + 2°; $p<0.05$ = significant).

Results: 320 consecutive patients (160 variable, 160 fixed) were included with no differences in age, body mass index, or preoperative deformity ($p=0.3$ to 0.8). A 5° resection angle was used in 46.3% of the variable and 80.0% of the fixed cohort patients. 80.2% of femoral components in the variable and 63.1% in the fixed cohort were within 0° + 2° ($p=0.002$; 84.6% of variable and 56.3% of fixed for valgus knees, $p<0.001$). The mean HKA alignment was improved in the variable cohort (-1.4° + 3.3° vs. -2.6° + 3.3°, $p=0.001$), but the difference within 0° + 3° did not reach significance (73.8% variable vs. 62.5% fixed, $p=0.09$).

Conclusion: Use of a variable distal femur resection angle improves femoral component alignment following TKA vs. a fixed angle technique.should guide patient expectations, critical evaluation of registry data, and evaluation of TKA outcomes.

No Improvement in Two-year Functional Outcomes Using Kinematic vs. Mechanical Alignment in TKA – A Randomized Controlled Clinical Trial

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Introduction: Mechanical Alignment (MA) in total knee arthroplasty (TKA) positions femoral and tibial components perpendicular to the mechanical axis. In contrast, Kinematic Alignment (KA) technique attempts to match implant position to the pre-arthritic anatomy of an individual patient. Recent studies suggest functional outcomes may be improved with KA, but prospective data is lacking. The aim of this study was to compare the two-year functional outcome between KA and MA in primary TKA.

Methods: One hundred patients undergoing primary TKA for osteoarthritis were randomized to either MA (n=50) or KA (n=50) groups. Full-length MRI scans assessed pre-op alignment in all patients. Computer Navigation was used in the MA group to ensure mechanical alignment accuracy. In the KA group, patient specific cutting-blocks were manufactured using individual pre-op MRI data. Alignment was assessed with post-operative CT scans in all patients. Functional outcome scores were assessed pre-operatively and at 6 weeks, 6 months, 1 and 2 years post-operatively.

Results: There was no difference in 2-year change scores (post-op minus pre-op score) in KA vs. MA patients for the Oxford Knee Score (21.9 vs 20.0, p=0.4), Western Ontario & McMaster Universities (WOMAC) score (17.8 vs 19.5, p=0.32), Forgotten Joint score (29.2 vs 26.7, p=0.8), EQ-5D (0.4 vs 0.3, p=0.4), and Knee Society Pain (51.9 vs 52.2, p=0.6) or Function scores (29.1 vs 24.0, p=0.3). Post-operative hip-knee-ankle axis was similar between groups (KA 0.4° vs MA 0.7° varus), but in KA femoral components were in more valgus (2.0° vs 0.6°, p=0.003) and tibial components in more varus (2.8° vs 0.7°p <0.001). Complication rates were similar between groups.

Conclusions: We found no difference in two-year functional outcome scores in TKAs implanted using the KA compared to the MA technique. Currently, it is unknown if the alterations in component alignment with KA will compromise long-term survivorship of TKA.

Differential Effect of Total Knee Arthroplasty on Valgus and Varus Knee Biomechanics During Gait

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Introduction: Total knee arthroplasty (TKA) improves function in knee osteoarthritis (OA). Its relationship with gait abduction or adduction moment has yet to be fully described. Pre and postoperative knee biomechanics were compared in TKA patients.

Methods: Gait analysis was performed on 27 knees prior to, at 6 months, and at 1 year after TKA. Reflective markers on lower extremity collected motion data at 60 Hz using six infrared cameras. Ground reaction forces were recorded at 960 Hz with a force plate. Stance phase was divided into braking and propulsive phases. Frontal plane knee angles and moments were calculated for each trial. Repeated-measures ANOVA was used to compare these results.

Results: In varus knees, static knee alignment was corrected from 2.2° varus to 3.3° valgus ($p=0.001$). In the braking phase, knee adduction impulse decreased from 0.145 to 0.111 Nm/kg*s at 6 months, but increased to 0.126 Nm/kg*s ($p>0.05$) at 1 year. The propulsive phase knee adduction impulse changed from 0.129 to 0.085 and persisted at one-year follow-up. Valgus knee static alignment decreased from 16.5° to 2.5° valgus ($p<0.001$). Total frontal plane impulse changed significantly from 0.01 (abduction) to 0.10 Nm/kg*s (adduction) at 6 months ($P = 0.01$) and persisted at one-year follow-up.

Conclusion: Varus knee parameters measured improved at 6 months, but showed reversion back to preoperative levels at 1 year. This suggests that restoration of anatomic axial alignment and soft tissue balance do not change medial loading conditions following TKA. In valgus knees, significant change in impulse from abduction to adduction occurred, which also remained at 1-year follow-up. These findings suggest that restoration of anatomic axial alignment and soft tissue balancing changes the lateral loading conditions valgus knees undergoing TKA.

Femoroacetabular Impingement: From Preservation to Total Joint Arthroplasty

Speakers:

Pathomechanics of FAI: Understanding the Disease
Christopher L. Peters, MD

Indications and Goals for Arthroscopic Versus Open Management
Paul E. Beaule, MD, FRCSC

Contraindications to Hip Arthroscopy
Asheesh Bedi, MD

Total Hip Arthroplasty after Hip Preservation Surgery: When and How
John C. Clohisy, MD

The motion-conflict phenomenon known as femoroacetabular impingement (FAI) is increasingly recognized as a cause of hip pain in young adults and a predisposing factor for development of hip osteoarthritis (OA). Over the past decade much clinical and basic science information has emerged supporting the idea that FAI is indeed a unique pathological entity associated with hip pain and degeneration in many but not all patients. Nevertheless, skepticism surrounds several areas including the strength of the relationship between FAI and hip OA, the ability to accurately reproduce and predict FAI pathomechanics, the ability to accurately stage the disease process in order to refine surgical decision making, and the scope and state of contemporary treatment strategies.

The purpose of this symposium is to succinctly present current experiential, clinical and basic science information supporting the above concepts with the goal of improving knowledge of the disease process, and refinement of patient selection and treatment. Specific information regarding the relationship between FAI and hip OA, the pathological mechanisms underlying FAI (from both an in-vivo and in-vitro perspective), unique approaches to disease staging, and contemporary treatment perspectives will be discussed by international experts in hip preservation surgery. Additionally, the symposium will emphasize surgical decision making for both open and arthroscopic approaches for FAI treatment and place into context the important role of hip arthroplasty in the contemporary management of patients with FAI.

Prior Lumbar Spinal Arthrodesis Increases Risk of Prosthetic-Related Complication and Revision Surgery in Primary Total Hip Arthroplasty

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Introduction: Eighteen percent of patients who undergo total hip arthroplasty (THA) have coexisting degenerative lumbar spine diagnoses, known as the 'hip-spine syndrome'. Limited data on this cohort suggests that they may have inferior functional improvement and pain relief. We hypothesize that prior lumbar spine arthrodesis (SA) increases risk of complications within 2 years following subsequent primary THA.

Methods: We retrospectively analyzed the prevalence of prior lumbar SA among 811,601 Medicare patients undergoing THA from 2005-2012. Patients with history of spinal arthrodesis undergoing hip arthroplasty (SAHA) were stratified by length of fusion construct (1-2 levels [SAHA<3] vs 3 or more levels [SAHA≥3]). The main outcome measure was the relative risk of developing prosthetic-related complications and undergoing revision arthroplasty within 24 months comparing SAHA and control THA patients.

Results: Out of 811,601 patients undergoing primary THA, 16,574 (2.0%) SAHA patients were identified. 12,757 (1.6%) patients were identified as SAHA<3 and 3,817 (0.4%) patients were identified as SAHA≥3. Age, sex, and regional distribution was similar between control patients compared to SAHA patients. The relative risk of developing any prosthetic complication within 24 months compared to control was 1.52 (95% CI [1.42,1.63]) for SAHA<3 patients and 1.93 (95% CI [1.73,2.15]) for SAHA≥3 patients. Risk of dislocation was 2.4% in control compared to 7.5% in SAHA≥3 patients (RR 3.19, 95% CI [2.74,3.70]). Two-year revision arthroplasty rate was 3.4% in the control group, 5.6% for SAHA<3 patients (RR 1.62, 95% CI [1.46,1.78]), and 7.8% for SAHA≥3 patients (RR 2.26, 95% CI [1.95,2.62]).

Conclusions: Greater than 2% of all patients undergoing total hip arthroplasty have a history of spinal arthrodesis, which significantly increases the risk of prosthetic-related complication and revision after primary THA. The interplay of coexisting degenerative hip and spine disease deserves the attention of both arthroplasty and spine surgeons to optimize patient outcomes.

Validated Risk Stratification System for Pulmonary Embolism Following Primary Total Joint Arthroplasty

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Ronald Huang, MD, Javad Parvizi, MD, FRCS,
Jay R. Lieberman, MD, Craig J. Della Valle, MD

Introduction: Stratification of patients into different risk categories for pulmonary embolism (PE) following total joint arthroplasty (TJA) may allow clinicians to individualize PE prophylaxis based on an appropriate risk-benefit scale. The purpose of this study was to categorize patients into different risk categories for PE following TJA.

Methods: Patients undergoing primary total hip or knee arthroplasty (THA or TKA) as part of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) were identified. Independent risk factors for PE within 30 days of surgery were identified. A point-scoring system to estimate the relative risk for PE was developed. To validate the system, the system was tested on patients undergoing TJA at a single institution, all of whom received warfarin prophylaxis.

Results: Using the ACS-NSQIP database, 118,473 patients undergoing TJA were identified. The incidence of PE within 30 days of the index arthroplasty was 0.50%. The risk factors associated with PE were: age≥70, female gender, higher body mass index (BMI; 25-30kg/m2 and ≥30kg/m2), and TKA (vs. THA); anemia was protective. Based on the nomogram analysis, the point scores derived for each of these factors were as follows: anemia -2; female +1; BMI 25-30kg/m2 +2; BMI ≥30kg/m2 +3; age≥70 years +3; TKA +5. The point scoring system was then applied to 19,053 patients from a single institution. Single-institution patients categorized as low risk using the point scoring system had a 0.39% risk for PE (95% CI=0.26-0.52%); medium risk, 1.42% (95% CI=1.11-1.72%); and high risk, 2.51% (95% CI=2.03-3.00%).

Conclusion: Using the ACS-NSQIP database, a point scoring system for the risk of PE following TJA was developed. This point scoring system was validated on patients from a single institution, all of whom received warfarin prophylaxis. This scoring system may facilitate risk stratification and optimize selection of chemical prophylaxis.

Individualized Risk Model for VTE following TJA

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Introduction: Venous thromboembolism (VTE) following total joint arthroplasty (TJA) continues to be an important and potentially fatal complication. Currently surgeons use a standard protocol for postoperative VTE prophylaxis and make little distinction between patients at different risk of VTE. The objective of this study was to develop a simple scoring system that can identify patients at higher risk for VTE in whom more potent anticoagulation may need to be administered.

Methods: Utilizing the National Inpatient Sample registry data, 1,721,806 patients undergoing TJA were identified, among which 15,775 patients (0.9%) developed VTE following their index arthroplasty. Among the entire cohort, all potential risk factors for VTE were assessed. An initial logistic regression model using all potential predictors for VTE was performed. A scoring system was then created based on the logistic regression coefficients and externally validated against our institutional data.

Results: Hypercoagulability, metastatic cancer, stroke, diagnosis of sepsis, and chronic obstructive pulmonary disease (COPD) carried the highest weight for increasing risk of VTE in our model. Patients with any one of these conditions had risk for postoperative VTE that exceeded the rate of 3%. There was a near perfect fit between the predicted VTE rate (using the model) and the actual rate of VTE in our institutional data up to a 5% rate of VTE.

Conclusions: Based on our VTE risk model, an iOS application has been developed (VTEstimator) that can be used to assign patients into low and high risk for VTE following TJA. We believe individualization of VTE prophylaxis following TJA is likely to improve the efficacy of preventing VTE while minimizing the untoward risks associated with the administration of anticoagulation.

The Interaction of Obesity and Metabolic Syndromein Determining Risk of Complication Following Total Joint Arthroplasty

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Introduction: The American arthroplasty population is increasingly co-morbid and current quality improvement initiatives demand accurate risk stratification. This investigation assesses risk of complication following THA and TKA attributable to obesity and metabolic syndrome (MetS) and seeks to identify any interaction between the two variables.

Methods: A retrospective analysis of all Medicare patients undergoing THA and TKA at a single institution between June 2009 and March 2013 investigated the interaction between obesity (BMI > 30), MetS, and risk for complications. MetS was defined as ≥2 of the following: diabetes, hypertension, dyslipidemia, or sleep apnea. Outcomes included CMS- reportable complications (pneumonia, myocardial infarction, death, pulmonary embolism, surgical site infection, surgical site bleeding, catheter-associated urinary track infection, mechanical complication, and readmission), as well as discharge disposition other than home, and length of hospital stay (LOS). Logistic regression models were fit to assess the effect of obesity and MetS on CMS-reportable complications and discharge to other than home; negative binomial regression was used for LOS.

Results: 1308 patients (850 TKA, 458 THA) were included. 382 patients (29.2%) had BMI < 30 without MetS; 334 (25.5%) had BMI < 30 with MetS; 219 (16.7%) had BMI ≥30 without MetS; and 373 (28.5%) had BMI ≥30 with MetS. Demographic and comorbidity data were significantly different between groups. Regression analysis found that MetS was significantly related to risk of CMS-reportable complications regardless of obesity (OR=1.45: 95% CI 1.01 – 2.10, p = 0.045). Obesity was significantly related to discharge disposition other than home (OR=1.5, 95% CI 1.20 – 1.88, p <0.001). There was no interaction evident between obesity and MetS on any outcome (p>0.3).

Conclusion: MetS increases risk for CMS-reportable complications following THA and TKA regardless of obesity status. Obesity is of less value than MetS in assessing overall risk for CMS-reportable complication following THA and TKA.

Pre-operative Reduction of Opioid Use Prior to Total Joint Arthroplasty

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Introduction: Opioids are widely used for chronic pain management in patients with osteoarthritis prior to undergoing a total joint arthroplasty (TJA) despite its possible negative impact on outcomes. The purpose of this study was to assess whether weaning of opioid use in the preoperative period would improve TJA outcomes.

Methods: Forty-one patients who had regularly used opioids and successfully weaned (defined as a 50% reduction in morphine equivalent dose) prior to a primary total knee or hip arthroplasty were matched with a group of TJA patients who did not wean. Both groups were compared to a matched control group of TJA patients who did not use opioids preoperatively. Patient-reported outcomes were assessed between six to twelve months post-operatively using the UCLA activity score, SF12v2, and WOMAC. Paired t-tests and ANOVA were performed to assess differences in TJA outcomes.

Results: Patients using opioids who successfully weaned performed significantly better than those that did not wean on WOMAC 43.7 vs 17.8, (P-value < 0.001), SF12v2 physical, 10.5 vs 1.85 (P-value = 0.003), UCLA Activity Score, with a mean delta score of 1.49 vs 0 (P-value < 0.001). There was no statistical difference between the two groups on SF12v2 mental, 2.48 vs 4.21 (P-value=0.409). Patients who successfully weaned from opioids had similar outcomes to control patients who did not use opioids: WOMAC 39.0 vs 43.7, (P-value = 0.31), SF12v2 physical, 12.5 vs 10.5 (P-value = 0.35), SF12v2 mental, 3.08 vs 2.48 (P-value = 0.82), UCLA Activity 1.90 vs 1.49 (p-value=0.23).

Conclusions: Patients with a history of chronic opioid use who successfully decrease their use of opioids prior to surgery had substantially improved clinical outcomes that were comparable to patients who did not use opioids at all. Patients who are on analgesics should be encouraged to wean their use prior to elective TJA.

Long-acting Opioid Use Independently Predicts Perioperative Complication in Total Joint Arthroplasty

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Introduction: Chronic opioid therapy is an increasingly utilized modality for treatment of osteoarthritis-associated pain despite multiple associated risks. The purpose of this study was to evaluate the effect of pre-operative opioid use on early post-operative outcomes following total joint arthroplasty (TJA). We hypothesize increased risk of complications associated with pre-operative opioid use, especially with long-acting opioids (LAO).

Methods: We retrospectively analyzed all patients who underwent primary TJA performed at a single institution. Patients were matched by age, gender, and procedure into 3 groups stratified by pre-operative opioid use (non-user, short-acting (e.g. Vicodin), long-acting (e.g. Oxycontin). Clinical outcomes assessed include length of stay, total in-hospital opioid use, distance walked postoperatively, and complications or revisions within 30 days.

Results: 174 patients were identified as matches (106 total hip, 68 total knee; mean age 60 +/-8.1 years). Comparing non-users, short-acting, and long-acting opioid users respectively, mean total mg of morphine equivalents administered in hospital was significantly higher (46mg vs 102mg vs 366mg; $p<0.001$), 90 day complication rates were significantly increased (5.2% vs 19.0% vs 25.9%; $p=0.01$), mean distance walked by post-operative day 1 was significantly lower (170ft vs 121ft vs 58.9ft; $p<0.001$), and discharge to facility was significantly more likely (12.1% vs 27.5% vs 53.4%; $p<0.001$). Length of stay was on average 1.2 days and 1.6 days longer for short-acting and long-acting opioid users respectively ($p=0.005$). Compared to nonusers, preoperative LAO use was an independent risk factor in multivariate analysis in predicting discharge to facility (OR: 6.74, CI: [2.39,19.03], $p<0.001$) and complication (OR: 6.15, CI: [1.46,25.95], $p=0.013$).

Conclusion: Opioid use prior to primary total joint arthroplasty significantly increases peri-operative opioid use, complications, and length of stay. Alternative non-opioid pain management or earlier referral to orthopaedic surgeons may decrease the prevalence of preoperative opioid dependence and mitigate associated adverse perioperative outcomes.

Formal Physical Therapy after Primary Total Hip Arthroplasty May Not Be Necessary

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Introduction: Many surgeons and patients believe that formal outpatient physical therapy (OPT) is necessary in order to optimize the functional outcome of patients undergoing total hip arthroplasty (THA). Limited evidence currently exists to support this belief. The purpose of this prospective, randomized study was to determine the effect of formal OPT on the functional outcome of THA.

Methods: We randomized 77 patients into two groups. In Group I, 39 patients received 2 months of formal OPT, with 2-3 sessions per week. In Group II, 38 patients received no formal OPT, but followed a prescribed exercise program on their own for a 2-month duration. Harris Hip Score (HHS), WOMAC, and SF-36 were recorded preoperatively and postoperatively at 1 month and 6 months. The results were analyzed using a linear mixed model with patients as a random effect, and treatment time and treatment group as independent variables.

Results: Preoperative functional scores and demographics between both groups were similar. There were no significant differences in any measured outcomes at 1 month or 6 months postoperatively. HHS for Group I were 67.67 ± 3.00 at 1 month and 80.19 ± 4.33 at 6 months. Group II had HHS scores of 71.26 ± 3.24 at 1 month and 84.68 ± 3.32 at 6 months (95% CI -12.44, 5.25 and -15.62, 6.63 respectively). Similarly, there were no significant differences in the WOMAC or SF- 36 scores at either postoperative interval. Cost to the patient for OPT visits ranged from $10-$60 per session for non- Medicare patients.

Conclusions: These findings suggest that formal OPT is not superior to prescribed, patient-directed home exercises. The value of formal OPT for all patients undergoing primary THA needs to be examined. Based on the findings of this study, we have moved away from routinely prescribing formal OPT for all patients after THA.

Direct Anterior Approach Does Not Reduce Dislocation Risk

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Introduction: The direct anterior approach (DAA) for total hip arthroplasty (THA) has rapidly become popular but there is little consensus regarding the risks and benefits of this approach in comparison with a modern posterior approach (PA). The purpose of this study was to compare the short term outcomes and complications following DAA and PA THA in a state joint replacement registry.

Methods: The Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) was queried for all patients undergoing primary unilateral THA between February 2012 and September 2014. Patients who underwent DAA THA were propensity score matched with patients undergoing PA THA. Multilevel logistic regression models using generalized estimating equations to control for grouping at the hospital level was utilized to identify differences in various outcomes for the predictor variable of DAA vs. PA.

Results: 11,112 patients were identified that met inclusion criteria. 2,147 matched pairs based on age, gender, BMI and ASA classification were identified. Mean age of the matched cohort was 64.8, mean BMI was 29.1 kg/m2 and 53% were female. There was no difference in dislocation rate based on approach (0.4% DAA vs. 0.4% PA, IRR=1.06, p=0.88). Procedure duration was increased with the DAA (100.94 38.00 min DAA vs. 76.35 27.72 min PA, IRR=1.32, p<0.005). There were no statistically significant differences in fracture rate, blood loss, hematoma, length of stay (LOS) or readmission.

Conclusion: There was no difference in the dislocation rate when comparing matched groups of patients undergoing DAA and PA THA. Trends indicating a slightly longer LOS with the PA and slightly greater risk of fracture, increased blood loss and hematoma with the DAA are consistent with previously published studies. Based on short term outcome and complication data, DAA and PA THA have no compelling advantage over each other.

Assessment of the Impact of Anterior vs. Posterior Surgical Approach for Total Hip Arthroplasty on Post-acute Care Service Utilization

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Introduction: Compare total hip arthroplasty surgical approach with post-acute care service utilization and cost for Medicare patients in the Bundled Payment for Care Improvement program.

Methods: Design: Cross-sectional study. Setting: Claims data derived from Medicare Bundled Payment for Care Improvement eligible participants. Participants: Data from 24,437 Medicare fee-for-service patients receiving total hip arthroplasties, DRG 470 (total joint replacement of the lower extremity), during the period January 2013 through December 2014 was collected. The posterior surgical approach (historic norm) was performed on 21,567 patients while 2,870 patients had the anterior surgical approach performed for total hip arthroplasty. Main Outcome Measures: Elective total hip arthroplasty complete episode and post-acute care costs; utilization rates (frequency and length of time) for inpatient rehabilitation facility, skilled nursing facility, home health and readmissions.

Results: The surgical approach for total hip arthroplasty showed no noticeable differences in post-acute care service utilization or cost. The anterior approach episode cost ($21,479) and post-acute utilization for skilled nursing (incident rate 33.9% and length of stay 22.9 days), home health (incident rate 65.1% and length of service 25.4 visits) and readmission rates of 9.9% provided minimal variation from the posterior approach episode cost ($21,267) and post-acute utilization for skilled nursing (incident rate 30.7% and length of stay 21.7 days), home health (incident rate 63% and length of service 25.7 visits) and readmission rates of 8.6% ($p = .001$).

Conclusions: Previous studies of anterior vs. posterior surgical approaches for total hip arthroplasty suggested that the tissue-sparing anterior approach would result in a more rapid recovery time requiring fewer post-acute services, ultimately decreasing overall episodic cost. The results of this study indicate that surgical approach alone is not the primary driver of post-acute care service utilization and cost. Others factors, such as physician-led, patient-focused care pathways are important in effective care redesign efforts.

13-year Evaluation of Highly Cross-linked Polyethylene Articulating with 28mm and 36mm Heads Using Radiostereometric Analysis (RSA)

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Introduction: HXLPE was introduced to decrease osteolysis and increase survivorship of total hip arthroplasty. Larger heads showed increased wear of conventional polyethylene. Since in vitro studies showed reduced wear of HXLPE with larger heads, their preponderance has increased. We aimed to evaluate head penetration and the steady state wear of HXLPE articulating with 28mm or 36mm heads using RSA.

Methods: 29 patients received tantalum beads in their liner to measure head penetration into the HXLPE. 16 patients received a 28mm head and 13 patients received a 36mm head. RSA and plain radiographic follow-up was scheduled 4-6 weeks, 6 months, 1, 2, 3, 4, 5, 7, 10, and 13 years postoperatively, with a CT scan taken at 13 years. The Wilcoxon signed-rank test determined differences in penetration over time ($p \leq 0.05$).

Results: 24 patients were followed at 6 months, 19 at 2 years, 17 at 3 years, 9 at 5 years, 10 at 10 years, and 9 at 13 years. CT scan analysis is in progress for all patients at 13 years. Head penetration used the postoperative film and steady state wear used the 1 year film as the baseline for comparison. At 13 years, the median± standard error steady state wear was 0.07±0.04mm for both the 28mm the 36mm cohorts. No change in steady state wear was found at any subsequent time point, either within the head groups or the overall cohort ($p \geq 0.09$).

Conclusion: The results indicate that the two cohorts showed low steady state wear of HXLPE at 13 years. There were no significant differences in the steady state wear over time. These results, using the most accurate method of RSA to assess wear, confirm that low wear of HXLPE is maintained in the long-term, and that the use of larger femoral heads is a viable option.

Minimum 10 Year Multi-center Study of THR with Highly Cross-linked Polyethylene and Large Diameter Femoral Heads

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Introduction: The first highly crosslinked and melted polyethylene acetabular component for use in total hip arthroplasty was implanted in 1998 and femoral heads larger than 32mm in diameter introduced 2004. The purpose of this study was to re-assemble a previous multi-center patient cohort in order to evaluate the radiographic and wear analysis of patients receiving this form of highly crosslinked polyethylene articulating against large diameter femoral heads at a minimum of 10 years follow-up.

Methods: Two centers contributed patients to this ongoing clinical study. Inclusion criteria for patients was: primary THR; femoral heads greater than 32mm; minimum 10 year follow-up. 69 hips have been enrolled with an average follow-up of 11.2 years (10-15), 32 females (50%). 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: Wear analysis: Using the average of the slopes of the individual regression lines, the wear rate was 0.004±0.094mm/yr. Using the early to latest film method, the wear rate was 0.035±0.076mm/yr Radiographic analysis: Acetabular side: the greatest incidence of radiolucency occurred in zone 1 at 27%; sclerotic lines had a less than 2% incidence in any of the 3 zones; there was no identified osteolysis. Femoral side: the highest incidence of radiolucencies was in zones 1 and 3, 7% and 4%; sclerotic lines were rare in any zone, maximum in zone 3, 4%; there was no identified osteolysis.

Conclusions: 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 10 year follow-up and there was no identified osteolysis.

A Multi-center, Prospective, Randomized Study of Outpatient vs. Inpatient Total Hip Arthroplasty

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Introduction: This study prospectively evaluates patient-reported satisfaction with outpatient (<12hr stay) vs. inpatient (overnight stay) THA in a broad patient population and determines predictive factors for patients unable to be discharged on the planned day.

Methods: A prospective, randomized control trial was performed with two institutions from July 2014 to March 2015. Patients were included if BMI<40kg/m2, age<75 years, and they were not wheelchair- or walker-bound preoperatively. 220 patients were randomized to outpatient or inpatient hospital stay. Both groups received the same preoperative counseling, perioperative anesthesia/analgesia, and physical therapy. The following variables were measured: visual analog scale (VAS) satisfaction and pain scores, complications and unplanned physician visits, and the number of phone calls to the surgeon's office.

Results: The outpatient and inpatient groups had similar age (60.3 vs. 60.7 years, respectively, p=0.80), gender (p=0.44), BMI (27.2 vs. 28.4 kg/m2, p=0.20) and preoperative comorbidities (p=0.39). At 4 weeks, satisfaction with the procedure was higher in the outpatient group (88 vs. 80, p=0.003), while satisfaction with the discharge timing was the same (outpatient 88%, inpatient 89%, p=0.97). On the day after surgery, the outpatient group experienced more pain (VAS 3.7 vs. 2.7, p=0.003). There were a similar number of complications, physician visits, and phone calls to the surgeon's office between the groups (p=0.32). 26% of patients randomized to outpatient required inpatient stay, and 6% of patients randomized to inpatient left on the day of surgery, with no patient factors identified as predictive of discharge failure.

Conclusion: This Level 1 study demonstrates that patients discharged the same day as their THA have slightly higher satisfaction scores but higher pain scores on the day after surgery. There are no differences in early complications, physician visits, readmissions, and calls to the surgeon's office postoperatively. However, even with standardized protocols, some patients may require overnight stay.

Oral Antibiotics Reduce Reinfection Following 2-stage Exchange: A Multi-center, Randomized Controlled Trial

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Introduction: A substantial number of patients develop recurrent periprosthetic joint infection (PJI) following two-stage exchange arthroplasty. The purpose of this multicenter randomized controlled trial was to determine if 3 months of oral antibiotics would decrease the risk of failure following a two-stage exchange.

Methods: We invited all members of the Knee Society to participate in the trial. Following Institutional Review Board approval seven centers enrolled patients who were randomized to receive three months of oral antibiotics or no further antibiotic treatment after operative cultures following the second stage reimplantation were negative. Oral antibiotic therapy was tailored to the original infecting organism(s) in consultation with an Infectious Disease specialist. Priori power analysis determined that 77 patients per group would be required to demonstrate a reduction in infection recurrence from 16% to 4% (β=0.80 and α=0.05). A logrank survival curve was used to analyze the primary outcome of reinfection.

Results: 53 Patients were randomized to the antibiotic group and 41 in the control group; 14 were excluded for protocol deviations (most commonly discontinuation of antibiotics prior to 90 days) leaving 40 patients in each group with a mean follow up of 16.3 months in the antibiotic and 11.4 months in the control group. PJI followed a TKA in 41 patients and a THA in 39. Mean age, BMI, sex distribution and Charlson index were similar amongst the groups suggesting appropriate randomization. There have been two failures in the antibiotic group compared to eight amongst controls (5% vs 20%; p=0.0232 using log rank survival curve analysis). Seven of the 8 failures in the control group were with new organisms and both failures in the antibiotic group were with the same organism.

Conclusions: This multicenter randomized trial suggests that at short-term follow-up, the addition of three months of oral antibiotics significantly improved infection-free survival.

The Alpha-defensin Test for PJI is Not Affected by Prior Antibiotic Administration

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Introduction: Previous studies have demonstrated that the administration of oral antibiotics to patients prior to performing diagnostic testing for PJI can interfere with the accuracy of test results. The purpose of the current study is to evaluate the effects of antibiotic administration prior to performing the alpha-defensin test for PJI.

Methods: Four institutions contributed prospective data, which included 106 hip and knee arthroplasties with MSIS- defined PJI. All patients also had an alpha-defensin test performed. Patients in one group (A) (28%) were on antibiotics prior to the diagnostic work-up, whereas patients in another group (B) (72%) were never given antibiotics before the diagnostic work-up. The alpha-defensin test result (S/CO), ESR (mm/h), serum CRP (mg/L), synovial leukocyte counts (cells/ul), and neutrophil percentage (%) were collected and compared between the two groups.

Results: The administration of antibiotics before performing the alpha-defensin test for PJI did not have a significant influence on the median alpha-defensin level (4.2 vs. 4.9,p=0.45). There was only one false-negative alpha-defensin result, found in group (B), among the 106 PJIs. Conversely, the median serum CRP (26 vs. 62,p=0.008), synovial fluid leukocyte count (17,300 vs. 29,400,p=0.008), and synovial neutrophil percentage (87% vs. 92%,p=0.034) were all significantly lower for patients in Group A. Furthermore, the combined percentage of false-negative results for these traditional tests among group (A), was greater than the percentage of false-negative results in group (B) (20% vs. 12%;p=0.01).

Conclusion: This, and previous studies, have demonstrated that premature antibiotics can compromise the results of traditional diagnostic tests for PJI, causing lower median results and significant increases in false-negative results. However, the alpha-defensin test for PJI maintains its performance even in the setting of antibiotic administration. Considering that many patients receive antibiotics prior to a diagnostic work-up for PJI, alpha-defensin testing should be considered as a standard test for PJI.

Articulating vs. Static Spacers in the Management of Periprosthetic Knee Infection: A Randomized Clinical Trial

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Introduction: Although the use of an interim antibiotic loaded spacer is considered standard for a two-stage exchange for periprosthetic joint infection (PJI), the use of articulating vs. a static spacer is controversial. The purpose of this multicenter, randomized control trial is to compare articulating and static spacers for the treatment of PJI after total knee arthroplasty (TKA).

Methods: 54 Patients who met MSIS criteria for PJI following a primary TKA at 3 centers were randomized; 26 into the articulating and 28 in the static group. Antibiotics and reimplantation timing were managed using the standard of care of each surgeon and institution. Power analysis determined that 56 patients were needed to identify a 13o difference in range of motion (ROM) between groups (β=0.80 and α=0.05). Demographics between the two groups were not significantly different, suggesting appropriate randomization.

Results: At a mean of 1.9 years (range, 1.0 to 2.9) following reimplantation, ROM was significantly better in patients who had an articulating spacer (113.1° vs. 99.5°, p=0.018). There was a trend toward a higher rate of re-infection among static spacers (18% vs.5%) however this difference was not significantly different with the numbers available for study (p=0.33). Similarly, the mean Knee Society Score was somewhat higher at 83 for the articulating and 76 for the static group (p=0.365). There was no difference in mean operative time at the first (129 vs. 133 minutes, p=0.804) or second stage (146 vs. 152 minutes, p=0.642). There was no difference in length of stay after the first stage (5.5 vs. 5.9 days, p=0.687) or second stage (3.9 vs. 4.1 days, p=0.598).

Conclusions: This randomized trial demonstrates that articulating spacers provide significantly better range of motion than static spacers in the treatment of PJI after TKA with a non-significant trend towards higher Knee Society Scores and decreased infection recurrence.

What is the Benefit of Staphylococcal Screening and Treatment Prior to Elective Hip/Knee Arthroplasty?

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Introduction: Deep infection following elective total joint arthroplasty is a devastating complication. Preoperative nasal screening for Staphylococcus aureus colonization and subsequent treatment of colonized patients is one proposed method to identify at-risk patients and decrease surgical site infections (SSI). The purpose of this study was to determine 1) if a preoperative Staphylococcal screening and treatment program would decrease the incidence of SSI in elective joint replacement patients and 2) if non-Staphylococcal infections would become more prominent among those patients who developed a SSI.

Methods: Beginning in January 2009, all patients having an elective joint replacement were screened prior to surgery for methicillin resistant Staphylococcus aureus (MRSA) and methicillin sensitive Staphylococcus aureus (MSSA) with nares swabbing. All patients with positive nares colonization for MSSA or MRSA were treated with mupirocin and chlorhexidine gluconate (CHG) showers for five days prior to surgery. All patients scheduled for elective joint replacement used CHG antiseptic cloths the evening prior to and the day of surgery. Perioperative infection rates were compared one year prior to five years post-implementation.

Results: 13,717 patients (4962 hips, 8755 knees) underwent primary joint replacement between January 2008 and December 2014. The SSI rates have decreased from 0.89% (pre-screening) to 0.27% (nasal screening) ($p<0.05$) following initiation of the decolonization protocol. Staphylococcal species represented 91.7% of the infecting organisms prior to the routine screening, whereas, Staphylococcal species only characterized 42.7% of the infecting organisms following screening and decolonization ($p<0.05$).

Conclusion: Staphylococcus aureus surveillance and treatment prior to elective hip/knee arthroplasty can reduce the incidence of SSI. Conversely, routine Staphylococcal screening and decolonization may result in a greater propensity to develop a non-Staphylococcal infection among those who develop a postoperative SSI.

Do Injections Increase the Risk of Infection Following TKA?

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Introduction: The purpose of this study was to determine if postoperative infection rates are increased following knee injection and to determine whether there is an association between time from injection to TKA.

Methods: The Humana Inc. administrative claims dataset was reviewed from 2007-2014 for all patients who received a knee injection prior to their ipsilateral TKA within one year. The cohort was then stratified by monthly time intervals out to 12 months corresponding to duration between injection and TKA. Postoperative infection within 90-days was identified using ICD-9/CPT codes. Records without laterality designation were excluded and analysis was performed using standard statistical techniques.

Results: 29,603 patients (35.4%) had an injection in the ipsilateral knee at least one year prior to TKA and 54,081 patients (64.6%) did not. There were no significant differences in Charlson Comorbidity Index between cohorts. Rates of any surgical site infection (SSI) and rates of infection requiring return to the operating room (1.5% vs 1.0%) were higher for patients with injections (odds ratio (OR) 1.2 and 1.4, respectively, $p<0.0001$). Rates of infection requiring return to operating room remained significantly higher for the injection cohort up to seven months between injection and TKA. OR for increased infection in the injected TKA group were 1.8 at 1 month, 1.6 at 2 months, and 1.3 at 3 months. There were no significant differences in infection rates after seven months.

Conclusions: There was a significantly higher odds of post-operative infection (OR 1.2, $p <0.0001$) and infection requiring return to operative room (OR 1.4, $p <0.0001$) when patients received an injection prior to TKA with a continued increase over the control group out to seven months. This association between injection and infection after TKA is important to consider during an arthroplasty surgeon's management of patients who have undergone injection.

The Timing of THA after Intra-articular Hip Injection affects Postoperative Infection Risk

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Introduction: Intra-articular hip injections are performed for both diagnostic and therapeutic purposes for patients with hip osteoarthritis. Data regarding any association between preoperative intra-articular steroid injection and risk of periprosthetic joint infection (PJI) after total hip arthroplasty (THA) is conflicting. The goal of the present study is to employ a national database to evaluate the association of preoperative ipsilateral IAHI at various time intervals prior to THA with the incidence of postoperative PJI.

Methods: A national insurance database was queried for patients who underwent THA following ipsilateral hip injection. Three cohorts were created: THA within 3 months of injection (n = 829), between 3 and 6 months after injection (n = 1,379) and between 6 and 12 months after injection (n = 1,160). A control group of THA without prior injection was created for comparison purposes (n = 31,229). The rate of postoperative infection was compared between injection cohorts and control THA using Pearson $\chi 2$ analysis, with $P < 0.05$ considered significant.

Results: The cohorts were similar in terms of gender, age group, smoking status and Charlson Comorbidity Index. The incidence of infection after THA at 3 months (2.41%, OR 1.9, P = 0.004) and 6 months (3.74%, OR 1.5, P = 0.019) was significantly higher in patients who underwent hip injection within 3 months prior to THA compared to controls [Tables 1 and 2]. There were no significant differences in infection rates in patients who underwent THA between 3 - 6 or 6 - 12 months after ipsilateral hip injection compared to controls [Tables 1 and 2].

Conclusion: The present study suggests a significant increase in postoperative PJI in patients who underwent injection within 3 months prior to THA. This association was not noted when THA was performed more than 3 months after injection.

A Randomized Controlled Trial of Oral and IV Tranexamic Acid: The Same Efficacy at Lower Cost?

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Introduction: Tranexamic acid (TXA) is a synthetic antifibrinolytic agent successfully used intravenously (IV) to reduce blood loss following total knee arthroplasty (TKA). An oral formulation of the medication is available, at a fraction of the cost of the IV preparation. The purpose of this randomized controlled trial is to determine if oral TXA is equivalent to IV TXA in reducing blood loss in TKA.

Methods: In this double-blinded, placebo-controlled trial, 73 patients undergoing primary TKA were randomized to receive 1.95g of TXA orally two hours preoperatively or a 1g IV bolus prior to wound closure. The primary outcome was reduction of hemoglobin. Power analysis determined that 30 patients were required in each group to identify a 1.0g/dL difference between groups with an alpha of 0.05 and a beta of 0.90. Equivalence analysis was performed with pooled and Satterthwaite t-tests with a p-value of < 0.05 suggesting equivalence between treatments.

Results: 36 Patients received IV TXA, 32 oral and 5 were excluded for protocol deviations. Patient demographics were similar between groups suggesting successful randomization. There was no difference in the mean reduction of hemoglobin between the oral and IV groups (3.45g/dL vs 3.31g/dL respectively; $p<0.001$, equivalence). Similarly, total blood loss was equivalent for oral and IV administrations at 1267ml vs 1229ml respectively ($p=0.007$, equivalence). One patient in each treatment group was transfused, and no patients experienced a thromboembolic event.

Conclusions: Oral TXA provides equivalent reductions in blood loss in the setting of primary TKA, at a cost of $14 compared to $47 to $108 depending on the IV formulation selected. As approximately 700,000 primary TKA are performed in the United States annually, a switch to oral TXA could yield total cost savings of between $23 million and $67 million dollars per year for our health care system.

Conversion Total Hip Arthroplasty: Is it a Primary or Revision Hip Arthroplasty?

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Introduction: Total hip arthroplasty (THA) is an increasingly common procedure among elderly individuals. Although conversion THA is currently bundled in a diagnosis related group (DRG) with primary THA, no study has identified whether patients undergoing conversion THA better resemble patients undergoing primary THA or revision THA. The American College of Surgeons National Surgical Quality Improvement Project (ACS-NSQIP) database collects data from hospitals nationwide about preoperative characteristics, intraoperative factors, and 30-day postoperative complications. The purpose of our study was to use these variables in the ACS-NSQIP dataset to compare patients undergoing conversion THA to those undergoing primary and revision THA in order to ensure proper DRG classification of these procedures.

Methods: Between 2009-2014, the ACS-NSQIP database identified 2,009 conversion THA patients, 5,089 revision THA patients, and 67,854 primary THA patients. Univariate analysis was used to compare fifty-three preoperative, intraoperative, and postoperative variables among these groups. A conservative Bonferroni-adjusted p-value of 0.0003 was calculated, and a less conservative p-value of 0.01 was used for comparison.

Results: Seventeen variables exhibited a significant difference ($p \leq 0.0003$) only between conversion and primary THA, one variable exhibited a difference only between conversion and revision THA, and three variables exhibited a difference between both conversion and primary THA, and conversion and revision THA. With $p \leq 0.01$, twenty-three, zero, and six differences were observed, respectively.

Conclusion: The disproportionate number of differences between conversion and primary THAs suggests that patients undergoing conversion THAs better resemble patients undergoing revision THAs. DRGs are traditionally comprised of procedures that have similar diagnoses and require comparable levels of resources from a hospital, so these results suggest that conversion THA should rather be bundled in the same DRG as revision THA. With hospitals emphasizing cost-containment strategies, this reclassification would be a step forward in improving the documentation of procedures in order to receive appropriate institutional reimbursement.

Liposomal Bupivacaine and Peri-articular Injection are Not Superior to Single Shot Intra-articular Injection for Pain Control in Total Knee Arthroplasty

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Introduction: Liposomal bupivacaine has been shown to be effective in managing post-operative pain in hallux valgus and hemorrhoid surgery. However, non-industry-supported and well-powered randomized studies evaluating its efficacy in Total Knee Arthroplasty (TKA) are lacking. Our hypothesis was that liposomal bupivacaine would not decrease post- operative visual analog pain scores (VAS) or narcotic consumption in the acute post-operative period.

Methods: Two hundred seven consecutive patients were enrolled into a single-blinded prospective randomized study. We included patients undergoing unilateral TKA by five fellowship-trained surgeons with a diagnosis of osteoarthritis, rheumatoid arthritis, or post-traumatic arthritis. Patients were excluded for any other diagnosis necessitating TKA, allergy to the medications, or pre-operative opiate use. Participants received standardized pain management, anesthesia, and physical therapy. Patients were randomized intra-operatively to one of three groups: an intra-articular (IA) injection of bupivacaine and morphine at the conclusion of the procedure, a peri-articular (PA) injection of a bupivacaine and morphine, or a PA injection of liposomal bupivacaine. Post-operative pain VAS and mean morphine equivalents (MME) consumed were recorded and compared utilizing analysis of variance (ANOVA). A power analysis demonstrated that 159 patients were needed for 80% power to detect a 25% difference in VAS or MME.

Results: Patients in each study group had a mean VAS score of 3.95 (SD 2.1), 3.97 (SD 1.9). and 3.86 (SD 1.8) (p=0.94), respectively. MME consumed per day in each group was 100.7 (SD 48.4), 100.1 (SD 42.2), and 98.9 (SD 41.6) (p=0.97).

Conclusions: Liposomal bupivacaine does not alter mean pain scores or post-operative narcotic consumption in patients undergoing unilateral TKA. Further, no difference was noted in comparing patients who received a single IA injection vs. a PA injection. To our knowledge, this is the first reported study to evaluate post-operative pain control between identical IA and PA injections in patients undergoing unilateral TKA.

The Future Is Here: Bundled Payments and ICD10

Moderator: Richard Iorio, MD, NYU Langone Medical Center Orthopaedic Surgery
Speakers: Richard Iorio, MD NYU Langone Medical Center Orthopaedic Surgery
James Slover, MD NYU Langone Medical Center Orthopaedic Surgery
Stephen Murphy, MD New England Baptist Hospital

Description of Topical focus and Learning objective:
The Bundled Payment for Care Initiative (BCPI) was begun in 2013 by the Centers for Medicare & Medicaid Services (CMS). However, it may be years until the data can determine whether BPCI enhances value without decreasing quality. In this symposium, the authors report the mid-term results of BPCI and outline the challenges and benefits of their respective healthcare delivery systems as applied to the provision of total joint replacement.

Methods of care management, cost control, quality improvement, and value creation are emphasized. In this review we explore the effect of BPCI on the value equation as it is applied to total joint arthroplasty (TJA).

Under the BPCI, organizations entered into payment arrangements that include financial and performance accountability for episodes of care. BPCI required that quality was maintained, and care was delivered at a lower cost to Medicare. Bundled pricing requires physicians and hospitals to align their interests and orthopaedic surgeons must assume a leadership role in cost-containment, surgical safety, and quality assurance. Because most orthopaedic surgeons practice independently and are not hospital-employed, models of physician-hospital alignment such as physician-hospital organizations or contract arrangements between practices and hospitals may be necessary for bundled pricing to succeed. Under BCPI hospitals, surgeons, or third parties can assume the risk for the bundle.

For patients, cost savings must be associated with maintenance or improvement in quality metrics. How quality is defined and measured and what processes and outcomes are rewarded can vary. Risk-stratified allowances for non-preventable complications must be incorporated into bundled pricing agreements to prevent the exclusion of patients with significant comorbidities, and higher care costs, such as hip fractures treated with a prosthesis. Bundled pricing depends upon economies of scale for success. CMS recommends a minimum threshold of 100 to 200 cases per year within a bundle for successful risk management. Furthermore, significant investment in infrastructure is required to manage quality data, and to distribute payments. Bundled pricing may not be appropriate for smaller orthopaedic groups or hospitals.

Detailed DRG understanding for the models and which procedures are included in the DRG's selected is essential. The formula for successful implementation of a cost effective episode for primary TJA patients involved initially a three pronged approach: 1. Improved care coordination and preoperative education of patients to set expectations and maximize communication; 2. Clinical pathway implementation and standardization of care utilizing evidence based medicine standards that all clinical providers could be comfortable with; and 3. Minimization of post-acute care inpatient facilities when unnecessary and utilization of the more cost effective clinical care coordination infrastructure. However, there are nuances to the BPCI value equation that can optimize the success of the initiative.

This symposium reports the learned experience of those who have early results with BPCI and how they have been successful with the implementation of the initiative.

This symposium will also discuss ICD 10 implementation and how it will impact your practice as an adult reconstruction surgeon.

Prospective Comparison of Tranexamic Acid vs. a Bipolar Sealer in Reducing Blood Loss in Primary Total Knee Arthroplasty ◊

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Samreen Fathima, MPH, Irwin Gross, MD

Introduction: Total knee arthroplasty (TKA) bears risk of blood transfusion increasing complication rates, cost, and length of stay. Methods studied previously to reduce transfusions include tranexamic acid (TXA) and a bipolar sealer. Our center has nearly eliminated transfusions via pre-operative anemia management. We decided to test both of these tools to determine any effect on change in hemoglobin as a primary endpoint.

Methods: A four armed, double-blind, placebo controlled, prospective design was chosen. Groups included total knees with TXA or placebo and a bipolar sealer group with TXA or placebo. TXA was bolused 20 mg/kg IV and the bipolar sealer was used to "paint" the knee. Patients >18 undergoing primary TKA were included and excluded with adverse reaction to TXA, coagulation disorder, platelets < 100,000, history of DVT, PE,CVA, acquired defective color vision, renal insufficiency, or coronary stents. An estimated sample size of 35 per group provided 80% power to detect a difference of 0.5 g/dL comparing delta hemoglobin pre-op day of surgery to post-op day 2. Comparisons utilized one-way ANOVA and Fisher's least significant difference test for continuous variables, and Pearson's chi-square test for categorical variables. 127 patients ultimately provided the necessary statistical endpoint.

Results: The mean hemoglobin change from baseline to post-operative days 2 was significantly lower in both groups with TXA compared to the control group (P = 0.002). The group with the bipolar sealer alone showed no difference compared to control (P = 0.074).

Conclusions: The data show that mean hemoglobin drop is lowered by TXA following total knee arthroplasty. There was no significant change due to the bipolar sealer compared to control. Multiple modalities have been shown to reduce transfusions following total knee. This study supports the use of TXA in primary total knee arthroplasty and calls into question to efficacy of the bipolar sealer.

◊ The FDA has not cleared the pharmaceuticals and/or medical devices listed here. Traqnexamic acid

Tranexamic Acid Reduced Blood Loss but not Transfusion after Hip Arthroplasty for Femoral Neck Fracture: A Randomized Clinical Trial of 138 Patients ◊

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Introduction: Tranexamic acid (TXA) has been shown to limit blood loss and transfusion in elective hip arthroplasty, but there is limited data on its use in arthroplasty for femoral neck fracture (FNF). Our goal was to investigate the effects of intravenous (IV) TXA on patients undergoing hip arthroplasty for acute FNF. Specifically, we asked: 1) does TXA reduce calculated blood loss, 2) does TXA reduce the incidence of allogenic blood transfusion, and 3) are there any observable differences in 30- and 90-day complications with TXA administration?

Methods: We performed a prospective, double-blinded, randomized controlled trial wherein patients undergoing either hemi- or total hip arthroplasty for acute FNF were administered TXA vs. placebo at the time of surgery. Of 281 patients eligible for review, 138 were randomized to receive either IV TXA or placebo (69 patients in each group). There were more patients with coronary stents in the TXA group, but demographics, medical characteristics, and surgical specifics were otherwise similar between groups. Follow-up was available for all patients through 90-days. Data included calculated blood loss, transfusion requirement, hospital readmission, and 30- and 90-day complications.

Results: TXA was effective in decreasing mean calculated blood loss (305 ml less for patients in the TXA group (p=0.0005)). Fewer patients received transfusions in the TXA group (17%) when compared to the placebo group (26%), but this was not statistically significant (p=0.22). TXA was safe with no differences in adverse events at 30- and 90-days.

Conclusion: This randomized clinical trial found TXA was safe and effective in reducing blood loss, but could not show a difference in transfusion for patients undergoing hip arthroplasty for femoral neck fracture. Whether 305 ml decrease in blood loss with TXA is clinically important or if a larger cohort would find a significant difference in transfusion is worthy of further study.

◊ The FDA has not cleared the pharmaceuticals and/or medical devices listed here. Tranexamic Acid

Hypoalbuminemia Predicts Joint Infection, Pneumonia, and Readmission after Total Joint Arthroplasty

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Erdan Kayupov, BS, Craig J. Della Valle, MD

Introduction: Malnutrition is a potentially modifiable risk factor for complications following total joint arthroplasty (TJA). While prior studies have identified associations between malnutrition, delayed wound healing, and surgical site infection (SSI), few studies have investigated the relationship between malnutrition and other complications. The purpose of this study is to investigate the association between preoperative hypoalbuminemia, a marker for malnutrition, and complications during the 30 days following TJA.

Methods: Patients who underwent elective primary total hip and knee arthroplasty during 2011-2013 as part of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) were identified. Only patients with preoperative serum albumin concentration were included. Outcomes were compared between patients with and without hypoalbuminemia (serum albumin concentration<3.5g/dL). All associations were adjusted for demographic, comorbidity, and laboratory differences between populations.

Results: 49,603 patients were included. The prevalence of hypoalbuminemia was 4.0%. In comparison to patients with normal albumin concentration, patients with hypoalbuminemia had a higher risk for SSI (2.29% vs. 0.96%, adjusted relative risk [RR]=2.0, p<0.001) and pneumonia (1.27% vs. 0.30%, adjusted RR=2.5, p<0.001). Similarly, patients with hypoalbuminemia had a higher risk for occurrence of any complication (7.3% vs. 4.0%; adjusted RR=1.5, p<0.001) and occurrence of a serious complication (2.1% vs. 1.2%; adjusted RR=1.4, p=0.042). The rate of hospital readmission was higher for patients with hypoalbuminemia (6.3% vs. 3.5%; adjusted RR=1.4, p<0.001).

Conclusions: The present study provides evidence that malnutrition is an independent risk factor for SSI, pneumonia, occurrence of any complications, and occurrence of serious complications following TJA. This study also demonstrates that malnutrition is independently associated with increased readmission. Future efforts should investigate methods of correcting nutritional deficiencies prior to TJA. If successful, such efforts could lead to substantial improvements in short- term outcomes for patients.

Peri-articular Liposomal Bupivacaine Offers No Benefit over Bupivacaine in Total Knee Arthroplasty

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Introduction: Peri-articular injection of liposomal bupivacaine has been rapidly adopted in many centers as part of multimodal pain management after total knee arthroplasty (TKA). The purpose of this study was to compare the efficacy of liposomal bupivacaine to standard bupivacaine.

Methods: We enrolled 162 patients undergoing primary TKA in this prospective, randomized, double-blinded clinical trial. 88 patients were randomized to liposomal bupivacaine (experimental group) and 74 patients were randomized to standard bupivacaine (control group). Both groups received spinal anesthesia and otherwise identical surgical approaches, pain management and rehabilitation protocols. Patient-reported visual analogue pain scores (VAS, in mm), narcotic consumption and narcotic-related side effects within 96 hours after surgery were recorded. The Knee Society Score (KSS) and Short-Form 12 (SF-12) were recorded preoperatively and 4-6 weeks after surgery. The results were analyzed using Mann-Whitney-U test.

Results: There were no significant preoperative differences in demographics, comorbidities, pain and function scores between the groups. The respective median VAS scores for the experimental and control groups were day1-am: 29 vs. 35 (p=0.28), day1-pm: 33 vs. 33 (p=0.48), day2-am: 28 vs. 34 (p=0.66), day2-pm: 29 vs. 30 (p=0.54), day3: 24 vs. 29 (p=0.99), day4: 25 vs. 22 (p=0.98). There was no significant difference between the groups in overall narcotic consumption (105 vs. 94 mg, respectively p=0.99), narcotic-related side effects and functional outcomes at 4-6 weeks (KSS 75 vs. 63.5, respectively, p=0.81, SF-12 physical 36.7 vs. 37.3, respectively p=0.95; SF-12 mental 55.1 vs. 56.5, respectively, p=0.8). The cost of liposomal bupivacaine per case was $315 vs. $4.92 for standard bupivacaine.

Conclusion: Liposomal bupivacaine, in this prospective, randomized clinical trial, did not demonstrate superior efficacy to standard bupivacaine for the outcomes measured, especially given the cost differential. As a result of this study, we have discontinued use of this medication for TKA at our institution.

A Randomized Controlled Trial Comparing Adductor Canal and Intra-articular Catheters for Pain Management after Primary Total Knee Arthroplasty

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Introduction: There are multiple modalities of pain control after total knee arthroplasty (TKA). Peripheral nerve blocks, such as adductor canal catheters (ACC), reduce opioid consumption and have less quadriceps weakness compared to femoral nerve blocks. Intra-articular catheters (IAC) decrease pain in TKA patients compared to intravenous or intrathecal opioids while preserving quadriceps strength. To date, no randomized controlled trials have compared the efficacy of ACC and IAC in TKA patients.

Methods: After IRB approval, 66 primary TKA were randomized to receive intraoperative IAC (30 patients) or postoperative ACC (36 patients). The IAC group received a constant infusion of 0.5% bupivacaine at 4 ml/hr, while the ACC group received 0.2% ropivacaine at 10 ml/hr. The primary outcome was pain using a visual analog scale (VAS) measured during physical therapy (PT) on postoperative day (POD) 1. Secondary outcomes were opioid consumption at 24 and 48 hours, time spent in the postanesthesia care unit (PACU), sedation used, number of falls, length of stay, and opioid tolerance.

Results: Opioid consumption was significantly reduced in the ACC group compared to the IAC group at 24 hours (23.4mg±4.3 vs. 35.8mg±3.4, p=0.021) and 48 hours (31.7mg±5.6 vs. 47.2mg±5.5, p=0.047). VAS pain was significantly reduced in the ACC group measured prior to (3.1±0.4 vs. 4.4±0.4), during (4.6±0.4 vs. 5.5±0.4), and after (4.1±0.4 vs. 4.8±0.3) PT on POD 1 (p=0.046). There were no differences between groups with respect to age, body mass index, sedation used, falls, time spent in the PACU, length of stay, and opioid tolerance

Conclusions: ACC provided better pain control on postoperative day 1 prior to, during, and after TKA patients first physical therapy session compared to IAC. In addition, ACC significantly reduced oxycodone consumption at 24 and 48 hours. Although these data are preliminary, we have shown evidence supporting ACC use over IAC for TKA.

Can Short but Reliable Measures of Knee-specific Function be Constructed Using Item Response Theory?

Barbara Gandek, PhD, John E. Ware, PhD, Milena Anatchkova, PhD, Courtland Lewis, MD, Patricia Franklin, MD, MBA, MPH

Introduction: Patient-reported outcomes (PRO) data are important in evaluating total knee replacement (TKR), but knee- specific PRO measures need to be shorter for routine use in clinical care. To examine how knee-specific function might be measured using fewer questions, this study used item response theory (IRT) and computerized adaptive testing (CAT) methods to evaluate the 22-item Function in Activities of Daily Living (ADL) and Sport/Recreation measures from the Knee injury and Osteoarthritis Outcome Score (KOOS).

Methods: 1,179 randomly-selected TKR patients (mean age=66.1, 61% female) from five medical centers completed the KOOS before and 6 months after TKR. To represent a full range of functional states, one survey per patient (pre-TKR or post-TKR) was randomly selected for psychometric evaluation. IRT model assumptions of unidimensionality, item local independence and monotonicity were evaluated. All 22 function items were calibrated using the graded response IRT model. Item usage was evaluated with real-data CAT simulations.

Results: Analyses supported calibration of all function items. Full 22-item bank and simulated CAT scores correlated highly (r=0.96). Reliability of the full item bank was ≥0.95 (as recommended for individual patient monitoring) across a range from -2.5 standard deviations (SD) below to 1.7 SD above the combined pre-TKR/post-TKR mean. CAT scores with reliability ≥0.95 were achieved in 5-10 items for 96% of patients before TKR but only 66% post-TKR; patients for whom highly reliable CAT scores could not be estimated post-TKR generally had higher function. Eight ADL items accounted for the majority of CAT administrations; most Sport/Recreation items had low IRT information and were rarely selected by.

Conclusion: IRT and CAT methods allow knee-specific function to be measured efficiently but reliably at the individual patient and aggregate practice level, using only 5-10 questions. However, higher levels of function at six months in some TKR patients may not be reliably captured.

Preoperative Optimization of TJA Surgical Risk

Moderator: William Jiranek, MD
Speakers: William Milhalko, MD, PhD, Louis Stryker, MD,
Bryan Springer, MD, Greg Golladay, MD

Plan: The speakers will briefly review why their assigned risk factor is significant. They will then discuss how the risk factor is best assessed and monitored. Lastly, they will present "real life" techniques to modify these risks, and the timing of the intervention. The goal is to provide joint surgeons with information they can use immediately for their patients.

Schedule:

1. Obesity - **William Milhalko MD PhD (**Campbell Clinic - Univ. Tennessee)
    a. Risk assessment of the obese patient and associated comorbidities
    b. Is BMI or body habitus more important?
    c. How does risk increase with BMI?
    d. Patient activation and how to modify the risk factors involved

2. Diabetes - **Louis Stryker MD** (Univ Texas Galveston)
    a. Best measures of glucose control
    b. Type 1, Type II or Everyone?
    c. Preop through postop control
    d. Working with the Med doc

3. Nicotine - **Bryan Springer MD** (Ortho Carolina)
    a. All or none? Or middle ground?
    b. Measuring nicotine levels
    c. Off for how long?
    d. Cessation strategies

4. Malnutrition - **Greg Golladay MD** (Virginia Commonwealth Univ.)
    a. What labs to check?
    b. How to supplement?
    c. How long does it take?
    d. Nutritionally depleted patient – Day of Surgery

Is Avascular Necrosis a Genetic Disease? A Genome-wide Association Study

Cody C. Wyles, BS, Susan L. Slager, PhD, Matthew T. Houdek, MD, Atta Behfar, MD, PhD, Rafael J. Sierra, MD

Introduction: Previous research has suggested that a genetic predisposition or epigenetic sensitivity to steroids may exist for patients that develop avascular necrosis (AVN). To identify novel genetic markers associated with AVN susceptibility, we conducted a large genome-wide association study (GWAS).

Methods: Phase I included collection and genotyping of DNA from 88 patients with AVN (50 steroid-induced) and from 176 controls (100 with a positive high-dose steroid history) that were also matched on age, sex, BMI, and ethnicity. Phase II involved incorporating genotype data from previous GWAS studies at our institution which included 102 AVN cases (22 steroid-induced) and 4,125 controls (1,813 with a positive steroid history). Testing was performed to identify differentially expressed single nucleotide polymorphisms (SNPs) in the genome that correlated with disease.

Results: For the entire cohort of Phase I patients, 11 genes contained 2 or greater SNPs that were significant at the $p<10^{-5}$ level. For the steroid subcohort of Phase I patients, 39 genes contained 2 or greater SNPs that were significant at the $p<10^{-4}$ level. The gene PPAR-γ was identified in both cohorts and was the focus of subsequent analysis with Phase I and II combination data. PPAR-γ had 7 SNPs significant at the $p<10^{-4}$ level and 1 SNP significant at the $p<10^{-6}$ level for the combination data.

Conclusions: To date, this study provides the most comprehensive dataset investigating genetic and epigenetic markers of AVN. PPAR-γ demonstrated several alterations in AVN patients, which is notable given its role in musculoskeletal tissue differentiation as well as lipid metabolism. Furthermore, patients treated with thiazolidinediones for diabetes management, which acts on PPAR-γ, are prone to an AVN-like syndrome, further suggesting a potential role in disease pathophysiology. Subsequent to further validation, these results can serve as the basis for potential risk-stratification diagnostics and pharmaceutical development.

Economic Impact of Ketorolac vs. Corticosteroid Intra-articular Knee Injections for Osteoarthritis ◊

Siraj A. Sayeed, MD, Brandon J. Goff, DO, Jaime L. Bellamy, DO

Introduction: Knee osteoarthritis (OA) is a disabling disease that affects millions and costs billions of dollars to treat. Corticosteroid gives varying pain relief and costs $12 per injection while Ketorolac costs $2 per injection at our institution. The aim of this study was to compare Ketorolac to corticosteroid based on pain relief using patient outcome measures and cost data.

Methods: Thirty-five patients were randomized to Ketorolac or corticosteroid intra-articular knee injection in a doubleblind, prospective study. Follow-up was 24 weeks. OA was evaluated using Kellgren-Lawrence (KL) grading. Injections were performed under ultrasound guidance. Visual analog scale (VAS) was the primary outcome measure. Other validated patent outcome measures were compared. A query of the institutional database was performed for ICD-9 codes 715.16 and 719.46, and procedure code 20610 over a 3 year period. Two-way, repeated measures ANOVA and Spearman-Rank Correlation were used for statistical analysis.

Results: Mean VAS for Ketorolac and corticosteroid decreased significantly from baseline at two weeks, 6.3 to 4.6 and 5.2 to 3.6, respectively, and remained decreased for 24 weeks. Mean WOMAC score for Ketorolac and corticosteroid increased from baseline at 2 weeks, 49 to 53 and 53 to 68, respectively. There was no significant difference in KS, SF-36, TL, and UCLA scores among Ketorolac or corticosteroid throughout the 24 weeks. There were 220, 602 and 405 injections performed on patients with the ICD-9 codes 715.16 and 719.46 during 2013, 2014 and 2015, respectively. The cost savings per year using Ketorolac instead of corticosteroid would be $2,259.40, $6,182.54 and $4,159.35 for 2013, 2014 and 2015, respectively, with a total savings of $12,601.29 over this time period.

Conclusion: Pain relief was similar between Ketorolac and corticosteroid injections. Ketorolac knee injection is safe and effective with a cost savings percentage difference of 143% when compared to corticosteroid.

◊ The FDA has not cleared the pharmaceuticals and/or medical devices listed here. Ketorolac Tromethamine

Average 10 Year Results of the Bernese Periacetabular Osteotomy for Severe Acetabular Dysplasia

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Gail Pashos, BS, Geneva Baca, BA,
Perry L. Schoenecker, MD, John C. Clohisy, MD

Introduction: The Bernese periacetabular osteotomy (PAO) has been shown to be effective in reducing the symptoms of acetabular dysplasia. For patients with severe acetabular dysplasia with subluxation of the femoral head or presence of secondary acetabulum, surgical realignment procedures remain controversial and the efficacy of acetabular reorientation has been questioned. The purpose of this study was to analyze the average 10 year clinical and radiographic results of the PAO in the treatment of adolescent and young adult patients with symptomatic, severe acetabular dysplasia.

Methods: This retrospective study reviewed patients who underwent a PAO for severe acetabular dysplasia as defined by Lateral center edge angle (LCEA) < 5°. All patients had hip pain and sufficient hip joint congruency on radiographs to be candidates for PAO. Clinical data collected included patient demographics, radiographic measurements, and modified Harris Hip score.

Results: The hip preservation database of one of the authors was queried and 40 patients (47 hips) were identified who had been treated with a PAO for severe acetabular dysplasia. 28 females and 12 males with average age of 22.2 years (range, 11-60) and BMI 23.5 kg/m2 were followed for an average of 128.5 months (range, 86-199). LCEA improved 29.0° on average (from -6° to 26.1°, $p<0.001$) and Acetabular center edge angle 26.7° on average (from -3.8° to 22.7°, $p<0.001$). MHHS improved an average of 16.4 points (from 66.9 to 82.6, $p<0.01$). Two hips (9.1%) required conversion to total hip arthroplasty and three required revision PAO (13.6%). One patient (5.3%) died of causes unrelated to PAO surgery.

Conclusions: The PAO can be an effective treatment for severe acetabular dysplasia. Our clinical and radiographic outcomes demonstrate improved hip function and major deformity correction. These data indicate favorable 10 year outcomes for the majority of patients treated with PAO for severe acetabular dysplasia

Femoral Morphology in Acetabular Dysplasia: Are Cam-lesions Common?

Lucas Anderson, MD, Jill A. Erickson, PA-C,
Russell P. Swann, MD, Ian McAlister, MD,
Mike B. Anderson, MSC, Rafael J. Sierra, MD,
Christopher L. Peters, MD

Introduction: Controversy exists regarding the true prevalence of cam-like deformity in the setting of acetabular dysplasia. We hypothesized that classic dysplasia hips (anteverted) would have a low prevalence of associated cam morphology.

Methods: We retrospectively reviewed 204 patients (229 hips) that had undergone PAO from two institutions. Preoperative AP and frog-lateral radiographs were analyzed for LCEA, alpha angles, anterior-offset and retroversion. Hips were classified as dysplastic (LCEA<20°, group A, n=168), borderline dysplastic (LCEA 20°-25°, group B, n=36) and other (LCEA>25°, group C, n=25). There were 150 females and 54 males with an average age of 28 years (range 13-56).

Results: LCEA was a mean 7°(range, -33° – 19°) for group A, 22° (range 20°– 25°) for group B and 32° (range 26°-46°) for group C. Mean alpha angle was 44° (range, 19° – 72°) for group A, 46° (35° – 78°) for group B and 48° (25° – 76°) for group C. Mean anterior offset was 11 mm (95% CI, 11mm – 11mm) for group A, 10mm (95% CI, 9mm – 12mm) for group B and 10mm (95% CI, 9mm – 11mm) for group C. 9% of group A femora had an alpha angle >55°. Prevalence of cam FAI (alpha angle >55°) for group B was 11% and 16% for group C. Retroversion was present in 11%, 52% and 88% in groups A, B and C respectively ($p<0.001$).

Conclusion: Prevalence of true Cam lesions in dysplastic hips having undergone PAO is less than the general population. Although flattening of the femoral head-neck junction is common, and likely associated with common valgus deformity and typically within the sphere of the alpha angle measurement; therefore, the pathomechanics of this deformity likely differs substantially from typical cam-impingement without associated acetabular dysplasia. Careful radiographic measurement should be performed to avoid over-treating these hips with unnecessary osteochondroplasty procedures.

When Hip Scopes Fail, They Do So Quickly

John J. Callaghan, MD, Nicholas Bedard, MD, Andrew Pugely, MD,
Christopher Martin, MD, Robert Westermann, MD,
Kyle Duchman, MD, Yubo Gao, PhD

Introduction: Rates of hip arthroscopy have been on an exponential rise over the last decade. The purpose of this study was to evaluate the rate of subsequent THA following hip arthroscopy and determine how soon after hip arthroscopy THA was performed.

Methods: The Humana Inc. administrative claims dataset was reviewed from 2007-2014 for all patients undergoing hip arthroscopy. This represents 16 million covered lives. Patients who underwent hip arthroscopy were identified using CPT codes and laterality modifiers for left and right hip arthroscopy. Patients were then tracked overtime for the occurrence of an ipsilateral THA. Rates of subsequent THA were then determined and time to subsequent THA was determined within 6 month intervals. Records without laterality designation were excluded.

Results: There were 1,305 patients that underwent hip arthroscopy in this dataset. Top three largest age groups for hip arthroscopy patients were: 40-44 (11.4%), 35-39 (10.4%) and 45-59 years (9.8%). Tracking of patients revealed 67 (5.1%) patients that had a hip arthroscopy went on to a subsequent ipsilateral THA within the time constraints of the dataset. Of the subsequent THA, 37.3% occurred within 6 months of hip arthroscopy and 85.1% had occurred within 18 months. 100% of subsequent THA occurred within 48 months of initial hip arthroscopy.

Conclusions: 5.1% hip arthroscopies (67 of 1,305 patients) went on to require subsequent THA during the time period included in this dataset. The time interval to conversion to THA was 37.3% at 6 months, 59.7% at 12 months, 85.1% at 18 months and 91% at 24 months. This data suggests that when hip arthroscopy fails, it fails relatively soon after the procedure. These results provide a needed understanding of rates and timing of THA after hip arthroscopy and serve as an important baseline as rates of hip arthroscopy continue to significantly increase.

Hip Arthroscopy Failure in the Setting of Acetabular Dysplasia: A Concerning Trend?

Tonya An, BS, **Jacob Haynes, MD,** Jeffrey Nepple, MD,
Anchor Study Group, John C. Clohisy, MD

Introduction: Despite the success of hip arthroscopy, evidence suggests that arthroscopy alone is inadequate for treatment of conditions such as acetabular dysplasia (AD) due to its failure to correct structural deformity. Our objective was to define the incidence of failed hip arthroscopy in patients with symptomatic AD requiring periacetabular osteotomy (PAO). We secondarily analyzed the patient and structural characteristics of the failed arthroscopy cases.

Methods: Utilizing a prospective, multicenter joint preservation database, we identified a cohort of patients from 2009- 2014 who underwent PAO after a single prior ipsilateral hip arthroscopy. A comparison cohort of PAO patients without prior arthroscopy was isolated. Demographic and radiographic data were summarized for each group. We compared the proportion of PAO after failed hip arthroscopy between the beginning and end of the study period by 2-tailed z-test.

Results: One hundred twenty-six patients had arthroscopic hip surgery prior to PAO, while 1297 patients underwent PAO without prior hip arthroscopy. The proportion of PAO procedures after previous ipsilateral hip surgery stayed constant (15- 20%); however, the rate of PAO after previous hip arthroscopy increased from 4% in 2009 to 10% in 2014 ($P=0.009$). Female sex, increased average LCEA and ACEA, and decreased acetabular inclination were associated with failed hip arthroscopy ($P<0.01$).

Conclusion: Our data illustrates an increase in the rate of PAO after previous hip arthroscopy over the past six years. While the rate of PAO following previous ipsilateral surgery remains constant, an increasing proportion of those previous procedures are failed hip arthroscopies. Additionally, we identified mild dysplastic features and female sex as characteristics associated with failure of hip arthroscopy. Our findings raise concern that isolated hip arthroscopy is being increasingly utilized in patients with acetabular dysplasia. These trends highlight the need for refined surgical indications for hip arthroscopy and further investigation into its impact on subsequent surgeries.

Outpatient Arthroplasty

Moderator: Michael Bolognesi, MD
Speakers: Michael E. Berend, MD, Michael Bolognesi, MD,
William Hamilton, MD, Jason Hurst, MD

We plan to educate the attendee on the current status of outpatient arthroplasty. We will define the required resources for doing this safely as well as clarify the required pre-operative risk stratification and clearance protocols for patients being considered for this approach. The attendee should understand how to identify these patients based on the material presented. We plan to discuss the difference between hip and knee patients in the outpatient setting as well as the anesthetic techniques required for care delivery in this setting. This discussion will include an explanation of the multimodal pain management that must occur in the peri-operative period in the facility and at home. We will discuss the associated medical issues that can arise in these patients and how they can be minimized. The attendee should understand all of the key issues associated with outpatient arthroplasty not limited to these medical considerations or the changes in practice that are required. We will also include education on what needs to happen to safely get the patients home as an outpatient. This should include the use of a team approach and this symposium will identify all of the key personnel that must play a role. We plan to make great effort to avoid overlap of key concepts across our Faculty and make sure that our symposium covers all of logistical considerations that an orthopaedic surgeon needs to be aware of.

Topic #1: Outpatient Arthroplasty: Patient Selection and Optimization Is the Key
Michael E. Berend, MD

Topic #2: Pain Management and Outpatient Arthroplasty
Michael Bolognesi, MD

Topic #3: Perioperative and Postoperative Management: Anesthesia,
Blood Management and Medical Issues
William Hamilton, MD

Topic #4: How Do You Get the Patients Home Safely? A Team Approach
Jason Hurst, MD

Safe Selection of Outpatient Joint Replacement Patients with Medical Risk Stratification: The "OARA Score"

R. Michael Meneghini, MD, Mary Ziemba-Davis, BA,
Marshall K. Ishmael, BS, Alex L. Kuzma, MD, Peter P. Caccavallo, MD

Introduction: While there is substantial interest in outpatient joint replacement, risk stratification and patient selection criteria currently are crude and unreliable in the ambulatory setting. The objective of this study was to assess the validity of a medically-based risk stratification score in selecting patients for outpatient joint replacement surgery.

Methods: A retrospective review of consecutive patients who underwent primary hip and knee arthroplasty in a highvolume academic practice with an early discharge program was performed. Patients underwent risk-assessment by a perioperative medical specialist. An Outpatient Arthroplasty Risk Assessment Score ("OARA Score") was developed to risk-stratify patients for outpatient joint replacement with categories of "low risk/appropriate" (0-59) and "high risk/not appropriate" (>59). OARA and ASA classification scores were calculated for all patients. Statistical analysis was performed to correlate scores with early discharge and to evaluate readmissions.

Results: 720 patients had a mean age of 62.2 years and mean BMI of 32.2. Mean OARA Scores for patients discharged the same day or the day after surgery were 27.3 and 26.3, respectively; versus mean OARA Scores of 42.8 and 58.4 for days two and three, respectively ($p < 0.005$). The positive predictive value of the OARA Score was 84.3% for same or next day discharge, compared to 56.2% for the ASA classification score. All cause readmission rates in this early discharge program were 0.0% for same day discharge compared to 2.6% for next day ($p = 0.083$) and 3.1% for day two or later ($p = 0.009$) discharges.

Conclusions: The OARA Score is a valid medical risk-stratification tool, accurately predicting the ability to undergo total joint arthroplasty in a same day or 23-hour outpatient program. The OARA Score has more precise predictive ability than the ASA classification with respect to early discharge with low all cause readmission rates. Significance: Accurate medical risk-stratification is an essential component of safe patient selection for outpatient joint replacement. The OARA Score is a valid tool that facilitates the assessment of patient appropriateness for hip or knee arthroplasty in the outpatient or ambulatory setting.

Comparing Primary Total Hip Arthroplasty Post-discharge Care Duration, Costs, and Outcomes

Karthikeyan Ponnusamy, MD, Zan Naseer, BS, Anne Kuwabara, BS, Mostafa El Dafrawy, MD, Louis Okafor, MD, Clayton Alexander, MD, Robert Sterling, MD, Richard Skolasky, DSc, Harpal S. Khanuja, MD

Introduction: Given Medicare's push to bundle post-discharge care with total hip arthroplasty (THA) payments, we sought to measure the duration and costs of post-discharge extended care facility (ECF) and home healthcare (HH) utilization and its impact on readmissions. We hypothesized ECF discharges would have higher costs and be independently associated with readmissions.

Methods: We conducted a retrospective cohort study of the 100% 2008 Medicare Provider Analysis and Review database, and identified primary THA patients by ICD9 codes and excluded fractures/ER admissions to select for elective cases. Patients discharged to an ECF (48,642 patients) were compared with HH (47,670 patients). Descriptive statistics of demographics, comorbidities, duration and costs of post-discharge care, and 60 day readmission and mortality rates were calculated. Multivariate logistic regression models of the association of discharge disposition with readmission and mortality were determined.

Results: Compared to HH, ECF patients were older (75.7 vs 70.9 years, $p<0.0001$) and more likely female (70.52% vs 55.13%, $p<0.0001$). ECF patients had longer (3.9 vs 3.5 days, $p<0.0001$) and costlier hospital stays ($47,775 vs $46,645, $p<0.0001$). Mean ECF length of stay was 18.4 days (standard error 0.1) and cost $11,423 (standard error $48). Of the ECF patients, 22.43% needed HH after ECF discharge for another 28.4 days and cost of $2,364. Whereas HH patients utilized services for 25.1 days (standard error 0.31) and cost $2,251 (standard error $29). At 60 days from discharge, ECF patients had greater readmission (11.99% vs 6.96%, $p<0.0001$) and mortality rates (0.67% vs 0.18%, $p<0.0001$). ECF discharge is an independent risk factor for 60 day readmissions (OR 1.7, 95%CI 1.7-1.8) and mortality (OR 2.8, 95%CI 2.2-3.6).

Conclusion: Discharge to ECF leads to greater costs and is independently associated with greater 60 day readmissions and mortality. Given post-discharge care accounts for 20% of costs, care pathways need to be re-examined.

We Can Safely Reduce the Utilization of Home Visiting Nurse Services Following Primary Total Joint Arthroplasty

Danielle Y. Ponzio, MD, Andrew G. Park, MD,
Suneel Bhat, MD, **James J. Purtill, MD**

Introduction: Home visiting nurse services (HVNS) in the post-acute care period following total joint arthroplasty are considered a way to facilitate shorter length of stay (LOS), increase the rate of discharge to home, and decrease complications, readmissions, and cost. Our purpose is to evaluate the value of HVNS as compared to discharge to home without services.

Methods: This is a single surgeon series of 509 primary total hip (THA, n=262) and knee (TKA, n=247) arthroplasty patients over one year at a single institution. For the first six months, patients were discharged home with HVNS, and for the second six months, they were discharged home without HVNS. During the first six-month period, 88.3% of patients were discharged home with no interim rehab transfer, 81.7% with HVNS. During the second six-month period, 95% were discharged home, 3.6% with HVNS. A retrospective analysis compared discharge disposition, LOS, discharge to home rate, complications, reoperations, readmissions, patient satisfaction, and number of office phone calls for the periods with (n=230) and without (n=279) HVNS. Costs were analyzed with Monte Carlo simulation of a decision tree developed from derived probabilities.

Results: The complication rate was similar (3.9% with- vs. 2.9% without-HVNS, $p = 0.62$) except a higher rate of TKA manipulation under anesthesia with HVNS (2.2% vs. 0.4%, $p=0.096$). Weekly office phone calls decreased (11.7 ± 2.6 vs. 9.0 ± 0.7, $p < 0.001$). Patient satisfaction was equivalent. Eliminating HVNS resulted in savings of $1177 per THA and $1647 per TKA, which represents a national annual savings of $341,937,571 for THA and $1,008,209,023 for TKA.

Conclusions: HVNS do not seem necessary after routine primary TJA. Complications, readmissions, and patient satisfaction were equivalent with or without HVNS suggesting overall cost savings (over $1.3 billion annually in the U.S.) with no compromise of patient care by elimination of HVNS.

Risk Reduction Efforts Do Not Decrease 30-day Primary Hip and Knee Readmissions for Disadvantaged CMS Patients

James A. Keeney, MD, Denis Nam, MD, Staci R. Johnson, MEd, Ryan M. Nunley, MD, John C. Clohisy, MD, Robert L. Barrack, MD

Introduction: We performed this study to assess the influence of minority or low socioeconomic status on responsiveness to protocols intended to reduce surgical complications and 30-day hospital readmission rates following TKA and THA.

Methods: After obtaining IRB approval, we retrospectively identified 156 THA (3.8%) and 138 TKA (4.1%) 30-day readmissions from 4,131 THA and 3,372 TKA procedures (2006-2013). The cohorts were subdivided into two groups relative to service-wide protocol changes initiated in 2010. Univariate analysis was used to compare readmission rates among minority and low socioeconomic groups before and after the initiation of risk-reduction initiatives. Multivariate stepwise logistic regression analysis was performed to assess the relative impact of patient demographic characteristics on 30-day readmission rates.

Results: 30-day THA readmission risks remained higher among minority patients (6.1% vs 3.0%, $p<0.01$), socioeconomically disadvantaged patients (6.5% vs 2.6% $p<0.001$), and socioeconomically disadvantaged minorities (10.4% vs 3.3%, $p<0.01$) than their respective counterparts after engagement of protocols. Higher 30-day TKA readmission rates were noted among socioeconomically disadvantaged patients (4.6% vs 1.8%, $p=0.02$), but not among minority patients (3.5% vs 2.8%, $p=0.12$). Higher 30-day readmission rates were associated with skilled nursing facility discharge (O.R. 3.3, 95% CI 2.4 – 4.5), Medicaid Insurance (O.R. 2.8, 95% CI 2.0 – 3.8), categorical BMI < 20 kg/m2 (O.R. 2.3, 95% CI 1.4 – 3.8), Medicare Insurance (2.2, 95% CI 1.8 – 2.7), African American race (O.R. 2.1, 95% CI 1.7 – 2.6), and low socioeconomic status, defined by Medicaid or Medicare status before 65 years of age (O.R. 2.0, 95% CI. 1.6-2.4).

Conclusion: Initiatives designed to reduce wound-related surgical complications effectively decreased 30-day TKA readmission rates, but were less effective for THA patients in a racial minority or low socioeconomic group. Risk models should consider their proportionally higher risks to avoid indirectly decreased access for these CMS beneficiaries.

Medicare's Hospital Acquired Conditions Policy: A Problem of Non-Payment After Total Joint Arthroplasty

John J. Callaghan, MD, Andrew Pugely, MD,
Christopher Martin, MD, Nicholas Bedard, MD,
Kyle R. Duchman, MD, Jacob Elkins, MD, PhD, Yubo Gao, PhD

Introduction: In 2008, CMS adopted a policy of non-payment for inpatient Hospital Acquired Conditions (HACs), but the epidemiology of HACs after Total Joint Arthroplasty (TJA) has not been explored. The purpose of this study was to explore the incidence of, risk factors for, and national costs of HACs after TJA.

Methods: The 2007 – 2011 Nationwide Inpatient Sample (NIS) was queried for patients undergoing elective THA/TKA. International Classification of Disease-9th Revision (ICD-9) codes were used to define diagnostic groups of THA/TKA and the presence or absence of HACs. The CMS HAC definitions were used, and each was identified using ICD-9 codes. Bivariate analysis was used to compare patient, case, and hospital characteristics in those with and without a HAC, and multivariate analysis was used to identify independent risk factors.

Results: 2.6 million cases of TJA were identified between 2007 and 2011. Of those, 69.2% were TKA and 30.8% THA. The incidence of HACs was 1.3% (34,375) for TKA and THA. The top three reasons for HAC were DVT/PE (47.2%), fracture/dislocation (37.5%), and surgical site infection (10.6%). Risk factors for HAC included, advanced age, female gender, lower income level, and pulmonary circulatory disorders ($p<0.005$ for all). In TJA patients, the average hospital LOS (3.2 vs 5.7 days, $p<0.001$), and mean hospital costs ($17,676 vs $24,102, $p < 0.001$) were significantly higher in patients experiencing a HAC. Over the 5 years period, HACs resulted in a potential hospital payment loss of greater than $200 million in reimbursements.

Conclusions: The incidence of HAC after TJA is low, but not insignificant at 1.31%. Patients with HAC incur almost twice the hospital LOS, and 30% higher costs. Non-payment for HAC has financial implications. Surgeons and other stakeholders should use this data to better understand the implications of HACs at their institution and work towards minimizing occurrence.

Differences in Hospital Billing for Total Joint Arthroplasty Based on Hospital Profit Status

Brett M. Hall, MD, Susan M. Odum, PhD,
Thomas K. Fehring, MD, Louis S. Stryker, MD

Introduction: Regional variations in hospital billing for total joint arthroplasty (TJA) have been previously reported. It is unclear however, what differences exist in hospital charges for TJA based on hospital profit status.

Methods: CMS Inpatient Provider Utilization and Payment Data were used for Medicare Severity Diagnosis Related Group (MS-DRGs) 469 (Major Joint Replacement with Major Complicating or Comorbid Condition) and 470 (Major Joint Replacement without Major Complicating or Comorbid Condition) for the fiscal year 2011 were analyzed. Generalized estimating equations (GEE) were used to determine the association of hospital profit status (Non-profit, Government supported, and Proprietary) with CMS charges and payment controlling for census region, MS-DRG, and total number of discharges. Due to nonnormality, charges and payments were log-transformed and inflation adjusted using the Consumer Price Index 2011 factor of 1.043491791.

Results: Data from 932 hospitals was available for DRG 469 and 2,750 hospitals for DRG 470. Significant differences in billing between institutions existed with median average hospital charges for non-profit, government, and proprietary institutions being $70,513.96, $73,541.13, and $113,204.25 ($p<.0001$) respectively for DRG 469 and $45,363.72, $44,956.76, and $62,714.90 ($p<.0001$) respectively for DRG 470. Median average CMS payments for non-profit, government, and proprietary institutions for DRG 469 were $22,333.85, $21,346.71, and $21,280.97 ($p=.017$) respectively and $14,461.75, $14,465.93, and $13,733.40 ($p<.0001$) respectively for DRG 470. Multivariate analyses indicate that nonprofit hospitals charge 5% more ($p=.021$) and receive 3% less ($p=.011$) payment compared to Government hospitals. Proprietary hospitals charge 34% more ($p<.0001$) and receive 7% less ($p <.0001$) payment compared to Government hospitals.

Conclusion: Significant differences in hospital charges based on institution profit status were found, with proprietary institutions charging significantly more than non-profit and government supported institutions. However, proprietary institutions had the lowest median average reimbursement. The reasoning behind the billing practices of hospital charging 4-5 times their expected reimbursement remains unclear.

Corrosion at the Head-Neck Junction: Why is the Happening Now?

Joshua J. Jacobs, MD, H. John Cooper, MD,
Young-Min Kwon, MD, Adolph V. Lombardi, MD

Corrosion at metal/metal modular interfaces in total hip arthroplasty was first described in the early 1990's [1], and the susceptibility of modular tapers to mechanically assisted crevice corrosion (MACC), a combination of fretting and crevice corrosion, was subsequently introduced [2]. Since that time, there have been numerous reports of corrosion at this taper interface, documented primarily in retrieval studies or in rare cases of catastrophic failure. It has been known that fretting corrosion at the modular taper may produce soluble and particulate debris that can migrate locally or systemically [3], and more recently there are increasing reports that this process can cause clinically relevant adverse local tissue reactions [4,5]. Based on the characteristics of this tissue reaction and the presence of elevated serum metal levels, this process appears quite similar to adverse local tissue reactions secondary to metal on metal bearing surfaces [6]. This symposium will address factors that contribute to this phenomenon, prevention strategies and tips for diagnosis and management.

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4. *Corrosion at the Head-Neck Taper as a Cause for Adverse Local Tissue Reactions After Total Hip Arthroplasty.* John Cooper, H., C.J. Della Valle, R.A. Berger, M. Tetreault, W.G. Paprosky, S.M. Sporer, and J.J. Jacobs, The Journal of Bone & Joint Surgery, 2012. 94(18): p. 1655-1661.

5. *Adverse Local Tissue Reactions Arising from Corrosion at the Neck-Body Junction in a Dual Taper Stem with a CoCr Modular Neck.* Cooper, H.J., R.M. Urban, R.L. Wixson, R.M. Meneghini, and J.J. Jacobs, The Journal of Bone & Joint Surgery, 2013. 95:865-872.

6. *Early failure of metal-on-metal bearings in hip resurfacing and large-diameter total hip replacement A CONSEQUENCE OF EXCESS WEAR.* Langton, D.J., S.S. Jameson, T.J. Joyce, N.J. Hallab, S. Natu, and A.V.F. Nargol, Journal of Bone and Joint Surgery-British Volume, 2010. 92B(1): p. 38-46

The Effect of the Medicare 3-day Rule on Patient Length of Stay and Disposition after Total Hip Arthroplasty

Victor H. Hernandez, MD, Michele D'Apuzzo, MD, Zachary D. Post, MD, Fabio Orozco, MD, Alvin Ong, MD, James A. Browne, MD

Introduction: Medicare will only cover a stay in a skilled nursing facility if it follows a hospital inpatient stay of at least 3 days. The 3-day rule was instituted in 1965 to prevent excessive utilization of the skilled nursing benefit. Our objective was to describe the trend in post-operative disposition of patients undergoing primary total hip replacement (THA) in the past 10 years. In addition, we compared the length of stay and inpatient cost between Medicare patients and those with private insurance.

Methods: We queried the Nationwide Inpatient Sample database for patients with a history of primary THA over the period of 2002- 2011. The data was weighted to allow national estimates. Only patients that had elective admissions, unilateral, primary THA, and a primary diagnosis of OA were included. Changes in demographics, hospital stays, disposition, and insurance were evaluated. Patients were matched based on age, gender, Elixhauser comorbidities (30 total), and chronic heart disease.

Results: A total of 1,946,006 procedures were estimated in the period 2002 to 2011. The change in patients discharged on day 1 went from 3% to 5.5% in the private group and from 1% to 1.9 %in the Medicare group. The percentage of patients not discharged until the 3rd day remained unchanged in the private group (49 to 51 %) while for Medicare patients it went from 49 to 57%.

Conclusions: The change in disposition associated with rapid recovery protocols after THA has been realized mostly in patients with private insurance. In contrast, the number of Medicare patients staying longer after THA has increased. This increase may likely be due to the Medicare 3-day rule. As the Medicare population increases in age, and are more likely to require inpatient rehabilitation after THA, revision of this rule is critical to increase the cost effectiveness of THA.

What is the Natural History of "Asymptomatic" Pseudotumours in MoM THA? Minimum 4-year MARS MRI Longitudinal Study

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Tsung-Yuan Tsai, PhD, Guoan Li, PhD,
Andrew A. Freiberg, MD, Harry E. Rubash, MD

Introduction: MARS MRI is an important cross sectional imaging modality in detection of adverse local soft tissue reactions in patients with metal-on-metal (MoM) hip arthroplasty. However, a high prevalence (61%) of the so-called cystic pseudotumours in patients with well-functioning hip prostheses has been reported. Potential evolution or progression of pseudotumours detected by MARS MRI in 'asymptomatic' patients beyond 1 year remains unknown. The aims of this longitudinal study were to: 1) determine the natural history of pseudotumours; and 2) characterize MRI feature(s) associated with progressive pseudotumours.

Methods: A total of 37 MoM hips in 32 'asymptomatic' patients (24 M, 8 F) with a mean age of 56 years (range 40-71) with pseudotumours confirmed on MARS MRI, who have elected to be treated non-operatively, were evaluated longitudinally. Pseudotumour progression on MRI was evaluated based on comparison between the initial and the latest repeat follow up MARS MRI images. Serum cobalt and chromium levels were analyzed.

Results: At the minimum of 4-year follow up (range 48-51 months), 4 patients (13%) demonstrated MRI evidence of progression. 5 patients (15%) were found to have 'regressed'. There was no measurable MRI progression of pseudotumours detected in the remaining 23 patients (72%). MRI features associated with progressive pseudotumours included the presence of increased cystic wall thickness as well as 'atypical' mixed fluid signal. MRI progression was not associated with increased median serum metal ion levels over time.

Conclusion: This is the longest longitudinal study evaluating the natural history of cystic pseudotumours detected by MARS MRI in the 'asymptomatic' patient population with contemporary MoM hip implants. At minimum 4 years follow-up, the natural history of predominantly cystic pseudotumours continue be non-progressive in the majority of 'asymptomatic' MoM patients, whereas the presence of MRI features of cystic wall thickening and heterogeneous fluid are associated with progressive pseudotumours.

National Trends in Bearing Surface Usage of Primary Total Hip Arthroplasty in Extremely Young Patients From 2009-2012

Sean Rajaee, MD, Raminta V. Theriault, MS, Mary E. Pevear, BA, **Eric L. Smith, MD**

Introduction: The ideal bearing surface for primary total hip arthroplasty (THA) in young patients remains a debate. Data on recent national trends is lacking. A 2006-2009 study found that hard-on-hard bearing surfaces (metal-on-metal (MoM)), (ceramic-on-ceramic (CoC)) were used more frequently in younger patients than hard-on-soft surfaces (metal-on- polyethylene (MoP)), (ceramic-on-polyethylene (CoP)). Despite the potential for superior longevity, hard-on-hard surfaces are associated with notable complications. The purpose of this study was to present the national epidemiology of bearing surface usage between 2009-2012 for THA performed in patients 30 and younger.

Methods: Using the Healthcare-Cost-and-Utilization-Project Nationwide Inpatient Sample for 2009-2012, 9,265 primary THA discharges (4,210 coded by bearing surface) were identified in patients 30 and younger. The prevalence of each surface type was analyzed along with patient and hospital demographic data. Statistical analysis was performed using SAS (SAS version 9.1.; SAS, Inc., Cary, NC) Significance was set for $p<0.05$.

Results: CoP was most commonly used, representing 35.6% of cases, followed by MoP (28.0%), MoM (19.3%) and CoC (17.0%). Hard-on-hard (MoM and CoC) represented only 36.4% of cases, a significant decrease from previous findings where hard-on-hard was the majority (62.2%) ($p<0.05$). Hard-on-hard decreased from 2009 to 2012, (MoM: 29.7% to 10.2%; CoC: 20.0% to 14.7%) while hard-on-soft (MoP and CoP) increased, especially CoP which saw the most significant increase from 25.7% in 2009 to 48.2% in 2012. A cost analysis revealed that CoP discharges were associated with higher hospital charges compared to other surface type discharges, with an average charge of $66,457 ($p<0.05$).

Conclusions: Bearing surface preference for young patients is changing rapidly. Use of hard-on-hard surfaces has decreased significantly in this population while CoP and MoP have become increasingly common. Decreased use of hard-on-hard surfaces likely represents the influx of reported complications including adverse local tissue reactions, acoustic changes and concerns for fracture. Determining the optimal bearing surface for young patients continues to be a challenge for orthopaedic surgeons as they weigh the risks and benefits of each.

The Effect of Flexural Rigidity, Taper Angle, and Contact Length on Fretting and Corrosion at the Head-neck Junction

Y. Julia Kao, MD, Chelsea N. Koch, BS,
Timothy M. Wright, PhD, Douglas E. Padgett, MD

Introduction: Although modularity at the head-neck junction in total hip arthroplasty (THA) allows for intraoperative adjustment of head size, neck length, and bearing surface, the presence of a modular junction creates a possible source of metal debris. Therefore, we sought to determine how (1) flexural rigidity, (2) taper angle, and (3) contact length affect fretting and corrosion at the head-neck junction.

Methods: 77 retrieved MoP THA components from 75 patients were obtained over a 10 year period at a single institution. The female taper of the heads and male trunnion of the stems were examined by two independent graders using an optical stereomicroscope and scored for fretting and corrosion (Goldberg et al. 2002). Trunnions were scanned using a noncontact 3D digitizer and dimensioned using Geomagic Qualify 12. Differences in continuous variables among tapers were assessed with Kruskal Wallis tests. When significant, post-hoc pairwise comparisons were performed with Mann- Whitney U tests with Bonferroni correction for multiple comparisons. Multivariable linear regression was used to assess the combined ability of contact length, rigidity, and taper angle to predict average stem fretting.

Results: Average stem fretting was inversely related to rigidity ($p = 0.002$) and taper angle ($p = 0.011$), while positively correlated to contact length ($p=0.008$). In multivariate models, contact length and rigidity predicted 21.5% of the variation in average stem fretting. Head taper fretting and corrosion and femoral stem trunnion corrosion were not associated with rigidity, taper angle, or contact length.

Conclusion: At the head-neck junction in THA, flexural rigidity of the femoral stem only affects the fretting visible on the stem trunnion. More rigid trunnions experienced less fretting, which suggests that fretting is predominantly a mechanically driven process.

Effect of Contamination on Torque Testing of the Taper Junction in Total Hip Arthroplasty

Ryan M. Palmer, DO, Laura Scholl, Gregg Schmidig, Hannah James, Jason Longaray, Brian S. Parsley, MD

Introduction: The advantages of a modular head-neck taper junction has established this technology as the mainstay in total hip replacement. However, the modular junction has the potential to create clinically significant corrosion. It is our hypothesis contamination is one of a series of variables that contributes to trunnion corrosion. We aim to evaluate the effect of contamination on the torque resistance of a CoCr head on a Ti-alloy trunnion.Methods 36 mm +0 CoCr femoral heads were tested with Ti6Al4V trunnions.

Methods: The samples were separated into Control, Gross Blood, Micro Blood, Gross Fat, and Micro Fat groups (n=5). The femoral heads were assembled onto the trunnions with a 2kN axial force. Dynamic torque testing was performed with an axial force of 2450 N and a cyclic torque of 0-5 Nm at a rate of 1Hz for 500 cycles. Static torque testing was then performed on the same specimen, maintaining an axial force of 2450N and rotating the trunnion 0.3 degrees/sec.

Results: Dynamic torque testing revealed two gross blood specimen which had slips of the taper, constituting failures. Static torque testing evaluated torque at 1 degree, with no significant differences. The control and micro blood groups had a larger steady state torque than the gross fat group ($p<0.05$) at 15 degrees.

Conclusions: We have found gross contamination, in the form of blood, provided for more slips of the taper when subjected to a dynamic torque. Slipping of the taper junction constitutes a failure, which could provide for increased micro-motion. Contamination showed no significant differences when evaluating the energy to statically rotate the specimen 1 degree. However, when the taper reaches a steady state torque at 15 degrees, we found significant variability in the gross fat group. We conclude contamination may contribute to increased micro-motion at the taper, and potentially corrosion production.

Does Taper Design Have an Effect on Taper Damage in Retrieved Total Hip Devices?

Genymphas B. Higgs, MS, Daniel M. MacDonald, MS, Antonia F. Chen, MD, MBA, Michael A. Mont, MD, Gregg R. Klein, MD, Matthew J. Kraay, MD, Jeremy L. Gilbert, PhD, Clare M. Rimnac, PhD, Steven M. Kurtz, PhD

Introduction: Taper design has been identified as a possible contributor to fretting corrosion damage at modular connections in THA systems but variations in as-manufactured taper interfaces may confound this analysis. This study characterizes taper damage in retrievals of two different taper sizes but comparable taper surface finishes and investigates if taper design is related to fretting and corrosion damage in the context of a multivariate analysis.

Methods: 252 CoCr femoral heads were identified in a collection of retrievals – 77 with Taper A and 175 with Taper B. Implantation time averaged 5.4 ± 6.0 years (range, 0 – 26 years) and the predominant revision reason was loosening (n=93). Explants were cleaned and analyzed using a 4-point semi-quantitative method. Step-forward multivariate linear modeling was used to identify factors affecting taper corrosion. Components were then selected to create two balanced cohorts, matched on the significant variables from the multivariate analysis.

Results: Implantation time ($p<0.001$), stem material ($p<0.001$), weight ($p<0.001$) and head offset ($p=0.001$) were identified as significant predictors of taper fretting and corrosion damage ($R2 = 0.48$). Based on these factors, twenty- three (23) components with Taper A were matched to the same number of components with Taper B to account for covariates between the two taper cohorts. No difference was found in damage score between the matched cohorts (median = 2 for both cohorts, $p=0.34$).

Conclusion: These results support the hypothesis that fretting and corrosion damage is insensitive to differences between the two taper designs, when controlling for significant covariates. Though this study is limited by the semi- quantitative nature of damage scoring and limited matched cohort size, the multivariate model derived explains almost half of the fretting corrosion damage we observed and is consistent with other studies identifying implantation time, material combination and head offset as contributing factors.

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Cross, Michael B., MD: 1 (Smith & Nephew); 3B (Acelity; Exactech, Inc; Intellijoint; Link Orthopaedics; Smith & Nephew); 5 (Smith & Nephew); 8 (Bone and Joint Journal 360; Journal of Orthopaedics and Traumatology; Techniques in Orthopaedics)

Curtin, Brian Matthew, MD: 2 (DePuy, A Johnson & Johnson Company); 3B (Iroko Pharmaceuticals; Johnson & Johnson); 8 (Clinical Orthopaedics and Related Research; European Journal of Orthopaedic Surgery and Traumatology; Journal of Arthroplasty; Orthopedics); 9 (American Association of Hip and Knee Surgeons; American Joint Replacement Registry Review Commission; International Congress for Joint Reconstruction)

Dalury, David F., MD: 1 (DePuy, A Johnson & Johnson Company); 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 4 (Johnson & Johnson); 5 (DePuy, A Johnson & Johnson Company); 8 (Journal of Arthroplasty)

Davis III, Charles M., MD: 8 (Journal of Arthroplasty); 9 (AAOS; American Association of Hip and Knee Surgeons)

Deirmengian, Gregory K., MD: 2 (Zimmer); 3B (Synthes, Zimmer, Biomet); 4 (CD Diagnostics, Biostar ventures; Domain; Trice); 5 (CD Diagnostics; Zimmer); 7 (Journal of Bone and Joint Surgery - American); 8 (Journal of Arthroplasty)

Della Valle, Craig J., MD: 1 (Biomet); 3B (Biomet; DePuy, A Johnson & Johnson Company; Smith & Nephew); 4 (CD Diagnostics); 5 (Biomet; CD Diagnostics; Smith & Nephew; Stryker); 7 (SLACK Incorporated); 8 (Orthopedics Today; SLACK Incorporated); 9 (American Association of Hip and Knee Surgeons; Arthritis Foundation; Hip Society; Knee Society; Mid America Orthopaedic Association)

Dennis, Douglas A., MD: 1 (DePuy, A Johnson & Johnson Company; Innomed); 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 4 (Joint Vue); 5 (DePuy, A Johnson & Johnson Company, Porter Adventist Hospital); 8 (Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Clinical Orthopaedics and Related Research; Orthopedics Today)

Diaz, Claudio, MD: (n)

Duncan, Stephen Thomas, MD: 3B (Mitek; Smith & Nephew); 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons)

Fabi, David W., MD: 2 (Medtronic)

Goetz, Devon D., MD: 8 (Clinical Orthopaedics and Related Research); 9 (society for arthritic joint surgery)

Golladay, Gregory, MD: 1 (Orthosensor, Inc); 2 (Orthosensor, Inc.); 3B (Cayenne Medical, Inc; Orthosensor; Stryker); 4 (Orthosensor, Inc.); 5 (Orthosensor); 8 (Editorial Board, Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons; Medical Society of Virginia)

Della Valle, Alejandro Gonzalez, MD: 3B (Link Orthopaedics; Merz Pharmaceuticals; Orthodevelopment; Orthosensor)

Goyal, Nitin, MD: 3B (Cayenne Medical; Stryker)

Hansen, Erik Nathan, MD: (n)

Higgins, Michael E., MD: 3B (Biomet); 4 (Johnson & Johnson; Stryker)

Higuera Rueda, Carlos A.: 3B (Covidien; KCI); 5 (KCI; Myoscience; Stryker); 8 (American Journal of Orthopedics)

Hill, Derek L., DO: (n)

Hull, Jason Ray, MD: (n)

Keeney, James A., MD: 9 (Society of Military Orthopaedic Surgeons)

Kelley, Todd C., MD: (n)

Kissin, Yair David, MD: 2 (Ethicon; Pacira); 3B (Ethicon; Pacira); 8 (American Journal of Orthopedics; Knee Journal); 9 (AAOS, Adult Knee Committee)

Klatt, Brian A., MD: 6 (Cempra Pharmaceuticals); 7 (SLACK Incorporated; Saunders/Mosby-Elsevier,Operative Techniques in Orthopaedics); 8 (Journal of Arthroplasty); 9 (AAOS,AAHKS Abstract Review Committee)

Kolessar, David J., MD: (n)

Lang, Jason Edward, MD: 3B (Smith & Nephew); 5 (Smith & Nephew)

Levine, Brett Russell, MD: 3B (Link Orthopaedics; McGraw-Hill; Orthoview; Zimmer); 5 (Biomet; Zimmer); 8 (Human kinetics; SLACK Incorporated); 9 (American Association of Hip and Knee Surgeons; CORD)

Manson, Theodore Thomas, MD: 1 (Stryker); 3B (Stryker); 8 (Journal of Arthroplasty); 9 (AAOS; American Association of Hip and Knee Surgeons)

Marshall-Rodriguez, Amanda D., MD: 9 (American Association of Hip and Knee Surgeons; OpWalk USA)

Mayman, David Jacob, MD: 2 (Mako; Smith & Nephew); 3B (Smith & Nephew; Mako); 4 (OrthAlign)

Melvin III, James Stuart, MD: 3B (OrthoMedFlex LLC); 4 (Gilead); 9 (American Association of Hip and Knee Surgeons)

Meneghini, R. Michael, MD: 1 (Stryker); 3B (Stryker); 5 (Stryker); 8 (Journal of Arthroplasty); 9 (Knee Society)

Mortazavi, S. M. Javad, MD: (n)

Nam, Denis, MD, MSc: 3B (KCI); 4 (OrthAlign Inc.); 5 (EOS Imaging)

Nandi, Sumon, MD: 8 (Journal

of Arthroplasty); 9 (American Association of Hip and Knee Surgeons)

Nunley, Ryan, MD: 1 (Microport); 3B (Biocomposites; Blue Belt Technology; Cardinal Health; DePuy, A Johnson & Johnson Company; Integra Sciences; Medtronic; Microport; Polaris; Smith & Nephew); 5 (Biomet; DePuy, A Johnson & Johnson Company; Medical Compression Systems, Inc.; Smith & Nephew; Stryker); 9 (American Association of Hip and Knee Surgeons; Missouri State Orthopaedic Association Board Member; Southern Orthopaedic Association Board Member)

Pagnotto, Michael R., MD: (n)

Parvizi, Javad, MD, FRCS: 3B (CeramTec; ConvaTec; Medtronic; Smith & Nephew; TissueGene; Zimmer); 4 (CD Diagnostics; Hip Innovation Technology; PRN); 5 (3M; Cempra; CeramTec; DePuy, A Johnson & Johnson Company; National Institutes of Health (NIAMS & NICHD); OREF; Smith & Nephew; StelKast; Stryker; Zimmer); 7 (Datatrace; Elsevier; Jaypee Publishing; SLACK Incorporated; Wolters Kluwer Health - Lippincott Williams & Wilkins); 8 (Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Journal of Bone and Joint Surgery - British); 9 (Eastern Orthopaedic Association; Muller Foundation)

Perricelli, Brett Christopher, MD: 2 (Biomet; Pacira Pharmaceuticals Inc); 3B (Pacira Pharmaceuticals Inc); 4 (Pacira Pharmaceuticals Inc); 8 (Journal of Arthroplasty); 9 (AAHKS – Abstract Review Committee; AAHKS – Patient Educational Committee Member)

Polkowski II, Gregory G., MD: 9 (American Association of Hip and Knee Surgeons)

Schroder, David T., MD: 4 (Pacira; Pfizer)

Schwarzkopf, Ran, MD: 3B (Intelijoint; Smith & Nephew); 4 (Gauss surgical; Pristine); 5 (Pricaria); 8 (Arthroplasty Today; Journal of Arthroplasty); 9 (AAOS)

Suarez, Juan C., MD: 2 (DePuy, A Johnson & Johnson Company); 4 (Pacira)

Whited, Brent William, MD: (n)

Wickline, Andrew B., MD: (n)

STAFF

Creed, Sharon: (n)

Furlan, Jean: (n)

Kerr, Joshua: (n)

Lusk, Eileen: (n)

Rodd, Denise: (n)

Rose, Patti: (n)

Stewart, Krista M.: (n)

Zarski, Michael J., JD: 9 (American Association of Hip and Knee Surgeons)

FACULTY

Abdel, Matthew P., MD: 8 (European Journal of Orthopaedic Surgery and Traumatology; Journal of Bone and Joint Surgery - British; Journal of Orthopaedic Research; Journal of Orthopaedics and Traumatology); 9 (Minnesota Orthopaedic Society)

Abella, Linda D., RN: (n)

Aguilar, Thomas U., MS: (n)

Alexander, Clayton, MD: (n)

Alijanipour, Pouya, MD: (n)

Alvarez, Andrew P., BS: (n)

Alvi, Hasham M., MD: (n)

Amanatullah, Derek, MD: 3B (Sanofi); 7 (Medscape)

An, Tonya W., BS: (n)

Anatchkova, Milena, PhD: 3B (DePuy, A Johnson & Johnson Company); 5 (DePuy, A Johnson & Johnson Company); 6 (Institutional Support: DePuy, A Johnson & Johnson Company; Stryker; Smith & Nephew)

ANCHOR Group: (n)

Anderson, Lucas, MD: (n)

Anderson, Mike B., MS, ATC: (n)

Austin, Matthew, MD: 1 (Zimmer); 2 (DePuy, A Johnson & Johnson Company; Zimmer); 3B (Zimmer); 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons; AAOS)

Ayers, David Christopher, MD: 8 (Journal of Bone and Joint Surgery - American); 9 (AAOS; American Orthopaedic Association; American Orthopaedic Association)

Baca, Geneva, BA: (n)

Bagheri, Behrad, MS: (n)

Baghoolizadeh, Mahta, BS: (n)

Baratta, Jaime L., MD: (n)

Barr, Christopher Joseph, BS: 6 (Zimmer); 8 (Journal of Bone and Joint Surgery – American; Spine)

Barrack, Robert L., MD: 1 (Stryker); 3B (Stryker); 5 (Biomet; Medical Compression Systems; National Institutes of Health (NIAMS & NICHD); Smith & Nephew; Stryker; Wright Medical Technology, Inc.); 6 (Stryker); 7 (The McGraw-Hill Companies Inc; Wolters Kluwer Health - Lippincott Williams & Wilkins); 8 (Journal of Bone and Joint Surgery - American; Journal of Bone and Joint Surgery - British); 9 (Hip Society; Knee Society)

Barry, Jeffrey, MD: (n)

Bas, Marcel A., MD: (n)

Bayan, Ali, FRACS: 2 (Lima); 3B (Lima)

Beal, Matthew D., MD: 1 (Medacta); 3B (Medacta; Zimmer; Zimmer); 5 (Medacta; National Institutes of Health (NIAMS & NICHD); Zimmer; Stryker; Mako Surgical); 9 (AAOS)

Beauchamp, Christopher Paul, MD, FRCS: (n)

Beaule, Paul E., MD, FRCSC: 1 (Corin U.S.A.; MEDACTA; MicroPort Orthopedics); 2 (MEDACTA; MicroPORT; Smith & Nephew); 3B (Biomet; Corin U.S.A.; DePuy, A Johnson & Johnson Company; MEDACTA; Smith & Nephew); 5 (Corin U.S.A.; DePuy, A Johnson & Johnson Company; MicroPORT); 6 (Journal of Bone and Joint Surgery – American; Wolters Kluwer Health – Lippincott Williams & Wilkins); 8 (Journal of Bone and Joint Surgery – American; Wolters Kluwer Health – Lippincott Williams & Wilkins)

Beausang, David Howe, ATC, BA, BOC, BOCO, BOCP, BS, BSN, CAE: (n)

Bedard, Nicholas, MD: (n)

Bedi, Asheesh, MD: 3B (Arthrex, Inc); 4 (A3 Surgical ;); 7 (SLACK Incorporated; Springer); 8 (Journal of Shoulder and Elbow Surgery;); 9 (American Orthopaedic Society for Sports Medicine;)

Behfar, Atta, MD, PhD: (n)

Bellamy, Jaime Lyn, DO: (n)

Berend, Keith R., MD: 1 (Biomet); 3B (Biomet); 5 (Biomet; Kinamed; Pacira); 8 (Clinical Orthopaedics and Related Research; Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Orthopedics; Reconstructive Review); 9 (AAOS Board of Specialty Societies (Knee Education Representative); American Association of Hip and Knee Surgeons; Knee Society)

Berend, Michael E., MD: 1 (Biomet); 3B (Biomet); 4 (Orthalign); 5 (Biomet; Johnson & Johnson, into our 501c3 research foundation; Stryker); 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons; Joint Replacement Surgeons of Indiana Research Foundation; Piedmont Ortho)

Berry, Daniel J., MD: 1 (DePuy, A Johnson & Johnson Company; DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 5 (DePuy, A Johnson & Johnson Company); 7 (Elsevier; Wolters Kluwer Health - Lippincott Williams & Wilkins); 8 (Journal of Bone and Joint Surgery - American); 9 (American Joint Replacement Registry; Hip Society; Mayo Clinic Board of Governors)

Bhat, Suneel B., MD: (n)

Bingham, Joshua, MD: (n)

Bini, Stefano A., MD: 8 (Arthroplasty Today, Associate Editor; Journal of Arthroplasty); 9 (AAOS; American Association of Hip and Knee Surgeons)

Bolognesi, Michael P., MD: 1 (Biomet; Zimmer); 2 (Biomet; Kinamed; Zimmer); 3B (TJO; Zimmer); 3C (Amedica); 4 (Amedica; TJO); 5 (Biomet; DePuy, A Johnson & Johnson Company; Zimmer); 6 (AOA); 8 (Arthroplasty Today; Journal of Arthroplasty; Journal of Surgical Orthopaedic Advances); 9 (American Association of Hip and Knee Surgeons; Eastern Orthopaedic Association)

Bohl, Daniel D., MD, MPH: (n)

Bozic, Kevin John, MD, MBA: 3B (Institute for Healthcare Improvement; Yale-New Haven Center for Outcomes Research); 9 (AAOS; American Joint Replacement Registry; Orthopaedic Research and Education Foundation)

Bragdon, Charles R., PhD: 1 (Zimmer); 5 (MAKO Surgical; Zimmer)

Briant-Evans, Toby, FRCS: 5 (Biomet)

Browne, James Andrew, MD: 3B (Biocomposites Ltd; DJ Orthopaedics; Ethicon); 8 (American Journal of Orthopedics; Journal of Arthroplasty)

Burns, Michael, MD: (n)

Butler, Paul, MD: (n)

Caccavallo, Peter, MD: (n)

Callaghan, John J., MD: 1 (DePuy, A Johnson & Johnson Company;); 3B (DePuy, A Johnson & Johnson Company); 7 (Wolters Kluwer Health - Lippincott Williams & Wilkins; Journal of Arthroplasty (Deputy Editor)); 8 (Journal of Arthroplasty); 9 (International Hip Society; Knee Society; Orthopaedic Research and Education Foundation)

Cancienne, Jourdan Michael, MD: (n)

Carter, Joshua, MD: (n)

Chalmers, Brian, MD: (n)

Chalmers, Peter Nissen, MD: (n)

Chen, Antonia, MD, MBA: 3B (ACI; Joint Purification Systems); 5 (3M; Myoscience); 7 (SLACK Incorporated); 9 (AAOS)

Clohisy, John C., MD: 3B (Microport Orthopedics, Inc.; Smith & Nephew); 5 (Pivot Medical; Smith & Nephew; Zimmer); 7 (Wolters Kluwer Health - Lippincott Williams & Wilkins)

Coleman, Jacob James, BS: (n)

Cooper, Herbert John, MD: 3B (KCI; Medacta USA; Smith & Nephew; Zimmer); 5 (KCI); 8 (Journal of Arthroplasty); 9 (AAOS)

Cox, John, MD: (n)

Cross III, William Wood, MD: 3B (Zimmer); 8 (Clinical Orthopaedics and Related Research; Journal of Orthopaedic Research; Journal of Orthopaedics and Traumatology; Journal of the American Academy of Orthopaedic Surgeons)

Dalury, David F., MD: 1 (DePuy, A Johnson & Johnson Company); 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 4 (Johnson & Johnson); 5 (DePuy, A Johnson & Johnson Company); 8 (Journal of Arthroplasty)

Davis III, Charles M., MD, PhD: 8 (Journal of Arthroplasty); 9 (AAOS; American Association of Hip and Knee Surgeons)

D'Apuzzo, Michele R., MD: (n)

DeHart, Matthew, MPH: (n)

Deirmengian, Carl A., MD: 2 (Zimmer); 3B (Synthes; Zimmer; Biomet); 4 (Biostar Venture Fund partner; CD Diagnostics; Trice; Domain); 5 (Zimmer; CD Diagnostics); 7 (Journal of Bone and Joint Surgery - American)

Deirmengian, Gregory K., MD: 2 (Zimmer); 3B (Synthes; Zimmer; Biomet); 4 (CD Diagnostics; Biostar ventures; Domain; Trice); 5 (CD Diagnostics; Zimmer); 7 (Journal of Bone and Joint Surgery - American); 8 (Journal of Arthroplasty)

Della Valle, Craig J., MD: 1 (Biomet); 3B (Biomet; DePuy, A Johnson & Johnson Company; Smith & Nephew); 4 (CD Diagnostics); 5 (Biomet; CD Diagnostics; Smith & Nephew; Stryker); 7 (SLACK Incorporated); 8 (Orthopedics Today; SLACK Incorporated); 9 (American Association of Hip and Knee Surgeons; Arthritis Foundation; Hip Society; Knee Society; Mid America Orthopaedic Association)

Diesfeld, Paul, PA-C: (n)

Dimitriou, Dimitris, MD: (n)

Duchman, Kyle, MD: (n)

Duncan, Stephen Thomas, MD: 3B (Mitek; Smith & Nephew); 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons)

Duwelius, Paul J., MD: 1 (Zimmer); 2 (Signature Health Care); 3B (Zimmer); 4 (UniteOR); 5 (Providence Orthopedic Foundation & Director of Providence Orthopedic Institute; Zimmer); 7 (Journal of Bone and Joint Surgery - American; Journal of Bone and Joint Surgery - American); 8 (Clinical Orthopaedics and Related Research); 9 (AAOS; Operation Walk-Freedom to Move CEO)

Edelstein, Adam, MD: (n)

El Dafrawy, Mostafa Hassib, MD: (n)

Electricwala, Ali J., MD: (n)

Elkins, Jacob, MD, PhD: (n)

Erickson, Jill, PA: (n)

Farrington, Bill, FRACS, FRCS, FRCS (ortho), MBBS: 3B (LIMA; Stryker); 5 (LIMA; Stryker)

Fathima, Samreen, MPH: (n)

Fehring, Keith, MD: 1 (DePuy, A Johnson & Johnson Company); 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 5 (DePuy, A Johnson & Johnson Company); 6 (DePuy, A Johnson & Johnson Company); 9 (American Association of Hip and Knee Surgeons; Knee Society)

Fehring, Thomas K., MD: 1 (DePuy, A Johnson & Johnson Company); 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 5 (DePuy, A Johnson & Johnson Company); 9 (American Association of Hip and Knee Surgeons; Knee Society)

Fillingham, Yale, MD: (n)

Frangiamore, Salvatore Joseph, MD, MS: (n)

Franklin, Patricia D., MD: 5 (Zimmer)

Freiberg , Andrew A., MD: 1 (Biomet; Zimmer); 3B (Zimmer; Biomet; Medtronic); 4 (ArthroSurface; Orthopaedic Technology Group)

Froimson, Mark I., MD: 3B (Medical Compression Systems); 4 (Medical Compression Systems); 8 (American Journal of Orthopedics; Journal of Arthroplasty; Journal of Bone and Joint Surgery - American); 9 (American Association of Hip and Knee Surgeons; Mid American Orthopaedic Association; American Orthopaedic Association)

Gagnier, Joel Joseph, PhD: (n)

Gandek, Barbara, PhD: (n)

Gao, Yubo, PhD: (n)

Garvin, Kevin L., MD: 3C (TRAK Surgical, Omaha NE); 8 (Wolters Kluwer Health - Lippincott Williams & Wilkins); 9 (AAOS; American Orthopaedic Association; Hip Society; Knee Society)

Gehling, Paxton Alexander, BS: (n)

Gera Jr., James T., MBA: (n)

Gerlinger, Tad L., COL. (ret), MD: 3B (Smith & Nephew); 9 (Society of Military Orthopaedic Surgeons)

Gilbert, Jeremy, PhD: 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company; Stryker; Zimmer); 5 (DePuy, A Johnson & Johnson Company; Stryker); 7 (Journal of Biomedical Materials Research – Part B: Applied Biomaterials); 8 (Journal of Biomechanical Materials Research – Part B: Applied Biomaterials)

Goff, Brandon, DO: (n)

Golladay, Gregory, MD: 1 (Orthosensor, Inc); 2 (Orthosensor, Inc.); 3B (Cayenne Medical, Inc; Orthosensor; Stryker); 4 (Orthosensor, Inc.); 5 (Orthosensor); 8 (Editorial Board, Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons; Medical Society of Virginia)

Goodman, Stuart Barry, MD: 3B (Integra); 3C (Accelalox; Biomimedica); 4 (Accelalox; Biomimedica; StemCor); 5 (Baxter; DJ Orthopaedics); 7 (ABJS:Clinical Orthopaedics and Related Research; Biomaterials; Journal of Orthopaedic Research); 8 (Biomaterials; Clinical Orthopaedics and Related Research; J Arthroplasty; J Biomed Mater Res; Journal of Orthopaedic Research; Open Orthopaedics Journal; Orthopedics; Regenerative Engineering and Translational Medicine); 9 (AAOS; AAOS; Biological Implants Committee AAOS; Society For Biomaterials)

Goyal, Nitin, MD: 3B (Cayenne Medical; Stryker)

Grayson, Christopher W., MD: (n)

Greene, Meridith E., PhD: 6 (Biomet; Zimmer)

Greenwald, A. Seth, D.Phil. (Oxon): 5 (Aesculap/B.Braun; Biomedical Development Corporation; Biomet; DePuy, A Johnson & Johnson Company; Iconacy Orthopedics; ImplantCast; Intellirod; Lima Corporate; MatOrtho; Maxx Orthopedics; Medacta; OmniLife Science; Ranier; Smith & Nephew; Total Joint Orthopedics (TJO); Zimmer); 6 (Seminars in Arthroplasty); 7 (Seminars in Arthroplasty); 8 (Hospital for Special Surgery Journal; Journal of Arthroplasty; Journal of Orthopaedic Surgery (APOA); Journal of the Korean Orthopaedic Association; Orthopedics; Orthopedics Today; Video Journal of Orthopaedics); 9 (AAOS; Orthopaedic Research and Education Foundation)

Gross, Erwin: (n)

Haight, Holly J., MD: (n)

Hall, Brett, MD: (n)

Hallstrom, Brian Richard, MD: 9 (AAOS)

Halsey, David A., MD: 9 (AAOS; AAOS; American Association of Hip and Knee Surgeons; Vermont Medical Society; Vermont Orthopaedic Society)

Hamilton, William G., MD: 2 (DePuy, A Johnson & Johnson Company); 3B(DePuy, A Johnson & Johnson Company); 5(Biomet; DePuy, A Johnson & Johnson Company; Inova Health Care Services)

Hansen, Erik Nathan, MD: (n)

Hanssen, Arlen D., MD: 1 (Stryker); 5 (Stryker); 7 (Elsevier); 9 (International Congress for Joint Reconstruction (ICJR))

Hartman, Curtis W., MD: 2 (Smith & Nephew); 3B (Smith & Nephew); 4 (Trak Surgical, Inc); 5 (Pfizer; Smith & Nephew)

Haynes, Jacob, MD: (n)

Heller, Snir, MD: (n)

Hernandez, Victor H., MD, MS: (n)

Higgs, Genymphas B.: (n)

Higuera Rueda, Carlos A., MD: 3B (Covidien; KCI); 5 (KCI; Myoscience; Stryker); 8 (American Journal of Orthopedics)

Hopper, Robert, PhD: (n)

Houdek, Matthew, MD: (n)

Howard, James, MD: 2 (DePuy, A Johnson & Johnson Company; Stryker); 3B (DePuy, A Johnson & Johnson Company; Stryker); 5 (DePuy, A Johnson & Johnson Company); 6 (DePuy, A Johnson & Johnson Company; Microport; Smith & Nephew; Stryker; Zimmer)

Hozack, William J., MD: 1 (Stryker); 3B (Stryker); 5 (Stryker); 8 (Journal of Arthroplasty); 9 (Hip Society)

Huang, Ronald, MD: (n)

Huddleston III, James I., MD: 1 (Exactech, Inc); 2 (Exactech, Inc; Zimmer); 3B (Biomet; California Joint Replacement Registry; Exactech, Inc; Porosteon; Zimmer); 4 (Porosteon); 5 (American Knee Society; Biomet; Robert Wood Johnson Foundation); 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons; California Joint Replacement Registry)

Hurst, Jason M., MD: 3B (Zimmer Biomet); 5 (Kinamed; Orthosensor; Pacira Pharmaceuticals; Zimmer Biomet)

Iorio, Richard, MD: 5 (Orthosensor; Pacira); 8 (Clinical Orthopaedics and Related Research; JBJS Reviews; Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Journal of the American Academy of Orthopaedic Surgeons); 9 (American Association of Hip and Knee Surgeons; Hip Society)

Ishmael, Marshall, BS: (n)

Jacobs, Joshua J., MD: 4 (Implant Protection); 5 (Medtronic Sofamor Danek; Nuvasive; Zimmer); 9 (Hip Society)

Jain, Rajesh K., MD, MPH: 8 (Journal of Arthroplasty)

James, Hannah Elizabeth, BA: 1 (DePuy, A Johnson & Johnson Company); 2 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company)

Jiranek, William A., MD: 1 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 4 (Johnson & Johnson); 5 (DePuy, A Johnson & Johnson Company; Stryker); 8 (Orthopaedic Knowledge Online); 9 (American Association of Hip and Knee Surgeons; Lifenet Health, Inc.; OLC Orthopaedic Learning Center)

Johanson, Per-Erik, MD: 5 (Biomet; DePuy, A Johnson & Johnson Company; Lima; Link; Smith & Nephew; Stryker; Zimmer)

Johnson, Staci, M.Ed: (n)

Kao, Y. Julia, MD: (n)

Kaufmann, Marc, DO: (n)

Kayupov, Erdan, MS: (n)

Kazarian, Gregory, BA: (n)

Keeney, James A., MD: 9 (Society of Military Orthopaedic Surgeons)

Khanuja, Harpal "Paul" Singh, MD: 8 (Journal of Arthroplasty); 9 (AAOS; American Association of Hip and Knee Surgeons)

Kheir, Michael Maher, BS: (n)

Klein, Gregg R., MD: 2 (Zimmer); 3B (Zimmer); 5 (Zimmer); 8 (American Journal of Orthopedics; Journal of Bone and Joint Surgery - American; Journal of Arthroplasty); 9 (AAOS)

Klingenstein, Gregory G., MD: (n)

Koch, Chelsea, BS: (n)

Kowalik, Thomas D., MD: (n)

Kraay, Matthew J., MD: 3C (Scientific Advisory Board for Cellbank)

Kurtz, Steven M., PhD: 2 (I am an employee and shareholder of Exponent, a scientific and engineering consulting firm. Exponent has been paid fees by companies and suppliers for my presentations (see 5, below).); 3B (I am an employee and shareholder of Exponent, a scientific and engineering consulting firm. Exponent has been paid fees by companies and suppliers for my consulting services on behalf of such companies and suppliers (see 5, below).); 5 (Active Implants; Aesculap/B.Braun; Ferring Pharmaceuticals; Simplify Medical; Smith & Nephew; Stryker; Zimmer; Biomet; DePuy Synthes; Medtronic; Invibio; Stelkast; Celanese; Formae; Kyocera Medical; Wright Medical Technology; Ceramtec; DJO); 6 (My employer, Exponent, provides consulting services to other medical device companies, not listed under 5, and receives fees for those services.); 7 (Elsevier)

Kuwabara, Anne, BA: (n)

Kuzma, Alexander L., MD: (n)

Kwon, Young-Min, MD, PhD: 5 (Principal Investigator; Institutional funding from Zimmer, Mako Surgical, Stryker, Biomet)

Lanting, Brent, MD: 5 (DePuy, A Johnson & Johnson Company; Smith & Nephew; Stryker; Wright Medical Technology, Inc.; Zimmer)

LeMarr, Angela, RN: (n)

Lewallen, David G., MD: 1 (Mako/Stryker; Pipeline; Zimmer); 2 (Zimmer); 3B (pipeline biomedical holdings; Zimmer); 3C (Ketai Medical Devices); 4 (Ketai Medical Devices); 9 (American Joint Replacement Registry; Orthopaedic Research and Education Foundation)

Lewis, Courtland G., MD: 5 (Biomet); 9 (American Association of Hip and Knee Surgeons; CT State Medical Society; Hartford County Medical Assn)

L'Hommedieu, Coles E., MD: (n)

Li, Guoan, PhD: 3 (Mako Medical)

Li, Wenjun, PhD: (n)

Lieberman, Jay R., MD: 1 (DePuy, A Johnson & Johnson Company); 3B (Arthrex, Inc; DePuy, A Johnson & Johnson Company); 4 (Hip Innovation Technology); 5 (Arthrex, Inc); 7 (Saunders/Mosby-Elsevier); 8 (American Association of Hip and Knee Surgeons; Journal of Arthroplasty; Journal of the American Academy of Orthopaedic Surgeons); 9 (AAOS; Western Orthopaedic Association)

Lombardi, Jr., Adolph V., MD, FACS: 1 (Biomet; Innomed; Orthosensor); 3B (Biomet; Orthosensor; Pacira Pharmaceuticals, Inc.); 5 (Biomet; Kinamed; OrthoSensor; Pacira Pharmaceuticals, Inc.); 8 (Clinical Orthopaedics and Related Research; Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Journal of Orthopaedics and Traumatology; Journal of the American Academy of Orthopaedic Surgeons; Knee; Surgical Technology International); 9 (Hip Society; Knee Society; Mount Carmel Education Center at New Albany; Operation Walk USA)

Longaray, Jason Augusto: 3A (Stryker)

Lyman, Stephen, PhD: 8 (HSS Journal; ISAKOS Journal (new journal); Journal of Bone and Joint Surgery – American); 9 (International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine)

MacDonald, Daniel, MS: 5 (StelKast)

Malchau, Henrik, MD: 1 (Stryker); 3B (Ceramtec); 3C (Biomet); 4 (RSA Biomedical Inc); 5 (Biomet; Zimmer; MAKO; DePuy; Smith & Nephew;); 9 (International Hip Society; ISAR (International Society for Arthroplasty Registries); RSA Biomedical; Scientific advisor for Biomet in northern Europe)

Maloney, William J., MD: 1 (Stryker; Zimmer); 3B (Flexion Therapeutics, Inc. - Scientific Advisory Board; ISTO Technologies, Inc - Board of Directors); 4 (Abbott; Flexion Therapeutics, Inc. --; Gilead; ISTO Technologies (Start up); Johnson & Johnson; Merck; Moximed; Pfizer; Pipeline

Orthopaedics; Stemedica (Start up); TJO); 8 (Journal of Orthopaedic Research; Journal of Orthopaedic Science); 9 (AAOS; AJRR; American Association of Hip and Knee Surgeons; Flexion Therapeutics, Inc.; ISTO Technologies, Inc.; Stemedica; Western Orthopaedic Association)

Maltenfort, Mitchell, PhD: (n)

Manning, David W., MD: 1 (Biomet); 2 (Medacta); 3B (Biomet, Medacta); 4 (Iconacy); 9 (AAOS: Program Committee-Subcommittee Adult Hip)

Maratt, Joseph Dominic, MD: 3A (Alexion Pharmaceuticals; Biogen; Momenta Pharmaceuticals); 4 (Alexion Pharmaceuticals; Asterias Biotherapeutics; Biogen; Merck; Momenta Pharmaceuticals; Sanofi-Aventis)

Martin, Christopher T., MD: 6 (Globus Medical; Medtronic); 9 (AAOS; Musculoskeletal Transplant Foundation)

Marwin, Scott E., MD: 1 (Smith & Nephew); 2 (Smith & Nephew); 3B (Smith & Nephew)

Masonis, John Leander, MD: 1 (Smith & Nephew); 2 (Smith & Nephew); 3B (Smith & Nephew)

Matthews, Christopher N., BS: (n)

McAlister, Ian P., MD: (n)

Meneghini, R. Michael, MD: 1 (Stryker); 3B (Stryker); 5 (Stryker); 8 (Journal of Arthroplasty); 9 (Knee Society)

Mihalko, William Michael, MD, PhD: 1 (Aesculap/B.Braun); 2 (Aesculap/B.Braun); 3B (Aesculap/B.Braun; Medtronic; Panoramic Healthcare); 5 (Aesculap/B.Braun; MicroPort; Smith & Nephew; Stryker); 7 (Saunders/Mosby-Elsevier; Springer); 8 (International Journal of Orthopaedics; Journal of Arthroplasty; Journal of Orthopaedic Research; Knee; The Journal of Long Term Effects of Medical Implants); 9 (American Board of Orthopaedic Surgery, Inc.; American Orthopaedic Association; ASTM International)

Mirza, Amer J., MD: 3C (Acumed, LLC)

Mokris, Jeffrey G., MD: 2 (Corin U.S.A.; DePuy, A Johnson & Johnson Company); 3B (Corin U.S.A.; DePuy, A Johnson & Johnson Company)

Mont, Michael A., MD: 1 (Stryker); 3B (DJ Orthopaedics; Medical Compression Systems; Sage Products, Inc.; Stryker; TissueGene); 5 (DJ Orthopaedics; National Institutes of Health (NIAMS & NICHD); Sage Products, Inc.; Stryker; Tissue Gene); 8 (American Journal of Orthopedics; Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Journal of Knee Surgery; Orthopedics; Surgical Techniques International); 9 (AAOS)

Moric, Mario, MS: 3B (Zimmer)

Morris, Michael J., MD: 3B (Biomet); 5 (Biomet; Kinamed; Pacira)

Morton, Diane, MS: (n)

Muratoglu, Orhun K., MD: 1 (Arthrex, Inc; Aston Medical; Biomet; Conformis; Corin U.S.A.; Iconacy; Mako; Meril Healthcare; Renovis; Zimmer); 2 (Biomet; Corin U.S.A.); 4 (Cambridge Polymer Group; Orthopedic Technology Group); 5 (DePuy, A Johnson & Johnson Company; Mako); 6 (Biomet)

Murphy, Stephen B., MD: 1 (Microport Orthopedics Inc.); 3B (Microport Orthopedics Inc.); 4 (Surgical Planning Associates, Inc.); 9 (International Society for Technology in Arthroplasty; International Society of Computer Assisted Orthopedic Surgery)

Nam, Denis, MD, MSc: 3B (KCI); 4 (OrthAlign Inc.); 5 (EOS Imaging)

Narkbunnam, Rapeepati, MD: (n)

Naseer, Zan, BS: (n)

Nebergall, Audrey K.: (n)

Nepple, Jeffrey, MD: 2 (Smith & Nephew); 3B (Smith & Nephew)

Nguyen, Long-Co, BA, BS: (n)

Nicholas, Stephen J., MD: 1 (Arthrex, Inc.); 3B (Arthrex, Inc.)

Nichols, Joseph C., MD: (n)

Nielsen, Christian S., MD, PhD: (n)

Nunley, Ryan, MD: 1 (Microport); 3B (Biocomposites; Blue Belt Technology; Cardinal Health; DePuy, A Johnson & Johnson Company; Integra Sciences; Medtronic; Microport; Polaris; Smith & Nephew); 5 (Biomet; DePuy, A Johnson & Johnson Company; Medical Compression Systems, Inc.; Smith & Nephew; Stryker); 9 (American Association of Hip and Knee Surgeons; Missouri State Orthopaedic Association Board Member; Southern Orthopaedic Association Board Member)

Oakes, Daniel A., MD: 3B (Zimmer); 8 (Journal of Knee Surgery; Journal of the American Academy of Orthopaedic Surgeons; Orthopedics); 9 (American Association of Hip and Knee Surgeons)

Obrock, Blake, DO: (n)

Odum, Susan Marie, PhD: 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons)

Okafor, Louis Chukwunonso, MD: (n)

O'Neill, Owen, MD: (n)

Ong, Alvin C., MD: 3B (Smith & Nephew; Stryker); 5 (Zimmer); 8 (Journal of Arthroplasty,Journal of Orthopedic Surgery and Research)

Orishimo, Karl, MS: (n)

Orozco, Fabio, MD: 3B (Stryker); 5 (Zimmer; Stryker); 8 (Journal of arthroplasty)

Padgett, Douglas E., MD: 1 (Mako); 2 (Mako); 3B (Mako; Medical Compression Systems; Stryker); 8 (Journal of Arthroplasty;); 9 (The Hip Society; Hospital For Special Surgery)

Padgett, Sarah, PA-C: 4 (Abbvie)

Pagnano, Mark W., MD: 1 (DePuy, A Johnson & Johnson Company; Stryker); 3B (Pacira); 7 (Clinical Orthopaedics and Related Research); 9 (Hip Society; Knee Society

Palmer, Ryan Michael, DO: (n)

Paprosky, Wayne Gregory, MD: 1 (Intellijoint; Mako Surgical Corp; Zimmer); 3B (DePuy, A Johnson & Johnson Company; intellijoint; Stryker; Zimmer); 4 (Intellijoint; Ketai Medical Limited); 6 (Cadence Health); 7 (Wolters Kluwer Health - Lippincott Williams & Wilkins); 8 (Journal of Arthroplasty;;); 9 (Hip Society;)

Park, Andrew G., MD: (n)

Park, Brian, MD: (n)

Parsley, Brian S., MD: 1 (Conformis Inc.); 2 (Conformis; Nimbic Systems); 3B (Nimbic Systems); 4 (Nimbic Systems); 5 (Conformis); 9 (American Association of Hip and Knee Surgeons)

Parvizi, Javad, MD, FRCS: 3B (CeramTec; ConvaTec; Medtronic; Smith & Nephew; TissueGene; Zimmer); 4 (CD Diagnostics; Hip Innovation Technology; PRN); 5 (3M; Cempra; CeramTec; DePuy, A Johnson & Johnson Company; National Institutes of Health (NIAMS & NICHD); OREF; Smith & Nephew; StelKast; Stryker; Zimmer); 7 (Datatrace; Elsevier; Jaypee Publishing; SLACK Incorporated; Wolters Kluwer Health - Lippincott Williams & Wilkins); 8 (Journal of Arthroplasty; Journal of Bone and Joint Surgery - American; Journal of Bone and Joint Surgery - British); 9 (Eastern Orthopaedic Association; Muller Foundation)

Pashos, Gail, BS: 4 (GlaxoSmithKline)

Patterson, Joseph, MD: (n)

Pavlou, Paul, FRCS (Ortho): (n)

Peters, Christopher L., MD: 1 (Biomet;); 2 (Biomet;); 3B (Biomet;); 8 (Journal of Arthroplasty;); 9 (AAOS; American Association of Hip and Knee Surgeons)

Pevear, Mary Elizabeth, BA: (n)

Plummer, Darren, MBA, MD: (n)

Polkowski II, Gregory G., MD, MSc: 9 (American Association of Hip and Knee Surgeons)

Ponnusamy, Karthikeyan E., MD: 9 (AAOS)

Ponzio, Danielle Y., MD: (n)

Porat, Manny D., MD: (n)

Post, Robert E., MD, MS: (n)

Post, Zachary D., MD: 3B (DePuy, A Johnson & Johnson Company; Orthodevelopment; Smith & Nephew; Stryker); 5 (Smith & Nephew); 7 (Journal of Bone and Joint Surgery - American);

Pozek, John-Paul J., MD: (n)

Pugely, Andrew James, MD: (n)

Purtill, James J., MD: 8 (Clinical Orthopaedics and Related Research; Journal of Arthroplasty; Knee); 9 (omega medical grants)

Rajaee, Sean, MD, MS: (n)

Rana, Adam J., MD: (n)

Rathod, Parthiv A., MD: (n)

Reedy, Mary E., RN: (n)

Reid, Jeremy, MD: (n)

Rezapoor, Maryam, MS: (n)

Ries, Michael D., MD: 1 (Smith & Nephew;); 3B (Smith & Nephew; Stryker;); 4 (OrthAlign;); 9 (Foundation for the Advancement of Research in Medicine;)

Rimnac, Clare M., PhD: 5 (DePuy, A Johnson & Johnson Company; Exponent, Inc.); 7 (Clinical Orthopaedics and Related Research); 8 (Clinical Orthopaedics and Related Research); 9 (Orthopaedic Research Society)

Roberts, Karl C., MD: 8 (Journal of Arthroplasty)

Robinson, Jonathan, MD: (n)

Rodriguez, Jose A., MD: 2 (Link Orthopaedics); 3B (Conformis; Exactech, Inc; Medacta; Smith & Nephew); 5 (DePuy, A Johnson & Johnson Company; Exactech, Inc; Smith & Nephew); 8 (Journal of Arthroplasty; Clinical Orthopaedics and Related Research, HSS Journal); 9 (American Association of Hip and Knee Surgeons)

Rogers, Thea, MPH: (n)

Rolfson, Ola, MD, PhD: 9(International Society of Arthroplasty Registers; Swedish Hip Arthroplasty Register)

Rothman, Richard H., MD: 1 (Stryker); 3B (Stryker; Stryker); 7 (Journal of Arthroplasty); 8 (Journal of Arthroplasty; Journal of Arthroplasty)

Rubash, Harry E., MD: 1 (Ceramtec; Stryker); 3B (Access Mediquip; Flexion; Pacira); 7 (Wolters Kluwer Health - Lippincott Williams & Wilkins); 9 (Hip Society)

Rupp, Gerald R., MD: (n)

Salin, Jeffrey W., DO: (n)

Santore, Richard F., MD: 3B (Medacta; Omni); 4 (Abbott; GlaxoSmithKline; Johnson & Johnson; Merck; Pfizer; Stryker; Zimmer); 8 (Clinical Orthopaedics and Related Research; Hip International; Journal of Arthroplasty; Journal of the American Academy of Orthopaedic Surgeons); 9 (Orthopaedic Research and Education Foundation; Sharp Healthcare Foundation)

Sayeed, Siraj A., MD: 3B (Medtronic)

Schmidig, Gregg, BS: 3A (Stryker); 4 (Stryker)

Schoenecker, Perry L., MD: 8 (Journal of Children's Orthopaedics; Journal of Pediatric Orthopedics); 9 (Pediatric Orthopaedic Society of North America

Schoifet, Scott D., MD: 3B (Stryker)

Scholl, Laura, MS: 3A (Stryker); 4 (Stryker)

Schroer, William C., MD: 2 (Biomet); 5 (Biomet)

Schwarzkopf, Ran, MD: 3B (Intelijoint; Smith & Nephew); 4 (Gauss surgical; Pristine); 5 (Pricaria); 8 (Arthroplasty Today; Journal of Arthroplasty); 9 (AAOS)

Scuderi, Giles R., MD: **1** (Zimmer,); 2 (Pacira; Zimmer,Medtronics,Convatec); 3B (MERZ Pharmaceutical; Pacira; Zimmer,Medtronics,Convatec); 5 (Pacira); 7 (Springer,Elsevier,Thieme,World Scientific); 8 (Orthopedic Clinics of North America); 9 (ICJR; Operation Walk USA)

Sculco, Peter Keyes, MD: (n)

Sculco, Thomas P., MD: 1 (Exactech, Inc); 8 (American Journal of Orthopedics); 9 (Knee Society)

Sems, Stephen A., MD: 1 (Biomet); 3B (Biomet)

Seviciu, Alexandru, MD: (n)

Shahi, Alisina, MD: (n)

Shen, Mary, BS, MS: (n)

Shrestha, Kush, MD: (n)

Sierra, Rafael Jose, MD: 1 (Biomet,); 2 (Biomet;); 3B (Biomet); 5 (DePuy, A Johnson & Johnson Company; Zimmer; Stryker, Biomet); 8 (Journal of Arthroplasty); 9 (Midamerica orthopedic society, Maurice Mueller Foundation; American Association of Hip and Knee Surgeons)

Sing, David, BS: (n)

Skolasky Jr., Richard L., ScD: 5 (AT&T Foundation; DePuy, A Johnson & Johnson Company; DePuy Spine); 8 (Quality of Life Research); 9 (Cervical Spine Research Society; North American Spine Society)

Slager, Susan L., PhD: (n)

Slover, James D., MD: 5 (Biomet; DJO, LLC)

Smith, Eric Louis, MD: 3B (Arthrocare; DePuy, A Johnson & Johnson Company; OMNI); 3C (OMNI); 5 (Conformis; DePuy, A Johnson & Johnson Company; OMNI; Pfizer; Stryker)

Somerville, Lyndsay, PhD: (n)

Sporer, Scott M., MD: 3B (Paciria; Smith & Nephew; Zimmer); 5 (Central Dupage Hospital; Stryker; Zimmer); 7 (SLACK Incorporated); 9 (American Joint Replacement Registy; Hip Society)

Springer, Bryan Donald, MD: 2 (DePuy, A Johnson & Johnson Company, Ceramtec); 3B (Convatec, Polaris; Stryker); 6 (Joint purifications systems.); 8 (Journal of Arthroplasty); 9 (AJRR)

Sterling, Robert S., MD: 8 (Journal of Arthroplasty; Journal of Surgical Education); 9 (AAOS; American Orthopaedic Association; Maryland Orthopaedic Association)

Stryker, Louis S., MD: (n)

Study Group, ANCHOR

Suleiman, Linda, MD: (n)

Swann, Russell P., MD: (n)

Tan, Timothy, MD: (n)

Taunton, Michael J., MD: 3B (DJ Orthopaedics); 5 (Stryker); 8 (Journal of Arthroplasty); 9 (AAOS; Minnesota Orthopedic Society)

Tay, Bobby, MD: 2 (Biomet; Stryker; Synthes); 5 (AOSpine North American; Globus; Nuvasive)

Teeter, Matthew G., PhD: 5 (Smith & Nephew)

Tessier, John E., MD: 6 (Smith & Nephew)

Theologis, Alexander, MD: 6 (Globus Medical; Medtronic; Stryker; Synthes)

Theriault, Raminta Veronika, MS: (n)

Thomason, Kayla M.: (n)

Tibbo, Meagan Elizabeth, BA: (n)

Troelsen, Anders, MD, PhD: 2 (Biomet); 3B (Biomet); 5 (Biomet; Zimmer); 6 (Biomet); 9 (DOS - Danish Orthopaedic Society – Scientific committee; EKS – European Knee Society – Communication committee)

Trousdale, Robert T., MD: 1 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 8 (Journal of Arthroplasty); 9 (American Association of Hip and Knee Surgeons; Hip Society; Knee Society)

Tsai, Tsung-Yuan, PhD: (n)

Urbani, Brian, MS: (n)

Urquhart, Andrew G., MD: 9 (Michigan Orthopaedic Society)

Vail, Thomas Parker, MD: 1 (DePuy, A Johnson & Johnson Company); 3B (DePuy, A Johnson & Johnson Company); 9 (American Board of Orthopaedic Surgery, Inc.; Knee Society)

Vajapeyajula, Sravya, BS: (n)

Van Doren, Bryce Allen, MA, MPH: (n)

Vasarhelyi, Edward, MD, MSc, FRCSC: 3B (DePuy, A Johnson & Johnson Company); 5 (DePuy, A Johnson & Johnson Company; Smith & Nephew; Stryker)

Viola, Jessica Rae, BS: (n)

Walker, Matthew L., MD: 5 (Stryker)

Walsh, Stephen Michael, MD: 1 (Innomed); 3B (Zimmer)

Ware, John, PhD: (n)

Watts, Chad, MD: (n)

Wenzel, John Thomas, MD: (n)

Werner, Brian, MD: (n)

Westermann, Robert W., MD: (n)

Wooten, Clint J., MD: (n)

Wright, Timothy M., PhD: 1 (Lima; Mathys Ltd); 3B (Zimmer); 4 (Exactech, Inc; Orthobond); 5 (Stryker); 7 (Wolters Kluwer Health - Lippincott Williams & Wilkins); 9 (Knee Society)

Wyles, Cody C., BS: (n)

Yates Jr., Adolph J., MD: 9 (American Association of Hip and Knee Surgeons)

Young, Simon, MD, FRACS: 5 (Stryker; Vidacare)

Younger, Victoria Ann, BS: (n)

Ziemba-Davis, Mary, BA: (n)

FUTURE AAHKS MEETINGS

AAHKS SPRING MEETING MARCH 31-APRIL 2, **2016**

26TH ANNUAL MEETING NOVEMBER 10-13, **2016**

27TH ANNUAL MEETING NOVEMBER 2-5, **2017**

SPECIALTY DAY
AAHKS/THE HIP SOCIETY/THE KNEE SOCIETY

MARCH 5, 2016 ORLANDO, FLORIDA

MARCH 18, 2017 SAN DIEGO, CALIFORNIA

AAHKS WISHES TO THANK THE FOLLOWING
COMPANIES FOR THEIR FINANCIAL SUPPORT OF THE
25TH AAHKS ANNUAL MEETING:
**DEPUY SYNTHES, SMITH & NEPHEW,
STRYKER AND ZIMMER BIOMET**

AAHKS 25TH ANNIVERSARY
AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS

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