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New! Women in Arthroplasty: Audrey K. Tsao, MD

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   Manager of Communications and Web Content
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EDUCATIONAL ACTIVITY SCOPE

The 2018 AAHKS Annual Meeting is designed to provide practicing orthopaedic surgeons with research based, state-of-the-art information on diagnosis, surgical and non-surgical treatment options and overall management of hip and knee conditions. This educational activity includes the review of the most current scientific research study findings, faculty and participant discussions and interactive symposia. It covers multiple clinical topics such as primary and revision total hip arthroplasty, primary and revision total knee arthroplasty, non-arthroplasty, infection, complications other than infection as well as health policy. It is aimed at improving overall surgeon competence related to the care of patients with arthritis and degenerative disease.

OBJECTIVES

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

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

ACCREDITATION AND CME CREDIT

The American Association of Hip and Knee Surgeons (AAHKS) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. The American Association of Hip and Knee Surgeons (AAHKS) designates this live activity for a maximum of 18 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

CLAIM CME CREDITS

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

DISCLAIMER

The material presented at this Annual Meeting has been made available by AAHKS for educational purposes only. This material is not intended to represent the only, nor necessarily the best methods or procedures appropriate for the medical situations discussed; but rather, is intended to present an approach, view, statement or opinion of the faculty, which may be helpful to others who face similar situations. AAHKS disclaims any and all liability for injury or other damages resulting to any individual attending a course and for all claims, which may arise out of the use of the techniques, demonstrated there in by such individuals, whether these claims shall be asserted by a physician or any other person.

CONTENT AGREEMENT

By attending in the Annual Meeting, participants acknowledge and agree that AAHKS and/or its agents may record the Program and related events, use audio and video recordings, photographs and presentation materials such as slides and abstracts for AAHKS’s purposes, including but not limited to other educational products, news, advertising and promotional purposes, without compensation.

FDA STATEMENT

Some pharmaceuticals and/or medical devices demonstrated at the Annual Meeting have not been cleared by the US Food and Drug Administration (FDA) or have been cleared by the FDA for specific purposes only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each pharmaceuticals and/or medical device he or she wishes to use in clinical practice. The AAHKS policy provides that “off label” status of the device or pharmaceutical is also specifically disclosed (i.e. that the FDA has not approved labeling the device for the described purpose). Any device or pharmaceutical is being used “off label” if the described use is not set forth on the product’s approved label.

www.AAHKS.org/Meeting
Education

DISCLOSURE

Each participant in the Annual Meeting has been asked to disclose if he or she has received something of value from a commercial company or institution, which relates directly or indirectly to the subject of their presentation. These are the disclosure categories:

- Nothing to disclose
- Royalties from a company or supplier
- Speakers bureau/paid presentations for a company or supplier
- Paid employee for a company or supplier
- Paid consultant for a company or supplier
- Unpaid consultant for a company or supplier
- Stock or stock options in a company or supplier
- Research support from a company or supplier as a PI
- Other financial or material support from a company or supplier
- Royalties, financial or material support from publishers
- Medical/Orthopaedic publications
- Editorial/governing board
- Board member/committee appointments for a society

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


Educational Grants

AAHKS wishes to thank
DePuy Synthes
Smith & Nephew
Stryker
Zimmer Biomet

For their generous educational grants that make the Annual Meeting possible.
Dr. Engh to Receive the 2018 AAHKS Humanitarian Award

Gerard “Jerry” A. Engh, MD has been selected as the 2018 American Association of Hip and Knee Surgeons Humanitarian Award recipient. Dr. Engh founded Operation Walk Virginia in 2006, which has provided hip and knee replacements to the underserved in Managua, Nicaragua, Ecuador, Guatemala, Panama and Bolivia. This chapter was one of the first to branch off from the Operation Walk chapter in Los Angeles founded by Lawrence D. Dorr, MD. Dr. Engh routinely brought along guest surgeons to his mission trips, and many have since gone on to establish their own chapters and successful Operation Walk missions.

Also part of Dr. Engh’s vision is to bring doctors from the host countries to the United States to learn by observing the surgical techniques involved in knee and hip replacement. The doctors are then be able to take these skills back to their own country—perpetuating the help for years to come.

After graduating from Davidson College, Dr. Engh attended medical school at the University of Virginia. Following an internship and residency at Yale-New Haven Hospital, he spent two years as a major in the Army Medical Corps. He then joined his brother working at The Anderson Orthopaedic Clinic in Virginia, which had been founded by his father, Otto Anderson Engh. Dr. Engh retired from the practice in 2013.

In recognition of Dr. Engh’s contribution to medical missions around the world, an Operation Walk Virginia board member remarked, “He deserves the AAHKS Humanitarian Award because of the amount of people he has touched in a positive way. From his patients at the Anderson clinic, to the fellows he has trained and all their patients, to his family, to his staff and now to patients across the globe. We are talking about hundreds of thousands of people who are better off because Dr. Jerry is in this world. We should all strive to leave such a positive mark on this planet.”

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

Nominations for the 2019 AAHKS Humanitarian Award are now being accepted through April 15, 2019 at www.AAHKS.org/Humanitarian.
## 2018 AAHKS ANNUAL MEETING SCHEDULE

### WEDNESDAY, OCTOBER 31, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m. – 5:00 p.m.</td>
<td>Exhibit Set-Up</td>
<td>Learning Center/Exhibit Hall</td>
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### THURSDAY, NOVEMBER 1, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>6:30 a.m. – 7:00 p.m.</td>
<td>Registration</td>
<td>Peacock Foyer</td>
</tr>
<tr>
<td>10:00 a.m. – 5:00 p.m.</td>
<td>Exhibit Set-Up</td>
<td>Learning Center/Exhibit Hall</td>
</tr>
<tr>
<td>1:00 p.m. – 5:00 p.m.</td>
<td>Poster Set-Up</td>
<td>Chantilly Ballroom</td>
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</table>

### Industry Symposia

Industry Symposia are separate from the official program planned by the AAHKS Annual Meeting Program Committee and DO NOT offer AMA PRA Category 1 Credit™ unless noted by the sponsor.

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 a.m. – 9:30 a.m.</td>
<td>AmnioFix: Where Does it Fit in Clinical Practice? MiMedx</td>
<td>Grand Ballroom E</td>
</tr>
<tr>
<td>10:00 a.m. – 12:00 p.m.</td>
<td>Novel Opioid Sparing Approach for Hip and Total Knee Procedures Avanos</td>
<td>Grand Ballroom A</td>
</tr>
<tr>
<td>10:00 a.m. – 12:00 p.m.</td>
<td>Physician-Driven Bundles in Outpatient Total Joint Surgery: A New Value-Based Paradigm Reflexion Health/Delta Joint Management</td>
<td>Grand Ballroom D</td>
</tr>
<tr>
<td>10:00 a.m. – 12:00 p.m.</td>
<td>Improving Patient Outcomes with Orthopedic Wound Management Solutions DePuy Synthes (Ethicon-Johnson &amp; Johnson)</td>
<td>Grand Ballroom E</td>
</tr>
<tr>
<td>10:00 a.m. – 12:00 p.m.</td>
<td>Cryoanalgesia*: A Path to an Opioid-Free TKA, Pre-op Through Rehab Myoscience</td>
<td>Grand Ballroom B</td>
</tr>
<tr>
<td>12:30 p.m. – 2:30 p.m.</td>
<td>Computer-Assisted Anatomic Tibia First, Balanced Femur TKA BrainLab</td>
<td>Grand Ballroom A</td>
</tr>
<tr>
<td>12:30 p.m. – 2:30 p.m.</td>
<td>Evolving Utility of Negative Pressure Therapy in Arthroplasty Patients: Review of New Clinical Evidence to Reduce Complications and Improve Functional Outcomes KCI – An Acelity Company</td>
<td>Grand Ballroom B</td>
</tr>
<tr>
<td>12:30 p.m. – 2:30 p.m.</td>
<td>Breaking Down the Buzz DOJ Surgical</td>
<td>Grand Ballroom D</td>
</tr>
<tr>
<td>12:30 p.m. – 2:30 p.m.</td>
<td>Transitioning to Same-Day Surgery: Outpatient Total Joints Medtronic</td>
<td>Grand Ballroom E</td>
</tr>
<tr>
<td>3:00 p.m. – 5:00 p.m.</td>
<td>Four Critical Enablers of Successful TJR Migration to an ASC Setting DePuy Synthes</td>
<td>Grand Ballroom E</td>
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</tbody>
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**THURSDAY, NOVEMBER 1, 2018**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
</table>
| 3:00 p.m. – 5:00 p.m. | Rising to Meet the Threat Posed by Periprosthetic Joint Infection, with Dr. Javad Parvizi  
*Heraeus Medical LLC* | Grand Ballroom B          |
| 3:00 p.m. – 5:00 p.m. | Cementing the Hip: New Focus on a Gold Standard  
*Heraeus Medical LLC* | Grand Ballroom A          |
| 4:00 p.m. – 5:30 p.m. | **International Reception** (Invitation Only)  
Co-hosted by AAHKS, British Hip Society and Italian Hip Society | Topaz Room             |
| 4:00 p.m. – 5:30 p.m. | **Young Arthroplasty Group Reception** (Invitation Only) | Emerald Room           |
| 5:00 p.m. – 7:00 p.m. | **AAHKS Board of Directors Meeting** (Invitation Only) | Wedgwood Ballroom      |
| 7:00 p.m. – 7:15 p.m. | **FARE Board of Directors Meeting** (Invitation Only) | Wedgwood Ballroom      |

**FRIDAY, NOVEMBER 2, 2018**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>6:00 a.m. – 7:30 p.m.</td>
<td><strong>Registration</strong></td>
<td>Peacock Foyer</td>
</tr>
<tr>
<td>6:00 a.m. – 8:00 a.m.</td>
<td><strong>Breakfast for all attendees</strong></td>
<td>Learning Center/Exhibit Hall</td>
</tr>
</tbody>
</table>
| 6:00 a.m. – 8:00 p.m. | **AAHKS and Guest Societies Poster Exhibition**  
Thank you to Stryker | Chantilly Ballroom      |
| 6:00 a.m. – 2:55 p.m. | **Learning Center/Exhibit Hall Open** | Learning Center/Exhibit Hall |
| 6:00 a.m. – 8:30 p.m. | **Surgical Technique Video Viewing** | Rotunda                |
| 7:00 a.m. – 2:45 p.m. | **Orthopaedic Team Member Course**  
**Chair:** James A. Browne, MD  
**Co-Chair:** Jeremy M. Gililland, MD  
**Co-Chair:** Jana L. Flener, PA-C | Wedgwood Ballroom      |
| 7:00 a.m. – 2:45 p.m. | **The Business of Total Joint Replacement: Finding Talent and Value**  
**Co-Chair:** William A. Jiranek, MD  
**Co-Chair:** Mark I. Froimson, MD, MBA | Senators Lecture Hall       |
| 7:00 a.m. – 2:45 p.m. | **AAHKS Resident Arthroplasty Course**  
Thank you to DePuy Synthes, Smith & Nephew, Stryker, and Zimmer Biomet  
**Chair:** Samuel S. Wellman, MD  
**Co-Chair:** James I. Huddleston, MD | Cortez Ballroom          |

*Resident Hip and Knee Breakout Sessions at 10:20 a.m. – 12:00 p.m. and 1:15 p.m. – 2:40 p.m.*
### FRIDAY, NOVEMBER 2, 2018

#### Industry Symposia

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
</table>
| 7:30 a.m. – 9:30 a.m. | Optimizing Results in Total Knee Arthroplasty  
*DePuy Synthes* | Grand Ballroom E |
| 7:30 a.m. – 9:30 a.m. | OA Symptom Management for Non-Operative and Non-Optimized Hip and Knee Patients: Cooled Radiofrequency Ablation  
*Avanos* | Grand Ballroom B |
| 7:30 a.m. – 9:30 a.m. | Practical Tools for Bundled Payment Success – Will Your Strategy Work?  
*Smith & Nephew, Inc.* | Grand Ballroom A |
| 7:30 a.m. – 9:30 a.m. | How Specialists Can Align with Referring Physicians in a Value-Based Environment  
*Surgical Care Affiliates* | Grand Ballroom D |
| 10:00 a.m. – 12:00 p.m. | Outpatient Total Joint Arthroplasty: Economics, Protocols and Challenges  
*Corentec America* | Grand Ballroom D |
| 10:00 a.m. – 12:00 p.m. | Advancing Total Hip Arthroplasty through Automation  
*DePuy Synthes* | Grand Ballroom E |
| 10:00 a.m. – 12:00 p.m. | Localized Treatment for Osteoarthritis Knee Pain with a Novel Intra-Articular Formulation  
*Flexion Therapeutics* | Grand Ballroom A |
| 10:00 a.m. – 12:00 p.m. | From Design to Data – A Value-Based Overview of Mako Technology  
*Stryker* | Grand Ballroom B |
| 10:00 a.m. – 12:00 p.m. | Zimmer Biomet Educational Event  
*Zimmer Biomet* | Mobile Lab in Anatole Sculpture Park |
| 11:00 a.m. – 1:00 p.m. | Lunch for all attendees | Learning Center/Exhibit Hall |
| 12:45 p.m. – 2:00 p.m. | "Ask the Experts" Case Sessions  
Thank you to Exactech | Grand Ballrooms and Sapphire Room |

#### Panelists

**Primary Hip**
- Daniel J. Berry, MD; Robert L. Barrack, MD; Thomas K. Fehring, MD; William J. Hozack, MD; Luigi Zagra, MD

**Primary Knee**
- Steven B. Haas, MD; Kirby D. Hitt, MD; Brett R. Levine, MD; Mark W. Pagnano, MD; Fares S. Haddad, BSc, MD(Res), FRCS

**Revision Hip**
- Thomas P. Sculco, MD; Kevin L. Garvin, MD; David G. Lewallen, MD; Wayne G. Paprosky, MD; Andrew R. Manktelow, BSc, MBBS, FRCS (Orth)
### Friday, November 2, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>12:45 p.m.</td>
<td>&quot;Ask the Experts&quot; Case Sessions, continued</td>
<td>Grand Ballroom D</td>
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<tr>
<td></td>
<td>Thank you to Exactech</td>
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<tr>
<td>Revisions</td>
<td>Panelists: Walter B. Beaver, MD; Matthew P. Abdel, MD; Robert M. Molloy, MD; Javad Parvizi, MD; Claudio C. Castelli, MD</td>
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<td></td>
<td>Joint Preservation</td>
<td>Sapphire Room</td>
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<td>Panelists: Robert T. Trousdale, MD; Robert L. Buly, MD; Jonathan M. Vigdorchik, MD; Atul F. Kamath, MD</td>
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<tr>
<td>2:30 p.m.</td>
<td>Break</td>
<td>Learning Center/Exhibit Hall</td>
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<tr>
<td>2:55 p.m.</td>
<td>President’s Welcome to the 2018 AAHKS Annual Meeting</td>
<td>Trinity Ballroom</td>
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<tr>
<td>3:00 p.m.</td>
<td>Session One: Primary Total Knee Arthroplasty</td>
<td>Trinity Ballroom</td>
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<td>Moderators: Craig J. Della Valle, MD and William A. Jiranek, MD</td>
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<tr>
<td></td>
<td>Paper #1</td>
<td>Matthew Walker, FRACS Auckland, New Zealand</td>
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<tr>
<td></td>
<td>No Difference in Five-Year Clinical and Radiographic Outcomes Between Kinematic and Mechanical Alignment in TKA – A Randomized Controlled Clinical Trial</td>
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<tr>
<td>3:06 p.m.</td>
<td>Paper #2</td>
<td>Kevin B. Fricka, MD Alexandria, VA</td>
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<tr>
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<td>To Cement or Not? Five-Year Update of a Prospective Randomized Trial Comparing Cemented vs. Cementless Total Knee Arthroplasty</td>
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<tr>
<td>3:12 p.m.</td>
<td>Paper #3</td>
<td>Denis Nam, MD, MSc Chicago, IL</td>
</tr>
<tr>
<td></td>
<td>A Prospective, Randomized Trial of Cemented vs. Cementless Total Knee Arthroplasty of the Same, Modern Design</td>
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<tr>
<td>3:18 p.m.</td>
<td>Paper #4</td>
<td>Tyler E. Calkins, BS Chicago, IL</td>
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<tr>
<td></td>
<td>Physical Therapy on Postoperative Day 0 Following Total Knee Arthroplasty: A Randomized Controlled Trial of 394 Patients</td>
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<tr>
<td>3:24 p.m.</td>
<td>Discussion</td>
<td></td>
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<tr>
<td>3:34 p.m.</td>
<td>Paper #5</td>
<td>David J. Mayman, MD New York, NY</td>
</tr>
<tr>
<td></td>
<td>The Effect of Topical and Intravenous Tranexamic Acid on Drug Levels in Patients Undergoing Total Knee Arthroplasty: A Randomized Double-Blind Placebo Controlled Study</td>
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<tr>
<td>Time</td>
<td>Event</td>
<td>Presenter(s)</td>
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<tr>
<td>3:40 p.m.</td>
<td><strong>Paper #6</strong> Intraoperative Ketamine During Total Knee Arthroplasty: A Prospective Randomized Controlled Trial</td>
<td>Eric Levicoff, MD Philadelphia, PA</td>
</tr>
<tr>
<td>3:46 p.m.</td>
<td><strong>Paper #7</strong> Is Operative Time a Predictor for Postoperative Infection Following Total Knee Arthroplasty?</td>
<td>Hiba Anis, MD Cleveland, OH</td>
</tr>
<tr>
<td>3:52 p.m.</td>
<td><strong>Paper #8</strong> Preoperative Weight Loss for Morbidly Obese Patients Undergoing Total Knee Arthroplasty: How Much Is Necessary?</td>
<td>Benjamin J. Keeney, PhD Hanover, NH</td>
</tr>
<tr>
<td>3:58 p.m.</td>
<td><strong>Discussion</strong></td>
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<tr>
<td>4:08 p.m. – 4:15 p.m.</td>
<td><strong>Guest Societies Recognition</strong> British Hip Society and Italian Hip Society</td>
<td>Presented by: Craig J. Della Valle, MD, and Rafael J. Sierra, MD</td>
</tr>
<tr>
<td>4:15 p.m. – 5:15 p.m.</td>
<td><strong>Symposium I</strong> Simplifying the Concepts of the Hip-Spine Relationship for THA</td>
<td>Moderator and Introduction: Matthew P. Abdel, MD</td>
</tr>
<tr>
<td></td>
<td>What’s the Problem and What’s the Relevant Terminology?</td>
<td>Lawrence D. Dorr, MD</td>
</tr>
<tr>
<td></td>
<td>How Do I Work-up a High-risk THA Patient?</td>
<td>Jonathan M. Vigdorchik, MD</td>
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<td>What Do I Need To Do Differently Intraoperatively?</td>
<td>Douglas E. Padgett, MD</td>
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<td>When Do I Use Dual-Mobility and Why Does It Work?</td>
<td>Matthew P. Abdel, MD</td>
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<td>Questions and Answers vs. Case-Based Panel Discussion</td>
<td>All</td>
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<td>5:15 p.m. – 5:20 p.m.</td>
<td><strong>The AAHKS Humanitarian Award</strong> Presented to Gerard A. Engh, MD</td>
<td>Presented by: Lawrence D. Dorr, MD</td>
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<td>5:20 p.m. – 5:30 p.m.</td>
<td><strong>AJRR Update</strong></td>
<td>Kevin J. Bozic, MD</td>
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<td>5:30 p.m. – 6:30 p.m.</td>
<td><strong>Symposium II</strong> The Comprehensive Management of the Bariatric Patient: Perspectives from Bariatric and Orthopaedic Surgeons</td>
<td>Moderator and Introduction: Mark I. Froimson, MD, MBA</td>
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<td>What are the Implications of Obesity on Total Joint Arthroplasty?</td>
<td>Bryan D. Springer, MD</td>
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<td>Understanding the Impact of the Obesity Disease, on the Patient</td>
<td>Raul J. Rosenthal MD, FACS, FASMBS</td>
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<td>How to Implement Bariatric Surgery into Your practice</td>
<td>John M. Morton, MD, MPH, FACS, FASMBS</td>
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<td><strong>Discussion</strong></td>
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**FRIDAY, NOVEMBER 2, 2018**

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<tr>
<td>6:30 p.m. – 8:00 p.m.</td>
<td><strong>Reception for All Attendees</strong> Thank you to United Surgical Partners International (USPI)</td>
<td>Learning Center/Exhibit Hall</td>
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<td>6:30 p.m. – 8:00 p.m.</td>
<td><strong>Learning Center/Exhibit Hall Open</strong></td>
<td>Learning Center/Exhibit Hall</td>
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**SATURDAY, NOVEMBER 3, 2018**

**FROM 6:00AM – 9:00AM, TRINITY BALLROOM IS OPEN TO PRE-APPROVED KEYNOTE SESSION TICKET HOLDERS ONLY. BALLROOM WILL RE-OPEN AT 9:05AM FOR ALL OTHER ATTENDEES.**

Please note: Ticket holders need to show Photo ID, Meeting Badge, and Keynote Ticket to be admitted.

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>5:30 a.m. (Check-in)</td>
<td><strong>5K Fun Run and 1 Mile Walk Benefiting FARE</strong> Thank you to Smith &amp; Nephew and Elsevier, publisher of the Journal of Arthroplasty and Arthroplasty Today</td>
<td>Trinity Strand Trail – Anatole</td>
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<td>5:55 a.m. (Start)</td>
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<tr>
<td>6:00 a.m. – 7:30 p.m.</td>
<td><strong>Registration</strong></td>
<td>Peacock Foyer</td>
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<tr>
<td>6:00 a.m. – 7:00 a.m.</td>
<td><strong>Coffee Service for Keynote Ticket Holders Only</strong></td>
<td>Learning Center/Exhibit Hall</td>
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<td><strong>Breakfast for All Attendees</strong></td>
<td>Chantilly Ballroom</td>
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<tr>
<td>6:00 a.m. – 7:00 a.m.</td>
<td><strong>Committee Informal Meetings</strong></td>
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<tr>
<td>9:05 a.m. – 7:30 p.m.</td>
<td><strong>Learning Center/Exhibit Hall Open</strong></td>
<td>Learning Center/Exhibit Hall</td>
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<td>6:00 a.m. – 8:00 p.m.</td>
<td><strong>Surgical Technique Video Viewing</strong></td>
<td>Rotunda</td>
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<td>6:00 a.m. – 7:30 p.m.</td>
<td><strong>AAHKS and Guest Society Poster Exhibition</strong> Thank you to Stryker</td>
<td>Chantilly Ballroom</td>
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<tr>
<td>6:55 a.m.</td>
<td><strong>Program Chair’s Welcome</strong> Matthew P. Abdel, MD</td>
<td>Trinity Ballroom</td>
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<tr>
<td>7:00 a.m. – 7:55 a.m.</td>
<td><strong>Symposium III</strong> Private Knee Arthroplasty: Should We Be Doing More?**</td>
<td>Moderator and Introduction: Adolph V. Lombardi Jr., MD, FACS</td>
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<td><strong>Indications and Techniques for Medial Unicompartmental Knee Arthroplasty</strong> Adolph V. Lombardi, Jr., MD, FACS</td>
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<td><strong>Robotically Assisted Medial Unicompartmental Knee Arthroplasty: My Surgical Technique</strong> Andrew D. Pearle, MD</td>
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<td><strong>Cases, Discussion, and Questions</strong> All</td>
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<td><strong>Lateral Unicompartmental Knee Arthroplasty: Indications and My Surgical Technique</strong> William A. Jiranek, MD</td>
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<td><strong>Patellofemoral Knee Arthroplasty: Indications and My Surgical Technique</strong> Jess H. Lonner, MD</td>
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<td><strong>Cases, Discussion, and Questions</strong> All</td>
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<td>7:55 a.m. – 8:55 a.m.</td>
<td><strong>Keynote Session</strong></td>
<td>Trinity Ballroom</td>
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<td><strong>Moderator:</strong> Matthew P. Abdel, MD</td>
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<tr>
<td>8:55 a.m. – 9:05 a.m.</td>
<td>Break</td>
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<td>9:05 a.m. – 10:01 a.m.</td>
<td><strong>Session Two: Revision Total Hip Arthroplasty</strong></td>
<td>Trinity Ballroom</td>
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<td><strong>Moderators:</strong> Ryan M. Nunley, MD and Bryan D. Springer, MD</td>
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<td>9:05 a.m.</td>
<td>Paper #9 Evaluation of the Spine Is Critical in Patients with Recurrent Instability After Total Hip Arthroplasty</td>
<td>Jonathan M. Vigdorchik, MD New York, NY</td>
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<td>9:11 a.m.</td>
<td>Paper #10 IV Tranexamic Acid (TXA) Effectively and Safely Reduces Transfusion Rates in Revision Total Hip Arthroplasties</td>
<td>Jeremy T. Hines, MD Rochester, MN</td>
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<tr>
<td>9:17 a.m.</td>
<td>Paper #11 Safety of Tranexamic Acid in Patients with Comorbidities: A National Assessment Using Claims Data from 1.7 Million Hip and Knee Arthroplasties</td>
<td>Calin S. Moucha, MD New York, NY</td>
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<td>9:23 a.m.</td>
<td>Discussion</td>
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<td>9:33 a.m.</td>
<td>Paper #12 Multicenter Evaluation of a Modular Dual Mobility Construct for Revision Total Hip Arthroplasty</td>
<td>Ronald C. Huang, MD New York, NY</td>
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<td>9:39 a.m.</td>
<td>Paper #13 Mid-Term Results of Dual Mobility for Monoblock Metal-on-Metal Revision – Is It Safe?</td>
<td>Nicholas, D. Colacchio, MD Charlotte, NC</td>
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<td>9:45 a.m.</td>
<td>Paper #14 Constrained Liner Revision Is Less Effective with Each Subsequent Constrained Liner Revision at Preventing Instability in Revision Total Hip Arthroplasty</td>
<td>Nicholas M. Hernandez, MD Rochester, MN</td>
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<td>9:51 a.m.</td>
<td>Discussion</td>
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</table>
| 10:01 a.m. – 10:56 a.m. | **Symposium IV**  
**Revision Total Hip Arthroplasty: How I Manage the Most Common Problems I See**  
*A case will be presented for each topic, then discussed by the panel and followed by questions from the audience:*  
I. The Unstable Total Hip Arthroplasty  
II. The Chronically Infected Total Hip Arthroplasty  
III. Periprosthetic Fracture of the Femur  
IV. Corrosion at the Head Neck Junction  
V. Wear and Osteolysis  
General Questions from Audience | Moderator and Introduction: Craig J. Della Valle, MD  
**Panelists:** Tad M. Mabry, MD  
Javad Parvizi, MD  
Benjamin M. Stronach, MD  
Luigi Zagra, MD  
All |
| 10:56 a.m. – 11:01 a.m. | Break                                                                                           |                   |
### Session Three: Primary Total Hip Arthroplasty

**Trinity Ballroom**

11:01 a.m. **Paper #15**
Title: IV vs. Oral Acetaminophen as a Component of Multimodal Analgesia After Total Hip Arthroplasty: A Randomized, Double-Blinded, Controlled Trial

**Moderators:** Jay R. Lieberman, MD and William G. Hamilton, MD

11:07 a.m. **Paper #16**
Title: Evaluation of Vitamin E Diffused Highly Crosslinked Polyethylene Wear and Porous Titanium Coated Shell Stability: A Seven-Year Randomized Control Trial using Radiostereometric Analysis

**Moderators:** Jay R. Lieberman, MD and William G. Hamilton, MD

11:13 a.m. **Paper #17**
Title: Posterior Hip Precautions Do Not Impact Early Recovery at Total Hip Arthroplasty: A Multicenter Randomized Controlled Study

**Moderators:** Jay R. Lieberman, MD and William G. Hamilton, MD

11:19 a.m. **Discussion**

11:29 a.m. **Paper #18**
Title: Time to Dislocation Analysis of Lumbar Spine Fusion Following Total Hip Arthroplasty: Breaking Up a Happy Home

**Moderators:** Jay R. Lieberman, MD and William G. Hamilton, MD

11:35 a.m. **Paper #19**
Title: Primary Total Hip Arthroplasty Instability Following Lumbosacral Fusion: What Are the Risk Factors?

**Moderators:** Jay R. Lieberman, MD and William G. Hamilton, MD

11:41 a.m. **Paper #20**
Title: Dynamic Sitting to Standing Radiographs More Accurately Depict Functional Mechanics Than Static Radiographs in Total Hip Arthroplasty

**Moderators:** Jay R. Lieberman, MD and William G. Hamilton, MD

11:47 a.m. **Discussion**

11:57 a.m. – 12:45 p.m. **Lunch for All Attendees**

12:45 p.m. – 1:41 p.m. **Session Four: Primary Total Hip Arthroplasty & Other**

**Trinity Ballroom**

12:45 p.m. **Paper #21**
Title: Cluster-Randomized Trial of Opiate-Sparing Analgesia After Discharge from Elective Hip Surgery

**Moderators:** James I. Huddleston, MD and Michael P. Bolognesi, MD

12:51 p.m. **Paper #22**
Title: Primary Total Hip Arthroplasty in Patients Less than 50 Years of Age at a Mean of 16 Years

**Moderators:** James I. Huddleston, MD and Michael P. Bolognesi, MD
### SATURDAY, NOVEMBER 3, 2018

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<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
<th>Location</th>
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<tr>
<td>12:57 p.m.</td>
<td><strong>Paper #23</strong>&lt;br&gt;Perioperative Periprosthetic Femur Fractures Are Strongly Correlated with Fixation Method: An Analysis from the American Joint Replacement Registry (AJRR)</td>
<td>Bryan D. Springer, MD&lt;br&gt;Charlotte, NC</td>
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<td>1:03 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>1:13 p.m.</td>
<td><strong>Paper #24</strong>&lt;br&gt;Does Taper Design Affect Taper Fretting Corrosion in Ceramic on Polyethylene Total Hip Arthroplasty? A Retrieval Analysis</td>
<td>Ali Sobh, MD&lt;br&gt;Royal Oak, MI</td>
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<td>1:19 p.m.</td>
<td><strong>Paper #25</strong>&lt;br&gt;Higher Volume Surgeons Have Lower Cost, Readmissions and Mortality After THA</td>
<td>Stephen B. Murphy, MD&lt;br&gt;Boston, MA</td>
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<td>1:25 p.m.</td>
<td><strong>Paper #26</strong>&lt;br&gt;The Effect of Body Mass Index in 30-Day Complications After Revision Total Hip and Total Knee Arthroplasty</td>
<td>Nicolas S. Piuzzi, MD&lt;br&gt;Cleveland, OH</td>
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<td>1:31 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>1:41 p.m. – 1:51 p.m.</td>
<td><strong>AAHKS 2017-2018 Health Policy Fellow Reports</strong></td>
<td>Nicholas B. Frisch, MD, MBA, and Bradford S. Waddell, MD</td>
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<td>1:51 p.m. – 2:01 p.m.</td>
<td><strong>AAHKS Presidential Award</strong>&lt;br&gt;Presented to Stefano A. Bini, MD</td>
<td>Presented by&lt;br&gt;Craig J. Della Valle, MD</td>
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<td>2:01 p.m. – 2:57 p.m.</td>
<td><strong>Session Five: Periprosthetic Joint Infection</strong>&lt;br&gt;&lt;br&gt;<strong>Moderators:</strong> Javad Parvizi, MD, and Brett R. Levine, MD</td>
<td>Trinity Ballroom</td>
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<td>2:01 p.m.</td>
<td><strong>Paper #27</strong>&lt;br&gt;Perioperative Antibiotic Prophylaxis in Total Joint Arthroplasty: A Single Dose Is as Effective as Multiple Doses</td>
<td>Timothy L. Tan, MD&lt;br&gt;Philadelphia, PA</td>
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<td>2:07 p.m.</td>
<td><strong>Paper #28</strong>&lt;br&gt;What Is the Role of Repeat Aspiration in the Diagnosis of Periprosthetic Hip Infection?</td>
<td>Adam J. Schwartz, MD, MBA&lt;br&gt;Phoenix, AZ</td>
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<td>2:13 p.m.</td>
<td><strong>Paper #29</strong>&lt;br&gt;Diagnostic Accuracy of the Alpha-Defensin Test for Periprosthetic Joint Infection in Patients with Inflammatory Diseases</td>
<td>Yushi Miyamae, MD&lt;br&gt;Yokohama, Japan</td>
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<td>2:19 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>2:29 p.m.</td>
<td><strong>Paper #30</strong>&lt;br&gt;Failed Debridement and Implant Retention Does Not Compromise Success of Subsequent Staged Revision in Infected Total Knee Arthroplasty</td>
<td>Simon W. Young, FRCS&lt;br&gt;Auckland, New Zealand</td>
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<td>2:35 p.m.</td>
<td><strong>Paper #31</strong></td>
<td>Scott R. Nodzo, MD Las Vegas, NV</td>
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<td></td>
<td>Nationwide Organism Susceptibility Patterns to Common Preoperative Prophylactic Antibiotics: What Are We Covering?</td>
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<td>2:41 p.m.</td>
<td><strong>Paper #32</strong></td>
<td>Ilya Bendich, MD San Francisco, CA</td>
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<td>Hepatitis C May Be a Modifiable Risk Factor in Total Joint Arthroplasty: Preoperative Treatment of Hepatitis C is Associated with Decreased Post-Operative Complications in US Veterans</td>
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<td>2:47 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>2:57 p.m. – 3:45 p.m.</td>
<td><strong>Symposium V</strong></td>
<td>Moderator: Daniel J. Berry, MD</td>
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<td></td>
<td>Practice Norms in Primary Hip and Knee Arthroplasty: What is Everyone Else Doing?</td>
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<td>3:45 p.m. – 3:51 p.m.</td>
<td><strong>FARE Grant Award</strong></td>
<td>Presented by Javad Parvizi, MD and Craig J. Della Valle, MD</td>
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<td>3:51 p.m.</td>
<td><strong>The James A. Rand Young Investigator’s Award</strong></td>
<td>Presented by James A. Browne, MD</td>
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<td>Large Opioid Prescriptions are Unnecessary After Total Joint Arthroplasty: A Randomized Controlled Trial</td>
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<td>3:57 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>4:00 p.m.</td>
<td><strong>The Lawrence D. Dorr Surgical Techniques &amp; Technologies Award</strong></td>
<td>Presented by Lawrence D. Dorr, MD</td>
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<td>Why Are Contemporary Revision Total Hip Arthroplasties Failing? An Analysis of 2500 Cases</td>
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<td>4:06 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>4:09 p.m.</td>
<td><strong>The AAHKS Clinical Research Award</strong></td>
<td>Presented by Mark I. Froimson, MD, MBA</td>
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<td>Prophylactic Tamsulosin Does Not Reduce the Risk of Urinary Retention Following Lower Extremity Arthroplasty: A Double-Blind Randomized Controlled Trial</td>
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<td>4:15 p.m.</td>
<td><strong>Discussion</strong></td>
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<td>4:18 p.m.</td>
<td><strong>In Memoriam: Richard H. Rothman, MD, PhD</strong></td>
<td>Trinity Ballroom</td>
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<td>4:20 p.m. – 4:35 p.m.</td>
<td><strong>Break</strong></td>
<td>Learning Center/Exhibit Hall</td>
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**SATURDAY, NOVEMBER 3, 2018**

**4:35 p.m. – 5:35 p.m.**

**Symposium VI**  
Periprosthetic Joint Infection in Hip and Knee Arthroplasty  

**Moderator and Introduction:**  
Fares S. Haddad, BSc, MD(Res), FRCS

**Practical Approach to Reducing the Infection Burden: Prophylactic and Preventative Measures in 2018**  
Matthew S. Austin, MD

**Diagnosis of Periprosthetic Infection: An Update on the Available Techniques, Controversies and Definitions**  
Denis Nam, MD

**Algorithmic Approach: Which Procedure, When and for Whom?**  
Fares S. Haddad, BSc, MD(Res), FRCS

**Two-Stage Revision: Managing the Interval, Antibiotics and Re-implantation**  
Andrew R. Manktelow, BSc, MBBS, FRCS(Orth)

**Case-Based Discussion**  
All

**5:35 p.m. – 6:30 p.m.**

**Session Six: Revision Total Knee Arthroplasty**  

**Moderators:** Scott M. Sporer, MD and Gregory G. Polkowski II, MD, MSc

**5:35 p.m.**  
**Paper #33**  
A Multi-Center Randomized Clinical Trial of Tranexamic Acid in Revision Total Knee Arthroplasty: Does the Dosage Regimen Matter?  
Yale A. Fillingham, MD  
Philadelphia, PA

**5:41 p.m.**  
**Paper #34**  
Topical Tranexamic Acid in Revision Total Knee Arthroplasty Reduces Transfusion Rates and May Be Associated with Earlier Functional Recovery  
Alejandro Gonzales Della Valle, MD  
New York, NY

**5:47 p.m.**  
**Paper #35**  
Next Generation Sequencing for the Diagnosis of Periprosthetic Knee Infection: A Multicenter Investigation  
Karan Goswami, MD  
Philadelphia, PA

**5:53 p.m.**  
**Discussion**

**6:03 p.m.**  
**Paper #36**  
Does Neutral Mechanical Alignment Improve the Durability of Revision Total Knee Arthroplasty?  
Matthew P. Abdel, MD  
Rochester, MN

**6:09 p.m.**  
**Paper #37**  
Ignore the Patella in Revision Total Knee Surgery  
David F. Dalury, MD  
Towson, MD

**6:15 p.m.**  
**Paper #38**  
What Is the Value of Component Loosening Assessment of a Preoperatively-Obtained Bone Scan Prior to Revision Total Knee Arthroplasty?  
David C. Holst, MD  
Denver, CO

**6:21 p.m.**  
**Discussion**

**6:30 p.m. – 8:00 p.m.**  
**Reception for All Attendees**  
Learning Center/Exhibit Hall
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<td>6:00 a.m.</td>
<td>Registration</td>
<td>Peacock Foyer</td>
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<td>6:00 a.m.</td>
<td>Breakfast for All Attendees</td>
<td>Trinity Ballroom Foyer</td>
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<tr>
<td>6:00 a.m.</td>
<td>AAHKS and Guest Society Poster Exhibition</td>
<td>Chantilly Ballroom</td>
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<td>7:00 a.m.</td>
<td>AAHKS Business Meeting</td>
<td>Trinity Ballroom</td>
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<td>7:15 a.m.</td>
<td>Session Seven: Non-Arthroplasty and Other</td>
<td>Trinity Ballroom</td>
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<td><strong>Moderators</strong>: Rafael J. Sierra, MD and</td>
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<td>Matthew S. Austin, MD</td>
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<td>7:15 a.m.</td>
<td>Paper #39 Natural History of the Dysplastic Hip Following</td>
<td>Cody C. Wyles, MD</td>
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<td>Periacetabular Osteotomy</td>
<td>Rochester, MN</td>
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<td>7:21 a.m.</td>
<td>Paper #40 Surgical Treatment of Femoroacetabular Impingement:</td>
<td>John C. Clohisy, MD</td>
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<td>Arthroscopy vs. Surgical Hip Dislocation – A Propensity Matched</td>
<td>St. Louis, MO</td>
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<td>Analysis</td>
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<td>7:27 a.m.</td>
<td>Paper #41 Patient Reported Outcomes in Joint Registries: Defining</td>
<td>Mohamad J. Halawi, MD</td>
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<td>the Optimal Collection Window</td>
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<td>Farmington, CT</td>
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<td>7:33 a.m.</td>
<td><strong>Discussion</strong></td>
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<td>7:43 a.m.</td>
<td>Paper #42 When Should Complete Blood Count Tests Be Performed</td>
<td>Beau J. Kildow, MD</td>
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<td>in Primary Total Knee Arthroplasty Patients?</td>
<td>Durham, NC</td>
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<td>7:49 a.m.</td>
<td>Paper #43 Identifiable Risk Factors to Minimize Postoperative Urinary</td>
<td>R. Michael Meneghini, MD</td>
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<td>Retention in Modern Outpatient Rapid Recover Total Joint Arthroplasty</td>
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<td>Indianapolis, IN</td>
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<td>7:55 a.m.</td>
<td>Paper #44 Transdermal Scopolamine as an Adjunct to Multi-Modal</td>
<td>Roshan Shah, MD</td>
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<td>Pain Management in Patients Undergoing Total Joint Arthroplasty</td>
<td>New York, NY</td>
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<td>8:01 a.m.</td>
<td><strong>Discussion</strong></td>
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<td>8:11 a.m. – 9:11 a.m.</td>
<td><strong>Symposium VII</strong>&lt;br&gt;Outpatient Joint Replacement: Practical Guidelines for Your Program Based on Evidence, Success, and Failures</td>
<td>Moderator and Introduction: R. Michael Meneghini, MD</td>
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<td>Introduction/Patient Selection</td>
<td>R. Michael Meneghini, MD</td>
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<td>Office and Staff Protocols</td>
<td>Alexander P. Sah, MD</td>
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<td>Facility Protocols and Pathways</td>
<td>William G. Hamilton, MD</td>
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<td>ASC vs. Hospital</td>
<td>Charles A. DeCook, MD</td>
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<td>Case Examples – Threats of Discharge Question and Answer</td>
<td>All</td>
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<td>9:11 a.m. – 9:16 a.m.</td>
<td><strong>The Hip Society Update</strong>&lt;br&gt;<strong>President:</strong> Douglas E. Padgett, MD</td>
<td>Trinity Ballroom</td>
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<td>9:16 a.m. – 9:21 a.m.</td>
<td><strong>The Knee Society Update</strong>&lt;br&gt;<strong>President:</strong> Robert L. Barrack, MD</td>
<td>Trinity Ballroom</td>
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<td>9:21 a.m. – 10:17 a.m.</td>
<td><strong>Session Eight: Complications Not Including Infection</strong>&lt;br&gt;<strong>Moderators:</strong> Mark J. Spanghel, MD and C. Lowry Barnes, MD</td>
<td>Trinity Ballroom</td>
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<td>9:21 a.m.</td>
<td><strong>Paper #45</strong>&lt;br&gt;Cotinine Testing Improves Smoking Cessation Prior to Total Joint Arthroplasty</td>
<td>Adam Hart, MD&lt;br&gt;Rochester, MN</td>
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<td>9:27 a.m.</td>
<td><strong>Paper #46</strong>&lt;br&gt;Diabetes Mellitus Type I Poses Greater Risk for Periprosthetic Joint Infection that Type II for Patients Undergoing Total Joint Arthroplasty</td>
<td>Jeremy M. Gililland&lt;br&gt;Salt Lake City, UT</td>
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<td>9:33 a.m.</td>
<td><strong>Paper #47</strong>&lt;br&gt;Smoking Adversely Affects Patient Reported Outcomes Following Total Joint Arthroplasty</td>
<td>Mark P. Cote, MD&lt;br&gt;Farmington, CT</td>
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<td>9:39 a.m.</td>
<td><strong>Discussion</strong></td>
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<td>9:49 a.m.</td>
<td><strong>Paper #48</strong>&lt;br&gt;Aspirin for Venous Thromboembolism Prophylaxis Decreases Mortality After Primary Total Joint Arthroplasty</td>
<td>Alexander J. Rondon&lt;br&gt;MD, MBA&lt;br&gt;Philadelphia, PA</td>
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<td>9:55 a.m.</td>
<td><strong>Paper #49</strong>&lt;br&gt;Are Patients More Satisfied with a Balanced TKA?</td>
<td>Gregory J. Golladay&lt;br&gt;MD&lt;br&gt;Richmond, VA</td>
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<td>10:01 a.m.</td>
<td><strong>Paper #50</strong>&lt;br&gt;Emergency Department Visit Within One Year Prior to Elective Total Joint Arthroplasty is Predictive of Postoperative Return to Emergency Department Within 90 Days</td>
<td>Michael D. Gabbard&lt;br&gt;MD&lt;br&gt;Detroit, MI</td>
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<td>10:07 a.m.</td>
<td><strong>Discussion</strong></td>
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**SUNDAY, NOVEMBER 4, 2018**

<table>
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<tr>
<th>Time</th>
<th>Session Description</th>
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<th>Moderators/Speakers</th>
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| 10:17 a.m. – 11:17 a.m. | Symposium VIII  
Taper Corrosion in Total Hip Arthroplasty: Applying the Best Evidence into Practice | Trinity Ballroom        | Moderator and Introduction:  
Joshua J. Jacobs, MD  
**What Surgeons Need to Know About Taper Corrosion in THA:** Joshua J. Jacobs, MD  
**How Big Is the Problem?:** Brian J. McGrory, MD  
**How to Evaluate for Taper Corrosion in MoP THA?:** Brett R. Levine, MD  
**What Are the Risk Factors for Taper Corrosion ALTR and Revision Outcome?:** Young-Min Kwon, MD, PhD  
**Case Presentations with Discussion:** All |
| 11:17 a.m. – 12:13 a.m. | Session Nine: Health Policy  
**Moderators:** J. Bohannon Mason, MD and Jonathan L. Schaffer, MD, MBA | Trinity Ballroom        |  
11:17 a.m.  
**Paper #51**  
Unintended BPCI Consequences Following Removal of TKA from Inpatient-Only List | Brian M. Curtin, MD, MS, Charlotte, NC |
|               |                                                                                     |                         | 11:23 a.m.  
**Paper #52**  
Age and Frailty Influence Hip and Knee Arthroplasty Reimbursement in a Bundled Payment Care Improvement Initiative | Andrew M. Pepper, MD, New York, NY |
|               |                                                                                     |                         | 11:29 a.m.  
**Paper #53**  
Perioperative Orthopaedic Surgical Home (POSH): Optimization of High-Risk TJA Candidates Is Effective | Afshin A. Anoushiravani, MD, New York, NY |
|               |                                                                                     |                         | 11:35 a.m.  
**Discussion** |
|               |                                                                                     |                         | 11:45 a.m.  
**Paper #54**  
Medical Malpractice Litigation Following Primary Total Joint Arthroplasty: A Comprehensive, Nationwide Analysis for the Last Decade | Linsen T. Samuel, MD MBA, Cleveland, OH |
|               |                                                                                     |                         | 11:51 a.m.  
**Paper #55**  
Preoperative Optimization Checklists Within the CJR Bundle Have Not Decreased Hospital Returns | Sean P. Ryan, MD Durham NC |
|               |                                                                                     |                         | 11:57 a.m.  
**Paper #56**  
Antibiotic-Loaded Bone Cement in Primary Total Knee Arthroplasty: Utilization Patterns and Impact on Complications Using a National Database | Darwin Chen, MD New York, NY |
|               |                                                                                     |                         | 12:03 a.m.  
**Discussion** |
|               |                                                                                     |                         | 12:13 p.m.  
**Concluding Remarks** | Craig J. Della Valle, MD |
|               |                                                                                     |                         | 12:15 p.m.  
**Adjourn** |
|               |                                                                                     |                         | 12:15 p.m.  
**Poster Take-Down**  
Any posters remaining after 1:00 p.m. will be discarded. | Chantilly Ballroom |

*2018 AAHKS ANNUAL MEETING | FINAL PROGRAM*
Paper #1

No Difference in Five-Year Clinical and Radiographic Outcomes Between Kinematic and Mechanical Alignment in TKA—A Randomized Controlled Clinical Trial

Simon W. Young, FRCS, Niall P. T. Sullivan, FRCS, Sherina Holland, PhD, William Farrington, FRCS, Ali Bayan, FRACS, Matthew Walker, FRACS

Introduction: Kinematic Alignment (KA) technique in total knee arthroplasty (TKA) attempts to match implant position to the pre-arthritic anatomy of an individual patient. This contrasts with a traditional neutral mechanical alignment (MA) goal. This study compares the mid-term survivorship, functional outcomes and radiographic signs of loosening/failure between these two techniques.

Methods: Ninety-nine patients undergoing primary TKA for osteoarthritis were randomized to either MA (n=50) or KA (n=49) groups. Computer Navigation was used for all patients in the MA group, and in the KA group patient specific cutting-blocks were manufactured using individual preoperative MRI data. Radiographs were obtained postoperatively, and at 1, 2, and 5 years. Functional outcome scores were assessed preoperatively and at 6 weeks, 6 months, 1, 2 and 5 years postoperatively. Radiographs were assessed using the Modern Knee Society Radiographic Evaluation System.

Results: There was no significant difference in patient reported outcome measures (PROMs) at five years. The difference between the means (MA vs. KA) were—Oxford Knee Score 0.42 ± 9.74 (p=0.77), WOMAC score 3.57± 3.12(p=0.32), Forgotten Joint Score 6.08± 5.39 (p=0.26), EQ-5D 0.05±0.28 (p=0.25), Knee Society Pain/Motion 1.44±2.43 (p=0.55) or Function Scores 5.13± 3.65 (p=0.16), and Range of Motion -1.80±1.7 (p=0.29). There were no significant differences in the presence of static or progressive radiolucent lines. There were no differences in the number of re-operations. The MA group had two revisions for infection and one secondary patella resurfacing. The KA group had one liner exchange for stiffness and one liner exchange plus secondary patellar resurfacing for on-going pain.

Conclusions: We found no significant difference in functional or radiographic outcomes between TKAs implanted with MA or KA. The revision and re-operation rates were similar. These mid-term results support the two-year findings of no difference in MA vs. KA, however the impact on long-term survivorship is still unknown.
To Cement or Not? Five-Year Update of a Prospective Randomized Trial Comparing Cemented vs. Cementless Total Knee Arthroplasty

Kevin B. Fricka, MD, Craig J. McAsey, MD, Supatra Sritulanondha, MPH

Introduction: The optimal mode of fixation in total knee arthroplasty (TKA) is a continuing subject of debate. The younger population of knee patients and longer life expectancies require excellent outcomes with longer durability. The purpose of this study was to compare mid-term outcomes for cemented and cementless TKA.

Methods: Previously, we reported two-year results for an original cohort of 100 TKA patients in a prospective, randomized trial. Exclusion criteria included patient age over 75 years and grossly porotic bone at time of surgery. Age, gender, and BMI were similar between groups. Knee Society Scores (KSS), Oxford scores and pain visual analog scales (VAS) were collected preoperatively and postoperatively. A power analysis indicated that a minimum of 42 patients per group was required to show a statistically significant difference in the KSS with 80% power. A 5-year follow-up has been obtained with radiographic analysis for 85 patients. Kaplan-Meier survivorship curves were generated with revision for any reason being the endpoint.

Results: At 5 years, the mean KSS clinical and functional scores, mean Oxford scores, and responses to self-reported questions for satisfaction (less pain and better function) were similar in both groups. The cementless group had two revisions, one for instability and one for malunion after late periprosthetic fracture. The cemented group had one revision for infection and one amputation following a traumatic knee dislocation. Survivorship with revision as an endpoint was equivalent (96%, p=0.98) for both groups. There was no significant difference in the incidence of radiolucencies between the groups (p=0.228), all were non-progressive, and 3/4 with subsidence from the two-year report had stabilized.

Conclusions: Cementless TKA continues to show equivalent patient reported outcomes and survivorship compared to cemented TKA at mid-term follow-up. Updates are planned at the 10 and 15-year intervals to obtain long-term outcomes.
Introduction: Highly porous surfaces promoting biologic fixation have renewed interest in cementless total knee arthroplasty (TKA), but the potential for failed ingrowth remains. This investigation compared the clinical outcomes of cemented and cementless versions of the same TKA design at a minimum of 2-years.

Methods: This was an IRB-approved, prospective, randomized controlled trial of patients aged 18 to 75 undergoing a primary TKA. Patients with inflammatory arthritis, a BMI > 40 kg/m², infection, or neuromuscular disorder were excluded. Patients were randomized to receive a cemented or cementless cruciate-retaining TKA of the same design. The cementless implant has highly porous fixation surfaces, but otherwise similar features as its cemented predecessor. Knee Society (KSS), UCLA, Oxford Knee, and Forgotten Joint Scores were collected. Patients were asked to rate their knee as a percentage of normal (100% = normal). Power analysis indicated 120 patients necessary to demonstrate a 20% difference in reporting of normal (alpha = 0.05, beta = 0.80). Chi-square and independent t-tests were performed.

Results: 120 patients were enrolled (56 cemented, 64 cementless). There was no difference in age, gender, BMI, or ASA score (p=0.1 to 0.9). There was no difference in change in hemoglobin on postoperative day 1 between the two cohorts (-2.5+0.9 vs. -2.6+1.4, p=0.5), but total operative time was decreased in the cementless cohort (82.1+16.2 vs. 93.7+16.7, p=0.001). No differences were seen in any clinical outcome measure (p=0.2 to 0.8). Cemented patients rated their TKA to be 87.0+12.3% of normal versus 87.6+13.8% in the cementless cohort (p=0.8). There was no radiographic evidence of component loosening in either cohort.

Conclusions: A recently introduced cementless TKA design demonstrates excellent results without early failure for aseptic loosening, but continued surveillance is necessary to determine its potential long-term benefit.
Introduction: Early mobilization with physical therapy (PT) has been emphasized as a strategy to facilitate early discharge following total knee arthroplasty (TKA). The purpose of this study was to determine whether starting PT the afternoon of postoperative day (POD) 0, instead of starting PT the morning of POD1, could shorten hospital length of stay.

Methods: Patients undergoing TKA were randomized intraoperatively to start PT the afternoon following surgery or the morning of POD1. Hospital length of stay in hours was compared between groups. A post-discharge telephone survey assessed satisfaction with inpatient PT, self-perceived readiness for discharge, and pain on POD0 using 10-point analog scales. A prior sample size calculation suggested that 328 patients were required to show a 4-hour difference in hospital stay between groups; 20% was added for attrition, resulting in 394 patients to be enrolled. Comparisons were made using the non-parametric Wilcoxon rank-sum test; consequently, medians are reported.

Results: Out of 394 patients enrolled and randomized, 378 (95.9%) completed the study. 183 were randomized to start PT on POD0 and 195 to start PT on POD1. Baseline characteristics did not differ between groups, suggesting appropriate randomization. Hospital length of stay did not differ between groups (intention-to-treat analysis: median of 32.0 hours for POD0 PT versus 31.0 hours for POD1 PT, p=0.646; as-treated analysis: median of 31.0 hours for POD0 PT versus 32.0 hours for POD1 PT, p=0.119). Finally, the two groups did not differ in satisfaction with inpatient PT (10.0 vs. 10.0, p=0.766), patient-reported readiness for discharge at time of discharge (10.0 vs. 10.0, p=0.968), or pain on POD0 (3.3 vs. 4.0, p=0.789).

Conclusions: This randomized trial suggests no difference in length of stay, patient satisfaction, or patient-reported readiness for discharge when PT is initiated on the day of TKA versus the morning after.
Paper #5

The Effect of Topical and Intravenous Tranexamic Acid on Drug Levels in Patients Undergoing Total Knee Arthroplasty: A Randomized Double-Blind Placebo Controlled Study◊

Kethy Jules-Elysee, MD, Audrey Tseng, BA, Lila R. Baaklini, MD, Alexander S. McLawhorn, MD, MBA, Taylor Cogsil, BA, Kara Fields, MS, David J. Mayman, MD, Thomas P. Sculco, MD

Introduction: Tranexamic acid (TXA) is used to decrease blood loss during total knee arthroplasty (TKA). We sought to examine if TXA levels changed systemically and in the wound when the drug is given intravenously (IV) compared to topical.

Methods: 76 TKA patients were enrolled. Patients received combined spinal-epidural anesthesia with 0.5% bupivacaine and an adductor canal nerve block. Before tourniquet (TQ) inflation, patients received 1.0 gm of TXA or placebo, and another dose three hours later. Topical TXA or placebo solution was poured into the wound 5 minutes prior to TQ release. The topical group received 3.0 gm of TXA in 75 mL of saline vs. placebo directly on the wound. Blood was measured for levels of TXA using high performance liquid chromatography. Wound blood from the Constavac drainage was measured 4 hours post-TQ release.

Results: Systemic TXA levels were higher in the IV group at all time points (p<0.001). At 4 hours post-TQ release, wound and systemic levels of TXA were similar in the IV group. Wound levels of IV TXA were greater than in the topical group (p<0.001). At 4 hours post TQ release, topical TXA wound blood levels were significantly higher than the systemic level (p<0.001). Calculated total blood loss was higher in the topical group (p=0.023), but there was no significance difference between the amount of wound blood from the drain (p=0.404).

Conclusions: High wound levels of TXA are achieved when the drug is given IV raising the possibility of the wound being its major site of action. Four hours post TQ release, higher wound blood levels are seen compared to topical administration. Topical TXA systemic levels in the blood are about 1/3 that of IV TXA at 1-hour post TQ release.

◊ The FDA has not approved tranexamic acid for use in orthopaedics.
### Intraoperative Ketamine During Total Knee Arthroplasty: A Prospective Randomized Controlled Trial

Timothy L. Tan, MD, Andrew Longenecker, MD, Janet Rhee, BS, Robert P. Good, MD, William Emper, MD, Kevin Freedman, MD, Julie L. Shaner, MD, Eric Levicoff, MD

**Introduction:** Multimodal pain protocols have increased in popularity with the aim of reducing narcotic consumption and side-effects. Multiple studies have demonstrated that ketamine, a glutamate receptor blocker, may decrease postoperative pain in abdominal and orthopaedic surgeries. However, its role with spinal anesthesia and total knee arthroplasty remains unknown. The purpose of this study was to determine the efficacy of sub-anesthetic dosing of ketamine during total knee arthroplasty (TKA) on postoperative pain and narcotic consumption.

**Methods:** In this prospective, randomized double blinded clinical trial, we enrolled 90 patients undergoing primary TKA with spinal anesthesia in a single institution between January 2016 to April 2018. Patients were randomized to intraoperative ketamine incision at a rate of 6mcg/kg/min for 75 minutes or a saline placebo. All patients received spinal anesthesia and otherwise identical surgical approaches, pain management and rehabilitation protocols. Patient-reported visual analogue pain scores (VAS) were calculated preoperatively, postoperative day (POD) 0 to 7 and 14 days. Narcotic consumption was evaluated on POD 0 and 1.

**Results:** There was no significant difference between the groups in terms of average, least, or maximum VAS pain scores (p>0.05 for all) for any of the first seven postoperative days. Average daily pain was 35.1 and 32.5 on POD0 (p=0.48), 47.4 and 55.0 on POD1 (p=0.19), and 53.4 vs. 49.1 on POD2 (p=0.49) for ketamine and saline placebo, respectively. There was also no difference in total morphine equivalents on POD 0 (35.5 vs. 27.3 p=0.31), and a trend toward increased narcotic consumption for ketamine on POD1 (44.2 vs. 33.5, p=0.05). There was no difference in narcotic or ketamine related side effects.

**Conclusions:** As part of multimodal pain management protocol, intraoperative ketamine does not result in any clinically significant improvement of the measured outcomes following TKA.
Is Operative Time a Predictor for Postoperative Infection Following Total Knee Arthroplasty?

Hiba Anis, MD, Alison K. Klika, MS, Michael A. Mont, MD, Wael K. Barsoum, MD, Carlos A. Higuera, MD, Robert M. Molloy, MD

Introduction: Determining risk factors is crucial in potentially avoiding surgical site infections (SSI) and prosthetic joint infections (PJI) after total knee arthroplasty (TKA). The purpose of this study was to evaluate the association of SSI and PJI with operative time in primary TKA.

Methods: A retrospective review was conducted using an institutional database yielding 12,541 primary TKA procedures performed between 2014 and 2017. Medical records were reviewed for diagnoses of SSI (skin and superficial wound infections) and PJI (deep joint infections requiring surgery) over an average 2-year postoperative period. Multivariate logistic regression was performed to adjust for gender, age, BMI, Charlson Comorbidity Index, year of surgery, hospital volume, and surgeon volume. Volume was determined as low, intermediate, or high by mean TKAs/year at each hospital (<250, 250-500, or >500, respectively) and by each surgeon (<50, 50-150, or >150, respectively).

Results: 324 patients with subsequent SSI had longer mean operative times (118±41 min) compared to non-infected patients (108±35 min, p<0.001). 82 procedures complicated by PJI (136±47 min) had longer mean operative times compared to non-infected patients (108±35 min, p<0.001). Multivariate analysis showed operative time was an independent predisposing factor for SSI (odds ratio [OR]=1.006; 95% confidence interval [CI], 1.003-1.009; p<0.001) and PJI (OR=1.010; 95% CI, 1.006-1.015; p<0.001). This corresponded to a 9% increased risk for SSI and a 15% increased risk for PJI for every 15-minute increase in operative time.

Conclusions: Identifying risk factors that are easily measurable and modifiable, such as procedure duration, can aid in risk-stratifying postoperative surveillance. These findings support recent studies. Moreover, this study differentiated effects of operative time on SSI and PJI and demonstrated these associations remain significant after adjusting for patient and hospital/surgeon factors. This study highlights the importance of minimizing intraoperative delay to significantly improve patient outcomes.

Notes
Introduction: Many surgeons require or request weight loss among morbidly obese (body mass index (BMI) >40) patients before undergoing TKA. We sought to determine how much weight reduction was necessary to improve operative time, length of stay (LOS), discharge to a facility, and physical function improvement.

Methods: Using a retrospective review of 2011-2016 prospectively collected cohort data at one tertiary institution, we identified 203 patients who were clinically measured as morbidly obese at least 90 days before surgery and had their BMI measured again at the immediate preoperative visit. Of these 203, 41% lost at least 5 pounds, 29% lost at least 10 pounds, and 14% lost at least 20 pounds. All models were adjusted for preoperative age, sex, year of surgery, bilateral status, physical function (PROMIS-10 physical component score, PCS), mental function (PROMIS-10 mental component score), and Charlson Comorbidity Index.

Results: Compared to morbidly patients who did not lose 20 pounds, losing 20 pounds before TKA among morbidly obese patients was associated with lower adjusted odds of discharge to a facility (OR 0.28, 95% CI 0.09–0.94, P=0.039), lower odds of extended LOS of at least 4 days (OR 0.24, 95% CI 0.07–0.88, P=0.31), and absolute shorter LOS (-0.87 days, 95% CI -1.39–-0.36, P=0.001). There were no differences in operative time or PCS improvement. Losing 5 or 10 pounds was not associated with differences for any outcome.

Conclusions: Although there were no differences for operative time or physical function improvement, losing at least 20 pounds before TKA was associated with shorter LOS and lower odds of facility discharge for morbidly obese patients. This has immense implications on patient burden and cost reduction, even while most patients remained morbidly or severely obese. Patients and providers may want to focus on larger pre-surgical weight loss.
Spinal pathology plays an intricate role in the risk of dislocation after primary THA. It has been shown in numerous studies that spinal fusion increases the risk of dislocation.

Objectives:

1. Understand how the spine affects the movement of the pelvis and how this relates to acetabular component positioning.
2. Understand how to recognize a patient at high-risk of dislocation after primary THA and how to decrease this risk.
3. Understand how to adapt acetabular component positioning and implant selection based on spinal pathology.

Outline:

Introduction of Symposium and Faculty
Matthew P. Abdel, MD

What’s the Problem and What’s the Relevant Terminology?
Lawrence D. Dorr, MD

How Do I Work-up a High-risk THA Patient?
Jonathan M. Vigdorchik, MD

What Do I Need to Do Differently Intraoperatively?
Douglas E. Padgett, MD

When Do I Use Dual-Mobility and Why Does It Work?
Matthew P. Abdel, MD

Questions & Answers vs. Case-Based Panel Discussion
The burden of obesity continues to rise both for the general public and within the arthroplasty population. When Osteoarthritis and Morbid Obesity coexist, managing these concurrent conditions using comprehensive and evidence-based protocols has been shown to improve outcomes and reduce complications and cost of care.

Objectives:

1. To provide surgeons with evidence on the best methods to mitigate and manage the risks associated with managing patients facing both obesity and advanced arthritis

2. To provide surgeons and their teams with the tools to create comprehensive teams and strategies to minimize the burden of managing these resource intensive patients

3. To provide guidelines on the metabolic effects of the weight loss surgeries available, the timing of arthroplasty surgery following bariatric surgery and special considerations in managing patients who require both procedures

Outline:

Introduction
Mark I. Froimson, MD, MBA

What Are the Implications of Obesity on Total Joint Arthroplasty?
Bryan D. Springer, MD

Understanding the Impact of the Obesity Disease on the Patient
Raul Rosenthal, MD, FACS, FASMBS

How to Implement Bariatric Surgery into Your Practice
John M. Morton, MD, MPH, FACS, FASMBS

Discussion
Among reconstructive procedures of the knee, partial knee arthroplasty has experienced the greatest growth over the past decade. However, questions persist regarding the optimal candidates for partial knee arthroplasty procedures that include medial unicompartmental, lateral unicompartmental, and patellofemoral replacement.

Objectives:

1. Describe the current indications for patellofemoral, medial unicompartmental, and lateral unicompartmental knee arthroplasty.
2. Identify the clinical presentation as well as radiographic evaluation and imaging studies which should be obtained preoperatively to determine patient selection for these specific operative interventions.
3. Adapt the surgical pearls which will facilitate the performance of these respective arthroplasties.
4. Present a literature review which forms the basis for the continued utilization of specific partial knee arthroplasty.
5. Enhance the practicing orthopaedic surgeon’s understanding of the current status of total partial knee arthroplasty.
6. Facilitate improved results in partial knee arthroplasty by clarifying patient selection.

Outline:

**Indications and Techniques for Medial Unicompartmental Knee Arthroplasty**
Adolph V. Lombardi, Jr., MD, FACS

**Robotically Assisted Medial Unicompartmental Knee Arthroplasty: My Surgical Technique**
Andrew D. Pearle, MD

**Cases, Discussion and Questions**

**Patellofemoral Knee Arthroplasty: Indications and My Surgical Technique**
Jess H. Lonner, MD

**Cases, Discussion and Questions**

Notes
Introduction: Previously underappreciated, the spine contributes substantially to THA dislocations, and must be taken into consideration during preoperative planning for revision THA due to recurrent instability. We developed a protocol to assess the functional position of the spine, the significance of these findings, and how to address different pathologies at the time of revision THA.

Methods: Prospectively collected data on 111 patients undergoing revision THA for recurrent instability from January 2014 to January 2017 at two institutions were included (protocol group) and matched 1:1 to 111 revisions specifically performed for instability not using this protocol (control group). Protocol patients underwent standardized preoperative imaging including a supine AP pelvis radiograph, standing AP pelvis, and sitting and standing lateral radiographs. Each case was scored according to the “Hip-Spine Classification in Revision THA” as follows:

1. Normal spinal alignment (defined by PI-LL±10°)
2. Flatback deformity (PI-LL>10°)
3. Hyperlordosis (PI-LL<-10)
   a. Normal spinal mobility
   b. Stiff spine (defined as <20° change in pelvic tilt or sacral slope from stand to sit)

Each group has an associated explanation and treatment recommendation, and instability was addressed surgically through the algorithm based on the above classification.

Results: Survivorship free of dislocation at 2 years was 97% in the protocol group (3 dislocations all within 3 months of surgery) vs. 84% in the control group (18 patients). Amazingly, 77% of the inappropriately positioned acetabular components would have been unrecognized by supine AP pelvis imaging alone. All cases fell within one of the five categories.

Conclusions: Using a new Hip-Spine Classification System in revision THA, we demonstrated a significant decrease in the risk of recurrent instability compared to a control group. Without the use of this algorithm, 77% of inappropriately positioned acetabular components would have been unrecognized.
Paper #10

IV Tranexamic Acid (TXA) Effectively and Safely Reduces Transfusion Rates in Revision Total Hip Arthroplasties◊

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Introduction: TXA has been shown to reduce transfusion rates in primary total hip arthroplasties (THAs), but data is limited in the revision setting. The purpose of this study was to compare the rate of blood transfusions and symptomatic venous thromboembolic events (VTEs) in revision THAs treated with or without IV TXA.

Methods: We performed a retrospective review of 3,264 revision THAs (2,645 patients) between 2005-2014, of which 1,142 patients received IV TXA (1g at incision and 1g at closure). The mean age was 65 years in the revision group with TXA (49% male), and 67 years in the revision group treated without TXA (45% male). Outcomes analyzed included rates of transfusion and VTE between cases treated with TXA and cases not treated with TXA. These comparisons were performed for the overall cohort, as well as within the subset of septic and aseptic cases. In order to minimize potential bias between these two subgroups, the analyses were weighted with inverse probability of treatment values based on a propensity score. Mean follow-up was 2 years.

Results: TXA significantly reduced the rate of blood transfusions after revision THA overall from 54% to 26% (p<0.001; unadjusted RR 2.1, adjusted RR 1.6), with a significant reduction in both septic (73% to 53%, p=0.04) and aseptic (49% to 18%, p<0.001) revisions. The rate of VTE was minimal overall, with 3 events (0.3%) in the group with TXA and 4 events (0.2%) in the group without TXA. There were no significant differences in VTE rates in those who did or did not receive IV TXA based upon the procedures being septic or aseptic in nature.

Conclusions: The use of IV TXA in revision THAs is associated with a significant reduction in transfusion rates, and a very low rate of VTEs (0.3%).

◊ The FDA has not approved tranexamic acid for use in orthopaedics.
Paper #11

Safety of Tranexamic Acid in Patients with Comorbidities: A National Assessment Using Claims Data from 1.7 Million Hip and Knee Arthroplasties

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**Introduction:** With increasing use of tranexamic acid (TXA) in total hip and knee arthroplasties (THA/TKA), safety concerns remain specifically regarding patients with preexisting comorbidities. Therefore, using national claims data, we aimed to study 1) current utilization patterns of TXA in THA/TKA procedures and 2) its impact on complications when used in patients with preexisting comorbidities.

**Methods:** In this retrospective cohort study we assessed data on n=1,694,795 THA/TKA procedures (Premier Healthcare claims database; 2006-2016). The main effect was TXA use; main outcomes were blood transfusion and complications (including acute renal failure, acute myocardial infarction and thromboembolism). Subgroups of interest were based on comorbidity burden: either by Deyo Charlson comorbidity index (0, 1, 2, >2) or history of thromboembolism, myocardial infarction or renal disease. Mixed effects models measured associations between TXA use and outcomes. We report odds ratios (OR) and 95% confidence intervals (CI).

**Results:** Overall transfusion rate was 16.9% (n=286,468) while TXA utilization rate was 25.6% (n=433,276); TXA utilization did not differ by patient comorbidity burden. TXA use was associated with decreased odds for blood transfusion while no increased odds for complications were observed. This effect was universal across comorbidity categories (Deyo Charlson 0, 1, 2, >2): blood transfusion OR 0.38 (CI 0.37-0.39), OR 0.39 (CI 0.38-0.40), OR 0.42 (CI 0.40-0.44), OR 0.47 (CI 0.45-0.49)/complications OR 0.68 (CI 0.65-0.72), OR 0.70 (CI 0.66-0.74), OR 0.74 (CI 0.69-0.79), OR 0.69 (CI 0.66-0.74), by comorbidity categories, respectively, all P<0.0001. Similar effects were observed when stratifying TXA use by cases with a history of thromboembolism, myocardial infarction or renal disease.

**Conclusions:** TXA utilization is similar in patients with and without comorbidities in THA/TKA cohort. While effective in reducing blood transfusions, TXA is not associated with increased complications irrespective of patient comorbidity burden. These findings support routine use of TXA in THA/TKA.

◊ The FDA has not approved tranexamic acid for use in orthopaedics.
Paper #12

Multicenter Evaluation of a Modular Dual Mobility Construct for Revision Total Hip Arthroplasty

Ronald C. Huang, MD, Arthur L. Malkani, MD, Michael A. Mont, MD, William J. Hozack, MD, Steven F. Harwin, MD, Geoffrey H. Westrich, MD

Introduction: The risk of instability following revision total hip arthroplasty (THA) is greater than after primary THA. New modular dual mobility (MDM) constructs have offered increased stability without compromising hip range of motion. The purpose of this study is to evaluate the outcomes of revision THA using MDM constructs.

Methods: The study is a multi-institutional retrospective cohort study of 370 hips that underwent revision THA with the MDM construct between April 2011 and April 2017. The average age was 66.0 years. There were 221 females and 149 males. The average BMI was 31.4 kg/m². Clinical, radiographic, and patient-reported outcomes were collected. Reasons for failure were assessed.

Results: Of the 370 patients, 315 patients met one-year minimum follow-up and were included in the study. Average follow-up was 3.3 years (range 1.0-7.7 years). The acetabular component was revised in 84% cases whereas only an MDM liner was placed in 16% of cases. Average Harris Hip Score improved from 54.8 to 83.4 (p<0.001). Thirty (9.5%) hips required reoperation, nine (2.9%) for instability, eight (2.5%) for acetabular component loosening, six (1.9%) for infection, four (1.3%) for periprosthetic fractures, one (0.3%) for acetabular component malposition, one (0.3%) for improper liner seating, and one (0.3%) for improper screw placement. Seven of 107 cases performed for instability had recurrent instability (6.5%), of which five did not undergo acetabular component revision during the index surgery. Recurrent instability was associated with not revising the acetabular component (p=0.003).

Conclusions: Revision THAs with MDM constructs provided a very low rate of instability, good functional improvement and a low reoperation rate. Recurrent instability following use of MDM in revision THA was associated with retention of the acetabular component, likely due to cup malposition. While longer-term follow-up is needed to fully assess these devices, there is clearly a benefit in the first few years following revision surgery.
Paper #13
Mid-term Results of Dual Mobility for Monoblock Metal-on-Metal Revision – Is It Safe?

Nicholas D. Colacchio, MD, Clint J. Wooten, MD, John R. Martin, MD, Jeffrey G. Mokris, MD, John L. Masonis, MD, Thomas K. Fehring, MD

Introduction: Revision of monoblock metal-on-metal (MoM) total hip arthroplasty (THA) is associated with high complication rates. Limited revision by conversion to dual mobility (DM) without acetabular component extraction may mitigate these complications. However, the concern for polyethylene wear and osteolysis remains unsettled. This study investigates the mid-term results of DM conversion of monoblock-MoM THA compared to formal acetalubar revision.

Methods: 143 revisions of monoblock-MoM THA were reviewed. 29 were revision to a DM construct and 114 were complete revision of the acetabular component. Mean patient age was 61. 55% were women. Components used, acetabular cup position, radiographic outcomes, serum metal ion levels, and HOOS Jr clinical outcome scores were investigated.

Results: At 3.6 years follow up [range 2-5 years] there were 2 revisions (6.9%) in the DM cohort, 1 for instability and another for periprosthetic fracture. Among the formal acetabular revision group there was 20% early complications (23/114) and 16% early revision surgery (18/114) for: aseptic loosening (6%), deep infection (6%), dislocation (4%), acetabular fracture (3%), and superficial infection or delayed wound healing (6%). In the DM cohort, there were no radiographic signs of aseptic loosening, component migration or polyethylene wear. One DM patient had a small posterior metadiaphyseal femur lesion that will require close monitoring. There were no other radiographic signs of osteolysis. There were no clinically significant elevations of serum metal ion levels. HOOS Jr scores were favorable.

Conclusions: Limited revision with conversion to DM is a viable treatment option for failed monoblock-MoM THA with lower complication rates than formal revision. Limited revision to DM appears to be a safe option for revision of monoblock-MoM THA with a cup in good position and an internal geometry free of sharp edges or articular surface damage. Longer follow-up is needed to demonstrate any potential wear implications of these articulations.
**Introduction:** Constrained liners have been used to treat recurring THA dislocations, but there is concern regarding its effectiveness. The aim of this study was to evaluate the rate and survivorship free of revision for dislocation because of constrained liner failure in patients who were revised to their first, second, or third constrained liner.

**Methods:** From 1989 to 2016, using our institution’s total joint registry, we identified 658 patients who were revised to their first constrained liner to prevent instability. During the same time period, there were 57 who were revised to a second constrained liner for dislocation because of one prior constrained liner failure, and 17 who were revised to a third constrained liner for dislocation because of two prior constrained liner failures. The mean follow-up was 5 years.

**Results:** In patients receiving their first, second, and third constrained liners, the survivorship free of revision for dislocation at 5 years was 90%, 54%, and 38%, respectively. Patients with a second constrained liner were more likely to have a revision for dislocation (Odds-Ratio=6.5; p=0.0001) compared to those receiving their first constrained liner. Patients with a third constrained liner had a trend towards being more likely to have a revision for dislocation (Odds-Ratio=2; p=0.09) compared to those receiving their second constrained liner.

**Conclusions:** After revision to a second constrained liner, 1/2 will undergo revision at 5 years, and after revision to a third constrained liner, 3/5 will undergo revision for dislocation. Patients receiving their second constrained liner are 6.5-fold more likely to have a dislocation requiring revision because of constrained liner failure compared to those receiving their index constrained liner. When a THA becomes unstable after a constrained liner, surgeons should optimize all other implant factors, and exercise caution before revising to another constrained liner.
Given the increasing demand for total hip arthroplasty, along with the number of implants presently in service, the absolute number of revision procedures being performed annually is on the rise.

**Objective:**

Learn how to evaluate and manage the unstable total hip arthroplasty, the chronically infected total hip arthroplasty, periprosthetic fractures of the femur, corrosion at the head-neck junction, and wear and osteolysis.

**Outline:**

**Introduction**

Craig J. Della Valle, MD

**Panel:**

Javad Parvizi, MD, Luigi Zagra, MD, Tad M. Mabry, MD, Benjamin M. Stronach, MD, MS

1. The Unstable Total Hip Arthroplasty:
   - Case Presentation, Discussion, Questions
2. The Chronically Infected Total Hip Arthroplasty:
   - Case Presentation, Discussion, Questions
3. Periprosthetic Fracture of the Femur:
   - Case Presentation, Discussion, Questions
4. Corrosion at the Head Neck Junction:
   - Case Presentation, Discussion, Questions
5. Wear and Osteolysis:
   - Case Presentation, Discussion, Questions

**Discussion and Questions**
**Introduction:** Multimodal analgesia, the administration of analgesic agents targeting multiple pain pathways, has seen increased popularity in pain management for total hip arthroplasty (THA) patients. Acetaminophen is a common non-opioid administered as part of multimodal panels due to its efficacy and minimal contraindications. Although intravenous (IV) acetaminophen presents pharmacokinetic benefits, such as increasing both serum blood and cerebrospinal fluid levels more rapidly, there is limited analysis of its clinical advantages compared to oral acetaminophen. The authors hypothesized that there would be a reduction in pain with activity, opioid usage, or opioid related side effects among patients receiving IV acetaminophen compared to oral acetaminophen.

**Methods:** In a double-blinded, controlled trial, 154 patients undergoing THA were randomized to receive oral acetaminophen plus IV placebo or IV acetaminophen plus oral placebo. Multimodal inpatient perioperative pain management consisted of a combined spinal-epidural and postoperative patient-controlled analgesia of bupivacaine and clonidine, intravenous ketorolac, oral meloxicam, and either tramadol for mild/moderate pain or oxycodone for severe pain. The primary outcomes were pain with physical therapy on postoperative day (POD) 1, measured on a 0-10 Numeric Rating Scale (NRS), the Opioid Related Symptom Distress Scale (ORSDS) score on POD 1, and cumulative opioid use over POD 1-3, converted to oral morphine equivalents (OME).

**Results:** There were no differences in ORSDS scores (p=0.212) or NRS pain scores with physical therapy (p=0.384) between groups. The IV acetaminophen group had a mean OME of 119mg compared to 100mg among the oral group. This was not significantly different (p=0.428).

**Conclusions:** Despite the similar outcomes, patients in both groups had low pain scores with activity, minimal opioid-related side effects, and limited opioid usage (OME of 120mg corresponds to six doses of tramadol 100mg over 3 days). This highlights multimodal analgesia as an effective method of pain control for THA.
Paper #16

Evaluation of Vitamin E Diffused Highly Crosslinked Polyethylene Wear and Porous Titanium Coated Shell Stability: A Seven-Year Randomized Control Trial using Radiostereometric Analysis

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Introduction: Vitamin-E diffused, highly-crosslinked polyethylene (VEPE) and porous titanium-coated (PTC) shells were introduced in total hip arthroplasty (THA) to reduce the risk of aseptic loosening. Radiostereometric analysis (RSA) is the gold-standard for the assessment of in vivo implant performance. The purpose of this study was to use RSA to: (1) evaluate the in vivo wear properties of VEPE, (2) assess the stability of PTC shells, and (3) report their clinical outcomes at 7-years.

Methods: Eighty-nine patients were enrolled into a prospective study. All patients received a PTC shell and were randomized to receive a VEPE liner (N=44) or a moderately-crosslinked polyethylene liner (ModXLPE) (N=45). RSA was used to measure polyethylene wear and cup migration. Differences in wear were assessed while adjusting for BMI, activity level, acetabular inclination, anteversion, and head size. Plain radiographs were assessed for radiolucency, and patient-reported outcome measures (PROMs) were administered at each follow-up.

Results: Seventy-three patients (82%) completed the 7-year visit. RSA quality metrics were excellent (mean condition number=28±1, mean error=0.19±0.01mm). Median 7-year linear penetration was -0.07±0.16mm and 0.00±0.22mm for the VEPE and ModXL cohorts, respectively (p=0.116). PROMs (p=0.310-0.807) and radiolucency incidence (p=0.330) were not different between the polyethylene cohorts. The average shell migration rate was 0.04±0.09mm/yr. At 7-years, patients with radiolucency (34%) demonstrated greater migration (mean difference:0.6±0.2mm; p<0.001). Disease-specific PROMs were lower for patients with radiolucency and greater migration (p=0.009-0.045). No implants appeared loose based on plain radiographic evaluation, and none were revised for aseptic loosening.

Conclusions: This is the first RCT to report 7-year RSA results for VEPE. All wear rates were below the previously-reported osteolysis threshold of 0.1mm/yr. PTC shells demonstrated acceptable primary stability through 7 years as indicated by low migration and lack of failures due to aseptic loosening. Patients with acetabular radiolucency were associated with higher shell migration and lower PROMs.

Notes
Introduction: Posterior hip precautions have been routinely prescribed to decrease dislocation rates. The purpose of this study was to determine if the absence of hip precautions improved early recovery after total hip arthroplasty via the posterolateral approach.

Methods: We prospectively enrolled patients undergoing total hip arthroplasty via the posterolateral approach by fellowship trained surgeons at three centers. Patients meeting our selection criteria were randomized to No Hip Precautions (NHP) or Standard Hip Precautions (SHP) for six weeks following surgery. We recorded HOOS Jr., health state visual analog score and rate of pain scores, preoperatively, and at 2, 6, 24 weeks and one year postoperatively. We also noted any dislocation episodes. Standard statistical analysis was performed.

Results: From 2016–2017, 149 patients were randomized to NHP and 150 patients were randomized to SHP. There were no differences in demographics. There was no difference in the average cup size (p=0.156) or head diameter (p=0.05) for each group. The only difference in outcomes scores between the two groups was at 2 weeks the SHP group had an improved HOOS Jr score when compared to the NHP (p=0.03). There was no difference in outcome scores between at all other time points when compared to preoperative assessments. In the SHP group there were 3 recorded dislocations (2%) and one in the NHP group 0.6% (p=0.62). Ninety five percent of patients in the SHP reported following precautions, while 39% of the NHP reported self-imposed precautions (p<0.001).

Conclusions: In this randomized controlled multicenter study the absence of hip precautions in the postoperative period did not improve subjective outcomes which may be explained by self-limiting behavior of NHP patients. Further, with the numbers available for the study, there was no difference in the rate of dislocation between the two groups.
**Paper #18**

**Time to Dislocation Analysis of Lumbar Spine Fusion Following Total Hip Arthroplasty: Breaking Up a Happy Home**

**Connor A. King, MD, David C. Landy, MD, PhD, Hue H. Luu, MD, Lewis L. Shi, MD, John M. Martell, MD, Michael J. Lee, MD**

**Introduction:** Prior studies reported an increased risk of dislocation in patients undergoing THA after LSF. Less understood is hip stability in patients with a previously stable THA undergoing LSF. This scenario is complicated not only by the need to understand when any resultant instability manifests but also by selecting appropriate controls. The aim of this study was to describe the dislocation free survival experience of patients with a previously stable THA undergoing LSF and to compare it to that of similar patients not undergoing LSF.

**Methods:** A retrospective analysis of Center for Medicare Service billing data from 2005 and 2014 was conducted utilizing the PearlDiver platform. Stable THA was defined as having no dislocation event within six months of THA. A 10-year Kaplan Meier survival analysis was performed to evaluate dislocation free survival.

**Results:** There were 863,182 patients that met inclusion criteria for primary THA. Among these, 17,223 patients underwent subsequent LSF. The comparison of Kaplan Meier Survival Analysis plots demonstrates a substantially sustained increase in the rate of dislocation that persists to long-term follow-up. Ten-year dislocation free survival for patients undergoing LSF after primary THA was 92.9%. Among primary THA without LSF there was a significantly higher dislocation free survival at 10 years (95.8%, P<0.001). Stratified by level of fusion the 10-year survival was 93.9% among those undergoing Fusion of 2–3 vertebra while it was 91.6% in those undergoing Fusion of 4-8 vertebrae (P=0.12).

**Conclusions:** This study demonstrates that dislocations of primary THA are significantly more common in patients who undergo subsequent LSF and that this increased risk is experienced not just in the perioperative period but persists for at least 10 years. This underscores the importance of counseling all patients undergoing LSF following THA on what is likely an increased lifetime risk of dislocation.
Primary Total Hip Arthroplasty Instability Following Lumbosacral Fusion: What Are the Risk Factors?

Matthew Siljander, MD, Jeffrey Cross, BS, Ryan Lilly, MD, Kevin Baker, PhD, Mary Coffey PhD, James J. Verner, MD

Introduction: Lumbosacral fusion can influence the flexibility of the lumbar spine and can impact total hip arthroplasty (THA) stability. The purpose of this study was to evaluate the incidence and risk factors of THA dislocation after lumbosacral fusion.

Methods: From 2007 to 2015, we identified 231 patients who had lumbar spine fusion prior to primary THA at our institution; 15 patients had at least one dislocation postoperatively. Risk factors for dislocation were assessed on patient factors, surgical approach, number of spinal levels fused, fusion to sacrum, and radiographic positioning of the acetabular component.

Results: The study population was 64.5% female with an average age of 66.4 years (range 44–89). Primary THA dislocation rate in patients with a prior lumbar fusion was 6.5%. There was no difference in age between patients that dislocated versus not, but women may have a higher rate of dislocation than men (women: 8.7%, men 2.4%; p=0.064). Patients that dislocated had a lower BMI (p=0.027). Increased head sizes had lower dislocation rates (p=0.035), with no dislocations in head sizes above 36 mm. There was no difference in dislocation based on cup inclination (p=0.34), but increased cup anteversion was associated with decreased dislocation risk (p=0.008). There was no increased risk in dislocation based on fusion to the sacrum (p=0.79), but increasing lumbar fusion levels were more likely to result in dislocation (p=0.022), with no reported dislocations in the 55 patients with only one fusion level.

Conclusions: Lumbar spine fusion prior to primary THA has a high rate of dislocation. Increasing number of fusion levels increases the risk of dislocation and increasing head size and anteversion of the cup appears to be protective. Careful attention to cup positioning should be employed in patients with lumbosacral spinal fusion.
**Introduction:** Hip osteoarthritis (OA) is frequently co-existent with lumbar degenerative pathology, and therefore static sitting-standing radiographs are often used to preoperatively evaluate dynamic changes in spinopelvic parameters when planning THA. The purpose of this study is to compare dynamic sitting-standing to static radiographs in the accuracy of determining functional spinopelvic mechanics in patients with hip OA.

**Methods:** An institutional review-board approved cohort of 50 patients with hip osteoarthritis whom underwent full body sitting-standing radiographs from August 2016–December 2017 at a single institution were retrospectively reviewed. Subjects who underwent dynamic (single leg extension standing, single leg step-up, and flexed seated) radiographs were compared to subjects who underwent normal standing and relaxed sitting radiographs. Spinopelvic parameters including pelvic incidence (PI), pelvic tilt (PT), sacral slope (SS), and lumbar lordosis (LL) were measured in both dynamic and static radiographs. Independent-sample t-tests and ANOVA were used to compare alignment parameters between both groups.

**Results:** A total of 50 patients with static radiographs were compared to 50 patients with dynamic radiographs. Standing PT (p<0.001), standing LL (p<0.001), sitting PT (p<0.001), and sitting LL (p=0.007) were significantly different between dynamic and relaxed cohorts, respectively. Dynamic imaging from single leg standing to the flexed seated position demonstrated greater effects of LL (p<0.001) and PT (p=0.001) in functional positions. Dynamic imaging showed a lower effect of PT (p=0.002) and greater effect SS (p=0.003) from the standing to step up compared to relaxed sitting to standing positions.

**Conclusions:** Dynamic sitting-standing imaging emphasizes the compensatory mechanisms of patients with concomitant hip and spine pathology more effectively than static imaging, and more reproducibly simulates high-risk positions of dislocation in THA. Dynamic radiographs should be included as part of routine spinopelvic evaluation when planning THA, especially in individuals with co-existing OA and lumbar pathology.
Introduction: Orthopedic surgeons have relied heavily on opiates after total hip replacement (THR) despite no clear evidence of benefit and a rapidly growing abuse epidemic. Multimodal analgesia may reduce or even obviate the need for opiates after elective surgery.

Methods: In a cluster-randomized, crossover trial, 235 patients undergoing THR were assigned to receive multimodal analgesia with minimal opiates (Group A-10 tablets), multimodal analgesia with a full opiate supply (Group B-60 tablets), or a traditional opiate regimen without multimodal analgesia (Group C-60 tablets). The multimodal regimen comprised scheduled-dose acetaminophen, meloxicam, and gabapentin. Primary outcomes were daily pain and opiate utilization for the first 30-days. Secondary outcomes included assessments of satisfaction, sleep-quality, opiate-related symptoms, hip function, and adverse events.

Results: Daily pain was significantly lower in both multimodal groups, Group A (Coeff -0.81, p=0.003) and Group B (Coeff -0.61, p=0.021). While daily utilization and duration of opiate use was lower for both Group A (Coeff -0.77, p<0.001) and Group B (Coeff -0.30, p=0.04) compared with Group C, opiate use was also lower for Group A than Group B (Coeff -0.46, p=0.002). There were significantly fewer opiate-related symptoms in Group A compared to Group C (p=0.005), but Group B and C didn’t differ (p=0.13). Additionally, both multimodal regimens improved satisfaction and sleep, and there was no difference in hip function or adverse events.

Conclusions: A multimodal analgesic regimen with minimal opiates improved pain control while significantly decreasing opiate utilization and opiate-related adverse effects. It’s time to rethink traditional opiate prescription after elective surgery.

Notes
Primary Total Hip Arthroplasty in Patients Less than 50 Years of Age at a Mean of 16 Years

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Introduction: The purpose of this study was to evaluate clinical and radiographic outcomes of patients under 50 years of age undergoing primary THA at minimum of 10 years.

Methods: 309 Consecutive THAs performed on 273 patients were reviewed. At a minimum of 10-years, 13 were deceased, and 23 were lost to follow-up leaving 273 THAs in 243 patients who were followed for a mean of 16 years (range 10-19.9 years). The cohort consisted of 115 females (47.3%) and 128 males (52.7%), with a mean age of 42.3 years at the time of surgery (range, 19-49 years old). 216 had highly cross-linked polyethylene (XLPE) and 57 non-XLPE acetabular liners. Analysis involved Kaplan-Meier survivorship with a log-rank test for equivalence, Fischer’s exact test for pairwise comparisons and a paired t-test for Harris Hip Score both with alpha=0.05 being statistically significant.

Results: There were six revisions for wear in the non-XLPE group (10.5%) compared to none in the XLPE group (p<0.001). Similarly, survivorship with revision for any reason at 15 years was significantly higher in the XLPE group 93.0% (95% CI 88.0 to 93.4%) compared to 84.2% (95% CI 71.9 to 91.5%) in the non-XLPE group (p=0.008). Additional revisions in the XLPE group included 6 for instability (2.8%), 5 secondary to infection (2.4%), and 3 stem failures (1.4%). Non-wear related revisions in the non-XLPE group included 5 due to instability (8.8%) and 3 stem failures (5.3%). Mean Harris Hip Scores for the entire cohort improved from a mean of 46.2 points preoperatively to 89.8 points postoperatively (p<0.001).

Conclusions: The use of XLPE has led to a significant reduction in the risk of failure in patients <50 years old, with over 93% survivorship at 15 years. Instability and infection, however, remain substantial causes of failure.

Notes
Introduction: Perioperative periprosthetic femur fractures (PPFx) following total hip arthroplasty (THA) remain a leading cause of early stem failure and revision and are associated with high rates of morbidity and mortality. We sought to analyze AJRR data to determine the relationship of femoral stem fixation to PPFx requiring revision.

Methods: All early (= 3 months from index arthroplasty) linked primary and revision hip arthroplasties where both procedures were reported to AJRR between 2012-2017 were analyzed to identify revisions for PPFx. We evaluated patient demographics, device characteristics (hemiarthroplasty vs. THA) and stem fixation.

Results: There were 10,277 linked revisions reported to AJRR during the time period of the study. Early PPFx requiring revision occurred in 622 patients (6.1%). The diagnosis for the index arthroplasty was osteoarthritis in 404 (65.0%) and femoral neck fracture in 218 (35.0%). 522 patients (84%) were treated with THA and 100 patients with hemiarthroplasty (16%). There was a preponderance of revisions for PPFx in females (70%). 58% of patients were ≥70 years of age, while 20% were ≥80 years of age. Cementless femoral fixation was associated with 93.7% (583 vs. 39) of the periprosthetic fractures. Patients with cementless stems were 2.6 times (95% CI 0.59-11.1) more likely to undergo early revision for PPFx than those with cemented fixation, although with the numbers of cemented stems available this was not statistically significant.

Conclusions: Mirroring other studies and national registries, there was an association between cementless fixation and PPFx in the AJRR. Nevertheless, there has been a trend over time of increasing utilization of cementless femoral fixation for both THA and hemiarthroplasty reported to the AJRR, with cementless fixation accounting for 93% of THA stems with early periprosthetic fracture. Additional analysis is needed to better understand this phenomenon, especially in the elderly.
Does Taper Design Affect Taper Fretting Corrosion in Ceramic on Polyethylene Total Hip Arthroplasty? A Retrieval Analysis

Matthew Siljander, MD, Ali Sobh, MD, Corinn Gehrke, BS, Samantha Wheeler, BS, Michael A. Flierl, MD, Drew D. Moore, MD, Erin Baker, PhD

Introduction: Ceramic-on-polyethylene (CoP) implants have exhibited lower fretting and corrosion scores than metal-on-polyethylene (MoP) implants. This study aims to investigate the effect of taper design on taper corrosion and fretting in modular ceramic total hip arthroplasty (THA) systems.

Methods: Under an IRB-approved protocol, a query of an implant retrieval library from 2002 – 2017 identified 120 retrieved CoP THA systems with zirconia toughened alumina (ZTA) femoral heads, with four different taper designs (11/13, 12/14, 16/18, V40). Femoral stem trunnions were visually evaluated and graded for fretting, corrosion and damage at the taper interface. Medical records were reviewed for patient demographics and implant characteristics. Data was statistically analyzed using Spearman correlation and rank sum tests with a Dunn’s post-hoc test, with a significance level of α=0.05.

Results: Four different taper designs were evaluated including: 11/13 (n=18), 12/14 (n=53), 16/18 (n=21), and V40 (n=28). There were no statistically significant demographic differences between taper groups for duration of implantation, laterality, patient age, and patient sex, but patients with 16/18 tapers had a higher BMI than V40 tapers (p=0.012). Duration of implantation had a weak positive correlation with both trunnion fretting (ρ=0.224, p=0.016) and corrosion (ρ=0.253, p=0.006). Summed fretting and corrosion scores were significantly greater on the V40 and 16/18 tapers compared with the 12/14 tapers (all p=0.001).

Conclusions: Taper fretting and corrosion were observed in ceramic THA implants and were greatest on implants with V40 and 16/18 tapers and lowest on implants with 12/14 tapers. Differences in taper design characteristics may lead to greater micromotion at the taper-head interface, leading to increased fretting and corrosion.
Introduction: The advent of value-based care has increased the focus on surgeon- and hospital-specific outcomes. However, methods to identify high quality, low cost surgeons are not well developed. The current study seeks to determine whether there is a relationship between surgeon Total Hip Arthroplasty (THA) volume and the outcomes of mortality, readmission, and Medicare expenditure for that surgeon.

Methods: We performed a retrospective analysis of Centers for Medicare and Medicaid Services (CMS) Limited Data Set (LDS) on all primary elective THAs performed in the United States (except Maryland) between January 2013 and June 2016 on Medicare patients. This represented 409,844 THAs totaling more than USD $7.7 billion in direct CMS expenditures. Surgeons were divided into five groups based on annualized volume of CMS elective THAs over the study period. Using regression, we calculated and compared CMS Part A payments over 90-day periods, readmissions, and mortality among the groups. Ninety-day payments and incidences of readmission and mortality were calculated and compared among the groups. For each episode, demographic information, geographic location, and Elixhauser comorbidities were calculated to control for major confounding factors.

Results: When compared to the highest volume group, each lower-volume group had increased costs, increased readmission rates, and increased mortality rates in a stepwise fashion. The lowest volume group resulted in 27.20% more CMS payments per case (p<0.001; 95% confidence interval (CI), 26.62%–27.78%), had an increased mortality odds ratio (OR) of 4.69 (p<0.001; 95% CI, 3.99–5.50), and had an increased readmission OR of 1.77 (p<0.001; 95% CI, 1.69–1.85) when compared to the highest volume group.

Conclusions: There is a strong association between a surgeon’s Medicare volume and lower CMS payments, mortality, and readmissions. Further, the majority of Medicare THA in the US are performed by surgeons who perform more than 10 operations annually.
Introduction: The impact of obesity on complications after total joint arthroplasty (TJA) has been well documented. However, few studies have specifically examined the effect on revision TJA. Therefore, the objective of this study was to explore the effect of BMI on 30-day readmissions and complications after aseptic revision total hip arthroplasty (rTHA) and aseptic revision total knee arthroplasty (rTKA), considering BMI as both a categorical and continuous variable.

Methods: 21,320 patients undergoing rTHA and rTKA were analyzed using the ACS-NSQIP database. We excluded 2,004 revision surgeries performed for PJI, and 450 surgeries due to missing BMI values, or because BMI values were 18.5 kg/m². 18,866 patients met the inclusion criteria (9,093 rTHA) (9,773 rTKA). Thirty-day rates of readmissions, reoperations, and major/minor complications were assessed between different BMI categories compared to the normal weight category using multivariate regression models. Spline regression models were created to study BMI as a continuous variable.

Results: There was a linear relationship between increased BMI and readmission and reoperation rates for rTKA (p<0.001). Morbid obesity was associated with an increased risk of readmission (p<0.001), reoperation (p=0.004), and adverse events (p=0.021) vs. normal weight patients undergoing rTKA. Major complication rates for rTKA appear to be lowest at approximately 30kg/m². For rTHA, major complication rates had a nadir of approximately 28kg/m². On multivariate analysis, adverse events and minor complications were significantly higher in morbidly obese individuals vs. patients with a normal BMI.

Conclusions: The BMI curves for rTKA show a linear relationship for BMI and readmission and a J-shaped curve for reoperation, minor complications and adverse events. Based on our findings, morbidly obese patients undergoing rTHA are not at a significantly higher risk for readmission, reoperation and major complications. The lowest rates of perioperative complications in both rTHA and rTKA occurred around a BMI of 28-30kg/m².
Paper #27

Perioperative Antibiotic Prophylaxis in Total Joint Arthroplasty: A Single Dose Is as Effective as Multiple Doses

Timothy L. Tan, MD, Noam Shohat, MD, Alexander J. Rondon, MD, MBA, Karan Goswami, MD, Sean P. Ryan, MD, Thorsten M. Seyler, MD, PhD, Javad Parvizi, MD

Introduction: Recent surgical site infection prevention guidelines recommend that no additional prophylactic antibiotics should be administered after the surgical incision is closed in clean-contaminated procedures. Although there is ample evidence to support this recommendation in non-arthroplasty surgery, there is concern about extending these guidelines to surgeries with an implant such as total joint arthroplasty (TJA). The aim of this study is to review pertinent literature and compare the efficacy of a single-dose prophylactic antibiotics versus multiple doses of antibiotics in prevention of periprosthetic joint infection (PJI) in patients undergoing TJA.

Methods: A retrospective study of 20,682 primary TJAs from 2006-2014 was performed. Patients who received a single dose of prophylactic antibiotics (n=4,523) were compared with patients who received multiple doses of antibiotics (n=16,159). A previously validated PJI risk score was assigned to each patient. Patients who developed PJI within one year were identified and a multivariate logistic regression analysis was performed to control for potential confounders.

Results: The overall PJI rate was 0.60% (27/4523) in patients who received a single dose of antibiotic compared to 0.87% (142/16159) in patients receiving multiple doses of antibiotics. There was no difference in the overall PJI rate between patients who received a single dose and those who received multiple doses in both the univariate (OR 0.674, p=0.064) or the multivariate analyses (OR 0.708, p=0.107). Furthermore, multiple doses did not demonstrate any additional benefit for patients with a high preoperative risk of PJI (adjusted OR 0.981, p=0.943).

Conclusions: This study supports the notion that the administration of additional antibiotics following skin closure may not be required in patients undergoing primary TJA, regardless of their preoperative risk of PJI. The findings of this large retrospective study combined with the body of existing literature highlight the need for a randomized, prospective study to base current guidelines on.

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Introduction: The American Academy of Orthopaedic Surgeons (AAOS) clinical practice guideline currently recommends repeat joint aspiration when workup of periprosthetic joint infection (PJI) reveals conflicting data. This guideline is based upon a single study of 31 patients published twenty-five years ago. We sought to determine the correlation between first and second aspirations and factors that may play a role in variability between them.

Methods: Sixty patients with less than 90 days between aspirations and no intervening surgery were identified at our institution and classified by MSIS criteria as infected, not infected, or not able to determine after both aspirations. Culture results from both aspirations were recorded. The rates of change and correlation in clinical diagnosis and culture results between aspirations were determined.

Results: Repeat aspiration changed the diagnosis in 26 cases (43.3%, 95% CI: 31.6%-55.9%, Kappa coefficient 0.32, p<0.001), and the culture results in 25 cases (41.7%, 95% CI: 30.1% to 54.3%, Kappa coefficient 0.27, p<0.01). Among patients initially MSIS negative, the proportion who changed to MSIS positive was greater for those with history of prior PJI compared to those without (66.7% vs. 0%, p<0.05), and the first aspiration mean volume was higher for those changed to MSIS positive compared to those that remained MSIS negative (12.0 ml vs. 3.0 ml, p<0.01). Among patients initially MSIS positive, the proportion of patients changed to MSIS negative was greater for those with history of adverse local tissue reaction (ALTR) to metal debris compared to patients without suspicion of ALTR (100% vs. 7.7%, p<0.05).

Conclusions: Repeat aspiration is particularly useful in patients with conflicting clinical data and prior history of PJI, suspicion of ALTR, or high clinical suspicion of infection.
**Paper #29**

**Diagnostic Accuracy of the Alpha-Defensin Test for Periprosthetic Joint Infection in Patients with Inflammatory Diseases**

Yushi Miyamae, MD, Jaiben George, MBBS, Alison K. Klika, MS, Wael K. Barsoum, MD, Carlos A. Higuera, MD

**Introduction:** Alpha-defensin has high accuracy to diagnose prosthetic joint infection (PJI). However, the reliability of the test in patients with systemic inflammatory diseases (e.g., rheumatoid arthritis [RA] and psoriatic arthritis [PsA]) is unclear. Several recent studies reported high accuracy of alpha-defensin in diagnosing PJI in a heterogenous population inclusive of primarily patients suffering from osteoarthritis, but also containing small numbers of patients with systemic inflammatory diseases. The purpose of this study was to determine the accuracy of alpha-defensin in diagnosing PJI in a homogenous cohort of patients afflicted by systemic inflammatory disease and underwent revision surgery.

**Methods:** A retrospective review was conducted of all 1374 cases who underwent revision total hip/knee arthroplasty at a single healthcare system from 2014 to 2017. Forty-three cases with inflammatory disease who received a one stage revision arthroplasty or the first stage of 2-stage revision arthroplasty with available preoperative alpha-defensin results were included. Two cases who received a spacer exchange were excluded from this study. Cases were classified as infected or not according to Musculoskeletal Infection Society (MSIS) criteria. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of alpha-defensin to diagnose PJI were calculated. Receiver operating characteristic (ROC) analysis was performed.

**Results:** A total of 41 cases met the inclusion criteria, including 17 with RA, 13 seronegative arthropathy (e.g., PsA), and 11 systemic inflammatory diseases (e.g., sarcoidosis). Fifteen cases were diagnosed as MSIS positive. The alpha-defensin test demonstrated a sensitivity of 93%, a specificity of 100%, a PPV of 100%, a NPV of 96%, and accuracy of 97% for the diagnosis of PJI. There was one patient with polymyositis who had a false-negative alpha-defensin result.

**Conclusions:** The alpha-defensin test provides useful information with high accuracy in diagnosing PJI in patients with inflammatory diseases.
**Introduction:** Prosthetic joint infection (PJI) is the leading cause of early revision following total knee arthroplasty (TKA). Debridement, antibiotics and implant retention (DAIR) is often the initial treatment of PJI; however, there is concern that a failed DAIR attempt undermines the success of future revision procedures. The aim of this study is to investigate how DAIR affects subsequent staged revisions for PJI.

**Methods:** A multicenter retrospective review was performed over a 15-year period. Treatment success was defined as implant retention without the use of long-term suppressive antibiotics. This was compared between patients who underwent a staged revision as the first procedure for PJI (staged only) and patients who failed DAIR prior to staged revision (F-Dair). Competing risk survival analysis was performed and adjusted for patient demographics, ASA score, organism type, BMI, age of prosthesis and the duration of symptoms.

**Results:** Of 293 eligible patients, 63 underwent stage revision and 230 underwent DAIR as the first procedure for PJI. 75 patients failed DAIR and underwent subsequent staged revision. The success rate of treatment was 72.0% in the F-Dair group compared to 79.4% in the staged-only group at an average follow-up of 6.2 years. On survival analysis, there was no significant difference in sub-distribution hazard ratio comparing the probability of failure in the two treatments groups (Figure 1, SHR=0.87; 95% CI 0.40-1.88; P=0.72).

**Conclusions:** This study suggested that a previously failed DAIR does not compromise the success rate of a subsequent staged revision.

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**Notes**

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Introduction: Many periprosthetic joint infections (PJI) are caused by organisms unsusceptible to first generation cephalosporins. We sought to evaluate the national susceptibility patterns of organisms to cefazolin/oxacillin, clindamycin, and vancomycin using antibiogram data.

Methods: Publicly available regional and state antibiograms were evaluated for antibiotic susceptibility patterns to commonly infecting gram-positive organisms. Antibiograms were created using the CLSI guidelines and breakpoints. Number of isolates tested in each antibiogram and percent of strains susceptible to oxacillin, clindamycin, and vancomycin were recorded. Oxacillin is used as a surrogate to cefazolin in antibiograms. A comparison of antibiotic susceptibilities was performed between organisms.

Results: Seven state and 41 regional antibiograms were reviewed (Figure 1). There were 105,335 Staphylococcal aureus isolates tested in which 48,783 (46.3%) were methicillin resistant (MRSA) strains. Oxacillin was a sensitive antibiotic in 99.2±4.8% of Methicillin sensitive Staphylococcus aureus (MSSA) isolates, 0±0% of MRSA isolates, 44.5±13.7% of coagulase negative staph organism isolates (CNS), and 30.6±10.5% of Staphylococcal epidermidis (SE) isolates. Clindamycin was a sensitive antibiotic in 75.8±8.4% of MSSA isolates, 60.2±13.2% of MRSA isolates, 60.3±11.4% of CNS isolates, and 56.2±6.5% of SE isolates. Vancomycin was a sensitive antibiotic in 99.9±0.4% of MSSA isolates, 99.8±0.4% of MRSA isolates, 99.8±0.5% of CNS isolates, and 99.6±0.7% of SE isolates. Figure 2 shows all organism and susceptibility patterns. Clindamycin was significantly less sensitive in MSSA isolates as compared to oxacillin and vancomycin (p<0.0001). Oxacillin was significantly less sensitive in CNS, SE, and MRSA isolates as compared to clindamycin and vancomycin (p<0.0001).

Conclusions: MSSA and MRSA represent 30-50% of infections in recent PJI studies. It is important to understand the limited susceptibility profile of first generation cephalosporins. The national clindamycin susceptibility pattern is limited compared to vancomycin and may not have a susceptibility profile suitable for use as a prophylactic antibiotic in cephalosporin allergic patients.
Hepatitis C May Be a Modifiable Risk Factor in Total Joint Arthroplasty: Preoperative Treatment of Hepatitis C is Associated with Decreased Postoperative Complications in US Veterans

Ilya Bendich, MD, Steven Takemoto, PhD, Joseph T. Patterson, MD, Alex Monto, MD, Thomas C. Barber, MD, Alfred Kuo, MD, PhD

**Introduction:** Hepatitis C Virus (HCV) is associated with poor outcomes in Total Joint Arthroplasty (TJA). Since 2014, oral direct-acting-antivirals (DAAs) have been available for HCV curative treatment. The goal of this study was to determine if HCV may be a modifiable risk factor in TJA by comparing postoperative complications of TJA patients with HCV who receive treatment preoperatively to those untreated. The US Veteran population was chosen given a high HCV prevalence.

**Methods:** A US Department of Veterans Affairs (VA) dataset of primary total knee arthroplasty (TKA) and total hip arthroplasty (THA) performed between 2014-2018, when DAAs were available, was retrospectively reviewed. HCV-infected patients were identified using ICD-9/10 codes and lab values. HCV-infected patients treated at least 3-months prior to TJA with DAA or ribavirin were included in the “treated” group. HCV-infected patients untreated were assigned to the “untreated” group. Medical and surgical complications up to 1-year postoperatively were identified using ICD-9/10 codes. Student t-test compared complication rates between groups.

**Results:** 42,268 patients underwent TJA (28,125 TKA, 14,143 THA) at VA Hospitals between 2014-2018. 7.5% of TJA patients had HCV. 9.3% of TJA HCV patients received HCV treatment at least 3-months preoperatively. For THA patients with HCV, medical and surgical complications up to 1-year postoperatively were 10.4% and 4.9% in the untreated group, respectively, and 0.8% and 0% in the treated group, respectively (p=0.001 medical, p=0.013 surgical). In TKA patients with HCV, medical and surgical complications up to 1-year postoperatively were 8.3% and 5.6% in the untreated group, respectively, and 1.1% and 0% in the treated group, respectively (p=0.001 medical, p=0.001 surgical).

**Conclusions:** TJA patients with HCV who receive treatment preoperatively have significantly lower postoperative medical and surgical complication rates. Study suggests HCV may be a modifiable risk factor in TJA; HCV-infected patients would likely benefit from HCV treatment.
Symposium V

Practice Norms in Primary Hip and Knee Arthroplasty: What is Everyone Else Doing?

Moderator: Daniel J. Berry, MD

Dr. Berry will conduct a poll of attendees using the audience response system with real-time display of results and commentary.

Objectives:

1. Identify what AAHKS peers are currently doing for perioperative management of primary THA and TKA and how this has changed in the key areas in the past two years
2. Identify what AAHKS peers are currently doing with respect to intraoperative decisions, choices, and practices in primary THA and TKA and how this has changed in the past two years

Outline:

1. Primary THA: Perioperative Management
3. Primary TKA: Perioperative Management

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Large Opioid Prescriptions are Unnecessary After Total Joint Arthroplasty: A Randomized Controlled Trial

Charles P. Hannon, MD, Tyler E. Calkins, BS, Jefferson Li, BA, Chris Culvern, MS, Brian Darrith, MD, Denis Nam, MD, MSc, Tad L. Gerlinger, MD, Craig J. Della Valle, MD

Introduction: Opioids are an important component of multimodal analgesia, but improper utilization places patients at risk for overdose and addiction. The purpose of this randomized controlled trial is to determine whether the quantity of opioid pills prescribed at discharge is associated with the amount of opioids consumed or unused by patients after total hip (THA) and knee (TKA) arthroplasty.

Methods: 304 Opioid naïve patients undergoing THA or TKA were randomized to receive a prescription for either 30 or 90 5mg oxycodone immediate release (OxyIR) tablets at discharge. All patients received acetaminophen, meloxicam, tramadol, and gabapentin perioperatively. Daily opioid consumption (morphine equivalent dose, MED), number of unused OxyIR pills, and pain scores were calculated for 30 days after discharge with a patient-completed medication diary. Number of OxyIR refills and total MED received were recorded for 90 days postoperatively. Power analysis determined that 141 patients per group were necessary to detect a 25% reduction in means in opiate consumption between groups. Statistical analysis involved t-test, rank sum, and chi-squared tests with alpha=0.05.

Results: 161 Patients were randomized to receive 30 tablets and 143 to receive 90. In the first 30 days after discharge, the median number of unused OxyIR tablets was 15 in the 30 group versus 73 in the 90 group (p<0.0001). Within 90 days of discharge, 26.7% of the 30 group and 10.5% of the 90 group requested a refill (p<0.001), leading to a mean of 777.1 MED versus 1089.7 prescribed (p<0.0001). There was no difference between groups in mean MED consumed and pain scores within the first 30 days. Baseline demographics and outcome scores were similar between groups suggesting appropriate randomization.

Conclusions: Prescribing a smaller number of opioids at the time of surgery is associated with equivalent pain scores and opioid consumption, yet a significant reduction in unused narcotics.

◊ The FDA has not approved gabapentin for acute postoperative pain.
Introduction: Historically, the most common indications for re-revision of a total hip arthroplasty (THA) have been aseptic loosening, instability, infection, and periprosthetic fracture. As revision implants and techniques have evolved, understanding why contemporary revision THAs fail is important to direct further improvement and innovation. As such, the goals of this study were to determine the implant survivorship of contemporary revision THAs, as well as the most common indications for re-revision.

Methods: We retrospectively reviewed 2589 aseptic revision THAs completed at our academic institution between 2005 and 2015 through our total joint registry. There were 39% isolated acetabular revisions, 22% isolated femoral revisions, 18% both component revisions, and 21% modular component exchanges. The mean age at index revision THA was 66 years, and 46% were males. The most common indications for the index revision THA were aseptic loosening (21% acetabular, 15% femoral, 5% both components), polyethylene wear and osteolysis (18%), instability (13%), fracture (11%), and other (17%). Mean follow-up was 6 years.

Results: There were 211 re-revision THAs during the study period. The overall survivorship free of any re-revision at 2, 5, and 10 years was 94%, 92%, and 88%, respectively. The most common reasons for re-revision were hip instability (52%), periprosthetic fracture (11%), femoral aseptic loosening (11%), acetabular aseptic loosening (9%), infection (6%), polyethylene wear (3%), and other (8%). A pre-revision diagnosis of instability had the worst survivorship free of revision at 10 years (79%).

Conclusions: Compared to historical series, the 88% survivorship free of any re-revision at 10 years in a difficult revision cohort is notably improved. As implant fixation has improved, aseptic loosening has become much less common after revision THA, and instability has come to account for more than half of re-revisions. Methods to further mitigate this risk may be emphasized during index revision THA.
Introduction: Postoperative urinary retention (POUR) is a common postoperative problem. Selective alpha-1 adrenergic antagonists, such as tamsulosin, are effective for treating various forms of urinary retention. The purpose of this study was to determine if prophylactic tamsulosin perioperatively reduces the incidence of postoperative POUR.

Methods: Male patients 35 years of age and older undergoing primary THA or TKA or unicompartmental knee arthroplasty at a single academic center from 2015 to 2018 were eligible for inclusion in the study. Patients were randomized to receive either tamsulosin 0.4 mg or placebo daily for five days prior to surgery, the morning of surgery, and the first postoperative day. Postoperatively, POUR was defined as any post-void residual urine volume greater than or equal to 200 mL, estimated urinary retention of greater than or equal to 200 mL in patients unable to void for 6 hours, patients experiencing discomfort or distention and unable to void, and new initiation of tamsulosin during postoperative hospitalization.

Results: 154 patients were enrolled in the study. 38 patients were excluded due to abnormal laboratory values, self-withdrawal, and canceled surgeries. The remaining study participants (N=116) were randomized to the tamsulosin (n=56) or placebo (n=60) groups. There was a total of 42 patients (36.21%) who developed postoperative urinary retention in the entire study cohort, with 23 cases of POUR (38.33%) in the placebo group and 19 (33.92%) in the tamsulosin group (p=0.622). The odds ratio is 0.826, but the risk difference (RD) is 4.41% between the groups.

Conclusions: Prophylactic tamsulosin did not reduce the incidence of urinary retention after lower extremity arthroplasty compared to placebo. The odds ratio indicates an approximately 17% decreased odds of developing POUR in the active medication group, although this was not statistically significant. Tamsulosin does not appear to be effective as a prophylactic measure in reducing POUR.
Symposium VI

Periprosthetic Joint Infection in Hip and Knee Arthroplasty

Moderator: Fares S. Haddad, FRCS
Faculty: Denis Nam, MD, Matthew S. Austin, MD, Andrew R. Manktelow, BSc, MBBS, FRCS (Orth)

Objectives:

1. Consider key aspects of patient selection and optimization prior to arthroplasty surgery
2. Review the technologies that are available to help differentiate the infected from the non-infected arthroplasty, as well as protocols and pathways for patient evaluation
3. Examine the selection of treatment methodology
4. Discuss two stage revision for periprosthetic joint infection management

Outline:

Introduction
Fares S. Haddad, FRCS

A Practical Approach to Reducing the Infection Burden: Prophylactic and Preventative Measures in 2018
Matthew S. Austin, MD

The Diagnosis of Periprosthetic Infection: An Update on Definitions and Techniques
Denis Nam, MD

An Algorithmic Approach: Which Procedure, When and for Whom?
Fares S. Haddad, FRCS

Two-Stage Revision: Managing the Interval, Antibiotics and Reimplantation
Andrew R. Manktelow, BSc, MBBS, FRCS (Orth)

Case-Based Discussion

Notes
A Multi-Center Randomized Clinical Trial of Tranexamic Acid in Revision Total Knee Arthroplasty: Does the Dosage Regimen Matter?

Yale A. Fillingham, MD, Brian Darrith, MD, Tyler E. Calkins, BS, Matthew P. Abdel, MD, Arthur L. Malkani, MD, Ran Schwarzkopf, MD, Douglas E. Padgett, MD, Robert A. Sershon, MD, Stefano A. Bini, MD, Craig J. Della Valle, MD

Introduction: Tranexamic acid (TXA) is proven to reduce blood loss following total knee arthroplasty (TKA), but there are limited data on the impact of similar dosing regimens in revision TKA that is associated with greater blood loss. The purpose of this multi-center randomized trial was to determine the optimal regimen to maximize the blood-sparing properties of TXA in revision TKA.

Methods: 233 septic and aseptic revision TKA from six centers were randomized to receive 1g pre-incision intravenous (IV) TXA, 1g pre- and post-incision IV TXA, 1g pre-incision IV and 1g intra-operative topical TXA, or three doses of 1950mg oral TXA given 2 hours preoperatively, 6 hours postoperatively, and the morning of postoperative day 1. Randomization was performed based on type of revision to ensure equivalent distribution among groups. The primary outcome was reduction in hemoglobin. Power analysis determined 40 patients per group were necessary to identify a 1g/dL difference with an alpha of 0.05 and beta of 0.80. Per-protocol analysis involved regression analysis and two one-sided t-tests for equivalence.

Results: One patient withdrew, 3 didn’t undergo surgery, 16 were screen failures, and 17 did not receive the assigned treatment, leaving 196 patients for the analysis. There was no significant difference in reduction in hemoglobin amongst treatment groups (2.88g/dL for oral TXA, 2.79g/dL for single-dose IV TXA, 2.59g/dL for combined IV/topical TXA, and 2.58g/dL for double-dose IV TXA; p=0.48). Similarly, calculated blood loss (p=0.63) and transfusions (p=0.78) were not significantly different between groups. Finally, equivalence testing assuming a 1g/dL difference in hemoglobin change as clinically relevant showed all possible pairings were statistically equivalent.

Conclusions: Despite the higher risk of blood loss in revision TKA, all TXA regimens tested had equivalent blood-sparing properties. Surgeons should consider using the lowest effective dose and the least costly regimen for TXA use in revision TKA.

◊ The FDA has not approved tranexamic acid for use in orthopaedics.
**Paper #34**

**Topical Tranexamic Acid in Revision Total Knee Arthroplasty Reduces Transfusion Rates and May Be Associated with Earlier Functional Recovery◊**

**Alejandro Gonzalez Della Valle, MD, Elina A. Huerfano, MD, Manuel Huerfano, MD, PhD, Kate A. Shanaghan, BA**

**Introduction:** Although use of tranexamic acid (TXA) has been proven to be effective in reducing blood loss/transfusions after primary total knee arthroplasty (TKA), there is a lack of evidence for its use in revision TKA. The purpose of this study was to evaluate if use of topical TXA in revision TKA is safe and associated with reduced blood loss/transfusion rates.

**Methods:** The study group was comprised of 76 revision TKAs who received 3g of topical TXA, compared to a control group of 205 revision TKAs, receiving no TXA. Each group was further stratified into subgroups according of the type of revision. All patients were followed for a minimum of 6 weeks. The blood loss, transfusions, changes in hemoglobin-hematocrit levels, Knee Society Score (KSS) and complications were recorded. Multivariate logistic regression was modelled to identify the risk factors of blood transfusion after revision TKA.

**Results:** The mean estimated blood loss, hemoglobin drop, and the transfusion rate were significantly lower in the study group than the control (p=0.008, p<0.001, p<0.001, respectively). Hidden blood loss was similar between the two groups (p=0.12). At six weeks, the improvement in the KSS was significantly higher in the study group than in the control (p<0.001). No significant differences were found in the rate of thromboembolic complications between the two groups (p=0.92). In the subgroup analysis, when both components were revised, the relative risk of transfusion was significantly lower with the use of TXA (RR=0.227; IC 0.0593–0.860; p=0.004). TXA was the main factor associated with avoiding blood transfusion (OR=0.087, 95% CI: 0.03-0.24; p<0.001).

**Conclusions:** Topical TXA in revision TKA is safe and effective in reducing blood loss and transfusions. This effect is enhanced when both components are revised. Additionally, the use of TXA may improve early functional outcomes.

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


**Paper #35**

**Next Generation Sequencing for the Diagnosis of Periprosthetic Knee Infection: A Multicenter Investigation**

**Karan Goswami, MD, Majd Tarabichi, MD, Noam Shohat, MD, Carlos A. Higuera, MD, Eric L. Smith, MD, Arthur L. Malkani, MD, Brian T. Palumbo, MD, Michael B. Cross, MD, Craig J. Della Valle, MD, Javad Parvizi, MD**

**Introduction:** Identifying the infecting organism in periprosthetic joint infection (PJI) continues to be a challenge, with one-third of PJIs reported to have negative cultures. Recent reports demonstrate that Next-Generation Sequencing (NGS) facilitates pathogen identification in culture-negative PJI (CN-PJI); however, this signal has not been externally corroborated. This multi-institutional study was initiated to examine the ability of NGS to identify the causative organism(s) in patients with PJI of the knee.

**Methods:** In this prospective multicenter study involving 13 academic institutions, samples were collected from 102 revision total knee arthroplasties (TKA). Synovial fluid, deep tissue and swabs were obtained at the time of surgery and shipped to the laboratory for NGS. Deep tissue specimens were also sent to the institutional lab for culture. Sensitivity and specificity were calculated, using the Musculoskeletal Infection Society (MSIS) definition of PJI as standard.

**Results:** In 36 revisions, the cases were considered to be infected; 26 of these were culture-positive (26/36; 72.7%), while NGS was positive in 21 (30/36; 83.3%). Among the positive cultures, complete concordance between NGS and culture was noticed in 19 cases (19/21; 90.4%). Two cases were discordant between NGS and culture. Among the 10 cases of culture-negative PJI, NGS identified an organism in 9 cases (90%). Five patients with negative NGS results had positive cultures, of which two were fungal species. Sixty-six revisions were considered aseptic; NGS identified microbes in 25 of 66 “aseptic” revisions (37.9%) and culture isolated an organism in 4 of 66 cases (6.1%). The remaining cases (41/66; 62.1%) were both NGS and culture-negative.

**Conclusions:** NGS was able to detect a pathogen in the majority (>90%) of culture-negative cases and demonstrated a high rate of concordance with culture in culture-positive cases. Our collaborative findings suggest that NGS is a useful adjunct for identifying the causative organism in PJI, particularly in the setting of CN-PJI.
Introduction: In contrast to primary total knee arthroplasty (TKA), little attention has been given to the relationship between durability and coronal alignment in revision TKAs. We hypothesized that a postoperative mechanical axis of 0±3° would result in better survivorship and functional outcomes, and retrospectively studied a large cohort of revision TKAs.

Methods: 981 revision TKAs (846 patients) were done with cemented varus-valgus constrained (VVC) implants between 2004 and 2014 at a single institution, and the 411 (42%) with pre- and post-revision hip-knee-ankle radiographs were reviewed. Mean age at revision TKA was 65 years, with 53% females. We defined a postoperatively neutrally-aligned group of 258 knees (0°±3°) and an outlier group of 153 knees. The mechanical axis range of the outliers was between 4°-12° varus and 4°-10° valgus. Ten-year Kaplan-Meier survivorship was calculated, and functional outcomes were assessed via Knee Society scores (KSS).

Results: At most recent follow-up, 22 of 258 neutrally-aligned revision TKAs were re-revised for aseptic loosening vs. 14 of 153 in the outlier group. The 10-year survivorship free of re-revision for aseptic loosening was 82% in the neutrally-aligned group vs. 77% in the outlier group (p=0.84). In total, 31 neutrally-aligned revision TKAs were re-revised for any cause vs. 23 in the outlier group. The 10-year survivorship free of any re-revision was 77% in the neutrally-aligned group vs. 70% in the outlier group (p=0.62). KSS were similar between the neutrally-aligned and outlier groups at 5 years (69 vs. 74; p=0.56).

Conclusions: After revision TKA with cemented VVC implants, we could not demonstrate a difference in functional outcomes or 10-year implant survivorship between a large group of mechanically well-aligned knees (0°±3°) and a group of outliers. While neutral mechanical alignment remains a useful goal in revision TKA, factors other than static coronal alignment may be as important in determining durability.
**Introduction:** In the setting of the aseptic revision, a common question is: what should be done with the resurfaced patella? We report on a series of aseptic RTKR where one or both components were revised, and the patella was not.

**Methods:** The study group was 147 consecutive RTKR in 137 patients where the patella was not revised, with average age 71.5 (range 43 to 93) and BMI 31.2 (range 21.5 to 50.8). The group was followed for a minimum of 5 years (range 5 to 9). At the time of final follow up 13 patients (15 knees) had died and 2 patients (2 knees) were lost to follow up leaving 121 patients (130 knees) available for review. Of this group, components revised included: 51 both components, 6 femur only, 3 tibia only, and 70 poly only. In 5 cases there was a mismatch between a retained non-oval patella and new trochlear groove. In 10 cases, patella polyethylene cold flow or wear was identified. Average time from primary to revision (age of the original patellar button) was 8.6 years (range 1 month to 17.9 years).

**Results:** At final follow-up of a minimum of 5 years (range 5 to 9), there had been no reoperations on any patella, and none were at risk of failure. 6 of the patella had tilt beyond 10 degrees on the sunrise view, but none were subluxed. KSS averaged 86 (range 24-100) at final follow-up.

**Conclusions:** At midterm follow-up in the group of RTKR where the patella was not revised, we identified no subsequent failures of the patella. This is despite the presence of patella poly-wear and mismatched shapes in several knees. Unless the button is loose, severely worn or maltracking, surgeons can confidently retain the original button in place.
What Is the Value of Component Loosening Assessment of a Preoperatively-Obtained Bone Scan Prior to Revision Total Knee Arthroplasty?

David C. Holst, MD, Marc R. Angerame, MD, Douglas A. Dennis, MD, Jason M. Jennings, MD

**Introduction:** Bone scintigraphy (BS) is frequently ordered to investigate cause of failure following total knee arthroplasty (TKA). Its correlation of component loosening with intraoperative findings at the time of revision TKA (rTKA) has not been well studied. This study investigated correlations between preoperatively obtained radiologist report (RR) of BS, preoperatively documented surgeon predictions (SP) of component loosening, and operative reports documenting intraoperative findings (IF).

**Methods:** Our institutional database was retrospectively reviewed for all rTKA done after BS and revealed 96 eligible cases. The RR and SP cohorts were subdivided into all potential combinations of component loosening and were then compared to each other as well as IF. In addition to calculating percentage correct of RR and SP compared to IF, the levels of agreement between RR and SP were compared using the kappa statistic.

**Results:** Of the 96 cases, the RR correctly correlated with IF in 35 cases (37%), and the SP was correct in 66 cases (69%), indicating the preoperative interpretation of the surgeon regarding component loosening at rTKA was correct more frequently (p<0.001). The kappa statistic between RR and IF was only 0.23 (95% CI 0.15-0.32), indicating minimal agreement. The kappa statistic between SP and IF was 0.57 (95% CI 0.46-0.68), indicating weak agreement. Furthermore, the kappa statistic between RR and SP was 0.36 (95% CI 0.27-0.45), also indicating minimal agreement.

**Conclusions:** In rTKA, there is weak agreement regarding component loosening between a radiologist’s opinion of a preoperatively obtained bone scan and the surgeon’s preoperative interpretation of clinical and radiographic data. While neither reliably accurately predicts what is found at the time of rTKA, the surgeon’s preoperative interpretation is more closely correlated with actual intraoperative findings of component loosening.
Introduction: Periacetabular osteotomy (PAO) remains the gold standard treatment for developmental dysplasia of the hip (DDH). The purpose of this multicenter cohort study was to delineate the long-term radiographic natural history of the dysplastic hip following PAO.

Methods: We evaluated all patients undergoing PAO from 1996-2012 at three academic institutions. Inclusion criteria were PAO for DDH or DDH and concomitant acetabular retroversion with minimum 5-year radiographic follow-up. Exclusion criteria were PAO for isolated acetabular retroversion, neurogenic dysplasia, Legg-Calve-Perthes, and prior hip surgery. There were 288 patients with 83% women; mean age and BMI were 29 years, 25 kg/m². Mean clinical and radiographic follow-up was 9.2 years (range, 5.0-21.1). Every preoperative and postoperative hip radiograph was assessed to determine the degree of osteoarthritis according to the Tönnis classification. Survivorship was analyzed by multistate modelling, which enables enhanced precision compared to Kaplan-Meier techniques.

Results: At final follow-up, 144 patients (50%) had progressed at least 1 Tönnis grade with 42 patients (14.6%) undergoing total hip arthroplasty. The mean number of years spent in each Tönnis grade following PAO was as follows: Tönnis 0=11, Tönnis 1=19, Tönnis 2=8, Tönnis 3=4. The probability of progression to THA increased significantly based on higher initial Tönnis grade (p<0.001). The most marked difference occurred between Tönnis 0 or 1 compared to Tönnis 2; for Tönnis 1, the probability of progression to THA at 5 and 10 years was 2% and 11%, respectively, compared to 23% and 53%, respectively, for Tönnis 2.

Conclusions: PAO significantly alters the natural history of DDH. Precise radiographic progression based on the Tönnis grade can now be used to ascribe prognosis for the native hip. Importantly, this investigation demonstrates a stark increase in progression to THA within 10 years of PAO for patients with Tönnis 2 compared to Tönnis 0 or 1 osteoarthritis.

Notes
Paper #40

Surgical Treatment of Femoroacetabular Impingement: Arthroscopy vs. Surgical Hip Dislocation–A Propensity Matched Analysis

Jeffrey J. Nepple, MD, Ira Zaltz, MD, Asheesh Bedi, MD, Paul E. Beaule, MD, FRCSC, Michael B. Millis, MD, Rafael J. Sierra, MD, Ernest L. Sink, MD, John C. Clohisy, MD

**Introduction:** Surgical treatment of femoroacetabular impingement (FAI) has continues to evolve. Hip arthroscopy is increasingly utilized for treatment of typical FAI deformities, while open surgical hip dislocation is reserved for complex or severe cases. The purpose of the current study was to compare the outcomes of surgical treatment of FAI between hip arthroscopy and open surgical hip dislocation utilizing a propensity analysis.

**Methods:** A prospective multicenter cohort undergoing primary surgical treatment of FAI was assessed. Follow-up at a minimum of one year was available in 621 hips (81.7%). Propensity scores reflect the likelihood of surgical treatment with arthroscopy versus surgical hip dislocation for a given set of covariates and allow subsequent matching to identify similar patients at baseline to include in the analysis. After propensity matching, a total of 256 patients are included in the current study. The primary outcome was a composite failure defined as total hip arthroplasty (THA), revision surgery, or clinical failure. Clinical failure was defined as improvement in mHHS less than 8 (MCID) and mHHS less than 74 (PASS).

**Results:** The mean mHHS was similar at baseline between the two groups (60.2 HA vs. 60.7 SD). Both groups demonstrated statistically significant improvements in all PROs. The final mHHS was not statistically different between the two groups (81.2 vs. 80.2, p=0.67). Similarly, the HOOS pain subscale was similar at final follow-up (80.6 vs. 77.7, p=0.32). The rates of THA (0% and 3.1%, p=0.409) and revision surgery (7.8% and 10.9%, p=0.34) were similar in the HA and SD groups. Overall rates of failure (revision surgery or clinical failure) were 21.9% for HA and 25.0% for SD (p=0.54).

**Conclusions:** Patients undergoing surgical treatment of FAI with either hip arthroscopy and surgical hip dislocation demonstrate significant improvements in PRO which are similar for patients undergoing hip arthroscopy or surgical hip dislocation.
**Paper #41**

**Patient Reported Outcomes in Joint Registries: Defining the Optimal Collection Window**

Mohamad J. Halawi, MD, Jay R. Lieberman, MD, Vincent J. Williams, MD, Mark P. Cote, PT, Michael Canfield, MD

**Introduction:** Patient-reported outcomes (PROs) are increasingly being used in joint registries and healthcare agencies to assess the quality of care. While there have been abundant publications describing their use, few have discussed the optimal timing of PROs administration postoperatively. The purpose of this study was to determine the optimal window for PROs collection in the postoperative period.

**Methods:** Our prospectively collected institutional total joint registry was queried for patients who underwent primary elective TJA. 866 procedures (416 TKA, 450 THA) were available for analysis. The primary outcomes were the net changes in Short Form-12 mental component summary (SF-12 MCS), Short Form-12 physical component summary (SF-12 PCS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), UCLA activity level rating, Oxford Hip Score (OHS), and Knee Society clinical rating system (KSCRS) at 6, 12, and 24 months postoperatively. Secondary outcomes were data acquisition costs and follow-up attrition rates.

**Results:** A significant plateau in PRO improvement was noted by 6 months postoperatively. For TKA, the percentage of overall improvement achieved by 6 months was 88.7%, 84.5%, 100%, and 90.5% for the WOMAC, SF-12 PCS, UCLA, and KSCRS respectively. For THA, these values were 92.7%, 83.5%, 88.0%, and 89.8% respectively for the same measures. There were marginal improvements from 6 to 12 months and no improvement from 12 to 24 months. Follow-up attrition rates at 6, 12, and 24 months were 85%, 69%, and 40% respectively. Our institutional costs for collecting a complete dataset per patient are $159, $333, and $1,256 for 6, 12, and 24 months respectively.

**Conclusions:** This study provides evidence that the vast majority of improvement in PROs following TJA occurs within the first six months postoperatively. Considering the high cost of data acquisition and attrition rates, collection of PROs beyond 6 months may not be necessary or cost-effective.
Introduction: Routine laboratory studies are often obtained following total knee arthroplasty (TKA). Moreover, laboratory studies are often continued daily until the patient is discharged from the hospital regardless of medical management. The purpose of this study was to investigate utility and cost of routine complete blood count (CBC) tests following TKA. Secondarily, to identify patient factors associated with abnormal lab values.

Methods: This retrospective review identified 484 patients who underwent primary TKA under a tourniquet at a single institution. Preoperative and postoperative CBC values were collected along with demographic data, use of tranexamic acid (TXA), and transfusion rates. Logistic regression models were calculated for all variables.

Results: Of the 484 patients who underwent primary TKA, 25 required transfusion (5.2%). Patients who required transfusion had a significantly lower pre-operative hemoglobin (11.47 g/dL) compared to patients who did not require transfusion (13.58 g/dL) p=0.005. Risk of transfusion was 5.2 times more likely in patients who were anemic preoperatively (95% CI 2.90-9.35) p<0.001. Without TXA, patients were 2.75 times more likely to receive a transfusion (95% CI 1.43-5.30) p<0.001. Length of surgery was not associated with increased risk of transfusion. There were no patients who received intervention for the outcome of platelet and white blood counts. Average number of CBC tests collected for patients who did not receive medical intervention was 2.89. This equated to $76,287 in hospital charges.

Conclusions: Maintaining high quality patient care while being cost effective is critical to the new era of bundled payments for total joint arthroplasty. Routine postoperative CBC tests in patients with a normal preoperative hemoglobin and receive TXA who undergo TKA with a tourniquet do not add value to patient care. Patients who are anemic prior to TKA or do not receive TXA should obtain a CBC. Consideration should be taken to refrain from further CBC tests if intervention is not necessary after day one post-TKA.
Paper #43

Identifiable Risk Factors to Minimize Postoperative Urinary Retention in Modern Outpatient Rapid Recover Total Joint Arthroplasty

Kent R. Kraus, BS, Nathan D. Duncan, MS, Nimra Nayyar, MPH, Mary Ziemba-Davis, BA, Mark Nielson, MD, R. Michael Meneghini, MD

**Introduction:** Postoperative urinary retention (POUR) following total joint arthroplasty (TJA) ranges from 0 to 75% reflecting variations in the perioperative practices of TJA programs; study populations; and definitions, measurement, and treatment methods for POUR. Further, POUR presents a significant barrier to outpatient and early discharge TJA. This study examined the incidence and risk factors for acute POUR in patients discharged on the day of, or the day after, surgery in a modern, evidence-based care and coordination early discharge TJA program.

**Methods:** Prospectively recorded data on 620 consecutive primary TJAs discharged on the day of or the day after surgery were retrospectively reviewed. POUR was diagnosed by a perioperative internal medicine specialist whose practice focuses exclusively on TJA. Univariate analysis of potential predictors was performed, followed by binary logistic regression (BLR) testing of predictors with p=0.20.

**Results:** After exclusions for confounds the final analysis sample consisted of 613 procedures. The overall incidence of POUR was 4.2% (n=26). Male sex, THA, history of urinary retention, use of neostigmine, and the absence of an indwelling catheter were associated with a higher prevalence of acute POUR and met criteria for entry into multivariate BLR. Seventeen additional predictors, including opioid spinals and outpatient surgery were unrelated to POUR. In the final BLR model, the probability of developing POUR in patients with a history of urinary retention, without an indwelling catheter, and who received neostigmine was 82.4%, which declined to 2.5% in the absence of these risk factors. All cases of POUR resolved, and there were no long-term complications.

**Conclusions:** Despite a relatively low incidence of 4.2%, patients with a history of POUR, the use of neostigmine by anesthesia should be carefully considered and potentially avoided in stand-alone ambulatory surgery centers.
Introduction: Postoperative nausea and vomiting (PONV) after surgery is detrimental to patient experience, tolerance of pain medication, rehabilitation progress, and functional outcomes. Given the importance of early rehabilitation following arthroplasty (TJA), we asked whether transdermal scopolamine is effective in reducing rates of PONV and improving functional outcomes following TJA.

Methods: We retrospectively reviewed the charts of 1,085 consecutive patients who underwent TJA between 2014 and 2017 and compared patients prior to the addition of the scopolamine patch in our peri-operative regimen (control group) to those after the addition (study group). All patients after 1/1/2014 were given scopolamine patch in the holding area unless contraindicated in our protocol (allergy, open angle glaucoma, age over 75 years, urinary retention history). 495 were excluded. Charts were reviewed for incidence of PONV, demographic information, surgical time, length of stay, distance walked with physical therapy, and VAS pain scores. Student t-test was used to compare continuous data and fisher exact test was used for categorical variables.

Results: The incidence of PONV was significantly lower in the scopolamine group compared to the control group (14.4% vs. 29.3%, p<0.0001). Patients who were given scopolamine also had a significantly shorter length of stay (2.3 days vs. 2.8 days, p<0.0001), were more likely to be discharged (84.0% vs. 63.9%, p<0.0001), had lower VAS pain scores on postoperative days (POD) 0-2 (p<0.01), were able to walk further distances on POD 0-3 (p<0.001), and received fewer morphine equivalents when compared to the control group on POD 1-2 (p<0.001).

Conclusions: Use of a scopolamine patch was associated with a significant reduction in PONV and improvement in functional outcomes following TJA. This data supports the use of transdermal scopolamine as part of a multi-modal, perioperative pain protocol in patients undergoing TJA.
There are growing trends in outpatient joint replacement that show how important it is to learn from past failures in order to shape future success.

Objectives:

1. Utilize real case examples of failures to illustrate potential risks and complications associated with outpatient joint replacement by highlighting consequences of overlooking the importance of patient selection and proper protocols.

2. Show how case examples have shaped current practices by learning from prior failures to emphasize the importance of an ever-evolving protocol for successful outpatient joint replacement.

3. Answer the most common real-life challenges related to outpatient joint replacement from general patient selection to specific details, such as dealing with urinary retention or nausea.

Outline:

Introduction: Why Are We Here? Growing Trends in Outpatient Joint Replacement
Michael Meneghini, MD

Patient Selection: It All Starts Here
Alexander Sah, MD

The Pathways and Protocols that Make It Work
Bill Hamilton, MD

The ASC Is Not Your Hospital OR.
Charlie DeCook, MD

Questions and Discussion
Michael Meneghini, MD
Introduction: Patients who are actively smoking at the time of primary joint arthroplasty (TJA) are at an increased risk of perioperative complications. Serum cotinine testing is a sensitive and specific method to verify abstinence from smoking and may therefore improve a patient’s chance of smoking cessation. The purpose of this study was to assess whether cotinine testing improves the self-reported quit-rate among smokers before TJA.

Methods: Our hospital performs a high volume of TJAs and documents smoking status at each clinic visit (at six-month intervals), as well as at the time of surgery through an institutional total joint registry. This information was used to identify all self-reported smokers (regularly cigarette smoking within 1 year of TJA) who underwent unilateral TJA from 2007 to 2018. Patients who underwent cotinine serum testing within one month before surgery were then separated from the cohort and compared to the smokers who did not undergo cotinine testing.

Results: Of the 28,758 primary TJAs identified, 8.8% (2,514) were smokers. Serum cotinine testing was obtained on 103 of these patients. The abstinence rate (by means of self-reporting) before surgery significantly improved from 15.8% to 28.2% in the untested versus cotinine-tested groups, respectively (p=0.005). Among patients who underwent cotinine testing, 77% were negative (abstinent). Among patients who stated they had quit smoking, 15% still had positive cotinine tests.

Conclusions: Smoking cessation remains a major challenge in contemporary TJA practices despite a concerted effort and sundry of tools to help patients quit. Our findings suggest that cotinine testing significantly improves the self-reported quit rates of smokers before surgery and helps identify the 15% who falsely report abstinence to ensure appropriate counseling of inherent risks. This simple, reliable, and relatively inexpensive test should therefore be considered as a valuable adjunct in helping smokers quit before surgery.
Introduction: The effect of diabetes on the risk of periprosthetic joint infection (PJI) is not well documented. We hypothesized that diabetes mellitus type 1 (DM1) patients would be at greater risk for PJI than those with diabetes mellitus type 2 (DM2) and that a history of diabetic complications would be associated with an increased risk for PJI.

Methods: We performed a retrospective cohort study on all adult patients that underwent hip or knee arthroplasty, with ≥2-years follow-up, within a state-wide database from 1996-2013. Of the 75,478 patients included, 1,668 had DM1 and 18,186 had DM2. There was no difference in age or sex between groups (p>0.05). Risk factors were calculated using Cox regression, adjusting for siblings and stratified by age. Logistic regression was used to analyze the effect of diabetic complications on risk of PJI, controlling for other known risks for PJI.

Results: The frequency of PJI in non-diabetic patients was 2.6% compared to 4.3% in all diabetics (RR 1.47, p<0.001). The patients with DM1 were at 1.8 times greater risk for PJI than DM2 (7% vs 4%, p<0.001). The following diabetic complications increased the risk of PJI: peripheral circulatory disorders (OR 2.59), ketoacidosis (OR 2.52), neurologic (OR 2.33), renal (OR 2.15), and ophthalmic (OR 1.76) (all p<0.002). The odds of PJI increased with each added complication (all, p<0.001) and patients with 4 or more complications were 9 times more likely to have PJI than uncomplicated diabetics. Overweight and obese DM2 patients were at greater risk for PJI whereas underweight DM1 patients were at greater risk (all p<0.05).

Conclusions: Our data showed an increased risk of PJI in DM1 patients compared with DM2, along with increasing risk for additional diabetic complications. These findings emphasize the need to better understand our diabetic patients’ medical histories for more appropriate risk management.

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Paper #46

Diabetes Mellitus Type One Poses Greater Risk for Periprosthetic Joint Infection than Type Two for Patients Undergoing Total Joint Arthroplasty

Christopher E. Pelt, MD, Christopher L. Peters, MD, Huong Meeks, PhD, Ian Duensing, MD, Jeremy M. Gililland, MD, Karen Curtin, PhD, Mike B. Anderson, MS
Introduction: While smoking is well accepted as a risk factor for surgical complications after total joint arthroplasty (TJA), little is known about the effects of smoking on patient reported outcomes (PROs). In this study, we investigated the association between smoking and a panel of commonly used PROs.

Methods: A retrospective review of prospectively collected joint registry data on 713 primary, unilateral total hip and knee replacements was performed. Two cohorts were compared: 1) active smokers and 2) former/never smokers. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Short-Form Physical and Mental Health Composite Score (SF-12 PCS and MCS) Oxford Hip Score (OHS), and the University of California Los Angeles activity level (UCLA) were assessed preoperatively and at 6 and 12 months postoperatively. The primary outcomes were the net changes in PROs as well as absolute scores at final follow up. A linear-mixed effects regression was used to examine the change in the outcome scores for the two groups.

Results: Nonsmokers demonstrated higher baseline preoperative PROs than active smokers. With the exception of SF-12 MCS (p=0.671) and UCLA (p=0.178), nonsmokers showed significantly greater improvements in WOMAC (p=0.002), SF-12 PCS (p=0.005), and OHS (p=0.033). Additionally, for each unit increase in packs per day smoked, the WOMAC scores decreased by 7.7 points (p=0.003), SF-12 PCS by 4.8 points (p=0.001) and OHS by 3.0 points (p=0.033). At final follow-up, nonsmokers had better absolute scores for all PROs measured (p<0.05).

Conclusions: Previous and never smokers achieved statistically and clinically greater improvement in most PROs after TJA when compared to active smokers. There was a dose-dependent inversely proportional relationship between smoking and outcomes. Since smoking is a modifiable risk factor, smokers should be counseled to quit smoking to optimize outcomes.
Aspirin for Venous Thromboembolism Prophylaxis Decreases Mortality After Primary Total Joint Arthroplasty

Alexander J. Rondon, MD, MBA, Noam Shohat, MD, Timothy L. Tan, MD, Karan Goswami, MD, Ronald C. Huang, MD, Javad Parvizi, MD

Introduction: Aspirin has increased in popularity as prophylaxis for venous thromboembolism (VTE) following total joint arthroplasty (TJA). However, the potential cardioprotective effects of aspirin when administered for VTE prophylaxis remains unknown. This study aimed to investigate the influence of VTE prophylaxis, including aspirin, with respect to mortality following primary TJA.

Methods: A retrospective review of 31,113 primary TJA patients from 2000-2017 was conducted. Patient demographics, BMI, and comorbidities were obtained through an additional electronic chart query. Patients were allocated into two cohorts based on the VTE prophylaxis administered: aspirin (25.9%, 8,061) and non-aspirin (74.1%, 23,072). Mortality was assessed through an institutional mortality database (updated biannually and externally validated). Univariate and multivariate regression analyses were performed.

Results: Overall, the mortality rate was 0.22% and 0.56% at 30-days and 1-year following TJA. The use of aspirin was independently associated with lower risk for death at both 30-days (OR 0.37, p=0.016) and 1-year (OR 0.52, p=0.006). Patients in the non-aspirin cohort demonstrated a 3-fold increased risk for death at 30-days (0.3% vs. 0.1%, p=0.004) and 2-fold increased risk of death at 1-year (0.7% vs. 0.3%, p<0.001) compared to aspirin. At 1-year, the primary cause of death in the non-aspirin group was cardiac (46/23,072, 0.20%). In the aspirin cohort, the rate of death due to cardiac cause was almost 5-fold lower (3/8,061, 0.04%, p=0.005). Risk factors for mortality at 1-year included higher mean age (p<0.001), male gender (p=0.024), pre-existent congestive heart failure (p=0.009), cerebrovascular disease (p=0.001), malignancy (p<0.001) and history of myocardial infarction (p<0.001).

Conclusions: This study demonstrates that administration of aspirin as a VTE prophylaxis reduces the risk of mortality following primary TJA. Given the numerous options available and permitted by the current guidelines, surgeons should be aware of this added benefit of aspirin when selecting VTE prophylaxis.
Are Patients More Satisfied with a Balanced TKA?

Alexander C. Gordon, MD, Gregory J. Golladay, MD, Thomas L. Bradbury, MD, Ivan Fernandez-Madrid, MD, Viktor E. Krebs, MD, Preetesh D. Patel, MD, Carlos A. Higuera, MD, Wael K. Barsoum, MD

**Introduction:** Studies have shown that as many as 1 in 5 patients is dissatisfied following TKA. The purpose of this study was to determine whether or not patients with a balanced TKA, as measured using intraoperative sensors, exhibit better clinical outcomes.

**Methods:** 318 patients scheduled for TKA surgery were enrolled in a 6 center, randomized controlled trial, resulting in two patient groups: a sensor-guided TKA group and a surgeon-guided TKA group. Intraoperative load sensors were utilized in all cases, however in one group the surgeon used the feedback to assist in balancing the knee and in the other group the surgeon balanced without load data and the sensor was used to blindly record the joint balance. For this evaluation, the two groups were pooled and categorized as either balanced or unbalanced. Clinical outcomes data were collected at 6 weeks, 6 months and 1 year postoperatively, including Knee Society Satisfaction and the Forgotten Joint Score. Using linear mixed models, these outcome measures were compared between the balanced and unbalanced patient groups.

**Results:** Of the 318 patients, 208 were balanced and 110 were unbalanced. When correcting for confounding factors, patients with a balanced knee exhibited greater satisfaction at 6 weeks, 6 months and 1 year compared to the patients with an unbalanced knee (p=0.011). Similarly, the same cohort of patients with a balanced knee showed a more forgotten joint (higher Forgotten Joint Score) at the same time intervals (p=0.044).

**Conclusions:** As patient reported outcomes become increasingly important for maintaining favorable hospital and provider metrics, it is imperative to find new methods to increase satisfaction levels among TKA recipients. In this study, patients with quantitatively balanced TKA had significantly better KSS satisfaction and forgotten joint scores compared to patients with unbalanced TKA.
Paper #50

Emergency Department Visit Within One Year Prior to Elective Total Joint Arthroplasty is Predictive of Postoperative Return to Emergency Department Within 90 Days

Michael D. Gabbard, MD, Michael A. Charters, MD, Sean Mahoney, BS, Wayne T. North, MD

Introduction: The Comprehensive Care for Joint Replacement Model, developed by Centers for Medicare and Medicaid Services, aims to improve the quality of joint replacement. Metrics, including emergency room visit rates after Primary Total Knee and Total Hip Arthroplasty (TKA and THA), are of particular interest. The purpose of this study was to determine if preoperative Emergency Department (ED) visits are predictive of postoperative ED visits among patients undergoing elective THA or TKA.

Methods: In a retrospective analysis of 6979 patients who underwent elective primary arthroplasty (2437 hip, 4542 knee), we identified all patients who had an ED visit from up to one year prior to their surgical date to 90 days after. We assessed if preoperative visit frequency or temporality are predictive of a return ED visit within 90 days.

Results: TKA and THA patients with a single preoperative ED visit had an OR of 1.9 and 2.0, respectively, of returning to the ER postoperatively (P<0.001). Increasing preoperative visit frequency correlated with increasing odds ratios (up to 5 preoperative visits) (OR 1.9-16.7, P<0.001). The proximity of the most recent preoperative visit to surgery was a risk factor for postoperative return to ED (OR 4.6 hips, 2.9 knees, P<0.001).

Conclusions: Presentation to the ED is common prior to total joint arthroplasty and is predictive of a postoperative visit within 90 days. Preoperative visit frequency and proximity prior to surgery increases a patient’s risk of a postoperative visit within 90 days.

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Symposium VIII

Taper Corrosion in Total Hip Arthroplasty: Applying the Best Evidence into Practice

**Moderator:** Joshua J. Jacobs, MD  
**Faculty:** Brian J. McGrory, MD, Young-Min Kwon, MD, PhD, Brett Levine, MD

An interactive didactic and case presentation format highlights treatment of THA patients with modular taper corrosion, enhancing understanding and applying evidence-based practice to optimize patient evaluation, revision surgery indication, surgical techniques and outcomes.

**Objectives:**

1. Understanding the spectrum of clinical presentations of adverse soft tissue reactions due to taper corrosion, reflecting a complex interplay of implant, surgical and patient factors.

2. Understanding the current state of knowledge of importance of various parameters affecting taper corrosion including patient-, implant- and surgeon-specific factors.

3. Gain understanding of utility and limitations of specialized diagnostic tests including blood metal levels and cross-sectional imaging studies in the clinical decision-making process.

4. Optimizing revision surgery outcomes for taper corrosion which involves careful pre-operative planning, implant selection, and surgical techniques to overcome challenges associated with soft tissue necrosis.

**Outline:**

- **Introduction**  
  Joshua J. Jacobs, MD

- **What Surgeons Need to Know About Taper Corrosion in MoP THA**  
  Brett Levine, MD

- **How Big is the Problem?**  
  Brian J. McGrory, MD

- **Risk Factors, Metal Levels, and Revision Outcome in Taper Corrosion ALTR**  
  Young-Min Kwon, MD, PhD

- **Case Presentations and Discussions**
Unintended BPCI Consequences Following Removal of TKA from Inpatient-Only List

Brian M. Curtin, MD, MS, Susan M. Odum, PhD

Introduction: Centers for Medicare and Medicaid Services (CMS) beginning in 2013 introduced the Bundled Payments for Care Improvement (BPCI) initiative to test innovative payment and service delivery models. Early BPCI implementers report decreased length of stays (LOS), discharges to inpatient facilities, and readmission rates with overall cost savings. Removing TKA from the Medicare Inpatient Only list may change the case-mix of patients included in 2018 BPCI bundles. The purpose of the study was to compare expenditures and post-acute events of a subset of total joint arthroplasty (TJA) patients discharged after 24 hours to all TJA patients regardless of LOS.

Methods: CMS data of 1,729 patients who underwent TJA in 2017 were identified using Diagnosis-Related Groups 469 and 470. All 1,729 patients were compared to a subset of 1,042 patients who had a LOS>24 hours. Expenditures and post-acute events within a 90-day episode including admission to an IRF/SNF, home health (HH) and readmissions were analyzed. Statistical analyses were performed using Wilcoxon tests and Chi Square tests.

Results: The median expenditures were $18,362 (IQR $13,447-$19,185) for all TJA patients and $21,118 (IQR $15,368-$22,772) for TJA patients discharged after 24 hours (p<0.001). The median post-acute care spent was $5,509 (IQR $1,685-$5,725) for all patients and $7,429 (IQR $2,961-$8,159) for patients with LOS>24 hours (p<0.001). Patients with a LOS>24 hours had a higher rate of SNF admissions (32% vs. 20%; p<0.001), IRF admissions (1% vs. 0%; p=0.25), HH (67% vs. 59%; p<0.001) and readmissions (8% vs. 6%; p=0.12).

Conclusions: Implications of removing TKA from the Inpatient Only List could potentially remove up to 40% of patients from the BPCI program leading to substantially less savings of almost $3,000 per patient, on average. Remaining bundle patients are also more likely to require HH and SNF following discharge.
**Introduction:** The Bundled Payment Care Improvement (BPCI) initiative aims to improve the quality of patient care while mitigating cost. How patient age and frailty affect reimbursement after hip and knee total joint arthroplasty (TJA) is not known. This study aims to evaluate if patient age and frailty affect cost of care.

**Methods:** A retrospective review of 1821 patients undergoing TJA at our institution under the BPCI initiative was performed from 2013 to 2016. We recorded demographics for patients, including age, and calculated their modified frailty index (mFI). Cost of care was obtained for each patient. Statistical analyses included T-test and ANOVA to evaluate age and frailty as independent categorical variables. Beta coefficients were utilized to evaluate age as a continuous variable. Multivariate linear regression models evaluated age and frailty’s combined contribution to cost.

**Results:** Age was evaluated as a categorical variable, with the median age of our sample population the categorical cutoff. Age greater than or equal to 72 years old increased cost by 8.6% and increasing mFI score increased cost by 4.4%, 10.8%, 31.7%, 35.3%, 69.1% for mFI scores 1-5, respectively (p-values<0.01). Age demonstrated an increase in cost of 0.68% per incremental age increase (p-value<0.01). Multivariate evaluation of increasing age and mFI revealed increased cost: mFI 2, 9.7% (CI 5.1%, 14.3%), mFI 3, 29.9% (CI 22.1%, 27.6%), mFI 4, 33.8% (CI 20.0%, 47.6%), mFI 5, 67.4% (CI 39.2%, 95.6%) (p-values<0.01).

**Conclusions:** Increasing age and frailty increase the cost associated with TJA. The BPCI initiative over-simplifies the cost associated with TJA. This information could de-incentivize care to older, higher-risk patients. Objective patient-specific/risk-adjusted stratification of BPCI pricing is necessary to be considered as a valid financial model.
Paper #53

Perioperative Orthopaedic Surgical Home (POSH): Optimization of High-Risk TJA Candidates Is Effective

Kelvin Y. Kim, BS, Afshin A. Anoushiravani, MD, Kevin K. Chen, MA, Robert Li, MD, Joseph A. Bosco, MD, James D. Slover, MD, Richard Iorio, MD

Introduction: It is well recognized that unplanned readmissions following total joint arthroplasty (TJA) are more prevalent in patients with comorbidities. However, few investigators have delayed surgery and medically optimized patients prior to surgery. In its current form, the Perioperative Orthopaedic Surgical Home (POSH) is a surgeon-led screening and optimization initiative targeting eight common modifiable comorbidities.

Methods: A total of 4,188 patients who underwent TJA between January 2014 and December 2016 were retrospectively screened by the Readmission Risk Assessment tool (RRAT) score. From this cohort, 1,194 subjects had a preoperative RRAT score of 3 and were eligible for inclusion. Patients were then separated into two cohorts based upon whether they were medically optimized according to the POSH initiative (POSH; n=216) or continued with surgery (non-POSH; n=978) despite their high-risk for readmissions. Demographics and quality metrics were then compared between the two cohorts.

Results: Since the implementation of the POSH initiative, patients with RRAT scores ranging from 3 to 5 have experienced lower 30-day (1.6% vs. 5.3%; p=0.03) and 90-day (3.2% vs. 7.4%; p<0.05) readmission rates when compared to the non-POSH cohort. Only 15.3% of medically optimized patients enrolled in the POSH initiative were discharged to a post-acute care (PAC) facility, whereas, 23.4% of non-POSH patients were discharged to a PAC facility (p=0.01). There were no differences in LOS and infection rates between the two cohorts. Moreover, 90-day episode of care costs were 14.9% greater among non-POSH Medicare TJA recipients and 32.6% higher if a readmission occurred.

Conclusions: The identification and medical optimization of comorbidities prior to surgical intervention may enhance the value of care TJA candidates receive. A standardized multi-disciplinary approach to the medical optimization of high-risk TJA candidates may improve patient engagement and perioperative outcomes, while reducing cost associated with TJA.
Medical Malpractice Litigation Following Primary Total Joint Arthroplasty: A Comprehensive, Nationwide Analysis for the Last Decade

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**Introduction:** With increased utilization of primary total joint arthroplasties (TJA), it is projected that 572,000 primary total hip (THA) and 3.4 million primary total knee arthroplasty (TKA) will be performed by 2030. Medical malpractice litigation against orthopaedic adult reconstruction surgeons are on the rise in the U.S. and estimated to be over two times that of a general physician. The purpose of this study was to: 1) determine the most common reasons of medical malpractice litigations against adult reconstruction surgeons; 2) report on the outcomes of these lawsuits.

**Methods:** The Westlaw legal research database was queried for jury verdicts and settlements completed between 2008 and 2018 for cases related to THA and TKA in the United States. Included cases were when the defendant was an orthopaedic surgeon, and when the plaintiff underwent THA or TKA procedure by them. Revision procedures were excluded. Causes of the lawsuit, patient characteristics, demographics, state/outcome of verdict or settlement, and indemnity payments were noted.

**Results:** One hundred-forty records (77 females (55%), 63 males (45%)) were included in the final analysis (63 THA (45%), 77 TKA (55%)). For all patients, infection was the leading cause for malpractice litigation (22%) followed by nerve injury (20%). In THA cases, nerve injury was the most common reason for lawsuit (38%), followed by leg length discrepancy (25%). For TKA, infection was the most common reason (34%). The jury ruled in defense favor 76%, and 20% in plaintiffs favor. Parties settled in 4%.

**Conclusions:** Infection and nerve injury were the most common reasons of malpractice litigation against adult reconstruction surgeons. The most likely outcome of these lawsuits was a jury verdict in favor of the surgeon. Regardless, surgeons should be cognizant of the potential for lawsuit due to these complications and should simultaneously ensure they inform patients of these potential complications of TJA preoperatively.
Preoperative Optimization Checklists Within the CJR Bundle Have Not Decreased Hospital Returns

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Introduction: The Comprehensive Care for Joint Replacement (CJR) model has resulted in the evolution of preoperative optimization programs to decrease costs and readmissions. At the investigating institution, one center is not within the CJR bundle and has dedicated fewer resources to this effort. The remaining centers have adopted an 11 metric checklist designed to identify and mitigate modifiable preoperative risks. We hypothesized that this checklist would improve postoperative outcomes for total knee arthroplasty (TKA) patients eligible for participation in CJR.

Methods: The institutional database was retrospectively queried for patients undergoing TKA from 2014 to 2018. Only patients with eligible participation in the CJR reimbursement system were included. Demographic information including age, sex, body mass index (BMI), and ASA score were determined, and outcome measurements comprising length of stay (LOS), disposition, 90-day ED visits, and hospital readmissions were explored. Statistical analysis was performed to determine differences in outcomes between CJR participating and non-CJR participating hospitals.

Results: 2,308 TKA patients including 1,564 from a CJR participating center and 744 from a non-CJR center were analyzed. There was no significant difference in patient age (median 71 years) or sex (62.4% female); however, patients at the non-CJR hospital had significantly higher BMI (p<0.001) and ASA scores (p<0.001). Patients in the CJR network had significantly greater discharges to home (p=0.050) compared to skilled nursing facilities, and shorter LOS (p<0.001). However, there was no reduction in 90-day ED visits or readmissions.

Conclusions: The resources utilized at CJR participating hospitals, including patient optimization checklists, did not effectively alter patient outcomes following discharge. Investments in infrastructure impacted only discharge disposition and LOS. While contributing to cost savings, this does not translate to improved patient outcomes. Likely, a checklist alone is insufficient and detailed optimization protocols for modifiable risk factors must be investigated.
Paper #56

Antibiotic-Loaded Bone Cement in Primary Total Knee Arthroplasty: Utilization Patterns and Impact on Complications Using a National Database

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Introduction: Routine prophylactic use of antibiotic-loaded cement in primary total knee arthroplasty (TKA) remains controversial and is currently not FDA-approved in the U.S. Its effectiveness in mitigating infection remains unclear while the high antibiotic elution may lead to other medical complications. The purpose of this population-based study was to evaluate utilization patterns of antibiotic-loaded bone cement in primary TKA, and its impact on outcomes and economic burden.

Methods: This retrospective cohort study utilized data from the nationwide Premier Healthcare claims database (2006-2016, N=1,184,270 TKA procedures). Multivariable models estimated associations between (prophylactic) antibiotic-loaded bone cement use (defined by inpatient billing) and postoperative infection, acute kidney injury (AKI), acute need for inpatient dialysis (from inpatient billing), allergic complications and those related to disturbances in the microbiome, 30-day and 90-day readmission, cost of hospitalization and length of stay (LOS). We report odds ratios (OR; or % change for continuous variables) and 95% confidence intervals (CI).

Results: Overall, antibiotic cement was utilized in 27.2% (N=322,476) of all primary TKA procedures. This increased from 17.3% in 2006 to 30.2% in 2010 and plateaued until 2016. Utilization of antibiotic cement was lower in rural hospitals (21.4%) and higher in large (>500 beds; 29.4%) hospitals. After adjusting for relevant covariates, antibiotic-loaded cement use was associated with significantly decreased odds for postoperative infection (OR=0.89; CI 0.83-0.96) and increased odds for AKI (OR = 1.06; CI 1.02-1.11). Associations with other outcomes were either statistically or clinically non-significant.

Conclusions: This is the first national study on the prophylactic use of antibiotic-loaded bone cement in primary TKA patients. With utilization rates of around 30% we found reduced odds for infection while there may be a potential increase AKI. These data highlight the need for cost-effective analyses with infection reduction weighed against serious adverse events.
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For the complete list of disclosures, visit www.AAHKS.org/Meeting.

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Sigita Wolfe  
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Cody Wyles, MD  
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Simon Young, MD, FRACS  
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Cameron Youngblood, PA-C  
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Luigi Zagra, MD  
American Association of Hip and Knee Surgeons: Board or committee member  
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AAHKS
2019 ANNUAL MEETING
NOVEMBER 7–10 • DALLAS

AAHKS
2020 ANNUAL MEETING
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MARCH 28, 2020 • ORLANDO

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