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DePuy Synthes Ambulatory Surgery Center (ASC) Capabilities for your OR and beyond

DePuy Synthes ASC Capabilities is your strategic partner for value and growth. Our dedicated team offers your center advanced patient care through a commitment to clinical excellence, economic value, and operational support.

Visit us at BOOTH #217 to learn more.
CCJR® 2021 will be streamed live in real time, December 9–11, 2021, according to the US Eastern Standard Time Zone (Orlando, FL).

ALREADY REGISTERED? You should have received an email with access titled “Welcome to your new CCJR – Current Concepts in Joint Replacement account”.

No email, please click here

TO REGISTER PLEASE CLICK HERE

Or visit www.CCJR.com
On behalf of the CCJR® Executive and Advisory Committees, The Hip Society and The Knee Society, we are thrilled to welcome you to CCJR® 2021, December 8-11, 2021, held at the Hyatt Regency Grand Cypress, in Orlando, FL.

During these extraordinary times, as the world continues to struggle with the effects of the pandemic, we are grateful to be able to present CCJR® 2021 as an in-person event, with real-time live-stream available to our many North American and international colleagues around the globe.

We look forward to welcoming our in-person attendees and industry partners to Orlando on Wednesday, December 8, and kicking off CCJR® with a reception in the Exhibit Hall.

Our educational program will begin on Thursday morning. This year, we offer to you a dynamic and exciting program designed to embrace a variety of engaging educational formats. We have incorporated many debates, pre-recorded live surgeries, video- and case-based presentations, panel discussions, and multiple opportunities for audience participation — both in-person and virtual. In the course of 2.5 days, we will address current controversies and discuss cutting-edge techniques. Our faculty will share with you their tips and tricks, triumphs and tragedies, pearls and pitfalls.

To maximize your CCJR® experience:

♦ **ATTEND the course in its entirety**: whether you are with us in-person in Orlando or watching us from afar, the design of CCJR® programming follows a logical and interconnected sequence of topics. You will get the most benefit from CCJR® by attending every fast-paced and engaging session.

♦ **COMPLEMENT your education with industry-sponsored sessions** presented outside of the CME program* to learn more about the latest advances in science, innovation, and technology!

♦ **PARTICIPATE in the “Best Question of the Day” contest!** Questions will be collected daily through Poll Everywhere platform, credited to the author, and answered by our faculty. In-person and virtual attendees are encouraged to submit their questions. Questions selected for discussion by our panels also will be entered into a drawing to win a **FREE registration to attend CCJR® 2022, December 7-10, Orlando, FL.** Good luck!

♦ **REMEMBER that CCJR® 2021 is presented in US EST/Orlando Time in person and virtually.** If you are attending virtually, make sure you consider the time difference (as applicable to your time zone). If you are a registered attendee and you are unable to join us in real time, you will have the opportunity to watch the CCJR® content on demand within 2 weeks following its conclusion.

♦ **VISIT the exhibit hall, network and engage.** The exhibit hall also serves as “The Hub” of CCJR® — a place to meet, interact, connect. Chat with our faculty about their presentations during the preceding sessions, meet other attendees, enjoy refreshments, and learn from our corporate partners about their newest products and solutions.

*Continued...*
WELCOME, continued

We take this opportunity to offer sincere thanks to our industry partners who lent their generous support to CCJR® once again. Visit https://ccjr.com/ccjr-2021-supporters/ and https://ccjr.com/ccjr-2021-exhibitors/ to learn more.

Thank you for joining us! We wish you an enjoyable CCJR® experience and a peaceful, happy, and healthy New Year.

We hope to see you again very soon!

Daniel J. Berry, MD
Senior Director
CCJR® Executive Committee

Adolph V. Lombardi Jr., MD, FACS
Deputy Director
CCJR® Executive Committee

William J. Maloney III, MD
Deputy Director
CCJR® Executive Committee

A. Seth Greenwald, D.Phil. (Oxon)
CCJR® Founder and Emeritus Director

CCJR® 2021
CCJR® meetings are proudly presented by The Hip Society and The Knee Society
Visit www.hipsoc.org or www.kneesociety.org for the best in arthroplasty education

SAVE THE DATE
CCJR® 2022
December 7–10, 2022, Orlando, FL
CME ACCREDITATION

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Academy of Orthopaedic Surgeons and the Knee Society.

The American Academy of Orthopaedic Surgeons is accredited by the ACCME to provide continuing medical education for physicians. The American Academy of Orthopaedic Surgeons designates The Knee Society’s 2021 Current Concepts in Joint Replacement, December 8 – 11, 2021 to be held in Orlando, Florida for a maximum of 21 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

SOCIAL MEDIA INFORMATION

#CCJR2021 #THISISCCJR #CCJR

www.facebook.com/CCJRmeetings
www.instagram.com/CCJRmeetings
www.twitter.com/CCJRMeetings

ABOUT CURRENT CONCEPTS IN JOINT REPLACEMENT® (CCJR®)

www.ccjr.com

Current Concepts in Joint Replacement® (CCJR®) is a premier educational event, and a not-to-be-missed global arthroplasty forum presented by two esteemed academic organizations: The Hip Society and The Knee Society. CCJR® offers a unique learning format that has contributed to the education of thousands of orthopaedic surgeons around the world over the last three decades. CCJR® faculty consist of contemporary thought leaders discussing topics related to hip and knee arthroplasty.

ABOUT THE HIP SOCIETY

www.hipsoc.org

The Hip Society was established in 1968, by Frank Stinchfield, MD, as a by-invitation only academic society together with twenty elite hip surgeons. The mission of The Hip Society is to advance the knowledge and treatment of hip disorders to improve the lives of our patients.

ABOUT THE KNEE SOCIETY

www.kneesociety.org

The Knee Society was established in 1983, as a forum for intellectual exchange of concepts in total knee arthroplasty. The main initial goal of the founding group was to bring together the scientific information related to total knee arthroplasty. The mission of The Knee Society is to promote outstanding care to patients with knee disorders through innovative research and education.

DISCLAIMER

The material presented in this continuing medical education program is being made available by The Hip Society and The Knee Society for educational purposes only. This material is not intended to represent the best or the only methods or procedures appropriate for the medical situations discussed; rather the material is intended to present an approach, view, statement or opinion of the authors or presenters, which may be helpful, or of interest to other practitioners. The attendees agree to participate in this medical education program, organized by The Hip Society and The Knee Society with full knowledge and awareness that they waive any claim they may have against The Hip Society and The Knee Society for reliance on any information presented in this educational program. In addition, the attendees also waive any claim they have against The Hip Society and The Knee Society for injury or other damage that may result in any way from their participation in this program.

All proceedings of CCJR® Winter 2021 event, including presentation of scientific content, may not be reproduced in any format or through any media, and all property rights in the material presented, including common-law copyright, are expressly reserved to the presenter, The Hip Society and The Knee Society.

No statement or presentation made during CCJR® Winter 2021 is to be regarded as dedicated to the public domain. Any sound reproduction, transcript or other use of the material presented at this course without the permission of the presenter or The Hip Society and The Knee Society is prohibited to the full extent of common-law copyright in such material. The approval of the U.S. Food and Drug Administration is required for procedures and drugs that are considered experimental. Instrumentation systems discussed and/or demonstrated during CCJR® Winter 2021 may not yet have received FDA approval.
HEALTH AND SAFETY INFORMATION

We are committed to creating a safe and healthy environment for everyone attending CCJR®. We are following best practices recommended by the Centers for Disease Control (CDC) and will abide by the legal mandates from the State of Florida in addition to those instituted by the Hyatt Regency Grand Cypress.

DO NOT attend if you are experiencing symptoms of COVID-19
DO NOT attend if you have been exposed to COVID-19
Maintain social distancing whenever possible
Masks are required

CCJR® APPAREL

This has never been offered before in the entire history of CCJR®. Be the first one to proudly wear CCJR® Apparel. Take advantage of the exclusive opportunity to take CCJR® home with you. Visit our Apparel Store and purchase quality items with the iconic CCJR logo.

EXHIBITS

Please give our exhibitors and supporters the time and attention they deserve. Pick up your exhibitor passport at registration and use it to visit all exhibitors, collect hole-punches for your visits, and enter a raffle to win one of two complimentary CCJR® 2022 registrations. Only those who have collected hole-punches from all exhibitors are eligible to enter the raffle. One entry per person, please.

BADGES

Valid badges are required for everyone entering the CCJR® 2021 designated space, participating in educational events, and partaking of the food and beverage functions. This includes guests of all ages. This policy will be strictly reinforced.

PHOTOGRAPHY

Photographs of CCJR® 2021 may be taken throughout the program by authorized staff. By registering for, and attending the events scheduled within the framework of the meeting, participants and their guests agree that their photograph may be used by The Hip Society and The Knee Society, in electronic and print promotional materials and other professional communications including web-based publications, without payment or other consideration.

VIRTUAL QUESTIONS

Participate in Polls
• Scan QR code below
• OR – respond to polls at pollev.com/ccjr
• OR – text CCJR to 22333 once to join, then vote

Submit Your Questions
• Scan QR code below
• Ask your question at pollev.com/ccjr
• To participate in the Best Question of the Day Contest, please enter your name when prompted

Network: CCJR2021
Password: 2021CCJR

← SCAN FOR POLLS AND AUDIENCE QUESTIONS
CCJR® Legacy

A. Seth Greenwald, D.Phil. (Oxon)
CCJR® Founder and Emeritus Director

Dr. A. Seth Greenwald, founder of the Current Concepts in Joint Replacement® (CCJR®) meetings—the largest independent educational events dedicated solely to joint arthroplasty in the world—has transferred their continuity to The Hip Society and The Knee Society, ensuring that this exceptional course remains independent, objective, and always relevant.

Dr. A. Seth Greenwald is the Director of Orthopaedic Research Laboratories. He is an internationally recognized bio-academician, thought leader, and educator with more than five decades of experience as a productive researcher in areas of joint biomechanics and artificial implants. He is the Founder and now, Emeritus Director, of the prestigious Current Concepts in Joint Replacement® meetings.

CCJR® meetings are presented by The Hip Society and The Knee Society in honor of Charles A. Engh, Sr., MD and Gerard A. Engh, MD

Charles A. Engh, MD pioneered the development of the cementless implant fixation achieved with microporous coatings using sintered metal beads, an innovation that has changed the nature of joint replacement surgery worldwide. Failures of cemented implants fueled his desire to find another method for implant fixation.

Gerard (Jerry) A. Engh, MD devoted his career to improving the quality of his patients’ lives through joint arthroplasty. During the course of his career, Dr. Engh pioneered research and development of implants for knee replacement. Along with several other Anderson physicians, he implemented a prospective database for tracking the outcomes of knee replacement surgery. Using this information coupled with his surgical experience, Dr. Engh developed the Anderson Orthopaedic Research Institute (AORI) Bone Defect Classification System that many clinicians currently use to describe the extent of bone damage in a knee that requires revision surgery.

The Hip Society and The Knee Society are grateful to acknowledge generous support and funding from the Anderson Clinic Post-Graduate Medical Education Foundation that enabled us to carry on the remarkable legacy of CCJR®.

The Anderson Clinic Post-Graduate Medical Education Foundation is a non-profit organization that was founded by Drs. Charles A. and Gerard A. Engh in 1983. To date, 132 fellows have been trained. Our six joint replacement faculty members train four fellows annually.

Our mission is to provide clinical evaluation of primary and revision hip and knee arthroplasty patients, surgical reconstruction and postoperative management. Clinical and surgical training utilizes a mentorship model in which fellows spend three months with individual faculty. Fellows become proficient in routine and complex primary hip and knee arthroplasty, as well as revision arthroplasty. Fellows are exposed to a multitude of reconstructive options, surgical approaches, and arthroplasty implants. We strongly encourage fellows to publish clinical research with the support of faculty and an institutional registry.
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CCJR® Executive Committee

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CCJR® Executive Committee

William J. Maloney, III, MD
Deputy Director
CCJR® Executive Committee

CCJR® Founder & Emeritus Director
A. Seth Greenwald, D. Phil (Oxon)

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Indiana University School of Medicine
Fishers, IN

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Chicago, IL

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Colorado Joint Replacement  
Denver, CO

Christopher Dodd, MD  
Nuffield Health The Manor Hospital  
Oxford, United Kingdom

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Anderson Orthopaedic Clinic  
Alexandria, VA

Thomas K. Fehring, MD  
OrthoCarolina Hip and Knee Center  
Charlotte, NC

Don S. Garbuz, MD, MHSc, FRCSC  
Gordon & Leslie Diamond Health Care Centre  
Vancouver, BC, Canada

Thorsten Gehrke, MD  
HELIOS Endo-Klinik Hamburg GmbH  
Hamburg, Germany

Steven B. Haas, MD  
Hospital for Special Surgery  
New York, NY
FACULTY, continued

Fares S. Haddad, MD (Res), FRCS (Orth)  
University College London Hospitals  
London, UK

George J. Haidukewych, MD  
Orlando Health  
Orlando, FL

William G. Hamilton, MD  
Anderson Orthopedic Clinic  
Alexandria, VA

Aaron A. Hofmann, MD  
Hofmann Arthritis Institute  
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Durham, NC

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Miami, FL

David G. Lewallen, MD  
Mayo Clinic  
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Jay R. Lieberman, MD  
Keck School of Medicine at USC  
Los Angeles, CA

Adolph V. Lombardi, Jr., MD, FACS  
Joint Implant Surgeons, Inc.  
New Albany, OH

Steven J. MacDonald, MD, FRCSC  
London Health Sciences Centre  
London, ON, Canada

William J. Maloney, III, MD  
Stanford University School of Medicine  
Redwood City, CA

R. Michael Meneghini, MD  
Indiana University School of Medicine  
Fishers, IN

Michael A. Mont, MD  
Rubin Orthopaedic Institute at Sinai Hospital  
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Mumbai, India

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Centrum für Muskuloskeletale Chirurgie  
Berlin, Germany

Christopher L. Peters, MD  
University Orthopaedics Center  
Salt Lake City, UT
We would like to extend special recognition to:

Jeffrey A. Geller, MD for providing and participating in surgical video demonstration “The Advanced Anterior Approach With Dual Mobility for Complex THA”

Peter K. Sculco, MD for providing and participating in surgical video demonstration “Implementing a Device That Will Tell You Exactly What Your Knee Arthroplasty Patient is Accomplishing”

Ran Schwarzkopf, MD for providing and participating in surgical video demonstration “Technical Tips and Tricks for Uncemented TKA”

Claudio Diaz Ledezma, MD for serving as faculty for Spanish Case Discussion Session
**CCJR® 2021 DAILY SCHEDULE**

### WEDNESDAY, DECEMBER 8, 2021

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00-3:00PM</td>
<td>Pre-Registered Participant Self Check-In and Badge Pick-Up</td>
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<tr>
<td>3:00-7:00PM</td>
<td>General Registration</td>
</tr>
<tr>
<td>5:00-7:00PM</td>
<td><strong>WELCOME RECEPTION/EXHIBITS OPEN</strong></td>
</tr>
<tr>
<td></td>
<td>All attendees with badges are welcome to attend. Please no children under age of 10.</td>
</tr>
</tbody>
</table>

### THURSDAY, DECEMBER 9, 2021

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00-7:15AM</td>
<td><strong>BREAKFAST</strong></td>
</tr>
<tr>
<td>6:00-7:15AM</td>
<td><strong>Non-CME Industry Supported Education Session</strong></td>
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<tr>
<td></td>
<td>ATTUNE® Knee System Tibia First Patient Specific Alignment Technique with VELYS™</td>
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<tr>
<td></td>
<td>Robotic Assisted Solution presented by DePuy Synthes, the Orthopaedics Company of</td>
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<td></td>
<td>Johnson &amp; Johnson</td>
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<tr>
<td>7:30-7:35AM</td>
<td>Welcome and Opening Remarks</td>
</tr>
<tr>
<td>7:35-9:05AM</td>
<td><strong>SESSION I: OUTPATIENT SURGERY</strong></td>
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<tr>
<td></td>
<td>Session Moderators:</td>
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<tr>
<td></td>
<td>1. William J. Maloney, III, MD</td>
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<tr>
<td></td>
<td>2. Matthew P. Abdel, MD, MS</td>
</tr>
<tr>
<td>7:35-7:45AM</td>
<td>Keynote: Making a Safe Transition to Outpatient Total Joint Arthroplasty</td>
</tr>
<tr>
<td>7:45-8:00AM</td>
<td><strong>DEBATE: Outpatient Surgery</strong></td>
</tr>
<tr>
<td>8:00-9:10AM</td>
<td>Outpatient Surgery: Pregame – Choosing the Patient, Getting the Patient Ready</td>
</tr>
<tr>
<td>8:07-8:13AM</td>
<td>Outpatient Surgery: In the OR – Tips on Anesthesia, Instrumentation Choice, Problem Solving</td>
</tr>
<tr>
<td>8:14-8:20AM</td>
<td>Outpatient Surgery: Postgame – Protocols for Patient Contact, Pain Management, Backup for Problems</td>
</tr>
<tr>
<td>8:20-8:35AM</td>
<td>Panel Discussion / Audience Questions</td>
</tr>
<tr>
<td>8:35-9:05AM</td>
<td><strong>S-1 Pre-Recorded Live Surgery: A Patient’s Journey Through an ASC for Revision TKA</strong></td>
</tr>
<tr>
<td>9:05-10:20AM</td>
<td>Outpatient Surgery Missteps: I Am Never Doing That Again!</td>
</tr>
<tr>
<td>9:10-10:00AM</td>
<td>Panel Discussion / Audience Questions</td>
</tr>
<tr>
<td></td>
<td>Speaker 1: Fares S. Haddad, MD (Res), FRCS (Orth)</td>
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<td>Speaker 2: Matthew S. Austin, MD</td>
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<td>Speaker 3: Carlos J. Lavernia, MD</td>
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<td>Speaker 4: Fred D. Cushner, MD</td>
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<tr>
<td>9:27-10:20AM</td>
<td><strong>The Gerard A. Engh, MD Keynote Lecture</strong></td>
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<tr>
<td>9:38-10:20AM</td>
<td>Panel Discussion / Audience Questions</td>
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<tr>
<td>10:20-10:30AM</td>
<td><strong>SESSION II: PRIMARY TKA: ALIGNMENT AND BALANCING</strong></td>
</tr>
<tr>
<td>10:20-10:30AM</td>
<td>Understanding the Terms and the Implications: Kinematic vs Mechanical vs Functional vs Anatomical Alignment; Gap Balancing vs Measured Resection</td>
</tr>
<tr>
<td>10:30-10:35AM</td>
<td>My Top 5 Technical Tips for a Better Primary TKA</td>
</tr>
</tbody>
</table>

**SESSION I: OUTPATIENT SURGERY**

- **Keynote: Making a Safe Transition to Outpatient Total Joint Arthroplasty**
  - Kevin J. Bozic, MD

**DEBATE: Outpatient Surgery**

- **Strict Patient Selection Criteria**
  - R. Michael Meneghini, MD
  - Scott M. Sporer, MD

- **General Criteria, but No Strict Checklist**
  - Adolph V. Lombardi, Jr., MD

**S-1 Pre-Recorded Live Surgery: A Patient’s Journey Through an ASC for Revision TKA**

**The Gerard A. Engh, MD Keynote Lecture**

**New Technologies to Follow Your Arthroplasty Patient Remotely: What’s Out There? Will You Really Use It?**

**SESSION II: PRIMARY TKA: ALIGNMENT AND BALANCING**

- **Understanding the Terms and the Implications: Kinematic vs Mechanical vs Functional vs Anatomical Alignment; Gap Balancing vs Measured Resection**
  - Simon Young, MBChB, FRACS, MD

- **My Top 5 Technical Tips for a Better Primary TKA**
  - Christopher Dodd, MD
# SESSION III
## KNEE KINEMATICS AND IMPLANT CHOICE: WHAT IS BEST IN 2021?

### 10:47-11:07AM • S-2 Pre-Recorded Live Surgery: Improve Your Outcomes with Sensor Balancing of TKA
- Surgeon: Martin W. Roche, MD  
- Moderator: Henry D. Clarke, MD or TBD

### 11:07-11:19AM • DEBATE: Uncemented TKA
- The Time Has Come for Uncemented TKA
  - Robert L. Barrack, MD
- Cemented TKA Is More Reliable: Why Switch?
  - Robert T. Trousdale, MD

### 11:19-11:39AM • S-3 Pre-Recorded Live Surgery: Technical Tips and Tricks for Uncemented TKA
- Surgeon: Ran Schwarzkopf, MD  
- Moderator: R. Michael Meneghini, MD

### 11:39-11:48AM • PANEL DISCUSSION / AUDIENCE QUESTIONS
- Panel: Matthew S. Austin, MD, Steven B. Haas, MD, Mark W. Pagnano, MD, Martin W. Roche, MD

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# SESSION IV
## UNICOMPARTMENTAL ARTHRITIS

### 1:20-1:22PM • CASE PRESENTATION: Medial Compartment Disease
- Presented by: Mark W. Pagnano, MD

### 1:22-1:35PM • DEBATE: Uni vs Total for Predominantly Medial Compartment Disease
- Unicompartmental Arthroplasty for This Patient
  - Keith R. Berend, MD
- Total Knee Arthroplasty for This Patient
  - Henry D. Clarke, MD

### 1:35-1:55PM • S-4 Pre-Recorded Live Surgery: Implanting a Device That Will Tell You Exactly What Your Knee Arthroplasty Patient Is Accomplishing
- Surgeon: Peter K. Sculco, MD  
- Moderator: Fred D. Cushner, MD

### 1:55-2:02PM • PANEL DISCUSSION / AUDIENCE QUESTIONS
- State of Unis: Fixed vs Mobile Bearing, Cemented vs Uncemented, Robotic vs Hand Instruments
  - Panel: Fred D. Cushner, MD, Christopher Dodd, MD, C. Anderson Engh, Jr., MD, William A. Jiranek, MD, Martin W. Roche, MD

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# SESSION V
## PRIMARY TKA: THE ROBOTS ARE COMING

### 2:02-2:12PM • KEYNOTE: Shopping for Robotic TKA Systems: What Is Being Offered Out There? What Are the Pluses and Minuses of the Main Features?
- Jan Victor, MD

### 2:12-2:32PM • S-5 Pre-Recorded Live Surgery: Precision TKA with Robotic Assistance
- Surgeon: Robert T. Trousdale, MD  
- Moderator: Mark W. Pagnano, MD

### 2:32-2:45PM • DEBATE: Robotics in Hip and Knee Arthroplasty
- A Wine Before Its Time
  - R. Michael Meneghini, MD
- It Is Time Already
  - Robert L. Barrack, MD

### 2:45-3:05PM • S-6 Pre-Recorded Live Surgery: TKA with Real-Time Soft Tissue Balancing and Robotic Assistance
- Surgeon: Matthew S. Austin, MD  
- Moderator: Martin W. Roche, MD
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Description</th>
<th>Panel/Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:05-3:20PM</td>
<td>PANEL DISCUSSION / AUDIENCE QUESTIONS</td>
<td>Panel: James A. Browne, MD, Thomas K. Fehring, MD, William J. Maloney, III, MD, Michael A. Mont, MD, Thomas P. Sculco, MD</td>
</tr>
<tr>
<td>3:20-3:45PM</td>
<td>BREAK • Visit the Exhibit Hall • Meet Faculty in the Hub</td>
<td></td>
</tr>
<tr>
<td>3:45-3:51PM</td>
<td>SESSION VI COMPLEX PRIMARY TKA: TECHNIQUES, TIPS AND VIDEO TECHNIQUES</td>
<td></td>
</tr>
<tr>
<td>3:55-4:01PM</td>
<td>Retained Hardware: Tips and Tricks</td>
<td>George J. Haidukewych, MD</td>
</tr>
<tr>
<td>4:01-4:05PM</td>
<td>CASE PRESENTATION: Patient with Problem Hardware</td>
<td>Presented by: Christopher L. Peters, MD Panel: Douglas A. Dennis, MD, George J. Haidukewych, MD, Adolph V. Lombardi, Jr., MD, Giles R. Scuderi, MD</td>
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<tr>
<td>4:05-4:11PM</td>
<td>Extra-Articular Deformity: Technical Elements</td>
<td>Arun B. Mullaji, MD</td>
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<tr>
<td>4:11-4:15PM</td>
<td>CASE PRESENTATION: Patient with Extra-Articular Deformity</td>
<td>Presented by: Christopher L. Peters, MD Panel: Douglas A. Dennis, MD, George J. Haidukewych, MD, Adolph V. Lombardi, Jr., MD, Giles R. Scuderi, MD</td>
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<tr>
<td>4:15-4:21PM</td>
<td>Pre-op Flexion Contracture: Technical Tips</td>
<td>Adolph V. Lombardi, Jr., MD, FACS</td>
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<tr>
<td>4:21-4:25PM</td>
<td>CASE PRESENTATION: Patient with Flexion Contracture</td>
<td>Presented by: Christopher L. Peters, MD Panel: Douglas A. Dennis, MD, George J. Haidukewych, MD, Adolph V. Lombardi, Jr., MD, Giles R. Scuderi, MD</td>
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<tr>
<td>4:25-4:31PM</td>
<td>Previous ACL Surgery with Chronic Flexion Laxity</td>
<td>Giles R. Scuderi, MD</td>
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<tr>
<td>4:31-4:35PM</td>
<td>CASE PRESENTATION: Patient with Previous ACL Reconstruction</td>
<td>Presented by: Christopher L. Peters, MD Panel: Douglas A. Dennis, MD, George J. Haidukewych, MD, Adolph V. Lombardi, Jr., MD, Giles R. Scuderi, MD</td>
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<tr>
<td>4:35-4:45PM</td>
<td>Most Valuable Knee Arthroplasty Paper in the Last 2 Years</td>
<td>Moderators: Adolph V. Lombardi, Jr., MD • Douglas A. Dennis, MD</td>
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<td>4:45-4:49PM</td>
<td>Paper 1: Jean-Noël Argenson, MD</td>
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<td>4:49-4:53PM</td>
<td>Paper 2: Fred D. Cusner, MD</td>
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<td>4:53-4:57PM</td>
<td>Paper 3: Antonia F. Chen, MD</td>
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<td>4:57-5:01PM</td>
<td>Paper 4: Jan Victor, MD</td>
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<tr>
<td>5:01-5:10PM</td>
<td>PANEL DISCUSSION / AUDIENCE QUESTIONS</td>
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<tr>
<td>5:30-5:45PM</td>
<td>AUDIENCE QUESTIONS FROM THE DAY; BEST QUESTION OF THE DAY AWARD</td>
<td>Moderators: Adolph V. Lombardi, Jr., MD • William J. Maloney, III, MD Panel: Steven B. Haas, MD, Aaron A. Hofmann, MD, Carlos J. Lavernia, MD, Scott M. Sporer, MD</td>
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</tbody>
</table>
5:45-6:30PM 🔗 POSTER TOUR

6:30-8:00PM

Sesión Educativa en Español
Non-CME Case-Based Round Table Discussion Session
For Spanish-speaking attendees, presented in Spanish
Moderators: Carlos J. Lavenna, MD, Rafael J. Sierra, MD, Claudio Diaz Ledezma, MD

FRIDAY, DECEMBER 10, 2021

6:00-7:15AM ☕️ BREAKFAST

6:00-7:15AM Non-CME Industry Supported Education Session
Revision Knee Arthroplasty – As Easy as 1, 2, 3?
presented by Zimmer Biomet

7:30-7:35AM Welcome and Announcements
Daniel J. Berry, MD

SESSION VII
CONTROVERSIES IN PRIMARY TKA AND THA
Session Moderators:
1. Robert L. Barrack, MD
2. Mathias P.G. Bostrom, MD

7:35-7:45AM KEYNOTE: Biologics and Other Things You Can Inject into a Joint: What Really Works and What Has No Proof?
Jay R. Lieberman, MD

7:45-8:00AM DEBATE: Use Dual Mobility in All High-Risk THA Patients
Absolutely Yes, Why Risk the Grief? Rafael J. Sierra, MD
Absolutely Not, Are You Kidding? Stephen B. Murphy, MD

8:00-8:30AM S-7 Pre-Recorded Live Surgery: The Advanced Anterior Approach With Dual Mobility for Complex THA
Surgeon: Jeffrey A. Geller, MD   Moderator: William G. Hamilton, MD

SESSION VIII
COMPLEX PRIMARY THA: TECHNIQUES, TIPS, AND VIDEO TECHNIQUES
Session Moderators:
1. Rafael J. Sierra, MD
2. Scott M. Sporer, MD

10:30-10:36AM DDH Crowe 1-3: Strategy, Technique, Pitfalls
Christopher L. Peters, MD

10:36-10:40AM CASE PRESENTATION: Crowe 2 DDH
Presented by: Rafael J. Sierra, MD
Panel: Daniel J. Berry, MD, James A. Browne, MD, George J. Haidukewych, MD, Douglas E. Padgett, MD, Christopher L. Peters, MD

10:40-10:46AM DDH Crowe 4: Strategy, Technique, Pitfalls
Daniel J. Berry, MD

10:46-11:00AM CASE PRESENTATION: Crowe 4 DDH
Presented by: Rafael J. Sierra, MD
Panel: Daniel J. Berry, MD, James A. Browne, MD, George J. Haidukewych, MD, Douglas E. Padgett, MD, Christopher L. Peters, MD

11:00-11:06AM Conversion Failed Intertrochanteric Fracture to THA: Strategy, Technique, Pitfalls
George J. Haidukewych, MD

11:06-11:10AM CASE PRESENTATION: Failed Intertrochanteric Fracture
Presented by: Rafael J. Sierra, MD
Panel: Daniel J. Berry, MD, James A. Browne, MD, George J. Haidukewych, MD, Douglas E. Padgett, MD, Christopher L. Peters, MD

11:10-11:16AM THA in Proximal Femoral Deformity: Strategy, Technique, Pitfalls
James A. Browne, MD
11:16-11:20AM  CASE PRESENTATION: Proximal Femoral Deformity
Presented by: Rafael J. Sierra, MD
Panel: Daniel J. Berry, MD, James A. Browne, MD, George J. Haidukewych, MD, Douglas E. Padgett, MD, Christopher L. Peters, MD

11:20-11:30AM  PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: Daniel J. Berry, MD, James A. Browne, MD, George J. Haidukewych, MD, Douglas E. Padgett, MD, Christopher L. Peters, MD

11:30-12:00PM  S-8 Pre-Recorded Live Surgery: Prevention of Infection in Joint Arthroplasty: Role of Sterile Povidone Iodine
Surgeon: Javad Parvizi, MD  Moderator: Adolph V. Lombardi, Jr., MD

12:00-12:04PM  Most Valuable Hip Arthroplasty Paper in the Last 2 Years
Moderators: Michael P. Bolognesi, MD  Antonia F. Chen, MD
Paper 1: Charles L. Nelson, MD
Paper 2: Michael A. Mont, MD
Paper 3: Kevin J. Bozic, MD, MBA
Paper 4: Scott M. Sporer, MD

12:04-12:08PM  AUDIENCE VOTE, PANEL DISCUSSION ON MOST VALUABLE PAPER, AUDIENCE QUESTIONS
Panel: Matthew P. Abdel, MD, MS, John J. Callaghan, MD, Stephen B. Murphy, MD, Thomas P. Sculco, MD

12:08-12:12PM  Non-CME Industry Supported Education Session Palm Room
New Technologies in the Treatment of Peri-Prosthetic Femur Fractures
Presented by DePuy Synthes, the Orthopaedic Company of Johnson & Johnson

12:12-12:16PM  Non-CME Industry Supported Education Session Innovation Theater
Leading Technologies With Efficiencies for Your ASC
presented by Zimmer Biomet

SESSION IX
CONTROVERSIES IN THA: OPERATIVE APPROACHES

1:30-2:00PM  THREE-WAY DEBATE
Points of Contention:
• The Posterior Approach has an unacceptably high dislocation rate!
• The DA approach has too many loose implants and periprosthetic fractures!
• The Anterolateral approach causes unacceptable frequency of abductor problems and is on life support: time to pull the plug!

RED TEAM: Posterior Approach – Why this approach is best and the others are worse
R. Michael Meneghini, MD (Team Captain), Mathias P.G. Bostrom, MD, Thomas K. Fehring, MD

BLUE TEAM: Direct Anterior Approach – Why this approach is best and the others are worse
William G. Hamilton, MD (Team Captain), Keith R. Berend, MD, Christopher L. Peters, MD

GREEN TEAM: Anterolateral Approach – Why this approach is best and the others are worse
David G. Lewallen, MD (Team Captain), George J. Haidukewych, MD, Steven J. MacDonald, MD, FRCSC

AUDIENCE VOTE TO DECLARE THE WINNING TEAM

2:00-2:06PM  My 5 Best Technical Tips for a Better Posterior Approach
C. Anderson Engh, MD

2:07-2:13PM  My 5 Best Technical Tips for a Better Direct Anterior Approach
Adolph V. Lombardi, Jr., MD

2:13-2:20PM  PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: John J. Callaghan, MD, Antonia F. Chen, MD, Charles L. Nelson, MD, Thomas P. Sculco, MD

SESSION X
COMPLICATIONS OF THA: CASE DISCUSSIONS

2:20-2:28PM  CASE PRESENTATION: Early Fx – Why Did It Happen? How to Avoid? How to Treat?
Presented by: Steven J. MacDonald, MD, FRCSC
Panel: John J. Callaghan, MD, Don S. Garbuz, MD, MHSc, Carlos J. Lavernia, MD, Douglas E. Padgett, MD, Scott M. Sporer, MD
AUDIENCE RESPONSE

2:28-2:36PM  CASE PRESENTATION: Leg Length Problem – Why Did It Happen? How to Avoid? How to Treat?
Presented by: Steven J. MacDonald, MD, FRCSC
Panel: John J. Callaghan, MD, Don S. Garbuz, MD, MHSc, Carlos J. Lavernia, MD, Douglas E. Padgett, MD, Scott M. Sporer, MD
AUDIENCE RESPONSE

2:36-2:44PM  CASE PRESENTATION: Recurrent Instability – Why Did It Happen? How to Avoid? How to Treat?
Presented by: Steven J. MacDonald, MD, FRCSC
Panel: John J. Callaghan, MD, Don S. Garbuz, MD, MHSc, Carlos J. Lavernia, MD, Douglas E. Padgett, MD, Scott M. Sporer, MD
AUDIENCE RESPONSE

2:44-2:52PM  CASE PRESENTATION: Draining Wound – Why Did It Happen? How to Avoid? How to Treat?
Presented by: Steven J. MacDonald, MD, FRCSC
Panel: John J. Callaghan, MD, Don S. Garbuz, MD, MHSc, Carlos J. Lavernia, MD, Douglas E. Padgett, MD, Scott M. Sporer, MD
AUDIENCE RESPONSE

2:52-3:00PM  CASE PRESENTATION: Psoas Tendinitis – Why Did It Happen? How to Avoid? How to Treat?
Presented by: Steven J. MacDonald, MD, FRCSC
Panel: John J. Callaghan, MD, Don S. Garbuz, MD, MHSc, Carlos J. Lavernia, MD, Douglas E. Padgett, MD, Scott M. Sporer, MD
AUDIENCE RESPONSE

3:00-3:10PM  PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: John J. Callaghan, MD, Don S. Garbuz, MD, MHSc, Carlos J. Lavernia, MD, Douglas E. Padgett, MD, Scott M. Sporer, MD
### SESSION XI
**THE ENEMY: INFECTION**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Venue</th>
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<tbody>
<tr>
<td>3:20-3:45PM</td>
<td><strong>BREAK • Visit Exhibit Hall • Meet the Faculty in the Hub</strong></td>
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**Javad Parvizi, MD**

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<tr>
<th>Time</th>
<th>Session</th>
<th>Venue</th>
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<tbody>
<tr>
<td>4:00-4:15PM</td>
<td><strong>DEBATE: Antimicrobial Irrigation (Dilute Betadine or Something Else) for Infection Prevention</strong></td>
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<td>4:15-4:24PM</td>
<td><strong>PANEL DISCUSSION / AUDIENCE QUESTIONS</strong></td>
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#### BREAK

- Visit Exhibit Hall
- Meet the Faculty in the Hub

#### SESSION XII
**TREATMENT OF INFECTION**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Venue</th>
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<tbody>
<tr>
<td>4:24-4:44PM</td>
<td><strong>S-9 Pre-Recorded Live Surgery: Articulating Spacer to Treat Periprosthetic Hip Infection</strong></td>
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<tr>
<td>4:44-4:50PM</td>
<td><strong>Debridement, Antibiotics and Implant Retention in 2021: Indications and Technical Points</strong></td>
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<tr>
<td>4:51-4:57PM</td>
<td><strong>How I Do a One-Stage: Principles and Technical Tips</strong></td>
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<tr>
<td>4:58-5:04PM</td>
<td><strong>How I Do a Two-Stage TKA: Spacer Choice, Technical Tips</strong></td>
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<tr>
<td>5:05-5:11PM</td>
<td><strong>How I Do a Two-Stage THA: Spacer Choice, Technical Tips</strong></td>
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<tr>
<td>5:12-5:20PM</td>
<td><strong>PANEL DISCUSSION / AUDIENCE QUESTIONS</strong></td>
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<tr>
<td>5:20-5:30PM</td>
<td><strong>AUDIENCE QUESTIONS FROM THE DAY, BEST QUESTION OF THE DAY AWARD</strong></td>
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<tr>
<td>5:30-5:45PM</td>
<td><strong>RECEPTION</strong></td>
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<td>7:00-9:00PM</td>
<td><strong>AUDIENCE QUESTIONS FROM THE DAY</strong></td>
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### SATURDAY, DECEMBER 11, 2021

#### SESSION XIII
**REVISION THA**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Venue</th>
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<tbody>
<tr>
<td>7:35-7:41AM</td>
<td><strong>Exposure: How to Do an Extended Greater Trochanteric Osteotomy</strong></td>
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<tr>
<td>7:41-7:49AM</td>
<td><strong>CASE PRESENTATION • Case 1: Exposure Challenge • Case 2: Exposure Challenge</strong></td>
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<tr>
<td>7:49-7:55AM</td>
<td><strong>Implant Removal: My Tips for Well Fixed Cup and Stem Extraction</strong></td>
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<tr>
<td>7:55-8:02AM</td>
<td><strong>CASE PRESENTATION • Case 1: Cup Removal (For Instability) • Case 2: Stem Removal (For Infection)</strong></td>
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<tr>
<td>8:02-8:07AM</td>
<td><strong>PANEL DISCUSSION / AUDIENCE QUESTIONS</strong></td>
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SESSION XIV
ACETABULAR REVISION

8:07-8:13AM Large Diameter Hemispherical Cup with Screws: The Workhorse; Technical Tips for Success
Don S. Garbuz, MD, MHSc

8:14-8:20AM Porous Metal Augments: Best Indications; Technical Tips
David G. Lewallen, MD

8:21-8:27AM Custom Triflange Cup: Why and How?
Mathias P.G. Bostrom, MD

8:28-8:34AM Pelvic Discontinuity: Distraction Technique
Wayne G. Paprosky, MD

8:35-8:43AM CASE PRESENTATION
Case 1: Acetabular Revision With Moderate Bone Loss
Case 2: Acetabular Revision With Severe Bone Loss
Presented by: C. Anderson Engh, MD
Panel: Mathias P.G. Bostrom, MD, Don S. Garbuz, MD, MHSc, David G. Lewallen, MD, Wayne G. Paprosky, MD

8:43-8:48AM PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: Mathias P.G. Bostrom, MD, Don S. Garbuz, MD, MHSc, David G. Lewallen, MD, Wayne G. Paprosky, MD, FACS

SESSION XV
FEMORAL REVISION

8:48-9:13AM S-10 Pre-Recorded Live Surgery: Concepts of Femoral Revision in 2021
Surgeon: Christopher L. Peters, MD    Moderator: Don S. Garbuz, MD, MHSc

Steven J. MacDonald, MD, FRCSC

9:20-9:35AM CASE PRESENTATION
Case 1: Femoral Revision with Moderate Bone Loss
Case 2: Femoral Revision with Severe Bone Loss
Case 3: Femoral Revision for Periprosthetic Femur Fracture
Presented by: Don S. Garbuz, MD, MHSc
Panel: C. Anderson Engh, MD, Steven J. MacDonald, MD, FRCSC, Stephen B. Murphy, MD, Scott M. Sporer, MD

9:35-9:45AM PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: C. Anderson Engh, MD, Steven J. MacDonald, MD, FRCSC, Stephen B. Murphy, MD, Scott M. Sporer, MD

9:45-10:15AM BREAK

SESSION XVI
REVISION TKA TECHNIQUES

10:15-10:21AM Exposure Challenges in Revision TKA: What To Do Before Reverting to Extensile Exposure; How to Do Quadriceps Snip; How to Do Tibial Tubercle Osteotomy.
Giles R. Scuderi, MD

10:22-10:27AM Implant Removal in TKA; My Favorite Technical Tips
Arun B. Mullaji, MD

10:28-10:33AM Implant Removal in TKA; My Favorite Technical Tips
Jean-Noël Argenson, MD

10:34-10:45AM PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: Henry D. Clarke, MD, Don S. Garbuz, MD, MHSc, FRCSC, Giles R. Scuderi, MD, Thomas P. Sculco, MD

SESSION XVII
REVISION TKA

10:45-10:51AM Biologic Metaphyseal Fixation with Cones: How To, Technique Tips
David G. Lewallen, MD

10:52-10:58AM Biologic Metaphyseal Fixation with Sleeves: How To, Technique Tips
Carsten Perka, MD

10:59-11:05AM Extensor Mechanism Reconstruction With Marlex Mesh
Matthew P. Abdel, MD, MS

11:05-11:20AM DEBATE: Stems in Revision TKA
Uncemented Diaphyseal Engaging Stems Are Easiest and Best
Steven J. MacDonald, MD, FRCSC
Cemented Stems Are More Reliable
James A. Browne, MD

11:20-11:30AM PANEL DISCUSSION / AUDIENCE QUESTIONS
Panel: Matthew P. Abdel, MD, MS, William A. Jiranek, MD, David G. Lewallen, MD, Carsten Perka, MD

11:30-12:00PM S-11 Pre-Recorded Live Surgery: Balancing and Fixation Principles in Revision TKA
Surgeon: Thomas K. Fehring, MD    Moderator: Douglas A. Dennis, MD
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Description</th>
<th>Presenters</th>
<th>Panel</th>
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<tbody>
<tr>
<td>12:00-12:04PM</td>
<td><strong>CASE PRESENTATION</strong></td>
<td>Revision for Bone Loss/Loosening</td>
<td>Bryan D. Springer, MD</td>
<td>Keith R. Berend, MD, Antonia F. Chen, MD, Douglas A. Dennis, MD, Christopher L. Peters, MD</td>
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<tr>
<td>12:04-12:08PM</td>
<td><strong>CASE PRESENTATION</strong></td>
<td>Flexion Instability, Stiffness</td>
<td>Bryan D. Springer, MD</td>
<td>Keith R. Berend, MD, Antonia F. Chen, MD, Douglas A. Dennis, MD, Christopher L. Peters, MD</td>
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<tr>
<td>12:08-12:12PM</td>
<td><strong>CASE PRESENTATION</strong></td>
<td>Varus/Valgus Instability</td>
<td>Bryan D. Springer, MD</td>
<td>Keith R. Berend, MD, Antonia F. Chen, MD, Douglas A. Dennis, MD, Christopher L. Peters, MD</td>
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<tr>
<td>12:12-12:16PM</td>
<td><strong>CASE PRESENTATION</strong></td>
<td>Periprosthetic Fracture</td>
<td>Bryan D. Springer, MD</td>
<td>Keith R. Berend, MD, Antonia F. Chen, MD, Douglas A. Dennis, MD, Christopher L. Peters, MD</td>
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<tr>
<td>12:16-12:30PM</td>
<td><strong>AUDIENCE QUESTIONS FROM THE DAY; BEST QUESTION OF THE DAY AWARD</strong></td>
<td>-</td>
<td>Adolph V. Lombardi, Jr., MD, William J. Maloney, III, MD</td>
<td>Keith R. Berend, MD, Antonia F. Chen, MD, Douglas A. Dennis, MD, Christopher L. Peters, MD</td>
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<tr>
<td>12:30PM</td>
<td><strong>Closing Remarks and Adjourn</strong></td>
<td>-</td>
<td>Daniel J. Berry, MD</td>
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**Diamond Level**

DePuy Synthes, the Orthopaedics Company of Johnson & Johnson, provides one of the most comprehensive orthopaedics portfolios in the world that helps heal and restore movement for the millions of patients we serve. DePuy Synthes solutions, in specialties including joint reconstruction, trauma, extremities, craniomaxillofacial, spinal surgery and sports medicine, in addition to the VELYS™ Digital Surgery portfolio, are designed to advance patient care while delivering clinical and economic value to health care systems worldwide.

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Silver Level

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Next Science is a medical technology company headquartered in Sydney, Australia, with a research and development center based in Jacksonville, Florida. Established in 2012, the company’s primary focus is on the development and continued commercialization of its proprietary XBIO® Technology to reduce the impact of biofilm-based infections in human health. XBIO is a unique, non-toxic technology with proven efficacy in eradicating both biofilm based and free-floating bacteria.

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United Surgical Partners International (USPI), a subsidiary of Tenet Healthcare Corporation (NYSE: THC), operates the largest ambulatory platform in the country. With more than 340 facilities across the United States, the company serves patients in ambulatory surgery centers and surgical hospitals. For more information, please visit www.uspi.com.

www.uspi.com
OsteoRemedies® is a Memphis, TN company focused on providing simple solutions to complex disorders for revision and infection disorders. With its recent novel product release OsteoRemedies® continues a trend of first to market innovation as the REMEDY SPECTRUM® GV Hip System and SPECTRUM® GV Bone Cement will provide surgeons with the first ever broad-spectrum treatment option with both Gentamicin and Vancomycin.

This newly released product line builds upon an existing array of unique products that address 2-stage revision of infected total joints with the REMEDY® Spacer System, the only pre-molded modular spacer system for hip, knee and shoulder. The company also provides OSTEOBOOST® Select™ Resorbable Bead Kit, the only tri-phasic bone void filler in bead kit formulation. As a company, OsteoRemedies® and its employees offer these unique products while functioning as a lean, adaptable business providing exceptional returns to its stakeholders in a compliant, ethical manner.

www.osteoremedies.com
Exhibitor Hall

**Hours**

**Wednesday, December 8** 5:00 – 7:00 PM
**Welcome Reception** 5:00 – 7:00 PM
**Thursday, December 9** 6:00 AM – 4:00 PM
**Friday, December 10** 6:00 AM – 7:00 PM
**Reception** 5:30 PM – 7:00 PM

**Exhibits**

Please give our exhibitors and supporters the time and attention they deserve. Pick up your *exhibitor passport* at registration and use it to visit all exhibitors, collect hole-punches for your visits, and enter a raffle to win one of two complimentary CCJR® 2022 registrations. Only those who have collected hole-punches from all exhibitors are eligible to enter the raffle. One entry per person, please.

**VISIT THE HUB**

Booth: 101
3M, with newly-acquired KCI, focuses on providing better care through patient-centered science. Helping transform patient outcomes by reducing the risk of preventable complications. From solutions for BSI and SSI risk reduction to vital sign monitoring and temperature management, our team is ready to partner with you to strive toward a world with zero complications.

Booth: 417
Guided by the Health Policy Committee, AAHKS provides physicians and their patients comprehensive and timely analysis of health policy issues pertaining to hip and knee surgery. Each year, there are changes in regulations affecting patient care reimbursement for hip and knee surgery. AAHKS develops strategies to keep up with changes and to influence the law-making process. Advocacy is necessary to maintain adequate compensation and reimbursement for services performed by hip and knee surgeons, as well as to ensure the quality of patient care.

Booth: 401
Aerobiotix is a pioneer in air quality management solutions for healthcare, assisted living, and education. Its medical-grade products sanitize air in occupied rooms—inactivating 99.9% of bacteria, viruses, and spores to reduce risk of infections and to improve environmental safety. Equipped with integrated tracking, Aerobiotix solutions help facilities worldwide measure and proactively manage air quality. Learn more at www.aerobiotix.com.

Booth: 516
Applied Medical designs, develops, manufactures, and sterilizes healthcare solutions that enable advanced surgical procedures and optimize patient outcomes. We achieve this while also reducing healthcare costs and offering unrestricted choice.

Booth: 202
BD is a medical technology company advancing health by improving discovery, diagnostics, and delivery. Our portfolio, leadership and partnerships make a difference for global healthcare.
LinkedIn – https://www.linkedin.com/company/bd1/
Twitter – https://twitter.com/BDandCo
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Booth: 314
Specialty manufacturer of orthopedic surgical instrumentation and consumables that bring you quality and value. Products include large and small bone blades, twist drills, burs, K-Wires, Steinman pins and accessories. Featuring the New EZX Acetabular Cup Removal System for hip revision surgery that reduces bone loss and surgical procedure time. Our customers have seen 40-60% savings when using our products.

Booth: 107
The CeramTec Group is a world-wide manufacturer of advanced ceramics. Visit our Mobile BIOLOX Education Center. Follow signage to Portico Patio.

Booth: 119
Connected care.

Booth: 403
In partnership with exceptional surgeons and hospitals, Compass Surgical Partners develops and manages surgery centers, with a specific focus on joint replacement and spine surgery. Compass strives to provide exceptional, high-value surgical services to local communities while also supporting the independent practice of medicine and surgery.
Booth: 318

Corin’s goal is to revolutionize orthopaedics through connected technologies, allowing surgeons to make intelligent decisions that complement our clinically proven implants to improve patient outcomes.

The combination of innovative implants with the OPS™ system for hip surgery and OMNIBot-otics® for robotic assisted knee surgery, assures Corin a unique position in the orthopaedic world, aimed at providing the surgeon with essential information to optimize the intervention for the patient’s benefit.

Booth: 217

DePuy Synthes, the Orthopaedics Company of Johnson & Johnson, provides one of the most comprehensive orthopaedics portfolios in the world that helps heal and restore movement for the millions of patients we serve. DePuy Synthes solutions, in specialties including joint reconstruction, trauma, extremities, craniomaxillofacial, spinal surgery and sports medicine, in addition to the VELYS™ Digital Surgery portfolio, are designed to advance patient care while delivering clinical and economic value to health care systems worldwide.

Building on our proud product innovation and legacy of industry firsts, we are reimagining the orthopaedic landscape with new advancements in medical technologies and digital surgery across the entire continuum of care to Keep People Moving today and tomorrow.

Booth: 413

Driven by DJO’s desire to create innovative products that help improve quality of life and restore movement to those suffering from degenerative arthritis, DJO Surgical® provides orthopedic surgeons with modern, patient-focused solutions for total joint arthroplasty. Partnerships with key surgeon consultants help provide advanced and proprietary patented solutions, including EMPOWR 3D Knee®, the only dual-pivot knee system on the market, and Altivate Reverse® Shoulder, a market-leading system.

Booth: 500

Medical devices.

Booth: 409

Exactech is a global medical device company that develops and markets orthopaedic implant devices, related surgical instruments and the Active Intelligence® platform of smart technologies to hospitals and physicians. Visit www.exac.com for more information and connect with us on LinkedIn, VuMedi, YouTube and Instagram.

Booth: 508

Heraeus Medical, the inventor and exclusive manufacturer of PALACOS® bone cements and cement mixing systems, is a global leader in joint fixation and infection management, driving continued innovation, simplicity, and clinical results. PALACOS® has been proven for 60 years in more than 34 million procedures globally.

The PALACOS® family of bone cements has the lowest revision risk and the most clinical studies, making it the gold standard in bone cement. Our PALACOS® pro 2021 All-in-One Fixation System limits the ability of outside elements to enter the bone cement during preparation, and of cement to enter the environment or cause harm to the operating room staff – while also providing hands-on safety for staff by removing the risk of glass cuts and glove punctures.

Booth: 309/410

Heron’s mission is to improve patient’s lives by developing best-in-class medicines that address major unmet medical needs. We are developing novel, patient-focused solutions that apply our innovative science and technologies to proven pharmacological agents.

Booth: 206

Innomed, Inc., a developer of instruments for orthopedic surgery, continues to introduce new and innovative products. We offer an array of unique instruments and patient positioning devices, designed by or in conjunction with orthopedic surgeons and surgical professionals.

Booth: 218

At Insperity, it’s not just HR outsourcing, it’s HR that makes a difference.™ Our comprehensive, scalable HR solutions offer an optimal blend of service and technology to facilitate growth by streamlining processes related to payroll, benefits, talent management and HR compliance. We provide the tools to help you lighten your administrative load, maximize productivity and manage risks – so you can focus on growth. Because that’s what it means to have a true HR partner.
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<td>Irrimax Corporation</td>
<td>Focused on reducing infections, healthcare costs and improving patient outcomes. Irrimax manufactures Irrisept Antimicrobial Wound Lavage, a single-use, manual, self-contained irrigation device comprised of 0.05% Chlorhexidine Gluconate (CHG) in 99.95% Sterile Water for Irrigation, United States Pharmacopeia (USP). Visit <a href="http://www.irrisept.com">www.irrisept.com</a> to learn more or request a sample.</td>
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<td>LinkBio</td>
<td>The sister company of Waldemar Link Germany and exclusive US distributor, providing solutions to complicated and unique revision and oncological cases. LinkBio carries on the tradition of German excellence in engineering into the US market.</td>
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<td>506</td>
<td>Maxx Orthopedics</td>
<td>Develops and manufactures innovative joint replacement products designed to help our global patient population Pursue Life®. Our focus is knee and hip replacement solutions for both hospitals and outpatient surgery centers throughout key product lines: Freedom Knee®, Libertas Hip® and our new outpatient offering – Maxx QRS® (Quick Recovery Solutions). We create ASC efficiency, so our surgeon partners get exactly what they want and when they want it. Sharpen the surgical flow.</td>
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<td>407</td>
<td>Medacta International</td>
<td>A Swiss company specializing in joint replacement, spine surgery, and sports medicine solutions. Medacta’s revolutionary approach and responsible innovation have advanced the standard of care with AMIS® hip replacement, MyKnee®, MyShoulder® and MySpine® patient matched technology, and M-ARS anatomic ACL reconstruction system. Medacta has grown dramatically by placing value on all aspects of the care experience through excellence in design, training, and sustainability.</td>
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<td>MicroGenDX</td>
<td>The leader in providing comprehensive DNA analysis for infections. Using Next Generation DNA Sequencing (NGS), we identify causative microbes and match DNA sequence codes of 50,000+ microbial species with 99.9% accuracy. MicroGenDX provides physicians with precise information needed to make confident treatment decisions.</td>
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<td>MicroPort Orthopedics</td>
<td>Delivers the latest in orthopedic technologies and procedures for the repair and reconstruction of the hip and knee joint. At MicroPort Orthopedics, we are continually driven to leverage our extensive experience in orthopedics and 20 years of superior clinical results to improve patient outcomes and drive provider satisfaction across the globe.</td>
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<td>An Augmented Reality (AR) platform that allows users to measure their motion using only a smartphone. MirrorAR™ is a revolutionary motion capture and mixed reality solution which can be used in any setting where in-home compliance and performance is key to individual success; such as physical rehabilitation, fitness training or surgery follow-up.</td>
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<td>Next Science is a medical technology company headquartered in Sydney, Australia, with a research and development center based in Jacksonville, Florida. Established in 2012, the company's primary focus is on the development and continued commercialization of its proprietary XBIO® Technology to reduce the impact of biofilm-based infections in human health. XBIO is a unique, non-toxic technology with proven efficacy in eradicating both biofilm based and free-floating bacteria.</td>
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Reprocess Medical Devices in Minutes, not Hours, with this Game Changing Combo

ONE TRAY® provides a solution that allows facilities to meet demands head on by processing loaner, consignment, and high turn hospital instrumentation in a fraction of the time it takes sterile wrap or other rigid containers. American Made and backed by our Lifetime Warranty, ONE TRAY® is committed to patient safety and providing years of effective and reliable service. Partner this with EZ-TRAX™ and MAXIMIZE reprocessing of orthopedic sets with the ability to take 6-8 trays down to 2-3. This saves approximately 3 hours in reprocessing per case resulting in approximately 75% reduction in cost and labor to process TJA instrumentation. No need to process unnecessary vendor trays costing your facility time and money. Increase cases per day, do MORE surgeries in LESS trays and mitigate cancellations.

The Orthopaedic Research and Education Foundation (OREF) is a charitable 501(c)(3) organization committed to improving lives by supporting excellence in orthopaedic research. OREF is dedicated to being the leader in supporting research that improves function, eliminates pain and restores mobility, and is the premier orthopaedic organization funding research across all specialties.

OrthAlign is the leader in simple, smart technology for joint surgery; powering partial knee, total knee, and total hip replacements using any approach. Using advanced microelectromechanical sensors, our solutions deliver clinically proven live-navigation in a cost-effective, easy-to-integrate package. We show you where you’re going, and then get out of your way.

OsteoRemedies® is a Memphis, TN company focused on providing simple solutions to complex disorders for revision and infection disorders. With its recent novel product release OsteoRemedies® continues a trend of first to market innovation as the REMEDY SPECTRUM® GV Hip System and SPECTRUM® GV Bone Cement will provide surgeons with the first ever broad-spectrum treatment option with both Gentamicin and Vancomycin. This newly released product line builds upon an existing array of unique products that address 2-stage revision of infected total joints with the REMEDY® Spacer System, the only pre-molded modular spacer system for hip, knee and shoulder. The company also provides OSTEOBOOST® Select™ Resorbable Bead Kit, the only tri-phasic bone void filler in bead kit formulation. As a company, OsteoRemedies® and its employees offer these unique products while functioning as a lean, adaptable business providing exceptional returns to its stakeholders in a compliant, ethical manner.

Pacira BioSciences, Inc. is the industry leader in its commitment to non-opioid pain management and regenerative health solutions to improve patients’ journeys along the neural pain pathway. To learn more about Pacira, including the corporate mission to reduce overreliance on opioids, visit www.pacira.com.

We are a surgical instrument manufacturer that developed implant specific osteotomes for the removal of total hip implants. Our patented technology and wide range of sizes allows the surgeon to remove any non cemented stem while conserving the most bone possible. We are poised to lead the industry in Bone Conserving Technology.

ROMTech® is the leader in advanced orthopedic rehab technology-- introducing to the world the first-ever, remote, telemedicine technology specifically for at-home orthopedic rehabilitation. Patients recovering from total knee replacement, total hip replacement, joint manipulations, ACL, and other arthroscopic repairs recover in half the time when doctors prescribe our medical devices. By enabling patients to complete therapy from the safety and privacy of their home, our patented telemedicine technology leads to faster outcomes, unparalleled pain management, and a faster return to quality of life.

Smith+Nephew is a global medical technology business with global leadership positions in Orthopaedic Reconstruction, Sports Medicine, Trauma Fixation, Extremities & Limb Restoration, and Advanced Wound Management. Visit www.smith-nephew.com for more information.
Booth: 317

Stryker is one of the world’s leading medical technology companies and, together with its customers, is driven to make healthcare better. The company offers innovative products and services in Orthopaedics, Medical and Surgical, and Neurotechnology and Spine that help improve patient and hospital outcomes. More information is available at www.stryker.com.

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Surgical Planning Associates, Inc. is a Boston-based medical technology company specializing in the development of innovative, cost-effective preoperative planning and navigation solutions for use in joint arthroplasty. SPA is committed to developing technology that improves patient outcomes and operating room efficiency. SPA technology, including the HipXpert and HipInsight Systems, has been used in more than 11,000 procedures on four continents.

Booth: 216

United Surgical Partners International (USPI), a subsidiary of Tenet Healthcare Corporation (NYSE: THC), operates the largest ambulatory platform in the country. With more than 340 facilities across the United States, the company serves patients in ambulatory surgery centers and surgical hospitals.

For more information, please visit www.uspi.com.

Booth: 201

Zimmer Biomet focuses on alleviating pain and improving the quality of life for people around the world through its innovative, collaborative ecosystem of outstanding products and solutions. As a trusted partner, Zimmer Biomet strives to deliver optimal clinical and economical outcomes in musculoskeletal health.
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**SICOT/CCJR® Award**

SICOT/CCJR Award is granted to the best oral and poster presentation in Arthroplasty

**2021 SICOT/CCJR® Awardee:**

**Dr. Sujit Kumar Tripathy**
MS,DNB, MNAMS, Dip SICOT, MRCS, MCH(UK)
Additional Professor, Orthopaedics
AIIMS, Bhubaneswar, India
The Role of Synovial Aspiration in the Diagnosis of Aseptic Loosening and Failure in Total Knee Arthroplasty

Rhamee Badr, MD

Introduction
Aseptic failure is the most common indication for revision total knee arthroplasty (TKA), accounting for up to 30% of cases worldwide. Instability and aseptic loosening are two common mechanisms of aseptic failure and may be characterized by an inflammatory, cellular response. Current methods of diagnosing aseptic loosening, such as radiographs and scintigraphy, are largely subjective. Furthermore, these tools have been shown to lack diagnostic accuracy and may be inconclusive in equivocal cases. In this study, we hypothesized that synovial fluid cell count and differential would be useful in the diagnosis of aseptic loosening, differentiating between aseptic loosening and other mechanisms of aseptic failure. We also hypothesized that serum inflammatory markers along with the synovial fluid cell counts and differentials in our aseptic failure cohort would be different from those of periprosthetic joint infections (PJIs) and well-functioning prostheses.

Methods
We performed a retrospective chart review of all patients at our institution undergoing revision TKA by three senior surgeons between January 2017 and April 2021. Revisions for infection, partial knee replacement revisions/conversions, and revisions without operative reports were excluded. Each patient was assigned to an aseptic failure category (i.e., aseptic loosening, instability, arthrofibrosis) based on intraoperative findings delineating failure mechanism and component fixation. Preoperative serum white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), c-reactive protein (CRP), and D-dimer levels were collected from all patients. Arthrocentesis was also performed for synovial fluid cell count with differential (percentage of polymorphonuclear neutrophils [PMN], eosinophils, lymphocytes, and monocytes). Serum and synovial data were compared between the aseptic loosening, instability, and arthrofibrosis groups using analysis of variance (ANOVA) and Tukey HSD post-hoc tests. ANOVAs were also used to compare synovial data from the present aseptic cohort to those of a literature cohort (Chalmers et al, 2015) of similar patients who underwent revision TJA for PJI (n = 93) as well as a control cohort with well-functioning prostheses (n = 30).

Results
Ninety-nine aseptic revision TKA procedures were included in the analysis (n = 37 aseptic loosening, n = 56 instability, n = 6 arthrofibrosis). There were no statistically significant differences in synovial cell count (p = 0.86), PMN (p = 0.69), eosinophil (p = 0.70), lymphocyte (p = 0.79), and monocyte (p = 0.26) levels between aseptic loosening and instability cases. Additionally, serum WBC (p = 0.26), ESR (p = 0.38), CRP (p = 0.36), and D-dimer (p = 0.52) levels were not significantly different between the two cohorts. Because of their similar laboratory profiles, the instability and aseptic loosening groups were pooled, yielding a mean serum WBC of 7.1 x 10^9/L, ESR of 17.1 mm/h, CRP of 2.1 mg/dL, D-dimer of 129.1 ng/mL FEU, and synovial cell count of 1018.4 x 10^6/L with 18.4% PMNs, 0.3% eosinophils, 54.0% lymphocytes, and 27.1% monocytes. Compared to the pooled instability and aseptic loosening group, the arthrofibrosis group had statistically significantly lower ESR (0.50x, p = 0.047), higher cell count (5.17x, p < 0.001), higher PMNs (2.75x, p = 0.02), higher eosinophils (8.3x, p = 0.001), and lower lymphocytes (0.44x, p =
When compared to the literature cohort of patients who underwent revision TKA for PJI (Chalmers et al, 2015), aseptic patients in this study had highly significantly lower cell counts ($p < 0.0001$) and PMNs ($p < 0.0001$) but higher lymphocytes ($p < 0.0001$) and monocytes ($p < 0.0001$) (See Table). Patients with aseptic failure had significantly higher cell counts ($p = 0.02$) but lower monocytes ($p = 0.01$) than control patients. There were no significant differences in PMNs ($p = 0.24$) or lymphocytes ($p = 0.13$) between aseptic and control patients.

Discussion and Conclusion
The present study found that, in aseptic failure, cases of aseptic loosening and instability had similar serum and aspirate laboratory profiles. Previous studies have suggested that mononuclear cells (i.e., lymphocytes, monocytes) may be involved in the pathogenesis of aseptic loosening and instability. Our results support this hypothesis, as this subgroup's aspirate data demonstrated a strong mononuclear predominance (81.1%). In contrast, the differential for cases of arthrofibrosis revealed a near-even split between mononuclear (50.3%) and polynuclear cells (49.7%). This mononuclear trend for aseptic loosening and instability was even more striking when compared to septic failure data, for which Chalmers et al (2015) reported a neutrophilic predominance (86%) with only 6% lymphocytes and 8% monocytes. Future studies with larger samples are warranted to better understand these laboratory trends. However, it appears that characteristically low total cell counts with high percentages of lymphocytes and monocytes can help differentiate aseptic loosening and instability from septic failure and arthrofibrosis. Identification of these trends can serve as a useful adjunct in the diagnosis of painful TKA, especially in equivocal cases.

Selected Reference

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<tr>
<td>Cell Count</td>
<td>939.9 ± 1,046.1</td>
<td>62,299 ± 73,376</td>
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<td>PMN</td>
<td>19.0 ± 22.7</td>
<td>86 ± 18</td>
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<tr>
<td>Lymphocyte</td>
<td>49.4 ± 32.4</td>
<td>6 ± 9</td>
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<td>28.2 ± 26.6</td>
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POSTER #2

Effects of the COVID-19 Pandemic on Outcomes following Total Knee and Hip Arthroplasty in a Large Hospital System

Om Patel, MD

Introduction
When cases of COVID-19 surged during the pandemic the Centers for Medicare and Medicaid Services (CMS) recommended cancellation of all elective cases on March 18th, 2020. All total joint arthroplasty (TJA) cases were halted at our large academic institution. Once TJA cases resumed, the altered landscape for patients and health systems led to shifts in patient demographics as well as postoperative outcomes following TJA. The goal of this study was to determine what, if any, differences existed in demographics of patient undergoing TJA following the resumption of cases and what impact this may have had on 90-day postoperative outcomes such as rates of thromboembolic events, length of stay (LOS), discharge disposition, mortality, and readmission in our large health system.

Methods
After obtaining IRB approval, a retrospective review was performed of all primary total knee arthroplasty (TKA) and total hip arthroplasty (THA) cases performed at 12 hospitals in our health system to produce 3 separate time cohorts for comparison. Revision and fracture cases were excluded. Cohort 1 was the 3-month period beginning on December 1, 2018; cohort 2 was the 3-month period beginning on December 1, 2019, just before the cancellation of elective cases; cohort 3 was the 3-month period beginning on June 1, 2020, just after the resumption of elective cases. Statistical analysis was performed to compare comorbidity profiles, 30- and 90-day rates of deep vein thrombosis (DVT) and pulmonary embolus (PE), LOS, discharge disposition, mortality, and readmission. We further stratified results by procedure type, TKA vs THA, to discover any differences in outcomes.

Results
A total of 6,167 primary TJA cases were included in this study (cohort 1 = 2,011 procedures; cohort 2 = 2,189 procedures; cohort 3 = 1,967 procedures). There were no significant differences in age between cohorts 1 (mean = 66.7, SD = 10.3), 2 (mean = 66.4, SD = 10.1), and 3 (mean = 66.3, SD = 10.4), p = 0.38. Sex distributions between Cohorts 1 (41.7% male, 58.3% female), 2 (42.1% male, 57.9% female), and 3 (41.2% male, 58.8% female) were statistically equivalent, χ² (2) = 0.30, p = 0.86. Cohort 3 had significantly lower rates of hypertension, χ² (2) = 195.9, p < 0.001; diabetes, χ² (2) = 32.0, p < 0.001; OSA, χ² (2) = 25.0, p < 0.001; tobacco use χ² (2) = 664.3, p < 0.001; CAD, χ² (2) = 59.2, p < 0.001; CHF, χ² (2) = 32.0, p < 0.001; and CKD, χ² (2) = 30.0, p < 0.001. Mean length of stay significantly decreased from 2.51 days (SD = 2.31) in cohort 1 to 2.18 days (SD = 1.76) in cohort 2, p < 0.001, and then again to 1.77 days (SD = 1.32) in cohort 3, p < 0.001. Cohort 3 had highly significantly greater rates of home discharge (94.8%) when compared to Cohorts 1 and 2 (40.7% and 42.9%, respectively), χ² (2) = 1241.3, p < 0.001. Cohort 3 had a significantly higher incidence of 90-day hospital readmission (4.2%) when compared to Cohorts 1 (1.8%) and 2 (1.5%), χ² (2) = 36.6, p < 0.001. Stratifying by procedure type, we
found no significant difference in mean length of stay, 90-day incidence of DVT, PE, readmissions, or mortality between THA and TKA.

**Discussion**
The resumption of elective cases during the COVID-19 pandemic impacted the environment of total joint arthroplasty from patient selection to post-surgical outcomes. TJA volume resumed to almost 90% of the 3-month period prior to the halting of elective surgeries. Patients in cohort 3 following the resumption of elective cases were healthier, had decreased LOS, and had higher rates of home discharge following TJA; However, this cohort also had a significantly higher rate of readmission. There were no significant differences in the rates of DVT/PE or mortality between the cohorts. Relatively healthier patients undergoing TJA following the resumption of cases is likely directly related to risk stratification and resource management as this was paramount during the pandemic. Furthermore, healthier patients were more likely to seek elective surgery during a pandemic due to self-realization of comorbidities and risk of contracting COVID. Mean length of stay was significantly lower in a stepwise manner between the 3 cohorts decreasing from 2.51 days to 2.18 days to 1.77 days, respectively. The decrease in LOS between cohorts 1 and 2 which are exactly 1 year apart could be related to the long-term trend of reduced LOS with improved patient optimization and use of rapid recovery protocols at our institution. The LOS decrease between cohort 2 and 3, however, we believe to be a direct impact of the pandemic as hospitals and patients were highly motivated to discharge sooner. Furthermore, patients were overwhelmingly more likely to discharge home (94.8%) as compared to pre-pandemic cohorts 1 and 2 (40.7% and 42.9%, respectively). Interestingly, patients undergoing TJA during the pandemic were healthier, had decreased LOS, and very high rates of home discharge yet this cohort had a significantly higher readmission rate, 4.2%, compared to 1.8% and 1.5% in cohorts 1 and 2, respectively.
Articulating Knee Spacers in the Treatment of Periprosthetic Joint Infection: All Poly Tibia or Just Use a Liner?
Andrew E. Apple, MD

Introduction
Treatment of periprosthetic knee joint infection most commonly includes implant removal, debridement, and placement of a static or articulating antibiotic spacer. Various types of articulating spacers have been described including metal-on-polyethylene (MoP) components or all-cement molded components. This study compares two types of MoP articulating spacer constructs — an all-polyethylene tibia (APT) and a polyethylene liner with a Steinmann pin or screw (PL).

Methods
A retrospective review evaluated 126 consecutive articulating knee spacers placed in 118 patients from September 2016 to August 2020. Demographic information, spacer construct components, complication rates, infection eradication, spacer longevity, and implant cost were analyzed. Complications were subdivided into the following groups: spacer-related, antibiotic-related, infection recurrence, medical, emergency room visits, and readmissions. Spacer longevity was measured for patients who underwent second-stage reimplantation and for those with a retained spacer at the time of the study.

Results
Sixty-four APT spacers were compared to sixty-two PL spacers. There were no statistically significant differences in overall complication rate (p<0.48), spacer-related complications (p=1.0), recurrent infection (p=1.0), antibiotic-related complications (p<0.24), medical complications (p<0.41), ER visits (p<0.44), or readmissions (p<0.12). PL spacers had lower implant costs than those with APT components ($1,474.19 vs. $2,330.47, respectively (p<0.0001). Thirty-one percent (20/64) of APT spacers and thirty percent (19/62) of PL spacers remained intact with an average duration of spacer retention of 154.5 days and 116.3 days, respectively. Surgeons who placed PL spacers were more likely to opt for planned reimplantation.

Conclusion
Articulating knee spacers constructed with either an APT or PL component have similar results regarding complication profiles and infection eradication. PL constructs are more cost effective if second-stage reimplantation is planned. Both constructs may be durable if longer-term spacer retention is planned.
**Articulating Hip Spacers with a Constrained Liner: Complication and Retention Rates**  
*Andrew E. Apple, MD*

**Introduction**
Various types of functional articulating spacers have been utilized as part of two-stage treatment for patients with periprosthetic hip joint infections (PJI). Functional hip spacers offer advantages such as improved patient mobilization, hip function, and soft tissue tension at the time of reimplantation. This study evaluates the results of articulating antibiotic hip spacers constructed with cemented constrained polyethylene acetabular liners and cemented femoral stems in the treatment of periprosthetic and native hip infections.

**Methods**
109 consecutive articulating hip spacers were placed from January 2016 to April 2020. Eighty-four spacers were placed for PJI while twenty-five were placed for native hip septic arthritis. Demographic information, spacer components, spacer-related complications, reinfection rates, and spacer longevity were analyzed. Spacer longevity was measured for patients who underwent second-stage reimplantation and for those with a retained spacer. Comparisons were also made between spacers placed for PJI and native hip septic arthritis.

**Results**
There were 10 (9.17%) spacer-related complications overall, with no significant difference in spacer-related complication rate between PJI and Native infections (8/84 PJI vs. 2/25 Native, p=1.0). Spacer-related complications included acetabular component dislodgement (5), prosthetic dislocation (2), periprosthetic fracture (1), femoral component loosening (1), and hematoma requiring reoperation (1). 98/109 hips (89.9%) were free from reinfection at one year with no statistically significant difference between PJI (90.5%) and Native (88.0%), p<0.71. At an average follow up of 1.3 years, 75/109 (69%) hips had undergone second-stage reimplantation (mean 157 days), while 34/109 (31%) have retained the spacer (mean duration 245 days).

**Conclusion**
Functional articulating antibiotic spacers with cemented constrained acetabular liners and metal femoral components demonstrate promising results in the treatment of PJI and native hip infections. This spacer construct appears to be reliable with regard to component fixation and durability, and may be an option if considering spacer retention.
**Introduction**

Periprosthetic joint infection (PJI) is a large burden on patients, surgeons, and health systems. The standard of care remains a two-stage exchange which can be highly taxing for patients. Given the morbidity of explantation, there is a need to examine methods in which implants can be retained in select patients. Modern plasma devices have been shown to inactivate microorganisms, with evidence in the dental literature demonstrating capacity to disrupt biofilm. The purpose of our study was to examine the impact of commercially available argon plasma system on microbial eradication, as well as the impact on material surface properties.

**Materials and Methods**

For the first aim of the study, we utilized an argon plasma system (ValleyLab Force Argon II system) and *E.coli* bacterial agar plates (due to biosafety level) to examine the impact on bacterial lawn growth. Power levels were tested from 0-120W to determine the ideal power and arc distance. Plasma application was performed at an instantaneous pulse, 1 second, 5 seconds, and 15 seconds. Radius of bacterial kill was examined using digital imaging. In the second aim of the study, argon plasma was applied at the same time points above to polished cobalt-chromium discs. The discs were then imaged under a Scanning Electron Microscope (SEM) to visually assess damage, and with Energy-dispersive X-ray Spectroscopy (EDS) to assess elemental composition.

**Results**

The ideal power level was found to be 60W to maximize radius of kill, and pulse applications provided 1.1mm radius of kill, 1 second applications provided 1.7mm radius of kill, and 5 seconds applications were found to provide a 3.1mm radius of kill. Beyond 5 seconds, there was minimal change in bacterial kill radius. Under the SEM, there was visible change in the surface of the cobalt-chromium discs visualized up to 2500x magnification. With EDS analysis, there was deposition of carbon char on the surface, however no change in the elemental composition of the disc itself.

**Discussion and Conclusion**

A commercially available argon plasma system may be a novel means of antimicrobial activity in PJI. In our study we found that argon plasma was able to eradicate *E.coli* effectively, however there was some visible damage to the surface of cobalt-chromium discs. Future study is indicated to study the direct clinical impact of this technology, however it may serve as an adjunct for management of PJI when implant explantation cannot be performed.
Covid Has Changed Practice: Converting Hip and Knee Arthroplasty Cases to Same Day Surgery Because of The COVID-19 Pandemic

Ahmed Cherry M.D., MSc

Purpose
In 2020, the COVID-19 pandemic meant that proceeding with elective surgery was restricted to minimise exposure on the wards. In order to maintain throughput of elective cases, our hospital was forced to convert as many cases as possible to same day procedures rather than overnight admission. In this retrospective analysis we review the cases performed as same day arthroplasty surgeries compared to the same period 12 months previous.

Methods
We conducted a retrospective analysis of patients undergoing total hip and knee arthroplasties in a 3 month period between October and December in 2019 and again in 2020, in the middle of the SARS-CoV-2 pandemic. Patient demographics, number of out-patient primary arthroplasty cases, length of stay for admissions, 30-day readmission and complications were collated.

Results
In total, 428 patient charts were reviewed for the months of October-December of 2019 (n=195) and 2020 (n=233). Of those, total hip arthroplasties comprised 60% and 58.8% for 2019 and 2020, respectively. Demographic data was comparable with no statistical difference for age, gender contralateral joint replacement or BMI. ASA grade I was more highly prevalent in the 2020 cohort (5.1x increase, n=13 vs n=1). Degenerative disc disease and fibromyalgia were less significantly prevalent in the 2020 cohort. There was a significant increase in same day discharges for non-DAA THAs (2x increase) and TKA (10x increase), with a reciprocal decrease in next day discharges. There were significantly fewer reported superficial wound infections in 2020 (5.6% vs 1.7%) and no significant differences in readmissions or emergency department visits (3.1% vs 3.0%).

Conclusion
The SARS-CoV-2 pandemic meant that hospitals and patients were hopeful to minimise the exposure to the wards and to not put strain on the already taxed in-patient beds. With few positives during the Coronavirus crisis, the pandemic was the catalyst to speed up the outpatient arthroplasty program that has resulted in our institution being more efficient and with no increase in readmissions or early complications.
Bacteremia in Patients undergoing DAIR Leads to Increased Re-infection Rates and 90-Day Costs

Daniel N. Bracey, MD

Introduction
Patients treated with debridement, antibiotics, and implant retention (DAIR) with bacteremia may have worse outcomes than those treated without bacteremia. The purpose of this study was to evaluate re-infection rates following DAIR in patients with and without bacteremia.

Methods
A retrospective review of the Medicare Standard Analytical Files from 2005-2014 was performed. Patients treated with DAIR for hip or knee arthroplasty after a diagnosis of prosthetic joint infection (PJI) were identified through international classification of disease 9th revision codes. The search identified patients who underwent DAIR with a diagnosis of bacteremia. This group was matched to a cohort of patients who underwent DAIR for the same indication without bacteremia. Patients were matched by comorbidities and Charlson Comorbidity Index score. The primary outcome was re-infection at 90-days, 6, 12 and 24 months after DAIR. 90-day Medicare charges were compared between both groups. Statistical analysis was performed using t-test, Chi-square and log-rank tests for survival probabilities. Kaplan Meier curves were used to present the survival comparisons.

Results
A total of 9,945 patients who underwent DAIR after a diagnosis of PJI were identified. Some 707 patients underwent DAIR for PJI with an associated diagnosis of bacteremia. We matched 334 patients from this cohort to patients without bacteremia. DAIR survivorship (figure 1) in PJI patients was significantly worse in those with bacteremia at 90-days (51.5% vs. 65.9%, p=0.001), 6-months (43.1% vs. 60.5%, p<0.001), 12-months (36.5% vs. 56.0%, p<0.001), and 24-months (32.6% vs. 53.3%, p<0.001). The 90-day costs of DAIR were significantly greater in PJI patients with bacteremia ($14,722±$4,086 vs. $8,052±$4,153, p=0.001).

Conclusions
Patients who undergo DAIR with concurrent bacteremia are at increased risk of re-infection. Furthermore, the 90-day costs are significantly increased in patients with bacteremia vs. those without bacteremia. Future prospective work is needed to optimize management of PJI patients with bacteremia.
Discordant Metal Allergy Tests and Inferior Patient Outcomes After Primary and Revision TKA
Daniel N. Bracey, MD

Introduction
Metal allergy testing may influence clinical decision making for patients undergoing total knee arthroplasty (TKA). Limited data has examined consistency of different testing modalities. This study compares different metal allergy test results and clinical outcomes after primary and revision TKA for patients with and without metal hypersensitivity.

Methods
Primary (n=28) and revision (n=20) TKA patients receiving hypoallergenic implants for metal allergies diagnosed by skin patch testing (SPT), lymphocyte proliferation testing (LPT) or lymphocyte transformation testing (LTT) were retrospectively reviewed. Agreement between tests was assessed by percentage and Kappa Statistic within patients who had multiple test modalities. Clinical outcomes post-operatively were compared to patients without metal allergies matched by age (+/-5 years), BMI (+/-5), gender and follow-up duration (+/-2 years).

Results
SPT and LPT showed weak agreement for nickel (71% matching results, k=0.43, n=28) and minimal agreement for cobalt (58%, k=0.17, n=17). SPT and LTT showed minimal agreement for nickel (54%, k=0.09, n=11), weak agreement (71%, k=0.4, n=11) for titanium, bone cement, vanadium, and zirconium, but strong agreement (91%, k=0.8, n=11) for chromium and cobalt. LPT and LTT blood tests agreement for nickel was weak (67%, k=0.5, n=6). Compared to matched controls, metal allergy patients undergoing primary TKA with hypoallergenic implants experienced less improvement in Knee Society Scores (36.1 vs 53.8, p=0.03), VR-12 physical component scores (7.6 vs 15.8, p=0.04) and range of motion (6.8° vs 20.7°, p=0.03). Patients undergoing revision TKA for multiple indications including metal allergy had worse clinical outcomes with significantly worse improvements in KSS functional scores (-2.3 vs 14.1, p=0.05) compared to matched patients revised for the same indication without metal allergy.

Discussion And Conclusion
Metal allergy tests produce conflicting results. Allergy patients may experience inferior clinical outcomes even with use of hypoallergenic implants. Clinician awareness may influence choice of testing and improve pre-operative counseling of this patient population.
Incidence and Risk Factors of Orthostasis After Primary Hip and Knee Arthroplasty

Gregory M. Kurkis, MD

Background
Postoperative orthostatic intolerance (OI) can limit mobilization after hip and knee arthroplasty. The orthopedic literature is lacking on the incidence and risk factors associated with OI after elective arthroplasty.

Methods
A retrospective case-control study of primary total hip (THA), total knee, and unicompartimental knee arthroplasty patients was conducted. Patients with OI events were identified, and data on potential demographic and perioperative risk factors was recorded. OI was defined as postoperative syncope, lightheadedness or dizziness that limited ambulation and/or required medical treatment. Statistical analysis was completed using Pearson’s chi-square test for categorical data and T-tests for continuous data. Binary logistic regression was then performed.

Results
500 consecutive patients were included in this study. The overall incidence of OI was 18%. On univariate analysis, significant risk factors for developing postoperative OI include older age, female gender, THA surgery, lower ASA class, absence of recreational drug use, lower estimated blood volume, lower preoperative diastolic blood pressure, spinal with monitored anesthesia care (MAC), posterior approach for THA, bupivacaine use in spinal, percent of blood loss, postoperative oxycodone or tramadol use, higher postoperative intravenous fluid volume administered, and lower postoperative hemoglobin level. Multivariate analysis demonstrated persistent significance of female gender, THA surgery, spinal with MAC anesthesia, bupivacaine use in spinal, and more intravenous fluid administered postoperatively.

Conclusion
OI affects a significant number of arthroplasty patients. Awareness of patient risk factors and modification of perioperative variables linked to OI may assist the arthroplasty surgeon in choosing the appropriate surgical setting, educating patients, and improving early postoperative recovery.
POSTER #10

Perioperative Cannabis May Reduce Persistent Opioid Use After Total Joint Arthroplasty

Vishal Hegde, MD

Introduction
Legalization of cannabis, in conjunction with growing concern over prescription narcotic use has garnered interest in cannabis for adjuvant pain control. This study examines the effect of cannabis use on perioperative opioid consumption after total hip (THA) or knee (TKA) arthroplasty.

Methods
Patients undergoing primary THA or TKA with minimum 6-month follow-up who self-reported cannabis use were retrospectively reviewed. Prior opioid users were excluded. 210 patients (128 TKAs and 82 THAs) were matched by age; gender; type of arthroplasty; Charlson Comorbidity Index; and use of nicotine, antidepressants, or benzodiazepines to patients who did not self-report cannabis use. Patients receiving an opioid prescription after 90 days postoperatively were classified as persistent opioid users (POU). Duration of opioid use (DOU) was calculated for non-POU patients as the time between surgery and their last opioid prescription. Differences in inpatient morphine milligram equivalents (MMEs), outpatient prescribed MMEs, POU and DOU were analyzed.

Results
Compared to matched controls, cannabis users consumed equivalent inpatient MMEs (109.0 vs 99.7, p=0.23) and outpatient MMEs (160 vs 147, p=0.35). There was no difference in DOU (12.7 vs 10.1 days, p=0.117). There was a significant difference in the rate of POU (1.4% (n=3) vs. 9.5% (n=20), p<0.001) between cannabis users and matched controls, respectively. Grouping patients by TKA or THA, there remained a significant difference in POU for both TKA (1.5% (n=2) vs. 10.9% (n=14), p=0.002) and THA (1.2% (n=1) vs. 7.3% (n=6), p=0.04). There remained no difference in inpatient MMEs, outpatient MMEs, or DOU when grouping patients by TKA or THA.

Conclusion
There is a significantly reduced rate of POU in patients who self-report perioperative cannabis use, even when broken down by TKA or THA. Prospective studies are needed to further explore the role of cannabis as an adjunct to perioperative pain control.
Background

Metal-on-polyethylene (MoP) total hip arthroplasty prostheses are known to release metal debris. Emerging preclinical evidence suggest that metal implants induce a pro-inflammatory response that ultimately chemoattracts leukocytes like macrophages and neutrophils to the surgical site. A similar leucocyte recruitment raises concern of higher risk of infection through the “trojan horse” mechanism (neutrophils and macrophages transporting pathogens from a remote site). The purpose of this study was to compare the infection occurrence between MoP and ceramic-on-polyethylene (CoP) implants.

Methods

With an alpha of 0.05, a beta of 0.2, an expected 60% increase in the incidence of PJI associated with MoP, we estimated the need for 11,000 patients for this study. We reviewed a consecutive series of 6,234 CoP and 4,775 MoP primary total hip arthroplasty patients from 2015 to 2019. The occurrence of periprosthetic joint infection at two years was defined according to the 2018 ICM definition. Statistical analysis consisted of descriptive statistics and regression modeling.

Results

When compared to CoP patients, MoP patients were older, with a higher body mass index and more commonly affected by comorbidities according to Elixhauser score (p<0.001). The absolute incidence of PJI was higher in MoP patients (2.40% vs 1.64%; p=0.007). When we adjusted for confounding factors in a multivariate analysis, the use of MoP was found independently associated with a higher risk of PJI (effect size 0.34, OR 1.75; p=0.007) as a result of a medium-to-small effect size.

Conclusion

Despite MoP and CoP are both available and widely used implants for primary total hip replacement, we found a higher incidence of PJI in the patients were MoP was preferred. While many confounding could affect bivariate analysis, a medium significant effect was observed in a multivariate model. The author hypothesize that the leucocyte recruitment of these implants and PJI should be studied further.
Table 1. Descriptive statistics of the cohort.

<table>
<thead>
<tr>
<th></th>
<th>CoP</th>
<th>MoP</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=6234</td>
<td>N=4775</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>60.6 (12.1)</td>
<td>64.4 (12.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female</td>
<td>3006 (48.2%)</td>
<td>2547 (53.3%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3228 (51.8%)</td>
<td>2228 (46.7%)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity:</td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>White</td>
<td>5211 (83.6%)</td>
<td>3985 (83.5%)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>809 (13.0%)</td>
<td>563 (11.8%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>214 (3.43%)</td>
<td>227 (4.75%)</td>
<td></td>
</tr>
<tr>
<td>Body mass index</td>
<td>28.6 (5.24)</td>
<td>29.0 (5.76)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Elixhauser comorbidity score</td>
<td>1.36 (1.23)</td>
<td>1.50 (1.24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Revision:</td>
<td></td>
<td></td>
<td>0.297</td>
</tr>
<tr>
<td>Not revised</td>
<td>6123 (98.2%)</td>
<td>4676 (97.9%)</td>
<td></td>
</tr>
<tr>
<td>Revised</td>
<td>111 (1.78%)</td>
<td>99 (2.07%)</td>
<td></td>
</tr>
<tr>
<td>Periprosthetic Joint infection:</td>
<td></td>
<td></td>
<td>0.005</td>
</tr>
<tr>
<td>Not infected</td>
<td>6167 (98.9%)</td>
<td>4693 (98.3%)</td>
<td></td>
</tr>
<tr>
<td>Infected</td>
<td>67 (1.07%)</td>
<td>82 (1.72%)</td>
<td></td>
</tr>
</tbody>
</table>

Continuous data is reported as mean and standard deviation. Categorical variable as number of count and percentage.

Table 2. Multivariate Logistic regression looking at PJI occurrence

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effect size</th>
<th>P Value</th>
<th>Odds Ratio</th>
<th>Lower 95</th>
<th>Upper 95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal on Polyethylene</td>
<td>0.56</td>
<td>0.003</td>
<td>1.75</td>
<td>1.21</td>
<td>2.54</td>
</tr>
<tr>
<td>Age</td>
<td>-0.005</td>
<td>0.540</td>
<td>1.00</td>
<td>0.98</td>
<td>1.01</td>
</tr>
<tr>
<td>Body mass index</td>
<td>0.08</td>
<td>&lt;0.001</td>
<td>1.08</td>
<td>1.05</td>
<td>1.11</td>
</tr>
<tr>
<td>Male sex</td>
<td>0.43</td>
<td>0.012</td>
<td>1.54</td>
<td>1.10</td>
<td>2.16</td>
</tr>
<tr>
<td>Race:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>Reference</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>-0.32</td>
<td>0.240</td>
<td>0.73</td>
<td>0.41</td>
<td>1.20</td>
</tr>
<tr>
<td>Other</td>
<td>-1.04</td>
<td>0.145</td>
<td>0.35</td>
<td>0.06</td>
<td>1.12</td>
</tr>
<tr>
<td>ASA</td>
<td>0.32</td>
<td>0.092</td>
<td>1.38</td>
<td>0.95</td>
<td>2.00</td>
</tr>
<tr>
<td>Elixhauser</td>
<td>0.28</td>
<td>&lt;0.001</td>
<td>1.32</td>
<td>1.17</td>
<td>1.48</td>
</tr>
</tbody>
</table>
Conversion Arthroplasty Following Early Failure of Hip Fracture Fixation
Andrew Hughes MD

Background
Conversion hip arthroplasty following primary fixation of trochanteric or femoral neck fractures can present a challenging procedure. As patients sustaining hip fractures are at high risk for complications and mortality, early failure requiring conversion total hip arthroplasty (THA) may lead to increased risk due to physiologic strains from a second major surgery. The purpose of this study was to examine complications and mortality in patients undergoing conversion THA within one year of previous surgery for hip fracture.

Methods
Patients undergoing conversion THA at a single institution between 2008 and 2018, within one year post hip fracture, were identified. Inclusion criteria were patients with two-year follow-up after undergoing THA following open reduction internal fixation (ORIF) via cephalomedullary nail, dynamic hip screw, or cannulated screws, or hemiarthroplasty insertion for trochanteric and femoral neck fractures. Demographics, inpatient complications, 90-day complication, 90-day readmissions, and mortality status were identified for each patient. Using age, sex, body mass index (BMI), and presenting fracture classification (femoral neck versus trochanteric), a propensity match was conducted to identify patients sustaining hip fractures that were treated with ORIF or arthroplasty and did not experience early failure. The primary outcome was mortality at 6 months, 12 months, and 24 months after conversion (or ORIF/arthroplasty for the control group). T tests, chi square tests, and Fisher tests were used to compare groups.

Results
Eighty-four patients undergoing conversion THA within one year of fracture were identified (49 femoral neck fractures, 35 trochanteric fractures). Average age at time of conversion was 77.6 years, and females represented 69.0% of the cohort. Conversion was performed most often following cannulated screw fixation, followed by cephalomedullary nailing. Inpatient or intraoperative complications occurred in 8.3% of patients, including two deaths. 90-day complications following discharge occurred in an additional 15.5% of patients, with 12.0% requiring readmission. Six-, twelve-, and twenty-four-month mortality rates were 8.3%, 11.9%, and 15.5%, respectively, in patients undergoing conversion. These rates were equivalent at all time points to the control group of hip fracture patients not requiring conversion (Table 1). The conversion group had a lower two-year mortality rate, which trended towards, but did not show statistically significance (15.5% versus 26.1%, p=0.055). When separating by fracture type, 24-month mortality was significantly lower for patients undergoing conversion following trochanteric fracture compared to patients not requiring conversion (17.1% versus 37.3%, p=0.046).

Conclusion
Conversion THA, following failure of ORIF or hemiarthroplasty within one year of hip fracture, subjects patients to a second major surgery, with exposure to supplemental complication rates equivalent to their primary admission. Our study found that whilst conversion arthroplasty patients demonstrated additional readmissions after their secondary procedure, they were not susceptible to an increased mortality risk compared to patients undergoing a single surgery following hip fracture. These findings demonstrate that conversion THA poses added risk to an already at-risk patient population, and thus adequate counseling is
imperative to ensure that patients and family members understand the significance associated with early failure and the need for an additional procedure. In certain patients, primary arthroplasty may represent a more suitable initial treatment option, in place of ORIF.

Table 1. Demographics, initial fracture type and fixation, and mortality for conversion and control groups

<table>
<thead>
<tr>
<th></th>
<th>Conversion Group (n=84)</th>
<th>Control Group (n=176)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age at Fracture</strong></td>
<td>77.0 +/- 9.1</td>
<td>77.7 +/- 9.2</td>
<td>0.596</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>69.0%</td>
<td>72.7%</td>
<td></td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>26.2 +/- 5.5</td>
<td>26.6 +/- 5.5</td>
<td>0.621</td>
</tr>
<tr>
<td><strong>Fracture Type</strong></td>
<td></td>
<td></td>
<td>0.885</td>
</tr>
<tr>
<td>Trochanteric</td>
<td>41.7%</td>
<td>42.6%</td>
<td></td>
</tr>
<tr>
<td>Femoral Neck</td>
<td>58.3%</td>
<td>57.4%</td>
<td></td>
</tr>
<tr>
<td><strong>Initial Fixation</strong></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CMN</td>
<td>33.3%</td>
<td>37.5%</td>
<td></td>
</tr>
<tr>
<td>DHS</td>
<td>11.9%</td>
<td>5.7%</td>
<td></td>
</tr>
<tr>
<td>Cannulated Screw</td>
<td>40.5%</td>
<td>13.6%</td>
<td></td>
</tr>
<tr>
<td>Hemiarthroplasty/THA</td>
<td>14.3%</td>
<td>43.2%</td>
<td></td>
</tr>
<tr>
<td><strong>6-Month Mortality</strong></td>
<td>8.3%</td>
<td>6.8%</td>
<td>0.622</td>
</tr>
<tr>
<td>12-Month Mortality</td>
<td>11.9%</td>
<td>12.5%</td>
<td>0.891</td>
</tr>
<tr>
<td>24-Month Mortality</td>
<td>15.5%</td>
<td>26.1%</td>
<td>0.055</td>
</tr>
</tbody>
</table>
**POSTER #13**

**40mm Femoral Heads with the Smallest Compatible Acetabular Components in Primary THAs: Is it Safe?**

*Brandon R. Bukowski, MD*

**Introduction**

Contemporary primary total hip arthroplasty (THA) often employs larger femoral heads to optimize stability. However, pairing 40mm femoral heads with the smallest compatible acetabular components poses a potential risk for implant failure secondary to highly cross-linked polyethylene (HXLPE) liner fracture or dissociation. The purpose of this study was to evaluate the incidence of liner fracture or dissociation, implant survivorship, and PE wear in primary THAs using 40mm femoral heads and the smallest compatible acetabular components.

**Methods**

We retrospectively identified 162 primary THAs involving 40mm femoral heads and acetabular components ≤56mm with HXLPE liners. The femoral head composition was delta ceramic in 57% and cobalt-chromium in 43%. Mean age was 62 years, 58% were females, and mean BMI was 32 kg/m². Surgical approach was posterior in 56%, anterolateral in 33%, and direct anterior in 11%. We evaluated the cumulative incidences of dislocation, any revision, and any reoperation utilizing a competing risk model. Femoral head penetration and osteolysis were assessed at minimum 8-year follow-up. Mean overall follow-up was 6 years.

**Results**

There were no liner fractures or dissociations. The 10-year cumulative incidences of dislocation, any revision, and any reoperation were 3.7%, 4.2%, and 7%, respectively. There were 6 dislocations with 5 of 6 occurring within 1 year. Mean linear femoral head penetration was 0.01mm/year and mean volumetric wear rate was 50mm³/year. There were 6 revisions for recurrent dislocation (2), aseptic loosening of the acetabular component (2), trunnionosis (1), and infection (1). There were 4 additional reoperations for periprosthetic fracture (2) and infection (2).

**Conclusions**

In this large cohort of primary THAs pairing 40mm femoral heads with the smallest compatible acetabular components, there was no evidence of liner fracture or dissociation. HXLPE wear rates were low and no osteolysis was apparent. However, the 10-year cumulative incidence of dislocation was still nearly 4%.
Extended Oral Antibiotic Prophylaxis After Aseptic Revision TKA: Does it Decrease Infection Risk?
Brandon R. Bukowski, MD

Introduction
Extended oral antibiotic prophylaxis (EOA) has been shown to potentially reduce infection rates after high-risk primary total knee arthroplasties (TKA) and reimplantations. However, data are limited regarding EOA after aseptic revision TKA. This study evaluated the impact of EOA on infection-related outcomes after aseptic revision TKA.

Methods
We retrospectively identified 904 consecutive aseptic revision TKAs performed between 2014 and 2019. Patients who received EOA >24 hours perioperatively (n=267) were compared those who did not (n=637) using an inverse probability of treatment-weighted model. The mean age was 66 years, mean BMI was 33 kg/m², and 54% were female. Outcomes included cumulative probabilities of any infection, periprosthetic joint infection (PJI), superficial infection, and reoperation and re-revision for infection. Mean follow-up was 2 years.

Results
The cumulative probability of any infection following aseptic revision TKA was 1.9% at 90 days, 3.5% at 1 year, and 8.8% at 5 years. Patients without EOA had a higher risk of any infection at 90 days (HR=7.1; p=0.01), but not at 1 year (p=0.8) or 5 years (p=0.7). The cumulative probability of PJI following aseptic revision TKA was 0.8% at 90 days, 2.3% at 1 year, and 6.5% at 5 years. Patients without EOA did not have an increased risk of PJI. There was a trend towards increased risk of superficial infection in patients without EOA at 90 days (HR=4.4; p=0.09) and 1 year (HR 1.9; p=0.06), but not at 5 years (p=0.5). There were no differences in re-revision or reoperation for infection at any timepoint between groups.

Conclusion
EOA following aseptic revision TKA was associated with a 7-fold decreased risk of any infection at 90 days. EOA were not associated with decreased risk of deep PJI, however. There were no differences in reoperation for infection at any timepoint based on EOA status.
Modular Fluted Tapered Stems for Periprosthetic Femur Fractures:
Excellent Results in 171 Revision THAs
Charles P. Hannon, M.D., M.B.A.

Introduction
Modular fluted tapered (MFT) stems have advanced treatment of Vancouver B2 and B3 periprosthetic femur fractures, but series to date have been limited by cohort size and follow-up duration. The purpose of this study was to determine implant survivorship, radiographic results, complications, and clinical outcomes of Vancouver B2 and B3 periprosthetic femur fractures treated with MFT stems in a very large series of patients.

Methods
We identified 171 Vancouver B2 (109) and B3 (62) periprosthetic femur fractures treated with a MFT stem between 2000-2018 using our institutional total joint registry. The mean age was 75 years, 50% were female, and mean BMI was 29 kg/m². The median stem diameter was 18 mm and median stem length was 210 mm. The cumulative incidences of revision and reoperation with death as the competing risk were calculated, radiographs were reviewed, and clinical outcomes were evaluated via Harris Hip Score (HHSs). The mean follow-up was 5 years.

Results
The 10-year cumulative incidence of any revision was 10%. There were 17 revisions of which only 3 were for the distal fluted portion of the MFT. Revision indications included periprosthetic joint infections (PJI) (n=6) and dislocation (n=11). The 10-year cumulative incidence of any reoperation was 15%. In addition to the above 17 revisions, there were 7 reoperations for: superficial wound complications (n=4), Vancouver B1 periprosthetic femur fracture (n=1), vascular occlusion (n=1), and acetabular cartilage degeneration requiring an acetabular component (n=1). Radiographically, there was one fracture non-union. All unrevised MFTs were radiographically well-fixed. Subsidence ≥ 5mm occurred in 11%, but all implants were stable at most recent follow-up. The mean HHS was 75 at 2 years (n=71).

Conclusion
In this large series of 171 Vancouver B2 and B3 periprosthetic femur fractures treated with MFT stems, we found such constructs were associated with a high rate of fracture healing and provided extremely reliable and durable implant fixation with no revisions for aseptic loosening. Dislocations and PJI were the most common complications.
Flexion Instability after Total Knee Arthroplasty: Operative & Nonoperative Management of 218 Cases
Charles P. Hannon, M.D., M.B.A.

Introduction
Flexion instability after total knee arthroplasty (TKA) is difficult to diagnose and treat. There is a paucity of literature on the effectiveness of nonoperative management, and series on revision TKAs are limited. The purpose of this study was to comprehensively evaluate the effectiveness and prognostic factors of nonoperative management of flexion instability, and also report the survivorship, clinical outcomes, and radiographic results after revision TKAs for flexion instability.

Methods
We identified 218 patients diagnosed with isolated flexion instability after primary TKA through our total joint registry between 1993 and 2018. The mean age was 66 years, 59% were women, and 58% had a CR implant. Initially, 152 patients (70%) were treated nonoperatively. First-time revision TKA was ultimately performed in 173 patients (64% to VVC and 30% to PS). Knee Society scores (KSSs) and radiographs were reviewed. Kaplan-Meier survivorship was calculated. Mean follow-up was 6 years.

Results
Of the 152 patients treated nonoperatively, 66% reported no improvement. Patients with a CR knee (HR 3.3; p<0.001), inflammatory arthritis (HR 1.6; p=0.03), smokers (HR 2.1; p=0.04), and patient-reported instability (HR 3.8; p<0.001) or effusions (HR 3.5; p<0.001) were more likely to fail nonoperative management and undergo revision. Of the 173 revised, the 10-year survivorship free of any re-revision was 87% with recurrent flexion instability (7), global instability (3), and infection (3) being most common. The 10-year survivorship free of any reoperation was 83%. KSSs improved from 50 to 65 (p=0.14). At final follow-up, all implants were well-fixed.

Conclusion
In the largest series to date of flexion instability after primary TKA, nonoperative management led to improvement in one-third. Patients with a CR knee or with patient-reported instability and/or effusions were most likely to undergo revision. Revision TKA demonstrated modest 10-year functional improvements and good survivorship, but instability remained the most common indication for reoperation.
POSTER #17

Safety of Total Hip Arthroplasty in a Free-Standing Ambulatory Surgery Center in Obese Patients
Zachary A. Mosher, MD

Introduction
Total hip arthroplasty (THA) is increasingly performed as an outpatient procedure, specifically in the free-standing ambulatory surgery center (ASC) setting. This study evaluated the safety of outpatient THA with planned same-day discharge (SDD) in patients with a body mass index (BMI) of 35 or greater.

Methods
A retrospective review of patients undergoing primary THA in 2 free-standing ASCs from June 2013 to June 2020 was performed. All patients with BMI of 35 or greater were included. Patients were evaluated for preoperative and demographic variables, day-of-surgery and intraoperative variables, and postoperative complications. Facility duration, time to postoperative ambulation, and postoperative facility duration were recorded. A Shapiro-Wilk test was used to evaluate the normality of facility times, and they were not normally distributed (p< 0.001), thus the median duration and interquartile range (IQR) was used. Postoperative evaluation included reoperations, readmissions, and emergency department (ED) visits during the 90-day global period.

Results
Two hundred two patients were included. Average age and BMI were 55.4±8.1 and 37.6±2.0, respectively. Patients had 2.4±1.5 comorbidities, with the most common being hypertension (137, 68%). Forty-seven patients had obstructive sleep apnea (23%). Seven patients were ASA Class 1, 121 were Class 2, and 74 were Class 3. One intraoperative complication of fracture was noted, and one patient required an indwelling Foley catheter for urinary retention. Total facility duration was 8 hours, 5 minutes (8:05) (IQR 7:04, 9:29), time to postoperative ambulation was 3:18 (IQR 2:29, 4:10), and postoperative facility duration was 4:23 (IQR 3:21, 5:42). One patient underwent next day discharge due to provider preference, but all others underwent SDD. Five patients (3%) had postoperative complications—2 surgical site infections, 2 dislocations, and 1 periprosthetic fracture. Four patients each (2%) required reoperation, readmission, and an ED visit.

Conclusion
Appropriately selected patients with a BMI over 35 may safely undergo THA in a free-standing ASC with reliable SDD and acceptable complication profiles.
Body Habitus Impact on Success of Cryoneurolysis for Post-Operative Total Knee Arthroplasty Pain Control

Clayton W. Wing MD

Background
With the increased in demand for primary TKA and the potential negative impact of opioid use, additional strategies to minimize postoperative pain are being employed. One adjuvant pain control technique is cryoneurolysis. This procedure utilizes temperatures below –20°C to cause nonpermanent analgesia via Wallerian degeneration. This technique has been shown in several studies to be effective in decreasing post-operative pain as well as the amount of opioids used following surgery. The application of this technique is through a either a short triple probe that targets sensory nerves in the subcutaneous tissues via an anatomical approach or a longer probe that is used in conjunction with ultrasound imaging to target sensory nerve of the superficial femoral and infrapatellar branch of the saphenous nerve. There is concern that with the shorter probes and anatomic approach that body habitus may detract from the efficacy of cryoneurolysis to these nerves due to the deep nature and shorter probes. This study aims to determine the relationship between body habitus and effectiveness of cryoneurolysis on post operative pain control.

Methods
A prospective randomized trial was previously carried out with 62 patients in the control and treatment arm. After IRB review we retrospectively performed a chart review on all patients at our institution who participated in the study from 2017 to 2019. A total of 57 patients were included in this analysis. The iovera device was utilized for cryoneurolysis via a short triple probe and anatomical approach; the target nerves for this study were the infrapatellar branches of the saphenous nerve (ISN) and the anterior femoral cutaneous nerve (AFCN). Study patients were divided into three groups (small, medium, and large) based on the soft tissue to femoral diaphysis ratio 7 cm proximal to the superior pole of the patella as viewed on lateral radiographs. The small group consisted of patients with ratio of 0.8 to 1.3, the medium group was 1.4 to 1.7 and the large group was >1.7. The patients were seen at follow-up post-operatively at 72 hours, 2 weeks, 6 weeks, and 12 weeks and the following outcomes were recorded at each visit: morphine equivalents, visual analog pain score (VAS), range of motion (ROM), and Knee Injury and Osteoarthritis Outcome Score Joint Replacement (KOOSJR). The outcomes between the groups were then compared using an ANOVA one-way test and then a Tukey Kramer post hoc test to pinpoint which group's means were significantly different.

Results
For 72 hours postoperatively, the only significantly different value was ROM between the small and medium group (96.59 vs 82.58, P = .044). Two weeks post operatively the small group had a decrease in morphine equivalents compared to the medium group (54.26 vs 142.86, p=.0097), but there was no significant difference between the small and the large group. At this time point there was also a significant decrease in VAS pain score between the small and medium groups (2.29 vs 3.95, p = .012) and the medium and large groups (3.95 vs 2.39, p = .012). At 6 weeks and 12 weeks post operatively, there was no significant difference in any outcome measure. Lastly 12 weeks post operatively there was an increase in ROM for the small group compared to the medium group (117.89 vs 111.59, P=.042).
Conclusion
Although the small group reported a decrease in pain and opioid use at 2 weeks post operatively compared to the medium group, there did not seem to be a linear correlation between the body habitus of the patient and the effectiveness of post operative pain management. This is evidenced by no significant difference in any outcome measure at any point in the study between the small group and the large group. Thus, based on this study, body habitus does not appear to have a negative impact on the effectiveness of the Iovera cryoneurolysis using the shorter anatomic probes.
Background
Many risk factors have been described for dislocation following total hip arthroplasty (THA), yet a patient-specific risk assessment tool remains elusive. The purpose of this study was to develop a high-dimensional, patient-specific risk-stratification nomogram that allows dynamic risk modification based on operative decisions.

Methods
29,351 THA performed between 1998-2018 were evaluated including 21,978 primary and 7,373 revision cases. During mean 6-year follow-up, 1,522 THA sustained a dislocation. Patients were characterized on non-modifiable factors (demographics, THA indication, spinal disease, spine surgery, neurologic disease, connective tissue disease), and modifiable operative decisions (surgical approach, femoral head diameter, acetabular liner [standard/elevated/constrained/dual mobility]). Multivariable regression models and nomograms were developed with dislocation as a binary outcome at 1-year and 5-years postoperatively.

Results
Patient-specific dislocation risk was wide-ranging from 2%-16% at 1-year and 3%-24% at 5-years in primary THA, and 7%-35% at 1-year and 10%-46% at 5-years in revision THA. In primary THA, direct anterior approach and lateral approach decreased risk compared to posterior approach (HR=0.27 and HR=0.58, respectively). In primary THA, when adjusting for approach, the combination of femoral heads ≥36mm and elevated liners yielded the largest decrease in risk (HR=0.28), followed by dual mobility constructs (HR=0.47). In revision THA, the adjusted risk of dislocation was most markedly decreased with dual mobility constructs (HR=0.34), followed by femoral heads ≥36mm and elevated liners (HR=0.60). In revision THA, adjusted risk of dislocation was decreased with acetabular revision, irrespective of whether other components were revised (HR=0.60).

Conclusion
This patient-specific dislocation risk calculator is strengthened by a robust multivariable model that accounts for comorbidities associated with instability and demonstrates wide-ranging patient-specific risk based on comorbid profile. The resultant nomograms can be used as a screening tool to identify high-risk THA patients and individualize operative decisions. Further refinement will include deep learning-assisted preoperative imaging and acetabular component position assessment.

Summary
This patient-specific dislocation risk calculator demonstrates wide-ranging risk based on comorbid profile and enables surgeons to quantify risk mitigation based on operative decisions.
Depression and Anxiety Are Associated with Increased Risk of Infections, Revisions, and Reoperations Following Total Hip Arthroplasty

Cody C. Wyles, MD

Introduction
Depression and anxiety are increasingly linked with worse health outcomes. Furthermore, there has been a historic lack of attention to these comorbidities within total hip arthroplasty (THA) cohorts. This study aimed to define the prevalence of anxiety and/or depression prior to primary and revision THAs, and assess impact on rates of any infection, revision, reoperation, and non-surgical complications.

Methods
Between 2000–2019, 10,011 THAs (8,701 primaries, 1,310 revisions) performed at a single academic center were identified in patients from a 27-county network of linked electronic medical records (EMRs). Depression and anxiety were determined from either diagnoses in the EMRs or through an artificial intelligence natural language processing program that identified medications used for depression or anxiety, which underwent subsequent manual chart review validation. Patients with mental health diagnoses other than depression or anxiety were excluded. Mean age was 69 years, mean BMI was 30 kg/m², 55% were female, and mean follow-up was 5 years.

Results
Combined depression/anxiety prevalence was 30% prior to primary THA and 33% prior to revision THA. Among primary THA patients with depression and/or anxiety, the risk of any infection (HR=1.5), revision (HR=1.7), reoperation (HR=1.6), and non-surgical complications (HR=1.3) were all significantly increased (p<0.001). This was even more pronounced after revision THA with increased risk of any infection (HR=1.9), revision (HR=2), and reoperation (HR=2.2) (p<0.001).

Conclusion
Depression and anxiety are common diagnoses prior to THA and associated with significantly higher risks of infection, revision, reoperation, and non-surgical complications that is approximately 1.5-fold higher in primary THA and 2-fold in revision THA. This topic deserves further study, and surgeons may consider mental health optimization to be of similar importance to preoperative variables such as diabetes control prior to THA.

Summary
Combined depression/anxiety prevalence was 30% prior to primary THA, 33% prior to revision THA and associated with significantly increased risk of infection, revision, reoperation, and complications.
Robotic-Assisted Total Knee Arthroplasty Allows for Resident Involvement and Teaching without Lengthening Operative Time

David G. Deckey, MD

Aims
Robot-assisted total knee arthroplasty (RA-TKA) has been hypothesized to improve precision, accuracy, and post-operative outcomes relative to manual total knee arthroplasty (M-TKA), however RA-TKA may increase operative times. Trainee impact on surgical time is an important consideration in the academic setting, as increased procedural times can expose patients to increased risk, increase cost, and limit overall case volume. We sought to evaluate whether RA-TKA procedures were longer than M-TKA procedures and whether the time differential was accentuated by trainee participation.

Patients and Methods
Two-hundred and twenty (110 M-TKA and 110 RA-TKA) consecutive, primary TKAs performed by a single surgeon with a trainee/fellow or physician assistant (PA) as first assist were reviewed. For M-TKAs, measured resection technique was used. For all RA-TKAs, the MAKO robotic system (Stryker, Mahwah, NJ) was used. Tourniquet time was measured from inflation immediately prior to skin incision to deflation after placement of the final polyethylene insert. PAs were used as controls for trainee procedures, as they perform a similar range of tasks in assisting the attending surgeon but were not responsible for learning operative techniques and performing components of the procedure.

Results
103 M-TKA and 96 RA-TKA were included. Overall tourniquet time was significantly longer for RA-TKAs in comparison to M-TKAs (99 v. 89 minutes; p<0.0001), however, there were no significant differences in tourniquet times between trainee- vs. PA-assisted surgery for either M-TKA (p=0.3107) or RA-TKA (p=0.6231).

Conclusions
Trainee presence was not associated with an increase in operative time during RA-TKA. This is important for 2 reasons: 1) this demonstrates that trainees can be educated in the use of robotic technology without compromising surgical efficiency or increasing patient risk due to an increase in surgical time; 2) the use of robotics in TKA to provide real-time feedback to trainees during the surgery does not impact surgical efficiency.
**Take home message**
Trainee involvement and teaching during robotic assisted total knee arthroplasty does not increase operative time when compared to manual total knee arthroplasty.
What is the Duration of Irrigation? An In-Vitro Study of the Time to Eradicate Bacteria with Common Irrigation Solutions

Zachary K. Christopher, MD

Background
Antiseptic irrigation solutions are commonly used by arthroplasty surgeons to reduce intraoperative bacterial colonization with the goal of reducing post-operative infections in the setting of primary total joint arthroplasty. Several commercially available antimicrobial irrigation solutions exist and are frequently used intraoperatively. Currently, the minimum irrigation time required to eliminate common microbes implicated in periprosthetic joint infection is not known.

Questions/Purposes
What is the minimum effective irrigation time required to prevent growth of Staphylococcus aureus, Staphylococcus epidermidis, and Cutibacterium acnes with frequently used commercially available antiseptic solutions?

Methods
Staphylococcus aureus, Staphylococcus epidermidis, and Cutibacterium acnes cultures were treated with povidone-iodine (0.35%), chlorhexidine (0.05%), sodium hypochlorite (0.5%), polyhexamethylene biguanide, and a proprietary acetic acid-based solution for 15, 30, 60, 90, and 120 seconds in triplicate. Bacterial growth was quantified using the drop-plate method after 48 hours growth and up to 21 days for C. acnes. Failure to eliminate all bacterial growth was considered “not effective” at that particular time point.

Results
Povidone-iodine 0.35% (Betadine), sodium hypochlorite 0.5% (Hysept), and acetic acid (Bactisure) eradicated all bacterial growth after 90 seconds of treatment, and as low as 15 seconds in S. aureus and C. acnes (Betadine) or S. epidermidis (Bactisure). Polyhexamethylene biguanide (Prosontan) had a longer mean time to kill requiring 90 seconds of treatment for elimination of S. aureus and S. epidermidis, and 120 seconds for C. acnes. Chlorhexidine 0.05% (Irrisept) did not effectively eradicate bacterial growth after 120 seconds of treatment in S. aureus or C. acnes but did eliminate all growth of S. epidermidis at that time point.

Conclusions
All tested antiseptic solutions demonstrated successful eradication of all bacterial growth in under 2 minutes of treatment time except chlorhexidine 0.05%. Povidone-iodine 0.35% may require the shortest duration of treatment time to successfully eradicate common bacteria in total joint arthroplasty.
The Viability of an Artificial Intelligence Prediction Model to Determine Candidates for Knee Arthroplasty

Derek J. Semaan, MD

Introduction
The use of artificial intelligence (AI) modeling has been increasing in healthcare; however, its application in orthopedics has been limited. Knee arthroplasty is one of the most common surgeries in orthopedics with some projections noting upward of a 300% increase over the next decade. Not all patients with knee pain are candidates for joint replacement, and primary care physicians (PCP) are often the gatekeepers for specialty referral. Tools that could help PCPs direct referrals would optimize healthcare utilization and patient care. The purpose of this study is to develop a prediction model, and assess its viability, to determine if patients with knee pain are candidates for total knee arthroplasty (TKA), unicompartmental knee arthroplasty (UKA), or no knee arthroplasty surgery.

Methods
Analysis was performed using radiographic and surgical data from a high-volume joint replacement practice. The dataset included three x-ray views (Anterior Posterior (AP), Lateral, and Sunrise) for 2767 patients along with information of whether that patient underwent an arthroplasty surgery (UKA or TKA) or not. This data was deidentified of protected health information (PHI) prior to AI model development. The radiographs were also put on the labelling platform DiagnosUs to harness a crowdsourced network of medical students and professionals to clean the dataset by identifying overexposed and/or corrupted data. Upon removing studies that didn't have all three views, the dataset of 8121 images from 2707 patients was finalized for model development. This dataset was then split into a training set (50%), validation set (20%), and holdout test set (30%). A computer vision model was trained using a transfer learning approach based on the tensorflow EfficientNetB4 architecture with image augmentations and 5-Fold Cross Validation. The performance of the computer vision model was evaluated on the hold out test set. Accuracy and Multiclass Receiver Operating Characteristic area under the curve (AUROC) were used to reliably evaluate the performance for predicting probabilities of the type of procedure needed to be done against clinical observations.

Results
The AI model achieved an accuracy of 83.3%. An AUROC for no surgery versus surgery was calculated to be 0.972 and for total knee versus not total knee was calculated to be 0.950. A 91.5% accuracy for predicting no surgery versus surgery was achieved. Negative predictive value for no surgery was calculated to be 88.5%; and positive predictive value for surgery was calculated to be 93.9%.

Discussion And Conclusion
The AI vision model demonstrated viability for predicting which patients are candidates for a UKA, TKA, or no surgical intervention. The model was especially accurate at distinguishing cases fit for a surgical intervention from those that did not require surgery. A larger data set analysis will further improve the accuracy of this model, and in conjunction with clinical data, could aid in clinical decision making for specialty referrals.
SURVIVORSHIP OF A METAL-ON-METAL TOTAL HIP IMPLANT WITH MODULAR TITANIUM TAPER ADAPTER

Derek J. Semaan, MD

Background
Use of metal on metal (MOM) as a bearing surface in total hip arthroplasty (THA) has sharply declined due to high failure rates from metal ion related complications. While certain MoM designs have demonstrated a survival rate of only 46%, not all MoM designs have performed the same. The purpose of this study is to evaluate the mid- to long-term survival of a specific MoM implant with a modular titanium taper adapter.

Methods
A retrospective review was performed on all primary THAs performed between 2004 and 2010 with the Magnum total hip system (Zimmer Biomet, Warsaw, IN). Initial query revealed 1014 hips. Patients were included in analysis if they had 2-year minimum follow-up and/or a revision surgery at any point along with a signed research consent. A total of 821 patients (946 hips) met inclusion criteria. Data collection included patient age, gender, body mass index (BMI), pre and postoperative Harris Hip Scores (HHS). Postoperative acetabular abduction angle was measured. Clinical outcomes were assessed along with revision rates, time to revision and reason for revision. Statistical analysis included paired-test test for ordinal variables, chi square analysis for categorical variables and Kaplan-Meier survival analysis.

Results
Mean patient age was 57.9 years old (range, 20 to 91 years old) and mean BMI was 31.8 kg/m² (range, 17.9 to 68.7 kg/m²). 58.2% of patients were male. Mean follow-up was 10.2 years (range, 0 to 16.1 years). Mean Harris hip score improved from 51.2 preoperatively to 82.2 postoperatively (p<0.001). Overall, there 64 revisions (6.77%) with 58 revisions (6.13%) for aseptic causes and 29 revisions (3.07%) specifically for metallosis-related complications. There was no statistically significant difference between females and males for all-cause revision (7.8% versus 6.0%, p=0.277), aseptic revision (7.1% versus 5.5%, p=0.315) or revision for adverse metal reaction (4.0% versus 2.4%, p=0.143). Mean acetabular component abduction was 43.2 degrees (range, 24 to 70 degrees) in patients who had aseptic failure compared to 42.7 degrees (range, 25 to 64 degrees) in patients who did not (p=0.546). Kaplan-Meier aseptic survival at 15 years was 89.4% (95% CI, 87.7% to 91.1%).

Conclusions
The results of this study demonstrate a more favorable mid- to long-term survivorship with this specific MoM implant as compared to other designs. While our institution no longer performs MoM THA, further investigation into differences in MoM implant designs is warranted.
POSTER #25

Is Radiographic Malseating of Modular Dual-Mobility Liners Associated with Tribocorrosion Damage in Total Hip Arthroplasty?

E. Bailey Terhune, MD

Introduction
As most modular dual mobility (DM) bearings have a junction between a Co-Cr liner and titanium shell, the risk of tribocorrosion at this interface remains a concern. The purpose of this study is to determine whether radiographic liner malseating is associated with liner tribocorrosion.

Methods
Seventeen retrieved modular DM implants with a mean in-situ duration of 14.1 months (range 1-83) were evaluated. Two manufacturers were included (11 and 6 liners, respectively). Liners were considered malseated if a distinct divergence between the liner and shell was present on postoperative radiographs. Taper tribocorrosion was analyzed qualitatively with the modified Goldberg Score (mGS) and quantitatively with an optical coordinate-measuring-machine (CMM).

Results
Four implants (23%) had severe grade 4 tribocorrosion, two (12%) moderate grade 3, eight (47%) mild grade 2, and three (18%) grade 1 or no visible tribocorrosion based on mGS. Longer in-situ duration positively correlated with increased mGS (r=0.83, p<0.001) and volumetric material loss caused by wear and corrosion (r=0.64, p=0.007). There was no difference in volumetric material loss between the two manufacturers (0.14 vs. 0.0 mm³, p=0.21).

Malseating occurred in 5 of 11 liners from manufacturer A and 0 of 6 liners from manufacturer B (p=0.10). Malseated components had a longer mean in-situ duration (36.8 vs. 4.6 months, p=0.002) and greater volumetric material loss (0.298 vs. 0.005 mm³, p=0.003), with no significant difference in mGS. However, multiple linear regression modeling did not show in-situ duration (p=0.12) or malseating (p=0.32) to be independently associated with volumetric material loss.

Conclusion
While malseated liners were associated with greater volumetric material loss, in our series they also had a longer mean in situ duration. Thus, the independent association of malseating on liner tribocorrosion is still unclear. While 35% of liners possessed severe or moderate tribocorrosion, longitudinal studies are required to determine its clinical significance.
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*Unable to assess due to deformation of liner during removal
Introduction
The purpose of this study was to identify the preoperative daily opioid dose associated with increased complications after revision total knee arthroplasty (TKA).

Methods
Patients in the Humana claims database undergoing revision TKA (2007-2017) with an opioid prescription within three months prior to surgery were stratified based on daily opioid dose: Tier 1) <10 milligram morphine equivalents (MME), Tier 2) 10-25 MME, Tier 3) >25 MME. Each tier was matched 1:1 to opioid naïve patients. Emergency department (ED) visits and readmissions were compared at 90 days. Surgical complications were compared at 2 years. Relative risks (RR) were calculated.

Results
Of 10,760 patients who underwent revision TKA, 4,968 (46.2%) were using preoperative opioids in the three months prior to surgery. After matching, length of stay was significantly longer in opioid users in all tiers (Tier 1: 6.26 vs 5.61, p=.003; Tier 2: 6.79 vs 5.76, p=.002; Tier 3: 7.24 vs 6.05, p<.001). ED visits were significantly higher in patients taking preoperative opioids in all tiers (RR 1.15, 1.38, 1.43, respectively). Readmission was significantly higher in opioid users in Tier 3 (10.4% vs 7.6%, p=.008). Risk of arthrodesis was significantly higher in Tiers 2 and 3 (RR: 2.38, 2.27 respectively). Subsequent revision surgery was significantly higher in opioid users in all tiers (RR 1.14, 1.19, 1.40 respectively).

Conclusions
Preoperative opioid use is associated with a dose-dependent increase in complications after revision TKA. Just two 5mg hydrocodone tablets daily leads to a significant increase in length of stay, ED visits and revision surgery. Higher doses are associated with readmission, superficial infection, and arthrodesis. This study highlights the high prevalence of preoperative opioid use and the powerful effect that opioids have on postoperative outcomes after revision TKA.
## Complications at 2 years after revision TKA

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Introduction
Total knee arthroplasty (TKA) is a reliable and safe procedure that is associated with predictably good outcomes. As perioperative management of patients undergoing TKA has advanced, more medically frail patients have become candidates. One such cohort is patients requiring chronic anti-coagulation (CA) for underlying medical comorbidities. We aimed to explore if these patients can expect similar complication rates following TKA as patients not requiring CA.

Methods
This is a retrospective cohort study using The Truven Marketscan® databases. Patients undergoing primary TKA were identified and divided into cohorts based on preoperative medication status (i.e., having an anti-coagulation prescription filled six prior to and six months following surgery). Patients undergoing revision surgery, those <18 years-old, and those without 6-month preoperative and two-year postoperative enrollment were excluded. Patient demographics and comorbidities were collected and controlled for in the analysis of 90-day and two-year outcomes. Univariate and multivariate analyses were performed to compare outcomes between cohorts.

Results
53,168 patients were included with 12,367 on preoperative CA (18.9%). At 90 days, CA patients had increased odds of wound complications (OR 1.64, 95% CI 1.42-1.91, p < 0.001), hematoma formation (OR 2.35, 95% CI 1.82-3.04, p < 0.001), and revision surgery (OR 1.26, 95% CI 1.06-1.50, p = 0.01). At two-years, CA patients had increased odds of periprosthetic joint infection (PJI) (OR 1.63, 95% CI 1.44-1.86, p < 0.001) as well as non-infectious revision surgery (OR 2.03, 95% CI 1.50-2.76, p < 0.001).

Conclusion
Preoperative CA is associated with significantly higher odds of 90-day and 2-year complications after primary TKA. In particular, the increased odds of PJI and aseptic revision should be noted given their significant associated morbidity. Patients receiving CA should be counseled preoperatively regarding these risks.
Outcomes Following Total Knee Arthroplasty in Patients with Prior Anterior Cruciate Ligament Reconstruction

Jacob M. Wilson, MD; James R. Markos, MD; Nicholas A. Bedard, M.D.; Daniel J. Berry, M.D.; Robert T. Trousdale, MD; Matthew P. Abdel, M.D.

Introduction
The degenerative implications of anterior cruciate ligament (ACL) injury are well documented. Despite this, there remains a paucity of data describing the outcomes of total knee arthroplasty (TKA) following prior ACL reconstruction (ACLR). Existing literature is limited by either cohort size or by follow-up duration. We aimed to describe the implant survivorship, radiographic results, clinical outcomes, and complications of TKA after ACLR at the mid-term in the largest series to date.

Methods
Patients undergoing primary TKA following prior ACLR between 1990 and 2016 were identified from our institutional total joint registry. Those with prior multiligamentous knee reconstructions and prior osteotomies were excluded. We identified 171 knees in 165 patients (42% female) with a mean age at TKA of 56 years. Mean follow-up was 8 years.

Results
The 10-year survivorship free of any revision and any reoperation were 92% and 88%, respectively. Seven patients were revised for instability, 4 for periprosthetic joint infection, and 2 for periprosthetic fracture. There were 5 additional reoperations: 3 manipulations under anesthesia (MUA), 1 superficial irrigation and debridement, and 1 arthroscopic synovectomy for patellar clunk. Radiographically, all surviving knees were well fixed at final follow-up. There were 19 complications (11.8%) not resulting in reoperation: 8 cases of postoperative stiffness, 7 venothromboembolic events, 3 superficial infections, 2 hematomas, and 2 patella fractures.

Conclusion
In the largest series to date describing outcomes of TKAs after ACLR, we found that 10-year survivorship was less than anticipated with instability being the most common reason for revision. In addition, the most common reason for reoperation was MUA indicating that balancing such knees is often difficult.
General versus Neuraxial Anesthesia in Revision Surgery for Periprosthetic Joint Infection

Joseph Serino, MD

Introduction
Neuraxial anesthesia for patients undergoing revision total hip or knee arthroplasty for periprosthetic joint infection (PJI) remains controversial, as there is concern for seeding the cerebrospinal spaces. The current study was thus performed to compare outcomes of revision surgery for PJI performed with general versus neuraxial anesthesia.

Methods
Patients undergoing revision hip or knee arthroplasty for PJI were identified in the 2005-2019 American College of Surgeons National Surgical Quality Improvement Program databases. Patient characteristics, comorbidities, procedures, and thirty-day outcomes were compared between cases performed with general and neuraxial anesthesia (spinal or epidural). Propensity score matching and multivariate analysis were used to control for differences in demographics, functional status, comorbidities, and procedure type between cohorts. The significance level was set using a Bonferroni correction.

Results
Of the 8,979 patients identified, 1,511 (16.8%) and 7,468 (83.2%) received neuraxial and general anesthesia, respectively. On univariate analysis of the unmatched cohorts, neuraxial anesthesia was associated with lower rates of any adverse event (35.6% vs. 46.4%, p<0.001), serious adverse events (22.2% vs. 29.8%, p<0.001), and minor adverse events (19.3% vs. 27.1%, p<0.001) compared to general anesthesia. Readmission and reoperation rates were similar between cohorts. Of the 875 (11.0%) reoperations, two had a diagnosis of intraspinal abscess, both occurring after general anesthesia (p=0.512). Among the 1,351 (16.2%) readmissions, none had a primary diagnosis of intraspinal abscess or meningitis. On multivariate analysis, neuraxial anesthesia had a lower risk of any adverse event (odds ratio [OR] 0.70, 95% confidence interval [CI] 0.62-0.79, p<0.001), serious adverse events (OR 0.77, CI 0.68-0.89, p<0.001), minor adverse events (OR 0.66, CI 0.58-0.77, p<0.001), sepsis (OR 0.57, CI 0.45-0.73, p<0.001), and transfusions (OR 0.63, CI 0.53-0.74, p<0.001). Compared to the propensity-matched cohort of 1,504 patients who received general anesthesia, neuraxial anesthesia was associated with similar benefits. In addition, the neuraxial anesthesia cohort had a lower rate of deep surgical site infection (OR 0.73, CI 0.61-0.88, p<0.001) and a higher rate of superficial surgical site infection (OR 2.95, CI 1.48-5.88, p=0.002) compared to the matched general anesthesia cohort.

Conclusion
Neuraxial anesthesia is associated with a significantly lower risk of any adverse event, serious adverse events, minor adverse events, sepsis, and blood transfusion when compared to general anesthesia in revision surgery for PJI. We found no evidence to suggest that neuraxial anesthesia increases the risk of intraspinal abscess or meningitis.
The Cost-Effectiveness of Tibial Metaphyseal Cones in Revision Total Knee Arthroplasty

Joseph Serino, MD

Introduction
Tibial cones have been successfully used to address contained bone defects in revision total knee arthroplasty (TKA). Cones potentially decrease the rate of aseptic loosening through improved fixation, but it remains unclear whether this justifies the additional cost. The purpose of this study was to evaluate the cost-effectiveness of tibial cones in revision TKA.

Methods
A Markov decision model was used for cost-effectiveness analysis. The average selling prices of all commercially available tibial cones were obtained from Orthopedic Network News in March 2020. The average annual aseptic loosening rate of a tibial cone was determined by a literature review of 21 studies (607 cones, Table 2). Inflation-adjusted hospitalization costs and baseline 5-year re-revision rates were calculated using the PearlDiver Database during 2010-2020.

Results
The average lifetime cost of revision TKA with a tibial cone exceeded that of revision TKA without a cone by $687-$4,093. The maximum cost-effective cone price varied from $3,514 at age 40 to $648 at age 90, compared to the current average price of $4,201. Cones became cost-effective when the baseline (non-cone) aseptic loosening rate ranged from 0.89% annually at age 40 to 4.38% annually at age 90, compared to the current average rate of failure without cones of 0.76% annually. For patients with an expected 5-year aseptic loosening rate of 5%, cones became cost-effective for patients ≤50 years old; at an expected aseptic loosening rate of 7%, cones were cost-effective for patients ≤60 years; at 10%, cones were cost-effective for patients ≤70 years; at 15-20%, cones were cost-effective for patients ≤80 years. At a price of $3,000, cones were cost-effective for patients ≤50 years old; at $2,000, cones were cost-effective for patients ≤70 years; at $1,000, cones were cost-effective for patients ≤80 years.

Conclusions
For the average patient undergoing revision TKA, tibial cones are not cost-effective. Cones may become cost-effective at lower prices, in younger patients or in patients at substantially increased risk of aseptic loosening.
Table 1: Variables used for Markov decision modeling

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibial cone cost¹</td>
<td>Orthopedic Network News</td>
<td>$4,201</td>
<td>Mean average selling price of all tibial metaphyseal cones offered by Zimmer Biomet (Warsaw, IN, USA), Smith &amp; Nephew (London, UK), and Stryker (Kalamazoo, MI, USA)</td>
</tr>
<tr>
<td>Initial revision cost¹</td>
<td>PearlDiver Database</td>
<td>$29,802</td>
<td>Average hospitalization cost of TKA revisions for aseptic loosening (ICD-9 996.41, 996.45, 00.80, ICD-10 T84.03)</td>
</tr>
<tr>
<td>Cost of re-revision for tibial component aseptic loosening²</td>
<td>PearlDiver Database</td>
<td>$34,874</td>
<td>Average hospitalization cost of TKA re-revision for aseptic loosening (ICD-9 996.41, 996.45, 00.80, ICD-10 T84.03)</td>
</tr>
<tr>
<td>Cost of re-revision for all other causes¹</td>
<td>PearlDiver Database</td>
<td>$35,808</td>
<td>Average hospitalization cost of re-revisions for infection (ICD-9 996.66, 996.67, ICD-10 T84.5), peri-prosthetic fracture (ICD-9 996.44, ICD-10 T84.04, M97.1), instability (ICD-9 996.47, 996.42, ICD-10 84.02), and femoral component loosening (ICD-9 996.41, 996.45, 00.82, ICD-10 T84.03), weighted by incidence</td>
</tr>
<tr>
<td>Annual re-revision rate for aseptic tibial cone loosening</td>
<td>Literature Review</td>
<td>0.136%</td>
<td>Weighted average based on literature review (Table 2)</td>
</tr>
<tr>
<td>Annual re-revision rate for aseptic tibial component loosening (without cone)²</td>
<td>PearlDiver Database</td>
<td>0.756%</td>
<td>Re-revision rate for aseptic loosening (ICD-9 996.41, 996.45, 00.80, ICD-10 T84.03)</td>
</tr>
<tr>
<td>Annual re-revision rate for all other causes²</td>
<td>PearlDiver Database</td>
<td>1.213%</td>
<td>Average re-revision rate for infection (ICD-9 996.66, 996.67, ICD-10 T84.5), peri-prosthetic fracture (ICD-9 996.44, ICD-10 T84.04, M97.1), instability (ICD-9 996.47, 996.42, ICD-10 84.02), and femoral component loosening (ICD-9 996.41, 996.45, 00.82, ICD-10 T84.03)</td>
</tr>
<tr>
<td>Annual mortality rate</td>
<td>Social Security Administration Period Life Tables</td>
<td>Varies by age</td>
<td>Sex-adjusted all-cause probability of death</td>
</tr>
<tr>
<td>Annual discount rate</td>
<td>None</td>
<td>3%</td>
<td>Discounts all costs equally by 3% per year</td>
</tr>
</tbody>
</table>

¹All costs adjusted to 2021 dollar value; ²Annual re-revision rates averaged over 5 years; TKA, total knee arthroplasty; ICD-9, international classification of disease; 9th revision codes, ICD-10, international classification of disease, 10th revision codes.

Table 2: Cost analysis of revision total knee arthroplasty with and without use of metaphyseal tibial cones. All costs adjusted to 2021 dollar value.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Lifetime Cost with Cone</th>
<th>Lifetime Cost without Cone</th>
<th>Increased Cost of Cone</th>
<th>Cost-Effective Cone Price</th>
<th>Cost-Effective Baseline Aseptic Loosening Rate¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>$45,049</td>
<td>$44,362</td>
<td>$687</td>
<td>$3,514</td>
<td>0.894%</td>
</tr>
<tr>
<td>50</td>
<td>$43,466</td>
<td>$42,493</td>
<td>$973</td>
<td>$3,229</td>
<td>0.965%</td>
</tr>
<tr>
<td>60</td>
<td>$41,417</td>
<td>$39,943</td>
<td>$1,474</td>
<td>$2,727</td>
<td>1.125%</td>
</tr>
<tr>
<td>70</td>
<td>$39,465</td>
<td>$37,401</td>
<td>$2,064</td>
<td>$2,137</td>
<td>1.409%</td>
</tr>
<tr>
<td>80</td>
<td>$37,208</td>
<td>$34,342</td>
<td>$2,866</td>
<td>$1,335</td>
<td>2.193%</td>
</tr>
<tr>
<td>90</td>
<td>$35,490</td>
<td>$31,397</td>
<td>$4,093</td>
<td>$648</td>
<td>4.383%</td>
</tr>
</tbody>
</table>

¹Minimum baseline (non-cone) annual aseptic loosening rate that would make a tibial cone cost-effective

Figure 1: Average lifetime cost of revision total knee arthroplasty with and without a tibial cone.
Figure 2: Cost-effective price of tibial cones

Figure 3: Cost-effective cone aseptic loosening rate by baseline aseptic loosening rate.
Figure 4: Cost-effective aseptic loosening rate of a tibial cone by cone price.
Periprosthetic joint infection following total hip arthroplasty (THA) can be a devastating complication which requires a lengthy treatment course and is often fraught with complications. There are various types of antibiotic-impregnated spacers which can be used to treat periprosthetic hip infections, with articulating spacers being utilized frequently with the goal of preserving patient range of motion and functionality. Many of these articulating spacers have pre-set sizes and stem options, which accommodate the majority of patients. However, with significant proximal femoral bone loss these spacers are not adequate, and augmentation is necessary to create a construct suitable for the patient. The goal of this article is to report a surgical technique which can be used in the salvage of failed antibiotic-impregnated spacers where severe femoral bone loss is present.
90-Day Readmission Rates Are Lowered with Early Discharge on Postoperative Day 1 (POD1) in Patients Undergoing Total Joint Arthroplasty: A Large Medicare Database Study

Justin A. Stafford DO

Background
The purpose of this study was to evaluate if postoperative length-of-stay (LOS) of 1 day when compared with 2-4 days following primary total knee (TKA) or total hip arthroplasty (THA) plays a protective role in reducing 90-day readmission rates, after controlling for influence of comorbidities.

Methods
Using the PearlDiver database, we identified patients who underwent TKA or THA between 2005 to 2014. Patients with a LOS of 1 day were filtered for each procedure to serve as a control group, whereas patients with a LOS of 2 days, 3 days, or 4 days served as the study groups. Patients in the study and control groups were matched according to age, gender, and Elixhauser-Comorbidity Index (ECI). This resulted in 648,758 patients amongst six TKA and 346,732 patients amongst six THA cohorts. Logistic regression analysis was used to analyze and compare odds of 90-day readmission rates. An alpha value less than 0.05 was considered statistically significant.

Results
Regardless of comorbid conditions, patients with a LOS of 2 days (OR: 2.89, 95% CI: 2.77 – 3.00), LOS of 3 days (OR: 2.80, 95%CI: 2.69 – 2.91), and LOS of 4 days (OR: 2.83, 95%CI: 2.72 – 2.95) following primary TKA had statistically significant greater 90-day readmission rates compared to patients who were discharged within a day of their index procedure. Similarly, patients with a LOS of 2 days (OR: 2.93, 95%CI: 2.77 – 3.10), LOS of 3 days (OR: 2.91, 95%CI: 2.75 – 3.07), or LOS of 4 days (OR: 2.91, 95%CI: 2.73 – 3.05) following primary THA had greater frequency of 90-day readmission rates compared to patients being discharged within a day of their index procedure.

Conclusion
Patients with LOS longer than one day were found to have greater odds of 90-day readmission rates following index TKA or THA after accounting for influence of comorbidities. Optimizing patients prior to surgery to minimize their in-hospital LOS is of critical importance. Fast-track protocols will continue to be influential in lowering perioperative complications and readmission burden while also ensuring that patients are well prepared for early discharge.
Ultrasound Guided Adductor Canal Block vs Intra-Operative Trans-Articular Saphenous Nerve Block: A Retrospective Analysis

Presented by: Linsen T. Samuel, MD, MBA
Senior Author: Joseph T. Moskal, MD, FACS

Introduction
The ultrasound guided adductor canal block (high ACB) has been shown to be an effective option for post-operative pain control in total knee arthroplasty (TKA). Unfortunately, its use can also add up to $2000 in cost, along with preparatory time to a TKA procedure. An intra-operative adductor canal block (low ACB) performed by the operative surgeon from within the joint has been described as an alternative. The hypothesis of this study was that the low ACB would achieve non-inferior pain control and opioid utilization post-operatively when compared to the high ACB.

Methods
This was a retrospective study of a prospectively maintained database comparing the high ACB vs the low ACB. The primary outcome measures were visual analogue scale (VAS) pain scores and morphine milligram equivalents consumed. Secondary outcome measures included post-operative outcomes (PROMIS, KOOS, knee ROM), length of stay, post-operative speed of mobilization, and complications related to the type of block.

Results
There were 139 patients in the study. There was a statistically significant difference in VAS score on POD #1 in the low ACB vs high ACB groups respectively (4.6 vs 3.7, P=0.02) but this was not felt to be clinically significant. There was lower opioid use in the first 24 hours between the in the low ACB compared to the high ACB group respectively (26.3 vs 30, P=0.29) but this did not reach statistical significance. There was no statistical difference in the PROMIS, KOOS, or post-op ROM. There were no block-related complications in either group.

Discussion
The low ACB is a safe, effective, and cost-saving alternative to the traditional high ACB for pain control in TKA.
Clinical Outcomes and Survivorship of Hybrid Total Hip Arthroplasty Performed Through the Anterior Approach

Presented by: Linsen T. Samuel, MD, MBA
Senior Author: Joseph T. Moskal, MD, FACS

Introduction

There is growing evidence that cemented femoral stems have lower complication rates in the elderly due to lower rates of periprosthetic fracture. The main objective of this study was to analyze the survival rate of a hybrid total hip arthroplasty (THA) construct utilizing a taper slip femoral stem implanted through the anterior approach (AA). Secondary outcome measures were the complication rate, the rate of aseptic loosening, coronal plane alignment of the stem, and grade of the cement mantle.

Methods

Patients who underwent AA hybrid THA from 2013 to 2020 were included. Indications for a cemented stem were age over 70, or patients with poor bone quality. Descriptive statistics were calculated for patient characteristics. Serial radiographs were reviewed for component alignment and for evidence of implant loosening. The survival of the femoral stem was recorded, with failure defined as femoral stem revision for any reason or radiographic evidence of implant loosening.

Results

A total of 473 hybrid THA were identified, with an average age of 76 years. Average follow-up was 38 months. Femoral stem survival was 99.2%. There were no cases of aseptic loosening of the femoral component. Average coronal stem alignment was 0.2 degrees varus, and all were within 5 degrees of neutral. Cement mantle grade was either A or B in 94% of cases.

Conclusion

AA hybrid THA is an excellent option in elderly patients, or patients with poor bone quality, with a femoral stem survival rate of 99.2% and a 0% rate of aseptic loosening.
Patient Satisfaction and Survivorship of Robotic-Assisted Lateral Unicompartmental Knee Arthroplasty at a Minimum two-year Follow-up

Hugo C. Rodriguez Jr., DO, MBS

Introduction
Unicompartmental knee arthroplasty (UKA) has been shown to be a successful treatment modality for isolated osteoarthritis (OA) of the knee. The reproduction of proper knee kinematics, limb alignment, as well as proper soft tissue balancing and component positioning have been shown to be of the upmost importance for a successful UKA. Robotic assistance has shown to be a reliable tool in order to replicate these factors, as compared to manual instrumentation alone. Recent studies have shown the potential of robotic-assisted surgery in controlling these surgical factors for medial UKA, however, studies assessing outcomes of robotic-assisted lateral UKA are lacking. Therefore, a retrospective single center study was performed to assess outcomes of robotic-assisted lateral UKA.

Methods
A total of 68 patients (72 knees) underwent robotic-assisted lateral UKA surgery from a single surgeon at a central institution between January 2008 and April 2019. All patients received a lateral UKA with a fixed-bearing metal backed onlay tibial component. Patients over the age of 18, with at least a two-year follow-up and a lateral UKA were contacted by phone and asked a series of questions to determine satisfaction and survivorship. Each patient was asked in a ‘yes’ or ‘no’ manner, if they have had their implant revised or reoperated for any reason. If the patient answered ‘yes’ they were then asked the date and reason of revision or reoperation, and the surgeon that performed the procedure. A 5-point Likert scale: “very satisfied”, “satisfied”, “neutral”, “dissatisfied”, or “very dissatisfied” was used to assess satisfaction. Patients were considered lost to follow-up after three failed attempts by phone contact.

Results
Of the total of 68 patients (72 knees), no patients declined participation within the study, 6 patients (6 knees) were deceased and 10 patients (10 knees) were lost to follow up (i.e. could not be contacted by phone). Data was collected from 52 patients (56 knees), with 25 (48%) male patients and 27 (52%) female patients and an average follow-up was 6.4 years. Of the 56 knees 3 had a revision, (94.6% survivorship) with one patient deciding to go with another surgeon and with one revision being due to trauma. Excluding the knees that needed a revision, 47 patients (51 knees) (96%) were either “very satisfied” or “satisfied” (Figure 1.).

Discussion/Conclusion
In this single center study, robotic-assisted lateral UKA was found to have high survivorship and satisfaction rate in patients that had at least a 2-year follow-up. In the future, larger prospective comparison studies with longer follow-ups are necessary in order to adequately compare survivorship and satisfaction rates of robotic-assisted lateral UKA to conventional UKA.
Figure 1. Satisfaction

- Very Satisfied: 83%
- Satisfied: 2%
- Neutral: 13%
- Dissatisfied: 2%
POSTER #36

Risk of Periprosthetic Infection Following an Intra-articular Corticosteroid Injection After a Unicompartmental Knee Arthroplasty

Hugo C. Rodriguez Jr., DO, MBS

Introduction
Unicompartmental knee arthroplasty (UKA) is a well-established treatment option for unicompartmental femoro-tibial osteoarthritis (OA) and has shown success in appropriate patients. Periprosthetic joint infection (PJI), as in all arthroplasty cases, is a significant concern after UKA and its prevention remains paramount. Perioperative intra-articular corticosteroid injections (IACIs) have been identified as a risk factor for developing PJI in the preoperative and postoperative periods in total knee arthroplasty (TKA) patients. The association between IACIs and the development of PJI in the UKA population, however, has not been fully elucidated. The purpose of this study is to determine the risk of PJI following IACI in patients with a preexisting UKA.

Methods
A retrospective analysis was performed using a large national data base. Patients were queried using Current Procedural Terminology (CPT), International Classification of Disease, Ninth Revision and Tenth Revision (ICD-9 and ICD-10) codes. The study group consisted of patients that had undergone a primary UKA and a subsequent ipsilateral IACI, while the control group included patients that had undergone a primary UKA and no ipsilateral IACI after. The study group was then assessed for PJI after 6 months (6M), 1 year (1Y), 2 years (2Y) and overall following an IACI. The control group was then assessed for its PJI rate overall and used as comparison with each time point in the study group using a multivariable binomial logistic regression analysis controlling for patient demographics (age, gender) and comorbidities (Obesity, Depression, Diabetes Mellitus, Alcohol abuse, Drug abuse, and Tobacco use). Statistical analysis was performed to calculate the odds ratios (OR), 95% confidence intervals (CI 95%) and p - values. An alpha value less than 0.05 was considered statistically significant.

Results Section
The study period between 2015 and April 30th, 2020 revealed that 42,725 patients underwent a primary UKA. There were 2,296 patients that received a postoperative IACI to the ipsilateral knee (5.4%). The percentage of PJI at each time point increased overall within the study group up to 2.4% which was greater than the overall PJI percentage in the control group (1.5%) (Table 1.). The study group’s PJI rate increased between the 6M (1.9%) and the 1Y (2.1%) time points but was found to not be statistically significant. The PJI rate within the study group between the 2Y (2.4%) and overall (2.4%) time points were found to be statistically significant (Table 1.) when compared to the control group. Patients in the control group had an overall rate of infection of
1.5% (n=613). The data also indicates that the majority of PJI occur within 2 years (98.2%) of an IACI with 86% of PJI occurring within 1 year of IACI.

**Conclusion**

Analysis of a nationwide large insurance database revealed that 5.4% of patients that undergo UKA have a postoperative steroid injection into their postoperative knee 98.2% of PJI occur within 2 years of an IACI. Although IACIs can improve pain and stiffness after UKA, this present study demonstrates that there is a correlation between postoperative IACI in patients with a preexisting UKA and PJI compared to controls who did not receive an injection.

**Table 1. Periprosthetic Joint Infections in the UKA Post Injection Population**

<table>
<thead>
<tr>
<th>Time Point after IACI</th>
<th>Periprosthetic Joint Infections</th>
<th>Odds-Ratio</th>
<th>CI 95%</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Months</td>
<td>n=43 (1.9%)</td>
<td>1.7</td>
<td>0.9 - 3.4</td>
<td>.09</td>
</tr>
<tr>
<td>1 Year</td>
<td>n=48 (2.1%)</td>
<td>1.7</td>
<td>0.9 - 3.1</td>
<td>.09</td>
</tr>
<tr>
<td>2 Years</td>
<td>n-55 (2.4%)</td>
<td>1.9</td>
<td>1.1 - 3.3</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Overall</td>
<td>n=56 (2.4)</td>
<td>1.9</td>
<td>1.1 - 3.4</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>
Causes, Costs and Risk-Factors for Emergency Department Visits Following
Primary Total Hip Arthroplasty

Mitchell K. Ng, MD

Introduction
A wide range of studies have examined 90-day re-admissions following primary total hip arthroplasty. In contrast, well-powered studies analyzing the relationship and nature of emergency department (ED) visits following primary total hip arthroplasties (THAs) have been limited to single-center studies, which have estimated a ~9% incidence of ED visits within 90 days post-operatively. The aim of this study was to: 1) compare baseline demographics of patients who did/did not have an ED visit; 2) determine leading causes of ED visits; 3) identify patient-related risk factors; and 4) quantify associated healthcare costs for these different ED visits.

Methods
Patients undergoing primary THA who had an ED visit within 90-days following the index procedure were identified using International Classification of Disease (ICD-9,10) and Current Procedural Terminology (CPT) codes from the Mariner insurance claims of the Pearldiver database dataset. The query yielded 682,950 patients who did (n = 21,836) and did not have (n = 661,114) an ED visit within 90-days following their index procedure between January 1, 2010 and March 31, 2018. Baseline demographics/co-morbidities between the control and study cohorts (Table 1), ED visit causes, associated patient-related risk-factors, and subsequent costs of care were collected and compared. Using Bonferroni-correction, a p-value less than 0.002 was considered statistically significant.

Results
Musculoskeletal etiologies/complaints were the most common cause of ED visits following primary THA. Risk factors associated with increased ED visits were alcohol abuse (Odds Ratio (OR): 1.90, p=0.0003), depressive disorders (OR: 1.10, p<0.0001), congestive heart failure (CHF) (OR: 1.12, p<0.0001), coagulopathy (OR: 1.11, p<0.0001), and electrolyte and fluid derangements (OR: 1.33, p<0.0001), as the greatest risk factors for post-operative ED visits (Table 2). Additionally, the study found pulmonary ($28,928.01) and cardiac ($28,574.69) associated ED visits attributed to highest costs of care within the study.

Conclusion
Musculoskeletal complaints were the leading driver for ED visits following primary THA, followed by cardiac and gastrointestinal complaints. As expected, patients with a higher Elixhauser co-morbidity index or any of the individual baseline co-morbidities included in this study were more likely to present to the ED relative to patients without. A plethora of risk factors were associated with increasing odds of ED visits with the top 5 being alcohol abuse, electrolyte/fluid derangements, CHF, coagulopathy, and depression (p<0.0001). By identifying demographic patterns of patients, causes, risk factors, and associated costs, this study highlights potential areas of pre-operative medical optimization to reduce 90-day ED visits following primary THA.
<table>
<thead>
<tr>
<th>Demographics</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.679</td>
</tr>
<tr>
<td>Female</td>
<td>12,398</td>
<td>56.8</td>
<td>376,313</td>
<td>56.9</td>
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<tr>
<td>Male</td>
<td>9,438</td>
<td>43.2</td>
<td>284,801</td>
<td>43.1</td>
<td></td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol Abuse</td>
<td>1,598</td>
<td>7.3</td>
<td>45,490</td>
<td>6.9</td>
<td>0.012</td>
</tr>
<tr>
<td>Arrhythmias</td>
<td>7,741</td>
<td>35.5</td>
<td>199,819</td>
<td>30.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>6,018</td>
<td>27.6</td>
<td>162,398</td>
<td>24.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>4,806</td>
<td>22.0</td>
<td>120,969</td>
<td>18.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>3,201</td>
<td>14.7</td>
<td>76,854</td>
<td>11.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>3,500</td>
<td>16.0</td>
<td>79,715</td>
<td>12.1</td>
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</tr>
<tr>
<td>COPD</td>
<td>8,244</td>
<td>37.8</td>
<td>226,693</td>
<td>34.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>7,745</td>
<td>35.5</td>
<td>211,739</td>
<td>32.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Dementia</td>
<td>1,612</td>
<td>7.4</td>
<td>39,040</td>
<td>5.9</td>
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<tr>
<td>Depressive Disorders</td>
<td>8,837</td>
<td>40.5</td>
<td>238,939</td>
<td>36.1</td>
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<tr>
<td>Diabetes Mellitus</td>
<td>9,071</td>
<td>41.5</td>
<td>260,934</td>
<td>39.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>1,950</td>
<td>8.9</td>
<td>52,483</td>
<td>7.9</td>
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</tr>
<tr>
<td>HIV</td>
<td>115</td>
<td>0.5</td>
<td>4,391</td>
<td>0.7</td>
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<tr>
<td>Hypertension</td>
<td>18,377</td>
<td>84.2</td>
<td>533,144</td>
<td>80.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>6,457</td>
<td>29.6</td>
<td>186,624</td>
<td>28.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Iron Deficiency Anemia</td>
<td>4,510</td>
<td>20.7</td>
<td>119,342</td>
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<tr>
<td>Ischemic Heart Disease</td>
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<td>181,386</td>
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<tr>
<td>Liver Disease</td>
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<td>93,345</td>
<td>14.1</td>
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<td>Obesity</td>
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<td>245,180</td>
<td>37.1</td>
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<td>Peptic Ulcer Disease</td>
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<td>36,489</td>
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<td>PVD</td>
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<td>28.2</td>
<td>161,627</td>
<td>24.4</td>
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<td>43,241</td>
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<td>Tobacco Use</td>
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<td>186,179</td>
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<td>&lt;0.0001</td>
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<tr>
<td>Valvular Disorders</td>
<td>5,803</td>
<td>26.6</td>
<td>154,663</td>
<td>23.4</td>
<td>&lt;0.0001</td>
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<tr>
<td>Pathologic Weight Loss</td>
<td>3,254</td>
<td>14.9</td>
<td>82,048</td>
<td>12.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>ECI‡</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>&lt;0.0001</td>
</tr>
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Table 1. Comparison of Baseline Demographics of Patients Who Did and Did Not Have Emergency Department Visits Within Ninety-Days Following Primary Total Hip Arthroplasty. COPD = Chronic Obstructive Pulmonary Disease; HIV = Human Immunodeficiency Virus; PVD = Peripheral Vascular Disease; ECI = Elixhauser-Comorbidity Index

‡ = Assessed using Welch’s t-test
<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds-Ratio</th>
<th>95%CI</th>
<th>p-value</th>
</tr>
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<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.02</td>
<td>0.99 – 1.05</td>
<td>0.06</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol Abuse</td>
<td>1.90</td>
<td>1.85 – 1.95</td>
<td>0.0003</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>1.09</td>
<td>1.06 – 1.13</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>1.00</td>
<td>0.97 – 1.04</td>
<td>0.653</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>1.10</td>
<td>1.04 – 1.16</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease</td>
<td>1.08</td>
<td>1.02 – 1.13</td>
<td>0.001</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>1.11</td>
<td>1.07 – 1.16</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>1.12</td>
<td>1.08 – 1.17</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>0.97</td>
<td>0.92 – 1.03</td>
<td>0.388</td>
</tr>
<tr>
<td>Dementia</td>
<td>1.08</td>
<td>1.02 – 1.14</td>
<td>0.001</td>
</tr>
<tr>
<td>Depressive Disorders</td>
<td>1.10</td>
<td>1.07 – 1.13</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>0.96</td>
<td>0.93 – 0.98</td>
<td>0.081</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>0.96</td>
<td>0.91 – 1.01</td>
<td>0.175</td>
</tr>
<tr>
<td>Fluid and Electrolyte Abnormalities</td>
<td>1.33</td>
<td>1.29 – 1.37</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Human Immunodeficiency Virus</td>
<td>0.70</td>
<td>0.57 – 0.84</td>
<td>0.0002</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.10</td>
<td>1.06 – 1.15</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>1.00</td>
<td>0.97 – 1.03</td>
<td>0.842</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td>0.99</td>
<td>0.94 – 1.05</td>
<td>0.863</td>
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<tr>
<td>Liver Disease</td>
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<td>0.96 – 1.05</td>
<td>0.752</td>
</tr>
<tr>
<td>Peptic Ulcer Disease</td>
<td>1.00</td>
<td>0.95 – 1.06</td>
<td>0.842</td>
</tr>
<tr>
<td>Psychoses</td>
<td>1.09</td>
<td>1.01 – 1.15</td>
<td>0.002</td>
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<td>Rheumatoid Arthritis</td>
<td>1.01</td>
<td>0.96 – 1.06</td>
<td>0.617</td>
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<tr>
<td>Tobacco Use</td>
<td>1.09</td>
<td>1.06 – 1.13</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Valvular Disorders</td>
<td>1.01</td>
<td>0.98 – 1.05</td>
<td>0.256</td>
</tr>
<tr>
<td>Pathologic Weight Loss</td>
<td>1.03</td>
<td>0.99 – 1.07</td>
<td>0.129</td>
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</table>

Table 2. Multivariate Binomial Logistic Regression Analysis Demonstrating Risk Factors Associated With Emergency Department Visits Within the Episode of Care Time Period Following Primary Total Hip Arthroplasty
Figure 1. Costs for Different Chief Complaints for Emergency Department Visits Following Primary Total Hip Arthroplasty
POSTER #38

The Association of Cannabis Use Disorder and Peri-Operative Complications Following Primary Total Knee Arthroplasty

Mitchell K. Ng, MD

Introduction
While studies have shown the implications of substance use on total joint arthroplasty, studies investigating the association of patients exclusively who have cannabis use disorder (CUD) following primary total knee arthroplasty (TKA) are sparse. As such, this study analyzed a private payor database to assess the relationship of CUD following primary TKA.

Methods
Data from the Mariner dataset was used to identify patients who have CUD undergoing primary TKA. CUD patients were ratio-matched 1:5 to a comparison population by age, sex, and comorbidities, yielding 55,553 patients in the study (n = 9,260) and case-matched (n = 46,293) population. Variables compared included in-hospital LOS, complications, and costs. A p-value less than 0.003 was considered statistically significant.

Results
CUD patients were found to have longer in-hospital LOS (3.61 vs. 2.07 days, p<0.0001), in addition to higher frequency and odds (OR) of medical (28.08 vs. 12.5; OR: 1.50, p<0.0001) and prostheses-related complications (9.63 vs. 5.16%; OR: 1.56, p<0.0001). CUD patients also incurred significantly higher episode of care costs ($29,025.34 vs. $24,258.17, p<0.0001).

Conclusion
With the continued legalization of cannabis use across the United States, studies investigating the association of cannabis on outcomes following primary TKA are limited. The current study helps to expand the current literature on outcomes of substance abuse following total joint arthroplasty and can serve to help educate patients of potential complications following their TKA.
Table 1. Demographic Profile of Cannabis Use Disorder Patients and Matched-Controls Undergoing Primary Total Knee Arthroplasty.
* = <11 Patients;
N/A = Non-Applicable;
CAD = Coronary Artery Disease;
\(^v\) = Assessed by Pearson’s Chi-Square Analyses

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Cannabis Use Disorder</th>
<th>Controls</th>
<th>p-value(^v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>10 - 14</td>
<td>*</td>
<td>N/A</td>
<td>*</td>
</tr>
<tr>
<td>15 - 19</td>
<td>13</td>
<td>0.14</td>
<td>64</td>
</tr>
<tr>
<td>20 - 24</td>
<td>19</td>
<td>0.21</td>
<td>93</td>
</tr>
<tr>
<td>25 - 29</td>
<td>31</td>
<td>0.33</td>
<td>154</td>
</tr>
<tr>
<td>30 - 34</td>
<td>107</td>
<td>1.16</td>
<td>528</td>
</tr>
<tr>
<td>35 - 39</td>
<td>226</td>
<td>2.44</td>
<td>1,135</td>
</tr>
<tr>
<td>40 - 44</td>
<td>572</td>
<td>6.18</td>
<td>2,859</td>
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<tr>
<td>45 - 49</td>
<td>1,346</td>
<td>14.54</td>
<td>6,730</td>
</tr>
<tr>
<td>50 - 54</td>
<td>2,100</td>
<td>22.68</td>
<td>10,500</td>
</tr>
<tr>
<td>55 - 59</td>
<td>2,160</td>
<td>23.33</td>
<td>10,800</td>
</tr>
<tr>
<td>60 - 64</td>
<td>1,524</td>
<td>16.46</td>
<td>7,620</td>
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<td>65 - 69</td>
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<td>70 - 74</td>
<td>312</td>
<td>3.37</td>
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</tr>
<tr>
<td>75 - 79</td>
<td>94</td>
<td>1.02</td>
<td>470</td>
</tr>
<tr>
<td>80 - 85</td>
<td>*</td>
<td>N/A</td>
<td>*</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4,690</td>
<td>50.65</td>
<td>23,448</td>
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<tr>
<td>Male</td>
<td>4,570</td>
<td>49.35</td>
<td>22,845</td>
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<tr>
<td>Comorbidities</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CAD</td>
<td>3,017</td>
<td>32.58</td>
<td>15,083</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>4,454</td>
<td>48.10</td>
<td>22,270</td>
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<tr>
<td>Hyperlipidemia</td>
<td>2,620</td>
<td>28.29</td>
<td>22,845</td>
</tr>
<tr>
<td>Hypertension</td>
<td>7,846</td>
<td>84.73</td>
<td>39,229</td>
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<tr>
<td>Obesity</td>
<td>5,267</td>
<td>56.88</td>
<td>26,334</td>
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Table 2. Frequency of Ninety-Day Medical Complications in Cannabis Use Disorder Patients and Matched-Controls Following Primary Total Knee Arthroplasty. CUD = Cannabis Use Disorder; OR = Odds-Ratio; 95%CI = 95% Confidence Interval
* = Adjusted for Age, Sex, Geographic Region, and Elixhauser-Comorbidity Index

<table>
<thead>
<tr>
<th>Medical Complications Assessed</th>
<th>CUD (%)</th>
<th>Controls (%)</th>
<th>OR</th>
<th>95%CI</th>
<th>p-value*</th>
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</thead>
<tbody>
<tr>
<td>Pneumoniae</td>
<td>4.11</td>
<td>0.99</td>
<td>2.41</td>
<td>2.08 – 2.80</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Respiratory Failures</td>
<td>1.49</td>
<td>0.35</td>
<td>2.23</td>
<td>1.75 – 2.85</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Myocardial Infarctions</td>
<td>0.73</td>
<td>0.19</td>
<td>2.13</td>
<td>1.51 – 2.99</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Ileus</td>
<td>0.69</td>
<td>0.24</td>
<td>1.97</td>
<td>1.41 – 2.75</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cerebrovascular Accidents</td>
<td>1.00</td>
<td>0.32</td>
<td>1.90</td>
<td>1.44 – 2.52</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Acute Kidney Injuries</td>
<td>4.78</td>
<td>1.47</td>
<td>1.66</td>
<td>1.45 – 1.89</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Urinary Tract Infections</td>
<td>6.50</td>
<td>2.96</td>
<td>1.52</td>
<td>1.37 – 1.70</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Transfusion of Blood Products</td>
<td>2.20</td>
<td>1.08</td>
<td>1.26</td>
<td>1.06 – 1.50</td>
<td>&lt;0.0001</td>
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<tr>
<td>Venous Thromboemboli</td>
<td>3.32</td>
<td>2.28</td>
<td>1.03</td>
<td>0.91 – 1.19</td>
<td>0.579</td>
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<tr>
<td>Deep Vein Thromboses</td>
<td>2.19</td>
<td>1.69</td>
<td>1.01</td>
<td>0.85 – 1.19</td>
<td>0.895</td>
</tr>
<tr>
<td>Pulmonary Emboli</td>
<td>1.05</td>
<td>0.92</td>
<td>0.62</td>
<td>0.49 – 0.78</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Total Medical Complications</td>
<td>28.08</td>
<td>12.5</td>
<td>1.50</td>
<td>1.40 – 1.61</td>
<td>&lt;0.0001</td>
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</tbody>
</table>

Table 3. Frequency of Two-Year Prostheses-Related Complications Among Cannabis Use Disorder Patients and Controls Following Primary Total Knee Arthroplasty. OR = Odds-Ratio; 95%CI = 95% Confidence Interval; PJIs = Peri-Prosthetic Joint Infections
* = Adjusted for Age, Sex, Geographic Region, and Elixhauser-Comorbidity Index

<table>
<thead>
<tr>
<th>Prostheses-Related Complications</th>
<th>CUD (%)</th>
<th>Controls (%)</th>
<th>OR</th>
<th>95%CI</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peri-Prosthetic Fractures</td>
<td>0.63</td>
<td>0.29</td>
<td>1.48</td>
<td>1.06 – 2.05</td>
<td>0.018</td>
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<tr>
<td>Broken Prostheses</td>
<td>0.59</td>
<td>0.32</td>
<td>1.38</td>
<td>1.00 – 1.92</td>
<td>0.055</td>
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<tr>
<td>Mechanical Loosening</td>
<td>2.07</td>
<td>1.14</td>
<td>1.33</td>
<td>1.12 – 1.59</td>
<td>0.001</td>
</tr>
<tr>
<td>PJIs</td>
<td>5.22</td>
<td>2.66</td>
<td>1.28</td>
<td>1.14 – 1.48</td>
<td>&lt;0.0001</td>
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<tr>
<td>Articular Bearing Surface Wear</td>
<td>0.14</td>
<td>0.12</td>
<td>0.95</td>
<td>0.48 – 1.75</td>
<td>0.885</td>
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<tr>
<td>Dislocation of Prostheses</td>
<td>0.98</td>
<td>0.63</td>
<td>1.07</td>
<td>0.83 – 1.37</td>
<td>0.585</td>
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<tr>
<td>Total Prostheses Complications</td>
<td>9.63</td>
<td>5.16</td>
<td>1.56</td>
<td>1.35 – 1.82</td>
<td>&lt;0.0001</td>
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</table>
INTRODUCTION
2-stage debridement and implant retention (2-DAIR) has recently gained popularity in treating acute prosthetic joint infection (PJI). Results of additional debridement have been impressive, but the case series lacked comparisons to control. Our study compares infection control rates, complications, and outcomes in patients with acute PJI managed with DAIR or 2-DAIR.

METHODS
We retrospectively reviewed 89 patients with acute PJI treated by a single surgeon with DAIR or 2-DAIR from 2015-2020. Patients had <3 weeks of symptoms and met MSIS criteria for infection. There were 46 males with a mean age of 64 years. 63 patients were treated with DAIR, while 26 were managed using a 2-DAIR protocol where patients underwent initial debridement, antibiotic bead placement, and subsequent return to the OR at an average of 16.3 days for repeat debridement and modular component exchange. Patients received a 6-week course of intravenous antibiotics and 3 months of oral antibiotics for suppression. Demographics, comorbidities, implant retention rates, and complications were compared between the groups. The McPherson host type and infection type classification system was used to categorize patients in both the DAIR and 2-DAIR groups. Regression analysis was performed to control postoperative vs. acute hematogenous infection, procedure, and comorbidities.

RESULTS
DAIR more often than 2-DAIR was used for immediate postoperative infection vs. acute hematogenous infection (p=0.017). The McPherson host types and infection types were not different between DAIR and 2-DAIR patients, p=0.728 and p=0.061, respectively. There was no difference in the overall implant retention rate between DAIR and 2-DAIR (63.49% vs. 69.23%, p=0.605). Average days to reinfection was significantly longer for the 2-DAIR cohort compared to DAIR (271.3 vs. 165.3, p=0.024) in patients who failed treatment. However, when controlling for infection, microorganism, index procedure, and comorbidities, there was no difference in days to reinfection (p=0.679). There were no differences in complications, 90-day readmission, or revision rates between the groups.

CONCLUSIONS
A staged debridement for acute PJI didn't improve rates of implant retention or time to reinfection. Randomized trials are needed to define indications and potential benefits of 2-DAIR.
Introduction
With an increasing number of younger patients undergoing primary total knee arthroplasty (TKA), there will be a corresponding increase in the number of younger patients who require revision TKA. While the results of TKA in younger patients are well known, there is little information with regards to the outcomes of revision TKA in this population. Therefore, the purpose of this study is to evaluate the 1) survivorship, 2) complications, 3) reoperations, and 4) clinical outcomes in patients under the age of 60 undergoing aseptic revision TKA.

Methods
We retrospectively reviewed 433 consecutive patients undergoing aseptic revision TKA. The principal cause for revision was aseptic loosening (191), instability (189), and arthrofibrosis (23). There were 189 patients less than 60 years with a mean age of 53 (range 26-59). We compared this group to a contemporary group of patients > 60 years undergoing revision TKA for aseptic failures (n=244) in terms of implant survivorship, complications and reoperations. Clinical outcomes were measured by the PROMIS-10 global physical and mental health metric.

Results
Among patients under age 60, the most common cause for revision was instability (90, 47.6%) compared to aseptic loosening for patients over age 60 (118, 48.4%; p=0.114). At a mean follow up of 47.5 +/- 20.4 months, a total of 28 (17.4%) patients less than 60 years of age required repeat revision compared to 25 (10.2%) 60 years or older (OR 1.94, 95% CI 0.73-5.22, p=0.187). The most common for re-revision in young patients was instability (11, 5.82%). Postoperative infection occurred in 3 (1.59%) patients less than 60 years of age, while 12 (4.92%) postoperative infections occurred in patients 60 years or older (OR 0.75, 95% CI 0.06-10.2, p=0.83). There were no statistical differences in rates of readmission (3, 1.59% vs 10, 4.10%, p=0.129), return to operating room (42, 22.2% vs 40, 16.4%, p=0.130), deep vein thrombosis (1, 0.53% vs 5, 2.05%, p=0.180), pulmonary embolism (2, 1.06% vs 3, 1.23%, p=0.869), and wound complication (16, 8.47% vs 28, 11.5%, p=0.312). Finally, there were no differences in both PROMIS physical health scores (72.3 +/- 13.7 vs 72.0 +/- 12.0, p=0.66) and PROMIS mental health scores (66.6 +/- 17.4 vs 65.8 +/- 14.7, p=0.72), at an average or 32.9 and 30.7 months, respectively.

Conclusion
While there was a trend towards increasing repeat revision TKA in patients less than 60 undergoing aseptic revision TKA, there were no difference in their perioperative and postoperative course compared to patients older than 60. This data can be used to counsel and set realistic expectations in younger patients with failed TKAs.
Has Patellofemoral Arthroplasty Improved Over Time?
A Meta-Analysis of the Literature

Brian A. Perez, MD

Introduction
For patients with isolated patellofemoral arthritis, patellofemoral arthroplasty (PFA) can be an option for pain relief and improved function. However, the results of PFA have been inconsistent with persistent pain, instability, and early conversion to TKA preventing widespread adoption. Improvements in implant design (from 1st to 2nd and from 2nd to 3rd generation implants) have led to theoretical improvements in patellofemoral contact pathways and kinematics, however, no large-scale studies have evaluated their function in regards to long-term survivorship and complication rate. Furthermore, no studies have definitely evaluated the difference in outcomes between different implant design characteristics (i.e., inlay vs. onlay designs and asymmetric vs. symmetric trochlealar component designs). Therefore, the purpose of this study is to compare the clinical outcomes of the various generations and design characteristics of PFA in terms of 1) patient reported outcomes, 2) patellofemoral instability, and 3) implant survivorship.

Methods
Assystematic review of the Medline, PubMed, Embase, and Cochrane databases including published reports detailing the outcomes of patellofemoral replacements was independently conducted by 2 independent reviewers according to the PRISMA guidelines. The studies were divided into 1st generation, 2nd generation, and 3rd generation groups based on the implants studied. Additionally, whether the implant incorporated an inlay or resurfacing design vs. an onlay or anterior cut design was determined. Finally, whether the femoral trochlear component design was symmetric or asymmetric in regards to the condyles was determined for each prosthesis included in the studies.

The various parameters of knee function including revision rate and time to revision, reoperation rate (other than revision), percentage of good to excellent results, patellofemoral instability rates, and average pre- and postoperative KSS Clinical and Functional scores were compared across generations. These parameters were also compared between inlay and onlay PFA designs and symmetric and asymmetric femoral trochlear component designs.

Categorical variables were compared using chi square analysis. Continuous variables were compared across generations using ANOVA testing. Student’s T-test was used to compare continuous variables between onlay and inlay groups and symmetric and asymmetric groups.

Results
The literature search yielded 38 relevant papers with an aggregated 1982 knees, which were divided into
groups based on the type of PFA studied (1st generation (n=535), 2nd generation (n=1050), and 3rd generation (n=397)). All parameters studied, with the exception of KSS Functional domain, improved from 1st generation to both 2nd and 3rd generation PFA. (Table 1) However, only KSS Functional domain (p<0.0001) and change in KSS Clinical and Functional domains (p<0.0001) improved in 3rd generation implants as compared to 2nd generation implants.

Onlay designs were superior to inlay designs for all parameters that were studied with the exception of KSS Functional domain, which was higher with inlay designs (p<0.0001). (Table 2) However, subgroup analysis of studies that evaluated 3rd generation PFA implants with inlay designs showed similar results to those achieved with onlay designs with similar failure rates (p=0.051), percentage of good to excellent results (p=0.07), rates of patellofemoral instability (p=0.59), and postoperative KSS Clinical scores (p=0.65). Reoperation rate remained higher (p=0.01) in the 3rd generation inlay group, while postoperative KSS Functional score (p<0.0001) was also higher in this group as compared to the onlay group.

Results were mixed in regards to symmetric and asymmetric designs with equivalent failure rates (p=0.18), patellofemoral instability rates (p=0.40), and postoperative KSS scores (p=0.40 and 0.12 for KSS Clinical and Functional scores, respectively). (Table 3) Percentage of good to excellent results was higher (p<0.0001) in the asymmetric group, and reoperation rate was higher (p<0.0001) in the symmetric group.

**Conclusion**

PFA is the primary technique used to treat isolated patellofemoral arthritis, but no previous studies have compared successive implant generations or design features of implants. The results of our analysis suggest that substantial improvements were seen with the advent of 2nd generation designs as compared to 1st generation PFA. However, there were no definitive improvements in 3rd generation implants, which incorporate increased sizing options and customized implants to better match native anatomy, as compared to 2nd generation implants. Onlay designs were superior to inlay designs in regards to patellofemoral instability, implant failure, and reoperation rates. However, 3rd generation inlay designs may also provide satisfactory results. Neither asymmetric nor symmetric designs were superior to the other, which is similar to the results seen in TKA design. Further studies are needed to determine the ideal implant design and patient selection criteria in PFA.
POSTER #42

Failure to Launch: Risk Factors and Prevention in Same-Day Discharge Following Total Joint Arthroplasty

David P. Foley, MD

Background
Rapid recovery protocols have enabled the transition of total joint arthroplasty (TJA) from the inpatient to outpatient setting. However, reasons for same-day discharge (SDD) failure have not been comprehensively identified. This study explored barriers to successful SDD following primary TJA.

Methods
A retrospective review of 398 consecutive primary unilateral TJAs performed by a single surgeon at an academic center between 2017 and 2020 with planned SDD was performed. Failure of SDD was defined as lack of discharge before midnight on the day of the procedure. Failure to achieve SDD was examined in relationship to 35 demographic, medical, social, and psychological characteristics of patients; intraoperative factors; and postoperative complications.

Results
Fifty-seven percent of the sample was female, with average age and BMI of 58 (19 to 83) years and 31 (18 to 54) kg/m². A binary logistic regression model retaining age, the Outpatient Arthroplasty Risk Assessment (OARA) score, morphine milligram equivalents (MMEs) consumed per hour, and postoperative urinary retention (p≤0.003) explained 74% of the variance in failed SDD. Every five year increase in age, 20 point increase in OARA score, and increase of 0.5 MMEs consumed per hour increased the likelihood of failure by 1.9 (95% CI 1.2, 2.9), 2.4 (95% CI 1.5, 3.8), and 4.0 (95% CI 2.4, 6.6) times, respectively. On average, patients who failed SDD (18±19) traveled fewer miles for surgery than those who achieved SDD (27±30, p>0.05).

Conclusion
Increasing age and comorbidities as reflected in OARA scores are predictive risk factors for failure to launch, highlighting the importance of patient selection when planning SDD. Urinary retention is a key complication that can prevent SDD. Successful outpatient TJA relies on the adoption of modern perioperative protocols, appropriate patient selection, and the ability to predict and prevent the common postoperative problems that routinely result in failure to launch.
Primary TKA in Patients with Concurrent Post-traumatic and Post-septic Arthritis: High Risk of Reinfection

Emmanuel Gibon, M.D., Ph.D.; Nicholas A. Bedard, M.D.; Cory Couch, M.D.
Daniel J. Berry, M.D.; Matthew P. Abdel, M.D.

Introduction
Post-traumatic and post-septic arthritis both independently increase the risk of periprosthetic joint infections (PJIs) after primary total knee arthroplasties (TKAs). Even worse, a subset of patients suffer from both pathologies. The goals of this study were to describe the patient survivorship, implant survivorship, complications, and clinical outcomes of patients with a prior history of both post-traumatic and post-septic arthritis undergoing primary TKA.

Methods
Between 1974 – 2018, 48 primary TKAs were performed at a single academic medical center in patients with both post-traumatic and post-septic arthritis. Mean time from injury and/or infection to TKA was 19 years. The mean pre-TKA CRP and ESR were 5 mg/L and 12 mm/h, respectively, and 23% also had a preoperative aspiration. Mean age at TKA was 61 years, 81% were male, and mean BMI was 32 kg/m². Posterior-stabilized designs were most common (69%), followed by varus-valgus constraint in 19%. Adjuvant stems were utilized in 35% of cases. Mean follow-up was 10 years.

Results
The 10-year mortality rate was 25%. The 10-year survivorship free of any revision was 81%, and free of any reoperation was 72%. There were 13 revisions with the most common indications being for reinfection (9), instability (1), and aseptic loosening (1). In addition to those 13 revisions, there were 11 other reoperations, most commonly irrigation and debridement (I&D) with implant retention (8), superficial wound I&D (2), and arthroscopic lysis of adhesions (1). The risk of PJI was 26% at 10 years. Non-operative complications occurred in 23%. The mean Knee Society Score increased from 41 preoperatively to 79 (p<0.05) at last follow-up.

Conclusion
Patient with a concomitant history of post-traumatic and post-septic arthritis undergoing a primary TKA have high rate of mortality, reinfection, and revision for PJI. Further investigation into reasons for this and mitigation strategies are recommended.
Can I Ski Doc? Return To Skiing Following Total Joint Replacement

Alex J Lancaster, MD

Background
Currently there is little data on performance, safety, or rates of return to downhill skiing after total joint arthroplasty (TJA). This leaves surgeons with little information for patient counseling regarding skiing.

Methods
A prospective online survey was sent to 4360 patients who had undergone at least one primary TJA at an academic center over the past 10 years. The survey asked patients about their prior and current downhill skiing activity, if any, and included skiing ability level, limitations, and reoperations. Demographics, patient-reported outcomes (PROs) and reoperations were also captured through chart review. Chi-squared, ANOVA, and t-tests were used to compare demographics and outcomes. Paired t-tests were used to compare pre and postoperative skiing levels.

Results
Of the 759 survey respondents, the average follow-up was 4.4 years with no difference across skiing groups. 34% had never skied, 26.5% had not skied in the 5 years prior to surgery (remote skiers), and 37.6% had skied in the 5 years leading up to surgery (recent skiers). 73.3% of recent skiers returned to skiing after surgery, compared to 11.9% of remote skiers. While there was a transient drop in skiing level in the year following surgery, the majority of skiers were able to return to their prior level which was advanced to expert in most. There was no difference in the ability to return to skiing in those with a single THA vs TKA vs multiple TJAs. Interestingly, rates of reoperation were not significantly different between patients who returned to skiing and those who did not. Not unexpectedly, all PROs were significantly higher in the patients that returned to skiing.

Conclusion
The majority of patients who were skiing in the 5 years prior to surgery were able to return to skiing after TJA at their same level without an increase in reoperation rates.
POSTER #45

High Survivorship of a Modular Titanium Baseplate Independent of BMI and Malalignment

Kimberly Stevenson, MD

Introduction
Tibial component aseptic loosening remains problematic in primary TKA. Multiple influential factors include component design, metallurgy, and cement technique. Additionally, reports advocate for longer tibial stem fixation in high body mass index (BMI) patients. We have utilized a single stem length modular titanium baseplate in all patients regardless of BMI, bone quality, or malalignment. We report the survivorship of this implant with particular focus on the impact of elevated BMI and post-operative malalignment.

Methods
We retrospectively reviewed patients who underwent TKA with a single modular titanium baseplate performed by two fellowship-trained arthroplasty surgeons at an academic medical center between 2004 and 2018. 2952 TKAs with a minimum of one year follow-up were included in the analysis. The primary outcome was component failure stratified by BMI and component malalignment. BMI thresholds were classified as < 30 and >30. Post-operative alignment was measured on long-standing radiograph. Chi-squared, Fisher’s Exact tests, and t-tests were used to compare outcome variables across groups.

Results
40 implants (1.4%) were revised; 21 (0.7%) for sepsis and 19 (0.6%) for asepsis. Failure was not associated with BMI, gender, ASA class, or CCI. There was no difference in failure rate between patients with BMI >30 and <30 (p=1.0). There was no difference in failure rate between knees that were aligned within 3 degrees of neutral mechanical axis and knees aligned outside that range (P=0.9). There was also no difference in radiographic evidence of loosening based on BMI or alignment. Age was associated with failure as patients with failed TKAs were younger (60 vs. 65, p=0.01).

Conclusion
This design of a specific modular titanium base plate with a cruciate-shaped keel and grit-blast surface demonstrated high survivorship regardless of patient BMI or postoperative malalignment over a long period of time. Component design remains an important variable impacting survivorship in TKA.
POSTER #46

Same Day Discharge for Primary Total Joint Arthroplasty at a Tertiary Academic Medical Center

J. Stewart Buck, MD

Introduction
The number of primary total joint arthroplasty (TJA) surgeries performed on an outpatient basis continues to grow. Many authors have demonstrated safety of same day discharge (SDD) for TJA, however this has predominantly been at ambulatory surgery centers in select patients. At our tertiary academic medical center, we transitioned to predominantly SDD for both primary total knee arthroplasty (TKA) and total hip arthroplasty (THA) through implementing care pathway changes. Our abrupt transition was secondary to a number of factors, including a scarcity of inpatient resources, changes to the inpatient only list, and increasing patient interest. This study set out to retrospectively compare the patient risk profiles, outcomes, and complications before and after this transition to predominantly SDD.

Methods
Our institutional registry was reviewed to identify patients that underwent primary TJA between September 13, 2019 and October 31, 2020. This included the 6 months prior to and the 6 months immediately following the transition to predominantly SDD.

Results
We identified 1,249 patients that underwent primary TJA (247 THA and 361 TKA prior to the transition, 282 THA and 359 TKA following). Prior to the transition 104/608 (17%) of patients were SDD. Following the transition 410/641 (64%) of patients were SDD. After the transition, among the 440 patients scheduled for SDD, there was a 93% success rate for SDD. When comparing SDD patients, those after the transition were older (p=0.003), had higher Joint Registry Risk Scores (p=0.0461) and trended towards higher BMIs and Charlson Comorbidity Index Scores. There were no significant differences in readmissions (p=0.5909), emergency department visits, (p=0.9207) or return to the operating room (p=0.5489).

Conclusion
This study demonstrates that the majority of patients are able to safely undergo SDD after primary TJA, even at a tertiary academic medical center, provided the appropriate care pathways and multidisciplinary teams are established.
Introduction
Total hip arthroplasty (THA) for developmental hip dysplasia (DDH) is a technically challenging procedure with good short and intermediate-term outcomes evident in the literature. These cases often require a subtrochanteric shortening derotational osteotomy (SDO) to limit leg lengthening, mitigate risk of peripheral nerve palsy and reduce excessive femoral anteversion. Due to the infrequency of this procedure, few studies exist detailing long-term clinical outcomes and survivorship. Our original paper, published in 2007, reported a 75% survivorship and good clinical outcomes in 23 SDO THA cases. The current study is a follow-up analysis of the long-term outcomes and survivorship of this original cohort. Further, we expand on modes of implant failure and revision strategies.

Methods
IRB approval was obtained and we reviewed all SDO THA cases performed between 1991 and 2001. Crowe classification and patient demographic data were recorded. Primary outcome measures included revision surgery for any reason and modified Harris Hip scores (mHHS). The secondary outcome measures included mode of implant failure and osteotomy union. Radiographic analysis was performed to evaluate for acetabular component position and evidence of wear, osteolysis and loosening.

Results
There were 25 SDO THA cases in 21 patients with a mean follow-up of 18 years (range, 4-27 years). Overall survivorship was 68% and the mean post-operative mHHS was 77 (range, 52 to 91). All 8 revisions were due to acetabular failure with a mean time to revision at 11 years (range, 1-24 years). Of the failures, 4 failed due to polyethylene wear (50%), 2 cases due to acetabular loosening (25%), and 2 cases due to recurrent instability (25%) (both recalled Sulzer shells). There were no femoral failures, nerve palsies, and no non-unions.

Conclusion
In this long-term study of 25 DDH cases, THA with SDO provided good functional outcomes and survivorship. Polyethylene wear and instability were the most common failure modes. We reported two cases of acetabular loosening however both were Sulzer shells which had been recalled for loosening. SDO was a reliable technique to reduce femoral length and adjust femoral version without any nerve palsies. The SDO technique should remain the gold standard THA in patients with DDH, marked leg-length discrepancy and femoral anteversion.
High Failure Rate Associated with Arthroscopic Lysis of Adhesions versus Manipulation Under Anesthesia for Treating Arthrofibrosis Following Total Knee Arthroplasty

Nathan P Thomas MD, PhD

Background
Arthrofibrosis following total knee arthroplasty is often treated by arthroscopic lysis of adhesions (ALA) or manipulation under anesthesia (MUA). This study compared the 2-year complication rates of ALA and MUA, and range of motion outcomes for ALA, early MUA, and delayed MUA.

Methods
This retrospective cohort study included 425 patients undergoing ALA or MUA following primary TKA. Demographics, clinical variables, and complication rates were collected from clinical records, and compared using Student’s t-test and Kaplan-Meier log rank tests. Multivariable logistic regressions were used for adjusted analysis. ROM data was analyzed using fixed and mixed-effect models.

Results
ALA patients were younger (55.2 vs 58.9 years, p<0.001) and underwent surgery further from the index TKA (22 vs 3.3 months, p<0.001). The Charlson Comorbidity Index (CCI) was higher in the MUA group. Preoperative ROM was significantly worse in the MUA cohort, but did not differ between groups post-procedure (117°, p=0.27) or at 2 years. Demographics and ROM outcomes were equivalent between early MUA and delayed MUA, performed after 3 months (p=0.75). The incidence of repeat arthrofibrosis (7.1%) and revision arthroplasty (2.4%) was similar between ALA and MUA cohorts, while ALA patients had significantly more SSIs (3.8%) compared to MUA patients (0.47%, p=0.017).

Conclusions
Equivalent ROM outcomes were seen between ALA, MUA and delayed MUA for treatment of arthrofibrosis following TKA. However, this study demonstrated a significantly higher complication rate, particularly SSI, following ALA, suggesting that MUA may be the preferred option for treating arthrofibrosis at both early and late time points.
Pannus Sign: A Radiographic Tool to Predict Postoperative Complications in Anterior Total Hip Arthroplasty

Atul Saini DO

Introduction
Many studies have demonstrated objective patient data such as BMI, HgbA1C, and age that are correlated to adverse outcomes in total joint arthroplasty. BMI, although a great tool, does not give the surgeon an accurate representation of the adipose and soft tissue distribution of the patient and, more importantly, how it may directly affect the procedure and subsequent postoperative course. This study introduces a new radiographic parameter, which we refer to as the pannus sign. We analyze its utility as a tool to predict adverse outcomes for patients that undergo total hip arthroplasty using the anterior approach. Our study questions if the radiographic position of the pannus at different points compared to the pubic symphysis on supine Anteroposterior (AP) pelvis x-rays correlates with postoperative complications and inpatient data such as infection, wound dehiscence, fracture, hospital length of stay, etc. We hypothesize that a pannus which drapes below the pubic symphysis will be correlated with an increase in complications.

Methods
We retrospectively reviewed patients who underwent primary total hip arthroplasty utilizing the anterior approach by multiple surgeons at a single institution from the years 2015-2020. Any revisions, bilateral cases, and arthroplasty for femoral neck fractures were excluded. The level of the pannus in relation to the pubic symphysis was assessed on immediate supine postoperative AP pelvis films. The pannus was noted to be either above (Pannus Sign 1), between the upper and lower borders (Pannus Sign 2), or below the level of the pubic symphysis (Pannus Sign 3). This was correlated with admission data as well as postoperative complications including: superficial and deep infection, wound dehiscence, etc. Continuous variables were expressed as means ± standard deviations, and categorical data was presented as percentages. Analysis was carried out using fisher’s exact test to determine odds ratios and a P Value of < 0.05 was considered to indicate a significant difference.

Results
A total of 600 patients were included in the study. A pannus sign 1 was identified in 490 patients (81.7%) and a pannus sign of greater than 1 was identified in 110 patients (18.3%). Patients with a pannus sign of 1 had a significantly lower average operating time (117.57 mins vs. 128.24 mins, P<0.01), lower average length of stay (1.93 days vs. 2.28 days, P<0.01), and a lower average BMI (27.34 vs. 33.39, P<0.01) as compared to patients with a pannus sign of greater than 1. There were a total of 33 readmissions. 10 readmissions were due to infection; 7/10 were in patients with a pannus sign 2 and 3, 3/10 were in patients with a pannus sign 1; odds ratio of 10.96 (P<0.01). No Fractures occurred in patients with a pannus sign 1, whereas 5 occurred in patients with a pannus sign 2 and 3 (P<0.01).

Conclusion
Our study introduces the pannus sign, which gives surgeons an efficient, easy, cheap, and reliable radiographic assessment tool to help with patient selection as well as counsel patients on their increased risk of periprosthetic fracture and infection and longer operative time and length of hospital stay for those undergoing anterior total hip arthroplasty.
Pigmented Villonodular Synovitis of the Hip in Patients Undergoing Total Hip Arthroplasty: A Retrospective Case-Controlled Analysis
Gagan Grewal, MD, MS

Background
Pigmented villonodular synovitis (PVNS) is a condition affecting larger joints such as the hip and knee. Little is known regarding the impact of PVNS on total hip arthroplasty (THA). Therefore, the aim of this study is to determine if patients with PVNS of the hip undergoing primary THA experience greater (1) in-hospital lengths of stay (LOS); (2) complications; (3) readmission rates; and (4) costs.

Methods
Patients undergoing primary THA for PVNS of the hip from the years 2005 to 2014 were identified using a nationwide claims registry. PVNS patients were matched to a control cohort in a 1:5 ratio by age, gender, and various comorbidities. The query yielded 7440 patients with (n = 1240) and without (n = 6200) PVNS of the hip undergoing primary THA. Endpoints analyzed included LOS, complications, readmission rates, and costs. Multivariate logistic regression was used to determine odds ratios (OR) of developing complications. Welch’s t-tests were used to test for significance in LOS and cost between the cohorts. A P-value less than .001 was considered statistically significant.

Results
PVNS patients had approximately 8% longer in-hospital LOS (3.8 vs 3.5 days, P = .0006). PVNS patients had greater odds of (OR 1.60, P < .0001) medical and (OR 1.81, P < .0001) implant related complications. Furthermore, PVNS patients were found to have higher odds (OR 1.84, P < .0001) of 90-day readmissions. PVNS patients also incurred higher day of surgery ($13,119 vs $11,983, P < .0001) and 90-day costs ($17,169 vs $15,097, P < .0001).

Conclusion
Without controlling for global trends in LOS, complications, readmissions, or costs between 2005 and 2014, the findings of the study suggest that PVNS of the hip is associated with worse outcomes and higher costs following primary THA. The study is useful as orthopedic surgeons can use the study to educate patients of the complications which may occur following their hip surgery.
Joint Line Deviation from Native Anatomy Using Mechanical Versus Kinematic Alignment in Total Knee Arthroplasty

Jarod A. Richards, MD

Introduction
The concept of kinematic alignment has been proposed in an effort to improve patient satisfaction. Purpose of this study was to determine variation or deviation from native joint line following Total Knee Arthroplasty (TKA) using mechanical versus kinematic alignment with virtual 3D intraoperative planning software.

Methods
An IRB-approved prospective cohort study evaluating effect of implant position and deviation from the native joint line in 100 consecutive patients undergoing TKA was performed. There were 65 females and 35 males with an average age of 65.6 years (47-91 years) and average BMI of 32.9 (17.6-50.5). Using preoperative CT and intraoperative 3D software, two virtual preoperative plans were created: neutral mechanical alignment (nMA) and restricted kinematic alignment (rKA). Templated bone resections (medial tibial, lateral tibial, distal lateral femoral condyle, distal medial femoral condyle, posterior lateral femoral condyle, posterior medial femoral condyle) were recorded. Using known implant planar thickness and planned bone resection, change in joint line was calculated for each of the above metrics. Paired t-tests were performed between cohorts.

Results
Implants placed in neutral mechanical alignment (nMA) TKA yielded significantly greater deviation from the native joint line especially along the lateral distal and posterior femoral condyle. nMA-TKA distal lateral femoral condyle mean joint line change was 4.3 mm lengthening (range 1.0-8.5mm) versus 2.6 mm (range 1.0-5.5mm) in the restricted kinematic alignment (rKA) cohort (p<0.001), resulting in a more horizontal joint line compared to the native oblique joint line; nMA-TKA posterior lateral femoral condyle length change was 5.2 mm (range 1.5-9.5mm) versus 2.3 mm (range 1-6mm) in rKA-TKA (p<0.001); and nMA-TKA mean lateral tibial resection was 6.9 mm versus 5.4 mm in rKA-TKA (p=0.001). nMA-TKA posterior medial femoral condyle mean joint line change was 0.94 mm versus 1.1 mm in rKA-TKA (p=0.009); nMA-TKA distal medial femoral condyle mean joint line change was 1.04 mm versus 1.05 mm in rKA-TKA (p=0.596); and nMA-TKA medial tibial mean resection was 4.11 mm versus 4.26 mm in rKA-TKA (p=0.177).

Discussion
Primary TKA placed in neutral mechanical alignment TKA resulted in a statistically significant joint line deviation compared to restricted KA-TKA primarily due to lengthening of the lateral femoral condyle resulting in a more horizontal joint line compared to the patient’s native oblique joint line. Further analysis is needed to determine the relationship between deviation from the native oblique joint in primary TKA and resulting soft tissue strain and clinical outcome.

Significance/Clinical Relevance
There is a greater interest in patient satisfaction following primary TKA. Kinematic alignment has been advocated to help improve patient reported outcomes. Neutral mechanical alignment places the mechanical axis perpendicular to the axis of the femur and tibia. Based on the results of this study, neutral mechanical alignment
lengthens the distal lateral femoral condyle and creates a horizontal joint deviating from the patient’s native oblique joint line. Further work is required to determine the clinical ramifications following joint line deviation.
POSTER #53

Mid Term Outcomes of a Novel Metaphyseal Porous Titanium Cone

Ittai Shichman, MD

Introduction
Loosening and migration are common modes of aseptic failure following complex revision total knee arthroplasty (rTKA). Metaphyseal cones allow surgeons to negotiate loss of femoral and tibial bone stock while obtaining stable bony fixation. This study examines the short term functional and radiographic outcomes in patients undergoing rTKA utilizing a novel metaphyseal cone system.

Methods
This multicenter retrospective study examined all patients who received a porous, titanium tibial or femoral cone (Legion Cone System, Smith&Nephew, Memphis, TN) for large bone defect in rTKA at four large institutions from 07/2017-04/2019 and presented for two-year follow-up. Patient demographics, indications for revision surgery, complications, readmissions, pre and post-operative knee range-of-motion (ROM), re-revision rates were evaluated. Radiographic measurements and implant osseointegration A radiographic assessment (knee X-ray in anterior–posterior and lateral view) by 2 blinded observers was performed to evaluate the level of osseointegration and implant subsidence at the bone–implant interface.

Results
One-hundred and four patients received 128 cone implants (84 tibial, 42 femoral cones; 27 patients with simultaneous ipsilateral tibial and femoral cones; 103 rTKA, 1 complex TKA) with mean follow-up of 32.75±6.54 months (include range here). The mean patient age was 65.62±8.39 years, and mean BMI was 32.17±6.56 kg/m². The pre-operative revision most common indications were aseptic loosening 36 (34.61%), periprosthetic infection (PJI) for 23 procedures (22.11%) and instability 17 (16.34%). Mean preoperative flexion/extension were 99.92±21.70°/3.84±6.37°. Two-year mean flexion/extension improved to 108.34±21.25° ($\Delta=+8.42^\circ$)/0.03±1.46°($\Delta=-3.81^\circ$). All-cause 90-day readmission occurred following 4 procedures (3.84%) (1 acute PJI, 1 for stiffness, 1 allergic drug reaction, 1 for pain). All-cause revision-free survivorship at 2-year follow up was 87.5% (91/104), and all-cause implant survivorship was 96.09% (123/128 cones).

Thirteen knees underwent revision surgery: 3 for acute PJI (3/3 cones retained), 4 for chronic PJI (3/4 cones removed, 1 retained), 5 for instability (2 cones retained, 3 removed) and 1 for mechanical failure of a hinged system (1/1 cones retained).

At most recent radiographic follow-up available all unrevised cones had evidence of osseointegration and no visible implant subsidence.

Conclusion: This study demonstrates excellent mid-term outcomes following the use of a novel porous, titanium metaphyseal cone in patients with large bone defects undergoing complex and revision TKA.
Long-term Mortality Rates and Indication-Specific Risk of Death Following Revision Total Hip Arthroplasty

Utkarsh Anil MD

Introduction

Accurately estimating risk of long-term mortality is paramount in the surgical decision-making process and patient counseling before revision total hip arthroplasty (rTHA). The purpose of this study is to determine the mortality rate after rTHA and compare the mortality risk between common indications for revision surgery.

Methods

A retrospective review of 187 patients who underwent their first rTHA from 2011 to 2021 was conducted at a high-volume, urban academic center. The electronic medical record (EMR) database was queried for mortality status, the reason for revision, patient demographics, and the date of their last clinical follow-up. Only patients confirmed dead in the EMR or with at least five years of follow-up were included in this study. For survivors, the last clinical visit date was used for censoring in the mortality analysis. Differences in patient demographics and indications for revision were assessed using chi-square and independent sample t-tests. A Cox proportional hazard model was utilized to estimate mortality rates for patient baseline characteristics and indications for revision. Kaplan Meier curves were used to display cumulative mortality risks for rTHA patients with different surgical indications.

Results

For rTHA patients with at least 5-year follow-up, the estimated mortality rate was 49.79 deaths per 1,000 patient-years (95% confidence interval [CI], 36.96 - 65.64). Patients who were revised due to periprosthetic fracture had a significantly higher risk of death than all other indications (hazards ratio [HR], 5.87; 95% [CI], 2.44-14.1; p= <0.001) and had a mortality rate of 172.91 death per 1,000 patient-years (95% [CI], 82.92 - 317.98). The next highest risk of death by indication was infection (HR, 3.97; 95% CI, 1.87 - 8.44; p= <0.001) with an estimated mortality rate of 115.37 deaths per 1,000 person-years (95% CI, 72.30 - 174.68). Other indications such as dislocation and implant failure did not significantly increase the risk of death.

Conclusion

The overall mortality rate in patients with at least 5-year follow up following rTHA was 49.79 deaths per 1,000 patient-years. In comparison to other common indications for revision, infection and periprosthetic fracture demonstrated a statistically significant higher mortality risk. These results should be considered in the surgical decision-making process and when counseling patients prior to rTHA.
### Table 1. Baseline characteristics of included revision total hip arthroplasty patients.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (N = 187)</th>
<th>Alive (N = 137)</th>
<th>Dead (N = 50)</th>
<th>P-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age - mean (SD)</td>
<td>65 (13)</td>
<td>61 (11)</td>
<td>74 (11)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Male - no. (%)</td>
<td>76 (41%)</td>
<td>50 (36%)</td>
<td>26 (52%)</td>
<td>0.081</td>
</tr>
<tr>
<td>BMI - mean (SD)</td>
<td>27.9 (5.9)</td>
<td>28.1 (5.6)</td>
<td>27.1 (6.7)</td>
<td>0.347</td>
</tr>
<tr>
<td>ASA - no. (%)</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>1</td>
<td>5 (2.8%)</td>
<td>5 (3.8%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>96 (53%)</td>
<td>88 (67%)</td>
<td>8 (16%)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>65 (36%)</td>
<td>37 (28%)</td>
<td>28 (57%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15 (8.3%)</td>
<td>2 (1.5%)</td>
<td>13 (27%)</td>
<td></td>
</tr>
<tr>
<td>Smoking Status - no. (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.195</td>
</tr>
<tr>
<td>Never Smoker</td>
<td>88 (48%)</td>
<td>65 (47%)</td>
<td>23 (48%)</td>
<td></td>
</tr>
<tr>
<td>Former Smoker</td>
<td>77 (42%)</td>
<td>54 (39%)</td>
<td>23 (48%)</td>
<td></td>
</tr>
<tr>
<td>Current Smoker</td>
<td>20 (11%)</td>
<td>18 (13%)</td>
<td>2 (4.2%)</td>
<td></td>
</tr>
<tr>
<td>Race - no. (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.535</td>
</tr>
<tr>
<td>White</td>
<td>131 (70%)</td>
<td>94 (69%)</td>
<td>37 (74%)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>26 (14%)</td>
<td>20 (15%)</td>
<td>6 (12%)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>4 (2.1%)</td>
<td>2 (1.5%)</td>
<td>2 (4.0%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>26 (14%)</td>
<td>21 (15%)</td>
<td>5 (10%)</td>
<td></td>
</tr>
<tr>
<td>Indication for Revision - no. (%)</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Aseptic Loosening</td>
<td>65 (35%)</td>
<td>55 (40%)</td>
<td>10 (20%)</td>
<td></td>
</tr>
<tr>
<td>Dislocation</td>
<td>21 (11%)</td>
<td>13 (9.5%)</td>
<td>8 (16%)</td>
<td></td>
</tr>
<tr>
<td>Implant Failure</td>
<td>10 (5.3%)</td>
<td>10 (7.3%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td>42 (22%)</td>
<td>20 (15%)</td>
<td>22 (44%)</td>
<td></td>
</tr>
<tr>
<td>Metallosis</td>
<td>11 (5.9%)</td>
<td>11 (8.0%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Periprosthetic Fracture</td>
<td>17 (9.1%)</td>
<td>7 (5.1%)</td>
<td>10 (20%)</td>
<td></td>
</tr>
<tr>
<td>Polyethylene Wear</td>
<td>17 (9.1%)</td>
<td>17 (12%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Impingement</td>
<td>2 (1.1%)</td>
<td>2 (1.5%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Hematoma</td>
<td>1 (0.5%)</td>
<td>1 (0.7%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Heterotopic Ossification</td>
<td>1 (0.5%)</td>
<td>1 (0.7%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
</tbody>
</table>

ASA, American Society of Anesthesiologists; BMI, body mass index; no., number; SD, standard deviation.
<sup>1</sup>Welch Two Sample t-test was used for continuous variables; Pearson’s Chi-squared test was used for categorical variables.
*p<0.05
Table 2. Mortality rates per 1,000 patient years following revision total hip arthroplasty.

<table>
<thead>
<tr>
<th>No. of Patients (%) (n=187)</th>
<th>No. of Events</th>
<th>Event rate per 1,000 person-years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>111 (59.4%)</td>
<td>24</td>
</tr>
<tr>
<td>Male</td>
<td>76 (40.6%)</td>
<td>26</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (BMI &lt;18.5)</td>
<td>8 (4.3%)</td>
<td>5</td>
</tr>
<tr>
<td>Normal weight (BMI between 18.5 and 25.0)</td>
<td>58 (31.0%)</td>
<td>16</td>
</tr>
<tr>
<td>Overweight (BMI between 25.0 and 30.0)</td>
<td>59 (31.5%)</td>
<td>15</td>
</tr>
<tr>
<td>Obese (BMI &gt; 30)</td>
<td>62 (33.2%)</td>
<td>14</td>
</tr>
<tr>
<td><strong>ASA Class</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 (2.7%)</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>96 (51.3%)</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>65 (35.8%)</td>
<td>28</td>
</tr>
<tr>
<td>4</td>
<td>15 (8.0%)</td>
<td>13</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>131 (70.1%)</td>
<td>37</td>
</tr>
<tr>
<td>Black</td>
<td>26 (13.9%)</td>
<td>6</td>
</tr>
<tr>
<td>Asian</td>
<td>4 (2.1%)</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>26 (13.9%)</td>
<td>5</td>
</tr>
<tr>
<td><strong>Indication for Revision</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aseptic Loosening</td>
<td>65 (34.8%)</td>
<td>10</td>
</tr>
<tr>
<td>Dislocation</td>
<td>21 (11.2%)</td>
<td>8</td>
</tr>
<tr>
<td>Infection</td>
<td>42 (22.5%)</td>
<td>22</td>
</tr>
<tr>
<td>Periprosthetic Fracture</td>
<td>17 (9.1%)</td>
<td>10</td>
</tr>
<tr>
<td>Implant Failure</td>
<td>10 (5.3%)</td>
<td>0</td>
</tr>
<tr>
<td>Metallosis</td>
<td>11 (5.9%)</td>
<td>0</td>
</tr>
<tr>
<td>Polyethylene Wear</td>
<td>17 (9.1%)</td>
<td>0</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1 (0.5%)</td>
<td>0</td>
</tr>
<tr>
<td>Heterotopic Ossification</td>
<td>1 (0.5%)</td>
<td>0</td>
</tr>
<tr>
<td>Impingement</td>
<td>2 (1.1%)</td>
<td>0</td>
</tr>
</tbody>
</table>

ASA, American Society of Anesthesiologists; BMI, body mass index; CI, confidence interval; No., number
*p<0.05
Table 3. Cox proportional hazard model based on indication for revision.

<table>
<thead>
<tr>
<th>Indication for Revision</th>
<th>No. of Patients (%) (n=187)</th>
<th>No. of Events</th>
<th>Hazard Ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aseptic Loosening</td>
<td>65 (35%)</td>
<td>10</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Dislocation</td>
<td>21 (11%)</td>
<td>8</td>
<td>2.25 (0.86-5.93)</td>
<td>0.10</td>
</tr>
<tr>
<td>Infection</td>
<td>42 (22%)</td>
<td>22</td>
<td>3.97 (1.87-8.44)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Periprosthetic Fracture</td>
<td>17 (9.1%)</td>
<td>10</td>
<td>5.87 (2.44-14.1)</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

Indications for revision with zero recorded events during study period

<table>
<thead>
<tr>
<th>Indication</th>
<th>No. of Patients (%)</th>
<th>No. of Events</th>
<th>Hazard Ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoma</td>
<td>1 (0.5%)</td>
<td>0</td>
<td>0.00 (0.00-Inf)</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Heterotopic Ossification</td>
<td>1 (0.5%)</td>
<td>0</td>
<td>0.00 (0.00-Inf)</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Impingement</td>
<td>2 (1.1%)</td>
<td>0</td>
<td>0.00 (0.00-Inf)</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Metallosis</td>
<td>11 (5.9%)</td>
<td>0</td>
<td>0.00 (0.00-Inf)</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Polyethylene Wear</td>
<td>17 (9.1%)</td>
<td>0</td>
<td>0.00 (0.00-Inf)</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Implant Failure</td>
<td>10 (5.3%)</td>
<td>0</td>
<td>0.00 (0.00-Inf)</td>
<td>&gt;0.9</td>
</tr>
</tbody>
</table>

CI, confidence interval; No., number

*p<0.05
Patients undergoing rTHA for periprosthetic fracture had a higher risk of death ($P = <0.0001$) than the patient cohort including patients undergoing rTHA for any other indication.
Figure 2. Kaplan Meier estimates for patients undergoing revision total hip arthroplasty for infection or any other indication.

Patients undergoing rTHA for infection had a higher risk of death ($P < 0.0001$) than the patient cohort including patients undergoing rTHA for any other indication.

Reason for Revision

Other

Infection

Overall Survival Probability

Years

$p < 0.0001$
**POSTER #55**

**Mid-Term Outcomes of a Monoblock Dual Mobility Cup Cemented into a Fully Porous Acetabular Component in Revision Total Hip Arthroplasty**

*Ittai Shichman, MD*

**Introduction**

Utilization of dual-mobility (DM) constructs has been a promising management option to address the risk of hip instability after complex revision total hip arthroplasty (rTHA). The aim of this study is to report a minimum 2-year outcome and survivorship of a cemented monoblock DM cup in a fully porous acetabular shell in complex acetabular rTHA cases.

**Methods**

A retrospective review of 27 patients who underwent revision THA with a novel construct that utilized an inner cemented DM cup (POLARCUP, Smith&Nephew, Memphis, TN) cemented into a fully porous outer acetabular metal shell (REDAPT, Smith&Nephew, Memphis, TN) was conducted. Demographics and clinical outcomes such as readmissions and revisions were collected.

**Results**

Twenty-seven cases with a mean follow-up of 2.50 ± 0.91 years were studied. Patients were on average 64.89 ± 10.54 years-old with a mean BMI of 28.29 ± 6.07 kg/m². The indication for acetabular rTHA was loosening in 13 hips (48.1%), instability in 6 (22.2%), prosthetic joint infection (PJI) in 5 (18.5%), and osteolysis in 3 (11.1%). Seven patients (25.9 %) required re-operations. Four patients underwent acetabular revision (periprosthetic joint infection: n=2 [7.4%]; dislocation: n=1 [3.7%]; aseptic loosening (fully porous cup): n=1 [3.7%]). Three patients underwent reoperation without acetabular implant revision (DAIR for PJI: n=2 [7.4%]; femoral periprosthetic fracture: n=1 [3.7%]). Kaplan-Meier (KM) survivorship analysis for all-cause acetabular revision showed rates of 96.3% at 6 months, 92.6% at 1 year, and 88.6% at 2 years. KM survivorship for aseptic acetabular revision showed rates of 96.3% at 1 year and 92.1% at 2 years. KM analysis for acetabular cup fixation showed rates of 100% at 1 year and 95.7% at 2 years. The rate of dislocation in our cohort was 3.7% (1/27).

**Conclusion**

The combined use of a dual-mobility cemented acetabular cup into a fully porous acetabular revision shell in complex rTHA cases has low risk of dislocation and loosening with excellent implant survivorship. Due to evidence of solid fixation and low rate of instability at 2 years, the use of this construct is a good option in patients with complex acetabular reconstruction and an elevated risk for instability.
POSTER #56

The Effect of Indication for Revision THA on Outcomes Following Revision THA

Ittai Shichman, MD

Introduction
Previous reports in the literature have investigated the effect of demographic variables on outcomes following revision total hip arthroplasty (rTHA); however, little has been published on the effect of indication for rTHA on patient post-operative outcomes. The purpose of this study is to investigate the impact of the reason for the rTHA on outcomes following the procedure.

Methods
This retrospective observational analysis investigated all patients who underwent unilateral, aseptic rTHA at an academic orthopedic specialty hospital between June 2011 and April 2020 who had at least 1-year of follow-up. Patients were categorized based on their reason for aseptic rTHA. Demographics, surgical factors, post-operative outcomes, and re-revision rates were collected and compared between the cohorts.

Results
In total, 654 patients were evaluated. Age was significantly different, with the youngest for leg length discrepancy (57.83 years) and the oldest for periprosthetic fracture (69.99 years; p=0.001). There were significant differences in type of revision, with the greatest proportion of full revisions for leg length discrepancy (LLD; 16.7%), acetabular-only revisions for component malpositioning (100%), femoral-only revisions for periprosthetic fracture (75.0%), and head/liner-only revisions for metal allergy (100%), soft tissue problems (100%), and trunnionosis (100%; p<0.001). There were significant differences in operative time (longest for LLD, shortest for metal allergy; p<0.001), length of stay (longest for periprosthetic fracture, shortest for soft tissue problems; p<0.001), discharge disposition (lowest rates of home discharge for metal allergy and periprosthetic fracture, highest rates for LLD, soft tissue problems, stiffness/heterotopic ossification, and trunnionosis; p<0.001), and re-revision rate (greatest for implant failure, such as acetabular liner or femoral stem fracture, lowest for LLD, metal allergy, and trunnionosis; p=0.048).

Conclusions
Patient outcomes following rTHA vary significantly based on the indication for revision. Understanding these differences can help orthopedic surgeons better optimize their patients prior to undergoing rTHA and counsel patients on potential postoperative complications.
### Table 1. Demographic information.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female (n=128)</th>
<th>Male (n=70)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean years (SD))</td>
<td>62.65 (10.60)</td>
<td>70.35 (5.35)</td>
<td>0.099</td>
</tr>
<tr>
<td>Score (n)</td>
<td>43.1 (14.3)</td>
<td>52.3 (10.0)</td>
<td>0.05</td>
</tr>
<tr>
<td>Component malpositioning (n=7)</td>
<td>66.3 (11.05)</td>
<td>50.0 (12.5)</td>
<td></td>
</tr>
<tr>
<td>Reduction / Instability (n=128)</td>
<td>69.99 (10.08)</td>
<td>37.6 (12.31)</td>
<td></td>
</tr>
<tr>
<td>Periprosthetic Fracture (n=72)</td>
<td>57.63 (12.04)</td>
<td>53.0 (14.34)</td>
<td></td>
</tr>
<tr>
<td>Implant Failure (n=24)</td>
<td>68.8 (12.96)</td>
<td>59.0 (12.96)</td>
<td></td>
</tr>
<tr>
<td>Linear wear (n=91)</td>
<td>60.85 (12.43)</td>
<td>64.86 (9.96)</td>
<td></td>
</tr>
<tr>
<td>Metal allergy (n=1)</td>
<td>64.33 (6.66)</td>
<td>67.80 (7.15)</td>
<td></td>
</tr>
<tr>
<td>Stiffness/ Heterotopic ossification (n=10)</td>
<td>65.50 (10.66)</td>
<td>65.50 (10.66)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. Surgical information – all revisions.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female (n=128)</th>
<th>Male (n=70)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of revision (n (%))</td>
<td>--</td>
<td>--</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Full</td>
<td>27 (21.3)</td>
<td>0.00 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Acetabular</td>
<td>7 (100.0)</td>
<td>61 (47.3)</td>
<td></td>
</tr>
<tr>
<td>Femoral</td>
<td>62 (51.9)</td>
<td>54 (75.0)</td>
<td></td>
</tr>
<tr>
<td>Head and/or Liner</td>
<td>5 (2.5)</td>
<td>0.00 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Surgical time (mean minutes (SD))</td>
<td>154.10 (67.37)</td>
<td>151.86 (60.02)</td>
<td></td>
</tr>
</tbody>
</table>

Categorical variables analyzed by Fisher’s exact test (•), where appropriate; continuous variables analyzed by Independent Samples T-Test (). **p<0.05 * p<0.01
<table>
<thead>
<tr>
<th>Variable</th>
<th>Aseptic loosenin g (n=197)</th>
<th>Component malpositionin g (n=7)</th>
<th>Dislocatio n/ Instability (n=128)</th>
<th>Periprostheti c Fracture (n=72)</th>
<th>Implan t Failure (n=24)</th>
<th>LLD (n=6)</th>
<th>Liner wear (n=91)</th>
<th>Metal allergy (n=1)</th>
<th>Metallicosi s (n=46)</th>
<th>Ostolysi s (n=65)</th>
<th>Soft tissue issues (n=3)</th>
<th>Stiffness/ Heterotopi c ossificatio n (n=10)</th>
<th>Trunnionosis (n=4)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay (mean days (SD))</td>
<td>3.95 (2.98)</td>
<td>3.43 (1.27)</td>
<td>3.81 (3.94)</td>
<td>4.54 (2.67)</td>
<td>2.69 (0.54)</td>
<td>2.80 (1.17)</td>
<td>5.00 (0.00)</td>
<td>2.89 (1.73)</td>
<td>3.45 (1.83)</td>
<td>1.67 (0.58)</td>
<td>2.70 (0.82)</td>
<td>2.55 (1.86)</td>
<td>&lt;0.001*</td>
<td></td>
</tr>
<tr>
<td>Discharge disposition (in [%])</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>&lt;0.001*</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>132 (67.0)</td>
<td>4 (57.1)</td>
<td>96 (75.0)</td>
<td>26 (36.1)</td>
<td>19 (79.2)</td>
<td>6 (100.0)</td>
<td>75 (82.4)</td>
<td>0 (0.0)</td>
<td>37 (80.4)</td>
<td>49 (75.4)</td>
<td>3 (100.0)</td>
<td>10 (100.0)</td>
<td>4 (100.0)</td>
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<tr>
<td>Acute Rehabilitatio n Facility</td>
<td>18 (9.1)</td>
<td>0 (0.0)</td>
<td>8 (6.3)</td>
<td>9 (12.5)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>5 (5.5)</td>
<td>1 (100.0)</td>
<td>1 (2.2)</td>
<td>1 (1.5)</td>
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<td>Skilled Nursing Facility</td>
<td>44 (22.3)</td>
<td>3 (42.9)</td>
<td>23 (18.0)</td>
<td>37 (51.4)</td>
<td>5 (20.8)</td>
<td>0 (0.0)</td>
<td>1 (12.1)</td>
<td>0 (0.0)</td>
<td>6 (13.0)</td>
<td>15 (23.1)</td>
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<td>Other</td>
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<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
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<tr>
<td>All cause 90-day ED visit (n [%])</td>
<td>12 (6.1)</td>
<td>1 (14.3)</td>
<td>10 (7.8)</td>
<td>5 (6.9)</td>
<td>1 (4.2)</td>
<td>0 (0.0)</td>
<td>6 (6.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (1.5)</td>
<td>1 (33.3)</td>
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<tr>
<td>All cause 90-day Readmission (n [%])</td>
<td>27 (13.7)</td>
<td>1 (14.3)</td>
<td>19 (14.8)</td>
<td>11 (15.3)</td>
<td>5 (20.8)</td>
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<td>8 (8.8)</td>
<td>0 (0.0)</td>
<td>4 (8.7)</td>
<td>8 (12.3)</td>
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<td>Reoperation (n [%])</td>
<td>12 (6.1)</td>
<td>0 (0.0)</td>
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<td>7 (9.7)</td>
<td>2 (8.3)</td>
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<td>Re-revision (n [%])</td>
<td>38 (19.3)</td>
<td>1 (14.3)</td>
<td>29 (22.7)</td>
<td>9 (12.5)</td>
<td>10 (41.7)</td>
<td>0 (0.0)</td>
<td>11 (42.1)</td>
<td>0 (0.0)</td>
<td>4 (8.7)</td>
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<tr>
<td>Number of re-revisions (mean revision (SD))</td>
<td>0.33 (0.84)</td>
<td>0.14 (0.38)</td>
<td>0.34 (0.72)</td>
<td>0.29 (0.97)</td>
<td>0.71 (1.08)</td>
<td>0.00 (0.00)</td>
<td>0.18 (0.55)</td>
<td>0.00 (0.00)</td>
<td>0.09 (0.29)</td>
<td>0.28 (0.63)</td>
<td>0.67 (1.16)</td>
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<td>Mortality (n [%])</td>
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<td>3 (2.3)</td>
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</table>

Categorical variables analyzed by Fisher’s exact test (†) or Chi square test (•), where appropriate; continuous variables analyzed by Independent Samples T-Test (). 
* p<0.05 
** p<0.01
Effect of Total Knee Arthroplasty on Coronal Alignment of the Ankle Joint

Ittai Shichman, MD

Background

The effect of total knee arthroplasty (TKA) on the ankle joint is not entirely clear. To date, only a few studies have been conducted on this topic, with conflicting outcomes. The purpose of this study was to assess postoperative changes in the coronal alignment of the ankle joint in patients undergoing TKA for various degrees of knee deformity.

Methods

This study included 107 patients who had undergone TKA for primary osteoarthritis. In all cases, preoperative coronal alignment deformity of the knee was corrected in an attempt to restore the native mechanical axis of the knee. Patients were stratified into one of three groups according to the degree of knee coronal alignment correction that was achieved intraoperatively: Group 1 (<10° varus/valgus correction, n=60), Group 2 (≥10° varus correction, n=30), and Group 3 (≥10° valgus correction, n=17). Knee/ankle alignment angles were measured on full-length, standing anteroposterior imaging preoperatively and postoperatively and included the hip-knee-ankle (HKA) angle, tibial plafond inclination (TPI), talar inclination (TI), and tibiotalar tilt (TTT) angle.

Results

Satisfactory correction of the knee deformity and restoration of the mechanical axis were achieved in all three groups (p<0.01). Significant changes in ankle alignment, specifically with regard to TPI (9.5°±6.9, p<0.01) and TI (8.8°±8.8, p=0.03) were noted in Group 3 patients (≥10° valgus correction) compared to the other two groups. Regardless of the degree of knee deformity correction, TKA did not lead to significant changes in the TTT angle.

Conclusion

A correction of ≥10 degrees in a genu valgum deformity can affect ankle joint alignment, leading to alterations in the tibial plafond (TPI) and the talar inclination (TI). These findings need to be taken into consideration in assessing candidates for TKA, especially for patients with concomitant deformities of the ankle and/or hindfoot joints.
Early Radiographic and Clinical Outcomes of an Additive Manufactured Acetabular Component

Jeff Frandsen, MD

Introduction

Additive manufacturing has been recently more widely adopted in the orthopaedic industry. This technology has been used for the manufacturing of multiple components, including primary and revision acetabular components. However, there is a paucity of literature on the radiographic and clinical outcomes of these relatively novel components. The aim of this study is to assess the two-year clinical and radiographic outcomes of a specific additive-manufactured acetabular component in primary total hip arthroplasty (THA).

Methods

We performed a retrospective review of 60 patients who underwent primary total hip arthroplasty (THA) at our institution with use of the Stryker Trident II acetabular component. Evaluation of anteroposterior (AP) and lateral radiographs was performed at 6 weeks, 1 year, and 2 years postoperatively. Radiographic measurements included acetabular inclination and anteversion (via an ellipse method on AP radiographs). Each radiograph was evaluated for radiolucencies in Charnley and DeLee zones, as well as for signs of biologic fixation. All radiographic assessments were performed by an independent orthopaedic surgeon and a musculoskeletal radiologist. Patient-reported outcomes and complications were obtained as well.

Results

Average follow-up was 1.1 years (SD=0.84). There were no cases of component loosening or changes in component position during follow-up. A radiolucent line was identified in 1 patient in zone 1, though only at 6 weeks. Radiographic signs of cup biologic fixation, including superolateral buttressing and medial stress shielding, were present in 85% of cases by final follow-up. The average inclination was 44.9° (SD=3.5°) and the average anteversion was 26.4° (SD=4.4°). PROMIS scores significantly increased at final follow-up and there were no complications in this cohort.

Conclusion

This study demonstrated excellent radiographic and clinical outcomes with this novel additive manufactured acetabular component. Although longer term follow-up is warranted, this acetabular component demonstrated excellent biologic fixation and reliable fixation at mid-term follow-up.
PERIOPERATIVE STATIN USE MAY REDUCE POSTOPERATIVE ARRHYTHMIA RATES AFTER TOTAL JOINT ARTHROPLASTY

John C. Bonano, MD

Background

Postoperative arrhythmias are associated with increased morbidity and mortality in total joint arthroplasty (TJA) patients. HMG-coA reductase inhibitors (statins) decrease atrial fibrillation rates after cardiac surgery, but it is unknown if this cardioprotective effect is maintained after joint reconstruction surgery. We aim to determine if perioperative statin use decreases the incidence of 90-day post-operative arrhythmias in patients undergoing primary TJA.

Methods

We performed a single-center retrospective cohort study in which 231 primary TJA patients (109 hips, 122 knees) received Simvastatin 80 mg daily during their hospitalization as part of a single surgeon’s standard postoperative protocol. This cohort was matched to 966 primary TJA patients (387 hips and 579 knees) that did not receive Simvastatin. New onset arrhythmias (bradycardia, atrial fibrillation/tachycardia/flutter, paroxysmal supraventricular tachycardia, and ventricular tachycardia) and complications (readmissions, thromboembolism, infection, and dislocation) within 90 days of the procedure were documented. Categorical variables were analyzed using Fisher’s exact tests. Our study was powered to detect a 3% difference in arrhythmia rates.

Results

Within 90 days postoperatively, arrhythmias occurred in 1 patient (0.4%) who received a perioperative statin, 39 patients (4.0%) who did not receive statins (p = 0.003), and 24 patients (4.2%) who were on outpatient statins (p = 0.005). This is 10-fold reduction in the relative risk of developing a postoperative arrhythmia within 90-days of arthroplasty and an absolute risk reduction of 3.6%.

Conclusion

Treating as few as 28 patients with perioperative Simvastatin prevents one new cardiac arrhythmia within 90-days in statin-naïve patients undergoing total joint arthroplasty.
Background
It is unclear whether reimplantation of a patellar component during two-stage revision for total knee arthroplasty periprosthetic joint infection (PJI) affects patient reported outcome measures (PROMs) or implant survivorship. The purpose of this study was to evaluate whether resurfacing the patella during reimplantation confers a functional benefit or increases implant survivorship after two-stage treatment for PJI.

Methods
After confound exclusions, a retrospective study of 103 consecutive two-stage revisions for knee PJI at a single tertiary academic center was performed. Patient demographics, comorbidities, Knee Society scores, KOOS JR score, UCLA Activity Level, satisfaction, postoperative assistive device use, implant survivorship, and radiographic patellar tilt and displacement were compared in patients who underwent reimplantation with and without a patellar component. Statistical analysis of outcomes and minimally clinical important differences in PROMS were evaluated.

Results
43 patients (41.7%) underwent reimplantation with a patellar component and 60 patients (58.3%) without a patella component. Demographics of age, BMI, sex, and ASA did not differ between groups (p≥0.156). At mean follow-up of 30 months, there were no differences in postoperative use of assistive devices (p=0.098), pain with walking (p=0.714) or stairs (p=0.318), or satisfaction (0.245) with numbers available. Radiographically, 68% of patients with unresurfaced patellae demonstrated >4mm of postoperative lateral patellar displacement compared to 40% of resurfaced patellae (p=0.011). Further, 66% of resurfaced patellae remained within 4mm of preoperative displacement, compared to 30% of unresurfaced patellae (p=0.007). However, PROMS did not differ based on patellar displacement (p>0.130). No difference was observed in all-cause reoperation survivorship (p=0.679).

Conclusion
Following two-stage revision for knee PJI, patellar resurfacing minimizes deleterious lateral patella displacement, likely via mechanical constraint within the femoral trochlea. However, resurfacing does not appear to significantly impact postoperative PROMs or survivorship. It is acceptable to avoid resurfacing the patella at reimplantation if bone loss creates excessive risk.
The Effect of Joint Line Elevation on Patient Reported Outcomes After Contemporary Revision TKA: Is Traditional Teaching Still Valid?

Cameron M. Metzger, MD

Background
Joint line elevation in revision total knee arthroplasty (rTKA) is considered a risk factor for inferior outcomes, engendering a dogmatic protocol of joint line restoration. However, this precedent is based upon historical data using rudimentary revision systems and unvalidated outcome measures. This study's purpose was to evaluate the effect of joint line height elevation on validated patient-reported outcome measures (PROMs) using modern revision implants.

Methods
327 rTKAs performed at a single institution were reviewed. Surgical technique prioritized flexion-extension gap balancing and accepted joint line elevation if necessary to achieve a balanced flexion-space. Radiographic measurements included changes in joint line height (from preoperative and calculated “intended” anatomic/native), and change in posterior condylar offset. Prospectively collected PROMs were evaluated using multivariate regression.

Results
The mean joint line elevation from preoperative and “intended” to postoperative joint line was 4.9±5.7mm and 7.2±6.6mm, respectively. The mean increase in posterior condylar offset was 1.0±4.6mm. Patients within ±5mm of preoperative joint line height were 3.88x more likely to achieve the MCID for KOOS, JR. An increase from intended joint line height >5mm or >8mm was not associated with differences in any other PROMS (p≥0.165).

Conclusions
In contemporary rTKA, recreating the joint line within 5mm of preoperative improves knee-specific health outcomes. These data support approximating native joint line height as a viable technique to optimize flexion-gap balance and subsequent patient outcomes in rTKA.
Selective Patella Resurfacing in Contemporary Total Knee Arthroplasty: A Matched Cohort Analysis

Gregory Schmidt, MD

Background
Leaving the patella unresurfaced in total knee arthroplasty (TKA) is increasing due to modern patella-friendly implants, awareness that complications are not uncommon with resurfacing, and knowledge that historical studies were scientifically confounded for many reasons. The purpose of this study was to examine the effect of selective patellar resurfacing on patient-reported outcome measures (PROMS) using modern implants and techniques.

Methods
166 TKAs performed between 2012 and 2019 with patellar resurfacing were case-control matched to 166 TKAs without patella resurfacing. Indications for not resurfacing the patella were central congruent tracking, joint space preservation radiographically and ≤ grade 3 patellar chondral damage. Case-control matching was based on age, sex, BMI, ASA-classification, preoperative comorbidities, and preoperative radiographic osteoarthritis severity scores. All TKAs were performed with contemporary patella-friendly components and modern perioperative protocols. Prospectively collected PROMS were evaluated at minimum 1-year follow-up.

Results
There were no significant differences between cohorts in demographics (p≥0.347), comorbidities (p≥0.443), or radiographic osteoarthritis severity scores (p≥0.078). Preoperatively, mean patellar tilt was less for the unresurfaced patella group (3 vs 4°, p=0.003); however, mean postoperative patellar tilt was not different (3 vs 3°, p=0.225). At minimum 1-year, there were no differences in PROMS between cohorts (p≥0.090); however, UCLA Activity Level was significantly higher for the unresurfaced patella group (6.4 vs 5.6, p< 0.001) increasing from a slightly higher preoperative activity level (4.9 vs 4.4, p=0.014). There was no difference in all-cause reoperation rates between cohorts (p=0.723).

Conclusion
In modern contemporary TKA, not resurfacing the patella in select patients achieves equivalent minimum 1-year patient-reported outcomes and potentially greater functional activity level compared to patella resurfacing. Leaving select patellae unresurfaced will likely conserve healthcare resources, decrease cost, improve operative efficiency, and minimize resurfacing-related complications to the extensor mechanism. Continued research with contemporary implants and surgical techniques and enhanced scientific rigor is warranted.
Osteoarthritic Severity in Unresurfaced Patellae Does Not Adversely Affect PROMS in Contemporary TKA

Gregory Schmidt, MD

Background
Selective patella resurfacing during total knee arthroplasty (TKA) is experiencing a resurgence as the value of universally resurfacing the patella with modern patella-friendly implants in contemporary TKA is questioned. However, as we define criteria for selective patella resurfacing, the degree of osteoarthritis (OA) acceptable to leave a native patella unresurfaced remains unknown. This study’s purpose was to examine the effect of patellofemoral OA severity on PROMS at minimum 1-year in primary TKAs performed without patellar resurfacing.

Methods
195 TKAs without patellar resurfacing were retrospectively reviewed. Preoperative patellofemoral OA was assessed in medial and lateral facets and graded on severity, marginal osteophytes, and joint space narrowing using Kellgren-Lawrence (KL) and OARSI atlas grading systems. All TKAs were performed using contemporary implants and modern perioperative protocols. Prospectively collected PROMS were evaluated at minimum 1-year follow-up in multivariate statistical models controlling for demographics and covariates.

Results
The cohort was 53% female with mean age and BMI of 61±11 years and 35±8 kg/m2. In multivariate regression, lateral patella KL grade of ≥2 was associated with lower pain scores and higher KOOS JR scores (p≤0.013), and a knee ‘always feeling normal’ at minimum 1-year (OR 2.37, 95%CI: 1.14-4.90, p=0.020). OA severity via marginal osteophyte and joint space narrowing grades were not associated with any PROMS in multivariate analysis with numbers available.

Conclusion
Interestingly, worse preoperative OA severity in the lateral patellar facet, graded with the KL system, predicted superior knee-specific PROMS in patients with unresurfaced patellae after contemporary TKA. This observation supports the clinical finding that patients with more severe OA have optimized patient satisfaction, and highlights the minimal contribution of patella OA to knee function after TKA for tibiofemoral disease. Further research is warranted to delineate selective patella resurfacing criteria for optimal TKA outcomes.
Introduction
While additional resources associated with direct anterior (DA) approach total hip arthroplasty (THA) such as fluoroscopy, staff, and special tables are well recognized, time consumption is not well studied. The purpose of this study was to analyze anesthesia and surgical time in DA and posterior approach THA in a large healthcare system across multiple facilities and surgeons.

Methods
3,155 unilateral primary THAs performed via DA or posterior approaches between 1/1/2017 and 06/30/2019 at nine hospitals and ambulatory surgery centers (ASC) in a large metropolitan healthcare system were retrospectively reviewed. All surgeons were experienced and beyond learning curves. 247 cases were excluded to eliminate confounds. Operating room (OR) in and out times and surgical times were collected via EMR electronic and manual data extraction with verification. Multivariate statistical analyses were utilized with p<0.05 significant.

Results
1261 DA approach (43%) and 1647 posterior approach (57%) THAs were analyzed. Mean total OR time, including anesthesia and positioning, was greatest for hospital-based DA THAs (146 mins), followed by hospital posterior approach THAs (126.4 mins), ASC-based DA THAs (118.1 mins) and ASC posterior THAs (90.1 mins) (p<0.001). In multivariate analysis, compared to the optimal ASC posterior approach group, the total OR time predictive model added 31 minutes per ASC DA THA, 33 minutes per hospital posterior THA, and 56 minutes for hospital DA THA (p<0.001). Similar predictive effect was observed for surgical time, which added 18 minutes per ASC-based DA THA, 22 minutes for hospital posterior THA and 29 minutes for hospital DA THA (p<0.001).

Conclusion
In the COVID era, efficiency should be enhanced to maximize patient access for elective procedures and facilitate the healthcare system financial recovery. Despite equivocal clinical results, DA approach THA consumes substantially more OR time when compared to the posterior approach in both the hospital and ASC setting.
Improving Postoperative Acute Kidney Injury Rates Following Primary Total Joint Arthroplasty

Nathan R. Angerett, DO

Introduction
Perioperative hip and knee arthroplasty complications remain a significant clinical and financial burden. Our institution has shifted to developing protocols to decrease these perioperative complications. This study focuses on acute kidney injury (AKI) rates status post primary total joint arthroplasty (TJA). Current literature demonstrates a 2%-15% incidence of AKI following TJA. However, there is a paucity of published literature on protocols that have effectively reduced AKI rates following TJA. The purpose of this study was to evaluate the effect that our institutionally developed perioperative renal protocol had on the postoperative AKI rates.

Methods
A retrospective cohort study was performed. Patient demographics, baseline creatinine, and post-operative creatinine values during the patient’s hospitalization were collected and analyzed. The pre-intervention cohort data contained all patients at our institution that underwent a primary TJA from November 1, 2016–January 1, 2018. The post-intervention cohort included all primary TJA patients from July 1, 2018–February 2, 2020. AKI was defined using the AKI Network (AKIN) classification system comparing baseline and postoperative creatinine values. A multivariate analysis was performed to determine the statistical significance of our results.

Results
Pre-intervention 1,013 patients underwent a primary TJA with 68 patients developing an AKI postoperatively. Post-intervention 2,169 patients underwent primary TJA with 90 developing an AKI (6.71% vs 4.15%, p value=0.0015, OR=0.59, 95%CI=0.42-0.82).

Conclusion
This study demonstrated that implementation of a perioperative renal protocol can significantly reduce AKI rates. A reduction in AKI rates following TJA will result in improved outcomes and secondarily decrease the financial impact of postoperative complications seen following TJA.
Partial versus Full Component Revision for Arthrofibrosis following Total Knee Arthroplasty
Zhongming Chen MD

Introduction
Arthrofibrosis occurs in up to 10% of patients who undergo total knee arthroplasty (TKA). For recalcitrant cases that are not amenable to manipulation under anesthesia (MUA), there is little consensus on whether one or both components should be revised. Therefore, the purpose of this study was to compare reoperation rates when management of arthrofibrosis involved partial versus full component exchange revision TKA. A secondary aim was to assess risk factors associated with undergoing lysis of adhesions (LOA) following primary TKA.

Methods
A large all-payer database was used to query all patients who underwent revision TKA for arthrofibrosis between January 2010 and April 2020. A total of 13,165 patients were identified, 12,927 (98.2%) of which underwent all-component knee revision (CPT-27447) while the other 238 (1.8%) underwent partial knee revision (CPT-27446). The rate of re-operation at 1- and 2-year follow-up was compared using chi-square analyses. A multivariate logistic regression was conducted to assess risk factors for requiring LOA.

Results
The incidence and odds of re-operation within 1 year following partial component revision TKA was significantly higher than full component revision (6.0 versus 3.6%, odds ratio (OR) 1.72, 95% confidence interval (CI) [1.01-2.92], p=0.044). This difference increased at 2 years following revision (8.8 versus 4.6%, OR 2.00 [1.29-3.13], p<0.01). Risk factors associated with the need for LOA included age less than 65 years (OR 4.04 [2.63-6.55], p<0.001), age between 65 to 74 years (OR 1.81 [1.17-2.96], p=0.01), and fibromyalgia (OR 1.51 [1.20-1.90], p<0.001).

Conclusions
Full component revision TKA for arthrofibrosis is associated with lower 2-year re-revision rate than partial component exchange. At 1-year follow-up, full component revision led to a lower re-revision rate. Risk factors for LOA include younger age and fibromyalgia. Accelerated functional rehabilitation with early range of motion should be emphasized for these at-risk patients.
Introduction
The Birmingham Hip Resurfacing arthroplasty (BHR; Smith & Nephew, Warwick, United Kingdom) has been in use for the management of hip arthritis in patients since 1997. Over the years, there have been increasing concerns regarding long term survival of hip resurfacing arthroplasties due to adverse reaction to metal debris (ARMD). We present 20 year results of 234 consecutive BHRs performed in our unit.

Methods
All the BHRs performed consecutively between 1999 and 2001 were followed up in our department. Patients were seen in clinics where they had clinical and functional assessment, imaging and blood tests. Imaging consisted of radiographs and ultrasound scans of the hip and blood tests included serum cobalt (Co) and chromium (Cr) levels. Patient reported outcome measures (PROMs) were collected at the clinics. These consisted of Oxford Hip Scores (OHS), hip disability and osteoarthritis outcome score (HOOS), Forgotten Joint Score (FJS) and EuroQol (EQ-5D 3L). Patients who could not attend clinics in person were sent postal questionnaires and requests for radiographs and blood tests. They had radiographs and serum Co/Cr levels performed locally.

Patient details were provided to the Australian Joint Registry to identify the total number of patients that had been revised and those who had died with prosthesis in situ. These were cross referenced with our own medical records. Survivorship analysis was performed using Kaplan Meier estimates. Revision for any cause was considered as an end-point for the analysis. Statistical software R Studio (version 1.3.1093, R Foundation, Vienna, Austria) was used for performing analyses. P value < 0.05 was considered significant for all the statistical tests.

Results
Mean follow-up was 20.9 (19.3 - 22.4) years. Prior to 20-year follow-up, 19 (8.1%) hips were revised and 26 (12 %) patients representing 26 hips had died. Among the remaining 189 hips, 115 (61%) were available for follow-up at 20 years. Mean age at operation was 52 (18 - 68) years. There were 75 females (34.6%) [mean age 50 (19 - 66) years] and 142 males (65.4%) [mean age 52 (18 - 68) years].

A total of 26 (12.4%) patients died from causes unrelated to the BHR and 19 (8.1%) revisions were identified by the joint registry and our own review. The cumulative implant survival rate at 20 years was 91.5% (95% CI 87.6 to 95.6). The cumulative implant survival rate for women was 87% (95% CI 79.7 to 94.9) (12 hips revised) and that for men was 96.5% (95% CI 93.5 to 99.6) (seven hips revised). The difference in cumulative survival rate between men and women was statistically significant (log rank, p = 0.029).

The mean OHS, HOOS JR, FJS were 45 (29 to 48), 89 (43 to 100), 84 (19 to 100) respectively. The five domains of EQ-5D 3L were 1.2, 1.03, 1.2, 1.3, 1.1 and 82.6 (50 to 100) respectively. USS in 98 patients (52%) showed evidence of gluteal tendinopathy in 14 patients, ilio-psoas tendinopathy and heterotrophic ossification in one patient each. Mean Co and Cr levels in 115 patients (61%) were 35.9 (8 to 374) nmol/l and 49.9 (9 to 408) nmol/l.
Discussion
This study shows that BHR provides excellent outcomes in young, male patients. To our knowledge, there is no other study reporting on minimum 20 year follow up of BHRs including functional assessment, USS, Co/Cr levels. As per our own records and the data provided by the AOANJRR, we can be confident that we are as accurate as possible with the numbers of hips revised in Australia and those that died with BHR in situ.
Home Health Care in Medicare-aged Patients Is Associated with Increased Early Emergency Visits, Readmissions, and Costs Following Total Knee Arthroplasty

Robert A Burnett, MD

Introduction
Some practices routinely provide patients with home health services believing that they are beneficial to assist with care and monitoring in the early postoperative period following total knee arthroplasty (TKA). The purpose of this study is to determine whether patients receiving home health services postoperatively had lower rates of complications, emergency room visits, and readmissions as well as to determine if home health provided value by reducing total episode-of-care costs.

Methods
We reviewed the Humana claims database to identify all primary TKA patients over 65 years old from 2010-2018. Patients who received home health services were matched using a propensity score algorithm to a set of similar patients that were discharged home without home health services. We compared complication rates, emergency room visits, readmissions, and 90-day episode-of-care claims costs between the groups. Multivariate regression analysis was performed to determine the independent effect of home health services on emergency department (ED) visits and hospital readmissions.

Results
Of the 185,444 TKA patients discharged home, 15,849 (8.5%) received home health services. Patients who received home health services had higher rates of ED visits at 2 weeks (3.3% vs. 2.8%, p=0.014) and 3 months (7.1% vs. 6.5%, p=0.038) as well as increased readmissions at 2 weeks (0.9% vs. 0.7%, p=0.028); complication rates were similar between groups (11.4% vs. 10.9%, p=0.159). Episode-of-care costs for home health patients were higher than those discharged under self-care ($24,266 vs. $22,539, p<0.001).

Conclusion
Home health services do not appear to provide value as they are associated with significantly increased costs and do not lower the rates of complications, ED visits or readmissions following TKA.
Table 1. Demographic Information for patients receiving home health versus patients discharged under self-care prior to and after matching.

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<th>Home Health</th>
<th>P value</th>
<th>Home Under self-care, Unmatched</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 15,849</td>
<td>N = 15,849</td>
<td></td>
<td>N = 169,595</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td>N (%)</td>
<td></td>
</tr>
<tr>
<td>Average age (yrs)</td>
<td>71.5±3.52</td>
<td>71.5±3.53</td>
<td>1.00</td>
<td>72.0±3.69</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>5361 (33.8)</td>
<td>4506 (28.4)</td>
<td>&lt;0.001</td>
<td>57,419 (33.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Northeast</td>
<td>3403 (21.5)</td>
<td>2669 (16.8)</td>
<td>&lt;0.001</td>
<td>36,138 (21.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>South</td>
<td>5059 (31.9)</td>
<td>7506 (47.3)</td>
<td>&lt;0.001</td>
<td>56,065 (33.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>West</td>
<td>2013 (12.7)</td>
<td>1159 (7.3)</td>
<td>&lt;0.0001</td>
<td>19,828 (11.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Location</td>
<td></td>
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<tr>
<td>Inpatient</td>
<td>15849 (100)</td>
<td>15845</td>
<td>0.923</td>
<td>169580 (100)</td>
<td>0.012</td>
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<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Female</td>
<td>9778 (61.7)</td>
<td>9763 (61.6)</td>
<td>0.872</td>
<td>108340 (63.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>1248 (9.2)</td>
<td>1248 (9.2)</td>
<td>1.00</td>
<td>12397 (90.8)</td>
<td>0.009</td>
</tr>
<tr>
<td>2011</td>
<td>2067 (9.7)</td>
<td>2067 (9.7)</td>
<td>1.00</td>
<td>19315 (90.3)</td>
<td>&lt;0.001</td>
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<tr>
<td>2012</td>
<td>2075 (9.6)</td>
<td>2070 (9.5)</td>
<td>1.00</td>
<td>19623 (90.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2013</td>
<td>2360 (9.3)</td>
<td>2360 (9.3)</td>
<td>1.00</td>
<td>23814 (90.7)</td>
<td>&lt;0.001</td>
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<tr>
<td>2014</td>
<td>2539 (9.0)</td>
<td>2544 (9.0)</td>
<td>0.939</td>
<td>25753 (91.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2015</td>
<td>2642 (10.1)</td>
<td>2642 (10.1)</td>
<td>1.00</td>
<td>23633 (89.9)</td>
<td>&lt;0.001</td>
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<tr>
<td>2016</td>
<td>1324 (5.4)</td>
<td>1324 (5.4)</td>
<td>1.00</td>
<td>23064 (94.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2017</td>
<td>1069 (4.6)</td>
<td>1069 (4.6)</td>
<td>1.00</td>
<td>21996 (95.4)</td>
<td>&lt;0.001</td>
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<tr>
<td>2018</td>
<td>525 (4.7)</td>
<td>525 (4.7)</td>
<td>1.00</td>
<td>10662 (95.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Average Length of Stay</td>
<td>2.90 ± 3.4</td>
<td>3.10 ± 2.69</td>
<td>&lt;0.001</td>
<td>3.03 ± 3.25</td>
<td>0.002</td>
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</tbody>
</table>
Table 2. Elixhauser Comorbidity Index breakdown of patients discharged with and without home health. Matched and unmatched groups are displayed.

<table>
<thead>
<tr>
<th>ECI Variables (%)</th>
<th>Home with Self-Care (N=15,849)</th>
<th>Home Health (N=15,849)</th>
<th>P value</th>
<th>Home Under Self-Care (N=169,595)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol Abuse</td>
<td>1.4</td>
<td>1.3</td>
<td>0.563</td>
<td>1.5</td>
<td>0.093</td>
</tr>
<tr>
<td>Blood Loss Anemia</td>
<td>7.9</td>
<td>8.3</td>
<td>0.173</td>
<td>8.3</td>
<td>0.967</td>
</tr>
<tr>
<td>Cardiac Arrhythmias</td>
<td>18.4</td>
<td>18.5</td>
<td>0.917</td>
<td>19.1</td>
<td>0.070</td>
</tr>
<tr>
<td>COPD</td>
<td>25.4</td>
<td>25.9</td>
<td>0.424</td>
<td>26.1</td>
<td>0.518</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>5.5</td>
<td>5.6</td>
<td>0.669</td>
<td>5.9</td>
<td>0.598</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>9.2</td>
<td>9</td>
<td>0.585</td>
<td>8.9</td>
<td>0.793</td>
</tr>
<tr>
<td>Deficiency Anemia</td>
<td>10.6</td>
<td>10.1</td>
<td>0.185</td>
<td>10.6</td>
<td>0.088</td>
</tr>
<tr>
<td>Depression</td>
<td>20.3</td>
<td>20.4</td>
<td>0.95</td>
<td>20.3</td>
<td>0.950</td>
</tr>
<tr>
<td>Diabetes, complicated</td>
<td>12</td>
<td>11.6</td>
<td>0.296</td>
<td>11.7</td>
<td>0.842</td>
</tr>
<tr>
<td>Diabetes, uncomplicated</td>
<td>33</td>
<td>32.2</td>
<td>0.131</td>
<td>32.9</td>
<td>0.100</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>1.4</td>
<td>1.6</td>
<td>0.249</td>
<td>1.7</td>
<td>0.224</td>
</tr>
<tr>
<td>Fluid and Electrolyte Disorders</td>
<td>18.3</td>
<td>18.5</td>
<td>0.656</td>
<td>19.7</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>HIV</td>
<td>0.2</td>
<td>0.1</td>
<td>0.274</td>
<td>0.1</td>
<td>0.487</td>
</tr>
<tr>
<td>Hypertension</td>
<td>34.2</td>
<td>34.5</td>
<td>0.645</td>
<td>35.8</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>24.9</td>
<td>25.4</td>
<td>0.359</td>
<td>25.9</td>
<td>0.215</td>
</tr>
<tr>
<td>Liver disease</td>
<td>7.4</td>
<td>7.2</td>
<td>0.467</td>
<td>7.7</td>
<td>0.029</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>2.4</td>
<td>2.2</td>
<td>0.279</td>
<td>2.3</td>
<td>0.292</td>
</tr>
<tr>
<td>Metastatic Cancer</td>
<td>1.2</td>
<td>1.1</td>
<td>0.639</td>
<td>1.4</td>
<td>0.013</td>
</tr>
<tr>
<td>Obesity</td>
<td>27.6</td>
<td>27.6</td>
<td>0.992</td>
<td>28</td>
<td>0.204</td>
</tr>
<tr>
<td>Other Neurological Disorders</td>
<td>10.3</td>
<td>9.8</td>
<td>0.209</td>
<td>10.5</td>
<td>0.007*</td>
</tr>
<tr>
<td>Paralysis</td>
<td>0.9</td>
<td>0.8</td>
<td>0.146</td>
<td>1</td>
<td>0.018</td>
</tr>
<tr>
<td>Peptic Ulcer Disease</td>
<td>3.4</td>
<td>3.6</td>
<td>0.266</td>
<td>3.7</td>
<td>0.776</td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>18.3</td>
<td>18.8</td>
<td>0.196</td>
<td>19.3</td>
<td>0.147</td>
</tr>
<tr>
<td><strong>Psychoses</strong></td>
<td>1.7</td>
<td>1.2</td>
<td><strong>&lt;0.001</strong>*</td>
<td>1.7</td>
<td><strong>&lt;0.001</strong>*</td>
</tr>
<tr>
<td>Pulmonary Heart Disease</td>
<td>5.1</td>
<td>4.9</td>
<td>0.548</td>
<td>5.6</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Renal Disease</td>
<td>12.6</td>
<td>13.3</td>
<td>0.075</td>
<td>13.6</td>
<td>0.272</td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>7.9</td>
<td>8.3</td>
<td>0.252</td>
<td>7.9</td>
<td>0.107</td>
</tr>
<tr>
<td>Solid tumor without Metastases</td>
<td>12.8</td>
<td>12.8</td>
<td>0.875</td>
<td>13.4</td>
<td>0.470</td>
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<tr>
<td><strong>Valvular Disease</strong></td>
<td><strong>17.9</strong></td>
<td><strong>18.9</strong></td>
<td><strong>&lt;0.001</strong>*</td>
<td>19.2</td>
<td><strong>0.005</strong>*</td>
</tr>
<tr>
<td>Weight Loss</td>
<td>4.7</td>
<td>4.4</td>
<td>0.179</td>
<td>4.9</td>
<td>0.002</td>
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</table>
Table 3. Frequency of surgical and medical complications following TKA in patients discharged home with and without home health care.

<table>
<thead>
<tr>
<th></th>
<th>Home Under Self-Care, Matched (N=15,849)</th>
<th>Home Health, Matched (N=15,849)</th>
<th>P value</th>
<th>Home Under Self-Care, Unmatched (N=169,595)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANY COMPLICATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>4.9%</td>
<td>4.5%</td>
<td>0.076</td>
<td>4.5%</td>
<td>0.937</td>
</tr>
<tr>
<td>3 months</td>
<td>11.4%</td>
<td>10.9%</td>
<td>0.159</td>
<td>11.1%</td>
<td>0.398</td>
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<tr>
<td><strong>MEDICAL COMPLICATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>76 (0.5)</td>
<td>64 (0.4)</td>
<td>0.311</td>
<td>830 (0.5)</td>
<td>0.153</td>
</tr>
<tr>
<td>3 months</td>
<td>174 (1.1)</td>
<td>149 (0.9)</td>
<td>0.164</td>
<td>1870 (1.1)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>DVT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>33 (0.2)</td>
<td>22 (0.1)</td>
<td>0.138</td>
<td>225 (0.1)</td>
<td>0.839</td>
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<tr>
<td>3 months</td>
<td>67 (0.4)</td>
<td>60 (0.4)</td>
<td>0.535</td>
<td>725 (0.4)</td>
<td>0.364</td>
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<tr>
<td>Pulmonary Embolism</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>110 (0.7)</td>
<td>84 (0.5)</td>
<td>0.072</td>
<td>998 (0.6)</td>
<td>0.355</td>
</tr>
<tr>
<td>3 months</td>
<td>126 (0.8)</td>
<td>159 (1.0)</td>
<td>0.0345</td>
<td>1561 (0.9)</td>
<td>0.298</td>
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<tr>
<td>Stroke</td>
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<td></td>
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<tr>
<td>2 weeks</td>
<td>&lt;11</td>
<td>&lt;11</td>
<td>*</td>
<td>137 (0.1)</td>
<td>*</td>
</tr>
<tr>
<td>3 months</td>
<td>35 (0.2)</td>
<td>30 (0.2)</td>
<td>0.535</td>
<td>374 (0.2)</td>
<td>0.420</td>
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<td>Urinary tract infection</td>
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<tr>
<td>2 weeks</td>
<td>399 (2.5)</td>
<td>368 (2.3)</td>
<td>0.263</td>
<td>4252 (2.5)</td>
<td>0.152</td>
</tr>
<tr>
<td>3 months</td>
<td>697 (4.4)</td>
<td>663 (4.2)</td>
<td>0.357</td>
<td>7516 (4.4)</td>
<td>0.145</td>
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<tr>
<td>Acute Kidney Injury</td>
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<td></td>
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<tr>
<td>2 weeks</td>
<td>92 (0.6)</td>
<td>76 (0.5)</td>
<td>0.217</td>
<td>918 (0.5)</td>
<td>0.308</td>
</tr>
<tr>
<td>3 months</td>
<td>194 (1.2)</td>
<td>174 (1.1)</td>
<td>0.297</td>
<td>2106 (1.2)</td>
<td>0.116</td>
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<tr>
<td>Myocardial Infarction</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>12 (0.1)</td>
<td>&lt;11</td>
<td>*</td>
<td>112 (0.1)</td>
<td>*</td>
</tr>
<tr>
<td>3 months</td>
<td>20 (0.1)</td>
<td>12 (0.1)</td>
<td>0.157</td>
<td>207 (0.1)</td>
<td>0.104</td>
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<tr>
<td><strong>SURGICAL COMPLICATIONS</strong></td>
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<tr>
<td>Manipulation Under Anesthesia</td>
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<tr>
<td>2 weeks</td>
<td>30 (0.2)</td>
<td>17 (0.1)</td>
<td>0.058</td>
<td>52 (0.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3 months</td>
<td>360 (2.3)</td>
<td>332 (2.1)</td>
<td>0.287</td>
<td>3438 (2.0)</td>
<td>0.584</td>
</tr>
<tr>
<td>Periprosthetic fracture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>&lt;11</td>
<td>&lt;11</td>
<td>*</td>
<td>45 (0.1)</td>
<td>*</td>
</tr>
<tr>
<td>3 months</td>
<td>24 (0.2)</td>
<td>20 (0.1)</td>
<td>0.547</td>
<td>187 (0.1)</td>
<td>0.653</td>
</tr>
<tr>
<td>Irrigation and Debridement</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2 weeks</td>
<td>43 (0.3)</td>
<td>36 (0.2)</td>
<td>0.431</td>
<td>273 (0.2)</td>
<td>0.064</td>
</tr>
<tr>
<td>3 months</td>
<td>109 (0.7)</td>
<td>88 (0.6)</td>
<td>0.135</td>
<td>870 (0.5)</td>
<td>0.515</td>
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<tr>
<td><strong>READMISSIONS</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Emergency Room Visits</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>448 (2.8)</td>
<td>525 (3.3)</td>
<td>0.014</td>
<td>4745 (2.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3 months</td>
<td>1035 (6.5)</td>
<td>1128 (7.1)</td>
<td>0.038</td>
<td>10704 (6.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital Readmissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>110 (0.7)</td>
<td>145 (0.9)</td>
<td>0.028</td>
<td>1234 (0.7)</td>
<td>0.04</td>
</tr>
<tr>
<td>3 months</td>
<td>345 (2.2)</td>
<td>372 (2.3)</td>
<td>0.308</td>
<td>3268 (1.9)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Fewer than 11 cases were reported, corresponding to a frequency of <0.07
Table 4. Adjusted OR for ER visits and hospital readmissions at 2 weeks and 3 months postoperatively in patients who receive home health.

<table>
<thead>
<tr>
<th></th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emergency Room Visit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>1.23 (1.21-1.26)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3 months</td>
<td>1.18 (1.12-1.24)</td>
<td>0.028</td>
</tr>
<tr>
<td><strong>Hospital Readmission</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>1.16 (1.14-1.18)</td>
<td>0.026</td>
</tr>
<tr>
<td>3 months</td>
<td>1.45 (0.74-4.12)</td>
<td>0.754</td>
</tr>
</tbody>
</table>

*Adjusted OR derived from multivariate logistic regression analysis with patient age, sex, and CCI used as covariates.
Table 5. Reimbursement rates associated with 90-day window following TKA. Cost data reported as total reimbursement and average reimbursement per TKA patient. Contribution amount represents the percentage of total cost difference between HH and non-home health costs.

<table>
<thead>
<tr>
<th>Episode of Care</th>
<th>Home Under Self-Care</th>
<th>Home Health</th>
<th>Difference</th>
<th>Contribution Amount</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (Average)</td>
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<td>$384,590,755 ($24,266)</td>
<td>$27,374,073</td>
<td>-</td>
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<td>Hospitalization</td>
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<td>$330,340,707 ($20,843)</td>
<td>$331,939,943 ($20,944)</td>
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<td>Total (Average)</td>
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<td>$24,347,075 ($1,536)</td>
<td>$24,347,075</td>
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<td>Emergency Room Visits</td>
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<td>$761,277 ($48)</td>
<td>$996,242 ($50)</td>
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<tr>
<td>Physical therapy</td>
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<td>Prescriptions</td>
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<td>$10,999,206 ($652)</td>
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<tr>
<td>Outpatient Visits</td>
<td>Total (Average)</td>
<td>$2,393,199 ($137)</td>
<td>$2,488,293 ($139)</td>
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</table>
Over Half of all Medicare TKA Patients Are Now Classified as an Outpatient –
3-year Impact of the Removal from the Inpatient Only List

Robert A Burnett, MD

Introduction
In 2018, Centers for Medicare & Medicaid Services (CMS) removed total knee arthroplasty (TKA) from its Inpatient Only (IPO) list. CMS continues to emphasize that only a small minority of TKA patients should be outpatient, yet many hospitals, fearful of an audit, have begun scheduling all TKA procedures as an outpatient. The policy change triggered many unintended consequences including increased patient copays, limited access for home services, reduced hospital DRG revenues, and reduced bundled payment margins. The purpose of this study was to determine how the impact of TKA removal from the IPO list affected the number of outpatient TKA patients over time, which patients were being labeled outpatient, and how outpatient classification affected discharge location and 90-day complication rates.

Materials and Methods
Using the PearlDiver administrative claims database, we reviewed a consecutive series of primary TKA Medicare patients from January 2015-June 2020. The cohort was divided into Medicare patients with an inpatient status from 2015-2017 and Medicare patients with an outpatient status from 2018-2020. We compared demographics, comorbidities, length of stay, discharge disposition, and 90-day medical and surgical complications between the outpatient and inpatient groups. Chi square analysis was used to compare categorical variables and Student’s T test was used to compare continuous variables amongst groups. Multivariate logistic regression analysis was used to further characterize any independent variables to determine who was classified as an outpatient.

Results
Of the 120,590 patients included in the study, 92,931 patients had an inpatient designation in 2015-2017 while 27,659 patients had an outpatient designation from 2018-2020. In 2015, only 1.8% of TKA were designated outpatient, however the designation increased rapidly beginning in 2018. In 2020, 53.8% of Medicare TKA patients were classified outpatient, despite a small decrease in length of stay (2.6 days vs. 2.4 days, p<0.001). The outpatient cohort did not have a lower comorbidity burden than the inpatient cohort (Table 2). There was a higher rate of acute renal failure (1.6% vs 1.3%, p=0.008), urinary tract infection (3.3% vs. 3.0%, p=0.008), and wound complication (0.7% vs. 0.5%, p<0.001) in the outpatient cohort. Outpatient status was associated with higher rates of SNF (4.1% vs 2.2%, p<0.001) and inpatient rehab admission (1.6% vs 0.7%, p<0.001). There were increased emergency department (ED) visits (5.0% vs 4.0%, p<0.001) and readmissions (2.2% vs 0.8%, p<0.001) associated with outpatient status.

Conclusion
Despite CMS guidance, over half of all Medicare TKA patients are being classified as outpatients, three years following the removal from the IPO list. Outpatients surprisingly had higher readmissions, rehabilitation discharge, and complications than the inpatient group. The mean length of stay among outpatients also exceeded two-midnights, suggesting many of these patients met inpatient criteria. As CMS contemplates whether to eliminate the IPO list entirely, hospitals should be aware of the adverse impact of classifying all TKA patients as an outpatient.
Impact of Proximal Tibial Varus Anatomy in Survivorship after Medial Unicompartmental Knee Arthroplasty

Robert B. Erlichman, MD

Background
Debate continues regarding the appropriate indications for medial unicompartmental knee arthroplasty (UKA). One area of contention, especially with osteotomy surgeons, is whether patients with a more varus proximal tibia should be considered candidates for UKA. The purpose of this study is to evaluate the impact of proximal medial tibial anatomy and survivorship with medial UKA.

Methods
A retrospective review from 2004 to 2017 identified patients who underwent a primary mobile bearing medial UKA with 2-year minimum follow-up or revision. There were 2305 patients (3030 knees) who met inclusion criteria to include preoperative AP knee radiograph to review. The medial proximal tibial angle (mPTA) was measured preoperatively on all knees. Records were reviewed on all patients for revision surgery and reason for revision. Analysis was performed on the impact of mPTA on all cause revision as well as knees revised for tibial failure (aseptic loosening, collapse, fracture). Further revision comparison was made between patients with a preoperative mPTA <80 degrees to those with a mPTA ≥80 degrees. Unpaired t-test was used to analyze mPTA difference while chi-square analysis was used to compare categorical outcomes.

Results
At a mean follow-up was 5.2 years (range, 0.5 years to 12.8 years), 152 knees (5%) underwent revision. The mean mPTA in knees that failed was 82.7 deg (range, 74.3 to 90 deg) compared to 82.9 deg (range, 74.7 to 89.7 deg) in knees that did not fail (p=0.300). Forty-one knees (1.3%) were revised for tibial failure. The mean mPTA in tibial failures was 82.5 degrees (range 77.7 to 88.8 degrees) and not significantly different than knees that did not have a tibial failure (82.9 degrees, range, 74.3 to 89.8 degrees) (p=0.289). The all cause revision rate in knees with a mPTA <80 degrees was 5.68% and not significantly different than the 4.96% revision rate in knees with a mPTA ≥80 degrees (p=0.634). The tibial failure rate in knees with a mPTA <80 degrees was 2.62% and not significantly different than knees with a mPTA ≥80 degrees at 1.25% (p=0.084).

Conclusion
Patients with increased proximal tibial varus did not have a statistically significant increased risk for tibial related or all cause failure after medial mobile-bearing UKA at midterm follow-up. Proximal medial tibial coronal alignment in general can be ignored in determining whether patients are candidates for medial UKA.
Minimum 25-Year Results of a Tapered Titanium Porous Plasma Spray Coated Femoral Component

Robert B. Erlichman, MD

Introduction
Previous studies have reported excellent results with tapered, titanium alloy, porous plasma-sprayed components in patients undergoing uncemented primary total hip arthroplasty (THA). The purpose of this study was to examine survival and clinical results at minimum 25-year follow-up.

Methods
We reviewed all patients who underwent primary THA at our center through 1995 with a specific femoral component, the Mallory-Head Porous (MHP; Zimmer Biomet, Warsaw, IN). This device, still marketed in the U.S., has been essentially unchanged since its 1984 introduction, except the porous coating was continued circumferentially along the lateral aspect in 1986 and an offset option was added in 1999 after our study period. There were 312 patients (370 THA) available for review. Mean age at surgery was 47 years (range, 21-66 years).

Results
Mean follow-up was 27.9 years (range, 25 to 36 years). There have been 31 femoral revisions (8.4%) with 9 infection, 8 failure of ingrowth, 8 revised well-fixed, 2 periprosthetic fracture, 2 polyethylene wear with trochanteric avulsion, 1 component breakage, and 1 malalignment well-fixed. Kaplan-Meier survival with endpoint of stem revision for all causes was 91.5% (95% CI: ±1.5%) at 35.8 years, and survival with endpoint of aseptic failure of ingrowth was 97.8% (95% CI: ±0.8) at 35.8 years. Harris hip scores improved significantly from 43 preoperatively to 76 most recently.

Conclusions
This tapered, titanium, porous plasma spray-coated femoral component continues to demonstrate high long-term survival with a low rate of femoral component revision for any reason or aseptic failure of ingrowth.
**Background**

Arthroscopic meniscal debridement or chondroplasty are commonly performed in patients with osteoarthritis (OA) for symptomatic management prior to total knee arthroplasty (TKA). We hypothesize that obesity, a modifiable risk factor associated with osteoarthritis (OA), may contribute to a significantly decreased interval between these procedures and subsequent TKA. The aim of this study was to analyze the influence of obesity on the timing and risk of subsequent TKA following arthroscopic meniscal debridement or chondroplasty.

**Methods**

The MarketScan database was queried from the period of January 2007 through December 2016. As defined by Current Procedural Terminology (CPT) codes, patients were identified who underwent chondroplasty or meniscus debridement of the knee and subsequent ipsilateral Total knee arthroplasty (TKA). Patients with no laterality indication, BMI data, underwent revision procedures, or another ipsilateral knee procedure in the studied interval were excluded. A total of 644,079 patients (565,959 meniscus debridement and 78,120 chondroplasty) were included with mean follow-up of 25.6 months. The primary outcome of this study was influence of BMI on the time from index procedure to TKA. The secondary outcome was the association of BMI with the odds of TKA after the index procedure. A multivariate regression analysis was used to control for covariates such as age, sex, and comorbidity status.

**Results**

Obese (BMI 30-39) and morbidly obese patients (BMI > 40) who underwent meniscus debridement or chondroplasty had a significant decrease in time to TKA relative to non-obese (BMI <30) patients. In morbidly obese patients who underwent chondroplasty or meniscal debridement, there was an increased odd of subsequent TKA.

**Conclusion**

Obesity is associated with a significant decrease in the time interval between index arthroscopic meniscus debridement or chondroplasty, and subsequent TKA. Morbidly obese patients that undergo these procedures have increased odds for progression to TKA.
POSTER #75

Hip Resection Arthroplasty Indicated as A Definitive Treatment: Is It Successful?

Laia Brunet, MD

Purpose
Hip resection arthroplasty (HRA) as a definitive treatment is an uncommon indication, although it is still in use in selected cases. This retrospective multicentre study evaluates a cohort of patients who have undergone HRA surgery, in order to assess (1) the rate of re-operation, (2) the rate of infection, and (3) the mortality rates after the HRA, indicated as a definitive treatment.

Methods
We conducted a review of the HRAs performed in two University Hospitals from 1994 to 2020, using an institutional database. This yielded to 26 HRAs in 24 patients. We recorded the indications for a definitive HRA, the outcomes and complications, and we analyzed the success of the HRA using a Kaplan-Meier curve.

Results
Seven cases (26.9%) required a re-operation after the HRA, in four cases for persistent hip infection, and in the three remaining cases a conversion to a total hip arthroplasty (THA) was reconsidered.

The mortality rate in the first 5 years was 19.2%. Ten patients (38.5%) died more than five years after the HRA, within a range of 5-20 years. Nine patients (34.6%) were alive at the latest followup. All the cases that required another surgery after the HRA were re-operated within the first 18 months. After this period, all the HRA survived without further re-operations.

Conclusion
Patients with a HRA indicated as a definitive treatment, showed an elevated re-operation rate and early mortality rate regarding previously published data. Only three cases were reconsidered for conversion to THA.
1.5-Stage Exchange Arthroplasty for Infected Total Knee Arthroplasty has Fewer Operations and Improved Spacer Function

Liam C Bosch, MD

Background
1.5-stage exchange arthroplasty is a method for treating subacute or chronic periprosthetic joint infection (PJI) using primary total knee arthroplasty (TKA) components and high-dose antibiotic cement where the spacer is intended to last for a prolonged time. The purpose of this study was to compare PJI clearance rates, spacer functionality, and overall number of operations between 1.5-stage exchange spacers and gold standard two-stage exchange arthroplasty using static cement spacers.

Methods
A retrospective review at a tertiary referral academic institution was performed between 2014 and 2019 to evaluate patients treated with 1.5-stage exchange arthroplasty (20 knees) and two-stage exchange arthroplasty (28 knees) for TKA-PJI with minimum 2-year follow-up. There was no difference between the cohorts with regards to body mass index, sex, McPherson classification or infecting organism. We evaluated PJI clearance, spacer functional outcome scores, and overall number of operations within 2 years.

Results
There was no significant difference in PJI clearance (85% vs 93%, p > .05) between 1.5-stage and two-stage revision. Knee Society function scores of 1.5-stage spacers were significantly higher than two-stage static spacers (41.8 vs 7.8, p < 0.001). Patients undergoing two-stage reimplantation had significantly more operations within two years of initial surgery (2.3 vs 1.2, p < 0.001).

Conclusions
1.5-stage exchange should be considered a viable alternative treatment for TKA-PJI which mitigates the morbidity of two-stage exchange arthroplasty by decreasing surgical interventions within two years and improving knee functionality at all stages of treatment without compromising PJI clearance rates.
POSTER #78

Factors Affecting the Incidence and Timing of Total Knee Arthroplasty Infection

Mark D. Hasenauer, MD

Introduction
Periprosthetic joint infection (PJI) following total knee arthroplasty remains an ongoing challenging clinical problem. The purpose of this study is to examine variables related to the incidence and timing of periprosthetic joint infection.

Materials
We retrospectively reviewed 8462 primary total knees performed at our institution between 2006-2018 for PJI. Mean follow-up is 3.7 years (76% >1yr). Seventy-eight dependent variables composed of patient reported diagnoses, demographics, and medications were used. Time to infection, success of infection treatment, and variables associated with infection are reported. Only statistically significant findings are reported (p<0.01).

Results
PJI occurred in 105 (1.24%) of cases. At 90 days and one year the chance of infection was 0.41% (35 infections) and 0.72% (61 infections), respectively. Multivariate regression revealed males (2.85x, 95% CI 1.69-4.79) and patients taking medication for major depressive disorder/generalized anxiety disorder (2.09x, 95% CI 1.20-3.64) were significantly more likely to develop an infection in the first year. In contrast, after the first year patients with a history of cellulitis (3.95x, 95% CI 1.90-8.23) and anti-epileptic medications (3.59x, 95% CI 1.72-7.48) were more likely to develop an infection. Before and after 90 days, 94% and 56% of infections were treated by debridement, antibiotics, and implant retention (DAIR) and their successful treatment rates were not different at 67 % and 61% (p=0.594), respectively.

SUMMARY
The majority of infections occur in first year. Importantly, patient variables associated with infection are different when comparing infections that occur before and after one year. Male sex increases chance of infection in first year but not after a year. Success of DAIR treatment is non-superior for infections that occur in first 90 days compared to treatments occurring after 90 days.
POSTER #79

Management of Metaphyseal and Diaphyseal Bone Loss in Failed Stemmed Revision Total Knee Arthroplasty Based Upon a New Classification System

Maxwell E Weinberg, MD

Introduction
With the increasing number of primary total knee arthroplasties (TKA) being performed annually there is also an expected increase in the number of revision TKA, as well as failed revision TKA with stemmed components with femoral and/or tibial metaphysis and diaphysis bone loss. The extent of femoral and tibial bone loss may represent a substantial impediment to achieving secure component fixation between the implant and the host bone. With the increasing number of failed revision TKA with stemmed components and more extensive bone loss, a robust classification system is needed to guide the surgical options to manage the bone loss and achieve secure component fixation.

Methods
The concept of zonal fixation in revision TKA has been popularized by Morgan-Jones with attention given to three anatomic zones in which fixation can be achieved: Zone 1, the joint surface or epiphysis; zone 2, the metaphysis; and zone 3, the diaphysis. While this concept provides an understanding of where and how secure fixation can be obtained, it does not provide a classification of the metaphyseal and diaphyseal bone loss that is necessary for pre-operative planning. A retrospective case based radiographic review of failed stemmed TKA components was the foundation for the classification system. This new bone loss classification system was applied to guide the surgical options to manage the bone loss and achieve secure component zonal fixation.

Results
This new classification system is based upon the location and degree of bone loss in the tibial and/or femoral metaphysis and diaphysis. The tibia and femur are graded independently. With the proposed classification system, Type 1 defects with minimal metaphyseal bone loss and intact diaphysis, can be addressed with metallic augments to address joint surface defects and align the components with cement fixation to the metaphysis and either press-fit diaphyseal stems or cemented stems. Small contained defects may also be treated with impaction bone graft. Cement fixation in the metaphyseal bone is inexpensive, readily available and can be used with either press-fit diaphyseal stems or cemented stems.

Type 2 defects have proximal tibial metaphyseal or distal femur metaphyseal bone loss that is significant and will not be mechanically supportive of the implant, but the diaphyseal bone is intact. Metaphyseal fixation can be achieved with cement, bone allograft or impaction bone grafting, trabecular metal cones or porous metaphyseal sleeves, along with either press-fit uncemented diaphyseal stems or cemented stems.

Type 2 defects have proximal tibial metaphyseal or distal femur metaphyseal bone loss that is significant and will not be mechanically supportive of the implant, but the diaphyseal bone is intact. Metaphyseal fixation can be achieved with cement, bone allograft or impaction bone grafting, trabecular metal cones or porous metaphyseal sleeves, along with either press-fit uncemented diaphyseal stems or cemented stems.

Type 3A and 3B, metaphyseal fixation with either trabecular metal cones or metaphyseal sleeve provides proximal fixation, but necessitates secure diaphyseal fixation beyond the diaphyseal endosteal bone loss with either a cemented or press-fit uncemented stem.

Type 4 defects have extensive metaphyseal and diaphyseal bone loss with pronounced expansion of
endosteal bone with profound cortical thinning, and reconstruction options include cones or sleeves for the tibial or femoral metaphyseal bone loss with impaction bone grafting of the diaphysis and long uncemented press-fit stems or cemented stems; proximal tibial or distal femoral replacement; or allograft prosthesis composite.

Discussion
Management of bone loss in cases with prior stem fixation can be challenging, with efforts to achieve secure metaphyseal and diaphyseal fixation in order to ensure longevity of the construct. The proposed classification can help surgeons approach these complex cases with a pre-operative plan based upon the radiographic images and have the necessary components available to achieve zonal fixation. Despite appropriate pre-operative planning, the final categorization of tibial and femoral bone loss occurs at the time of surgery, with the possibility that the bone loss may be more severe than expected.
Background
Proximal femoral replacement (PFR) is a method of hip reconstruction utilized in the field of arthroplasty and musculoskeletal oncology. It is traditionally reserved for use either as a salvage procedure following failed total hip arthroplasty (THA) in which there is severe proximal bone loss or poor bone quality, or after wide margin resection of tumors involving the proximal femur. PFR surgical techniques as well as implant design have changed dramatically over the years with increasing utilization of PFRs. However, despite improved long-term outcomes, failure of the PFR construct remains a significant problem. It is unknown whether these two indications for PFR differ in failure risk or the longevity of the implant.

Materials and Methods
This study retrospectively evaluated patients who underwent PFR over a consecutive fifteen-year period for primary sarcoma or metastatic disease of the proximal femur, hereafter termed the neoplasm cohort, or conversion to PFR after failed THA. PFR failure was defined as either recurrent prosthetic dislocations, periprosthetic fracture, aseptic loosening, or infection that ultimately resulted in revision surgery. Kaplan-Meier survival analysis was used to assess implant survival and a cox proportional hazards model was used to assess for independent variables affecting implant survival. The threshold for statistical significance was set to p < 0.05.

Results
A total of 99 patients were evaluated including 58 in the neoplasm cohort and 41 in the failed THA cohort, respectively. There were several differences in baseline patient characteristics, including age (p < .001), comorbid hypertension (p = .008), and cardiac disease (p = .014). The revision rate was significantly higher in patients undergoing PFR for failed THA (31.7%) than patients undergoing PFR for neoplasm (10.3%, p = .008). The longevity of the PFR construct was significantly shorter on Kaplan-Meier analysis (p = .025) in the failed THA cohort. Multivariate analysis with a cox proportional hazards model showed that THA failure was an independent predictor for PFR failure (p = .026).

Conclusion
This study revealed significantly worse PFR implant survival in patients undergoing PFR for the indication of failed THA compared to neoplasm. It also demonstrated that failed THA is an independent predictor for failure of the PFR implant using cox proportional hazards model. While the underlying etiology of this relationship remains to be explicitly outlined, poor bone quality and soft tissue integrity, multiple prior surgeries, and comorbid conditions are likely contributing factors.
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<th>Failed THA</th>
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<td>n = 58</td>
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**Bold** p-value denotes statistical significance, p < .05

ASA = American Society of Anesthesiologists Physical Status; THA = Total Hip Arthroplasty
POSTER #82

Does Bariatric Surgery Prior to Primary Total Knee Arthroplasty Improve Outcomes?

Sean P. Ryan, MD

Introduction
Preoperative management of morbidly obese patients prior to total knee arthroplasty (TKA) remains debated. Recent advancements in bariatric techniques have increased its utilization. We hypothesized that bariatric surgery prior to primary TKA would mitigate postoperative complications and improve implant survivorship, particularly with modern bariatric techniques.

Methods
A single center retrospective review from 1992-2020 identified 205 bariatric surgery patients with subsequent primary TKA. This cohort was matched 1:1:1 to patients without bariatric surgery and with BMI <40 kg/m² and BMI ≥40 kg/m². Revisions, reoperations, and 90-day complications were evaluated. Subgroup analysis compared historical (pre-2012) to contemporary (2012 and after) bariatric techniques. Mean follow-up was 6 years.

Results
Bariatric patients demonstrated higher revision rates than low (HR 4, p<0.01) and high BMI (HR 9, p<0.01) controls, as well as increased reoperations when compared to the low (HR 2, p<0.01) and high BMI (HR 6, p<0.01) groups. Reoperation for instability was more common in bariatric patients than the low (HR 15, p=0.01) and high BMI (HR 17, p<0.01) groups. Reoperation for infection was higher in the bariatric group relative to the high BMI cohort (HR 6, p=0.02), but not low BMI cohort (HR 4, p=0.06). There was no difference in 90-day complications (p=0.33). Contemporary bariatric procedures had similar 90-day complications (p=0.18).

Conclusion
The risks associated with obesity are well established, but the question remains if bariatric surgery improves outcomes. This study found bariatric surgery patients have worse implant survivorship, mostly related to infection and instability. Further investigation into perioperative optimization is warranted.
Short Course of Oral Antibiotic Treatment after Two-stage Exchange Arthroplasty Appears to Decrease Early Reinfeciton

Sean P. Ryan, MD

Introduction
Recent evidence has suggested a benefit to extended postoperative prophylactic oral antibiotics after two-stage exchange arthroplasty for treatment of periprosthetic joint infections (PJIs). We sought to determine reinfection rates with and without a short course of oral antibiotics after two-stage exchange procedures.

Methods
A retrospective review identified patients undergoing two-stage exchange arthroplasty for PJI of the hip or knee. Patients were excluded if they failed a prior two-stage exchange, had positive cultures at reimplantation, prolonged IV antibiotics postoperatively, and/or life-long suppression. This resulted in 444 reimplantations (210 hips, 234 knees). Patients were divided into three cohorts based on duration of oral antibiotics after reimplantation: no antibiotics (101), ≤2 weeks (267), or >2 weeks (76). The primary endpoint was reinfection within 1-year of reimplantation.

Results
Within 1-year of reimplantation, there were 34 reinfections, including 11.9% (12/101) without oral antibiotics, 6.7% (18/267) with ≤2 weeks oral treatment, and 5.3% (4/76) with >2 weeks oral treatment. Multivariate Cox regression showed a reduced reinfection rate in the ≤2-week cohort relative to no antibiotics (HR 0.44, p=0.03). While the smaller cohort with >2 weeks of antibiotics did not significantly reduce the reinfection rate (HR 0.44, p=0.16), when combined with the ≤2-week cohort, use of oral antibiotics had an overall reduction of the reinfection rate (HR 0.44, p=0.03).

Conclusion
These data support the hypothesis that a short course of oral antibiotics after reimplantation decrease the 1-year reinfection rate. Future randomized studies should seek to examine the efficacy of different durations of oral antibiotics to reduce reinfection.
Background

To assess how implant alignment affects unicompartmental knee arthroplasty (UKA) outcome, we compared tibial component alignment of well-functioning UKAs against two groups of failed UKAs, revised for progression of lateral compartment arthritis (“Progression”) and aseptic loosening (“Loosening”).

Methods

We identified 37 revisions for Progression and 61 revisions for Loosening from our prospective institutional database of 3,351 medial fixed-bearing UKAs performed since 2000. Revision cohorts were matched on age, gender, body mass index, and postoperative range of motion with “Successful” unrevised UKAs with minimum 10-year follow-up and Knee Society Score ≥70. Tibial component coronal (TCA) and sagittal (TSA) plane alignment was measured on postoperative radiographs. Limb alignment was quantified by hip-knee-ankle (HKA) angle on long-leg radiographs. In addition to directly comparing groups, a multivariate logistic regression examined how limb and component alignment were associated with UKA revision.

Results

In the Progression group, component alignment was similar to the matched successes (TCA 3.6°±3.5° varus vs. 5.1°±3.5° varus, respectively, p=0.07; TSA 8.4°±4.4° vs. 8.8°±3.6°, p=0.67), whereas HKA angle was significantly more valgus (0.3°±3.6° valgus vs. 4.4°±2.6° varus, p<0.001). Loosening group component alignment was also similar to the matched successes (TCA 6.1°±3.7° varus vs. 5.9°±3.1° varus, p=0.72; TSA 8.4°±4.6° vs. 8.1°±3.9°, p=0.68), and HKA was significantly more varus (6.1°±3.1° varus vs. 4.0°±2.7° varus, p<0.001). Using a multivariate logistic regression, HKA angle was the most significant factor associated with revision (p<0.001).

Conclusions

In this population of revised UKAs and long-term successes, limb alignment was a more important determinant of outcome than tibial component alignment.
Introduction
Sessile bacteria in periprosthetic joint infections (PJI) induce an immunosuppressive cytokine profile through an unknown mechanism. Immune checkpoints, like programmed cell death 1 (PD-1) and its ligand (PD-L1), initiate innate immunosuppressive pathways essential for self-tolerance. Several malignancies and chronic infections co-opt these pathways to derive a survival advantage. We hypothesized that PJI-induced local immunosuppression occurs via PD-1/L1 upregulation.

Methods
This was a prospective cohort study with 6 months follow-up. PD-1/L1 expression in periprosthetic tissue was evaluated using immunohistochemistry and compared in patients undergoing revision hip or knee arthroplasty for a PJI versus an aseptic failure, defined by the MSIS criteria. A board-certified pathologist estimated the percentage of immune cells expressing PD-1/L1 in the global tissue sample and in the high-powered field of maximum expression. Student T, Mann Whitney U, Chi-squared, and Fisher exact tests were used for statistical comparison with a p-value of < 0.05 indicating significance.

Results
Fifteen patients with a PJI (48%) and 16 patients with an aseptic failure (52%) were included with no differences in baseline characteristics. PD-1 expression was uniformly low. Conversely, maximum PD-L1 expression was upregulated in patients with a PJI (40%, interquartile range [IQR] 5-75%) versus an aseptic failure, (22%, IQR 1-48%, p=0.039). In the PJI cohort, maximum PD-L1 expression was higher among patients who had an elevated erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP) 6 weeks postoperatively (48%, IQR 18-74% vs 20%, IQR 1-38%, p=0.041) and among patients who developed a recurrent PJI (69%, IQR 53-86% vs 29%, IRQ 5-70%; p=0.039). Patients with global PD-L1 expression over 5% trended toward a near 22-fold increase in the odds of reinfection after PJI treatment (Odds Ratio [OR] 21.9, 95% confidence interval [CI] 0.9-523.5, p=0.057) and patients with maximum PD-L1 over 20% trended toward a 15-fold in the odds of re-infection (OR 15.0, 95% CI 0.6-348.9, p=0.092).

Conclusions
Periprosthetic PD-L1 expression is upregulated in PJI and may predict treatment failure, which supports immune checkpoint upregulation as a mechanism of PJI-induced local immune dysfunction. Future studies should confirm PD-L1 as a risk factor for re-infection in larger cohorts.
Background
Measured resection (MR) and gap balancing (GB) techniques are utilized to ensure proper femoral component position. This study compares these techniques, evaluating relative differences in femoral component position, effects of preoperative knee alignment on relative femoral component positioning, and early clinical outcomes.

Methods
An intraoperative analysis was performed in 63 consecutive GB primary total knee replacements (TKR). Each knee underwent placement of the MR guide prior to placement of the GB tensioner, utilizing respective pin sites to evaluate femoral component position. GB rotation was determined relative to MR as externally (ER), internally (IR), or non-rotated (NR). Clinical effects of relative rotation of GB components were evaluated. Early clinical comparisons were made between GB and MR utilizing a retrospective cohort of 60 consecutive MR primary TKR with 2-year minimum follow up.

Results
GB resulted in relative ER (39.7%), IR (20.6%), and NR (39.7%) compared to the MR technique. Varus, valgus, or neutral alignment did not correlate to the incidence of relative rotation. Knee society scores (KSS) and 2-year functional range of motion (FROM) were not statistically different between relative rotations. MR and GB showed no significant difference in FROM, KSS, or revisions at 2 years.

Conclusion
GB resulted in relative rotation 60% of the time. Despite a varying degree of relative rotation, no clinical differences were observed at 2-year follow up in gap balanced knees. Furthermore, we found that preoperative anatomic alignment did not affect component position. Ultimately, there was no clinical superiority of either technique at 2-year follow up.
Manipulation Following Primary TKA: a Predictor of Poor Clinical Outcome?
Travis D. Parkulo, MD

Introduction
Contracture following primary TKA can be disabling for the patient with diminished range of motion, with poor function leading to patient dissatisfaction. Manipulation under anesthesia (MUA) with or without arthroscopic lysis of adhesions is commonly performed to address post-operative stiffness. The purpose of this study was to determine if patients who undergo manipulation with or without arthroscopic lysis of adhesions for contracture following their primary TKA are at increased risk for poor clinical outcome.

Materials and Methods
Primary TKA patients from 2005 to 2019 were identified from the 5% Medicare Part B claims data. 142,593 patients with primary TKA were identified and stratified into two groups: those who underwent manipulation under anesthesia (MUA) with or without arthroscopic lysis of adhesions within 1 year of the index primary TKA and a control group without MUA or lysis of adhesions within 1 year of the index primary TKA. The study group consisted of 3658 patients (2.6%), who met the inclusion criteria of patients undergoing MUA with or without lysis of adhesions. Outcome measures included revision surgery and prosthetic joint infection (PJI) within 1, 2, and 5 years from the index procedure, along with 30 and 90 day readmission risk. Patient demographics and co-morbid conditions were evaluated to identify risk factors and the study group divided based on the timing of the manipulation from the index procedure: less than 2 months, 2-3 months, 3 to 6 months, or 6 months to 1 year. Multivariate Cox regression was used to compare complications and revision risks between the manipulation group and the control group adjusting for various patient, clinical, and hospital factors.

Results
97% of the patients undergoing treatment for stiffness following TKA underwent MUA only without debridement or lysis of adhesions. 41% of the MUA procedures were performed within 2 months, 71% within 3 months and 95% within 6 months of the index procedure. The risk of revision surgery in the MUA group was 3.35%, 6.39%, and 13.26% at 1 year, 2 years, and 5 years respectively. Adjusted revision risk was significantly greater in the MUA group at 1 year, 2 years, and 5 years compared to the control group with a hazard ratio (HR) of 3.81, 3.90, and 3.22 respectively, p<0.001. Timing of MUA played a role with increased risk of 1 and 2 year revision for the 6-12 months MUA groups versus the 0-2 and 2-3 months MUA groups, p<0.05. 1-year revision risk was 2.57% (95% confidence interval (CI): 1.87%-3.52%) for the 0-2 months group, 3.05% (95% CI: 2.17%-4.29%) for the 2-3 months groups, and 7.79% (95% CI: 4.77%-12.60%) for the 6-12 months group, while the corresponding 2-year revision risks were 5.68% (95% CI: 4.58%-7.04%), 5.62% (95% CI: 4.36%-7.23%), and 11.01% (95% CI: 7.32%-16.39%) for the 0-2, 2-3, and 6-12 months MUA groups, respectively. The risk of PJI in the MUA group was 2.60%, 4.11%, and 9.90% at 1 year, 2 years, and 5 years, respectively. The adjusted risk of PJI was also significantly greater in the MUA group compared to the control with a HR of 2.24, 2.23, and 2.05 at 1 year, 2 years, and 5 years respectively, p<0.001. The incidence of manipulation was higher in Blacks versus White individuals (4.05% versus 2.48%, p<0.001). Obesity, younger age, and race were risk factors for revision surgery (p<0.001 for 1, 2, and 5 year adjusted revision risk, except for race at 1 year (p=0.057)). Obesity, younger patients, cardiac disease, and economic status were risk factors for PJI (p<=0.005). There was no
difference in 30 and 90 day readmission risk between the MUA with or without debridement and control groups.

**Conclusion**
The overall incidence of MUA following primary TKA in the Medicare population was 2.6% with Blacks having significantly higher incidence of MUA than White individuals. Patients undergoing MUA for stiffness following the index primary TKA had significantly increased risks of subsequent revision and PJI at 1, 2, and 5 years, p<0.001. Obesity, younger age, and race were risk factors for revision surgery, while obesity, younger patients, cardiac disease, and economic status were risk factors for PJI. Patients undergoing MUA within 3 months of the index surgery demonstrated decreased revision risk compared to MUA after 6 months. Additional studies are needed to evaluate the role of timing of MUA, race and comorbidities to decrease the risk of revision and PJI in patients following MUA and improve clinical outcomes in patients undergoing TKA.
Limb length discrepancy in total knee arthroplasty and its impact on functional outcome: a prospective cohort study

*Sujit Kumar Tripathy, Siddharth Pradhan
All India Institute of Medical Sciences, Bhubaneswar-751019, India

Introduction:
- TKA principle involves soft tissue balancing after appropriate bone resection to equalize the flexion-extension gap, and hence limb length alteration is unavoidable.
- Limb length discrepancy (LLD) has been shown to increase the incidences of back pain, radiculopathy, gait disorders and general dissatisfaction.
- The mechanical load and isometric torque are more on the longer limb, which negatively impacts the nearby joints.
- The western literature reported minimal LLD (<5.5mm) that has no clinical relevance, the developing and underdeveloped countries have reported substantial limb length discrepancy (>10mm) following unilateral TKA.

Materials and methods:
- Study design: prospective cohort
- Study duration: Jan 2019 to March 2020
- Patients operated with unilateral or bilateral TKA were evaluated for radiographic and perceived LLD in both preoperative and postoperative periods.
- Patients with flexion contracture of >15 degrees, previous surgery on ipsilateral limb, hip pathology, severe ankle or foot deformity, severe extraarticular deformity, and inability to stand or walk were excluded.

Results:
- Preoperative LLD in the unilateral and bilateral TKA groups was 0.75 ± 0.60 and 0.58 ± 0.52 cm (MD, 0.17, p-value 0.197).
- Postoperative LLD in the unilateral group was 0.76 ± 0.85 cm (Fig 1) and bilateral group was 0.59 ± 0.92 cm (MD, 0.16, p-value 0.402).
- LLD of <10mm was seen in 80.2% and ≥10mm in 19.7% of patients.
- The functional outcome (WOMAC) was significantly affected when LLD exceeded 10mm (correlation coefficient 0.54, p-value <0.001).
- Linear regression analysis revealed no significant effect of age, sex, height, weight, BMI, preoperative LLD, and difference in deformity between the limbs on postoperative LLD.
- 34.5% of patients perceived LLD in the preoperative period, which decreased to 3.7% in the postoperative period. Perceived LLD did not correlate to radiographic LLD and functional outcome.

Discussion:
- Sabir et al. warned that unilateral TKA in bilaterally affected OA knee might end up with significant LLD causing patient dissatisfaction and poor functional outcome.
- We had similar observation as the functional outcome was adversely affected when LLD exceeded 10mm.
- Kim et al. reported a significantly lower Knee Society Score in patients with a postoperative LLD of >15mm.
- Chinappa et al. reported that functional outcome is affected by perceived LLD and not by radiographic LLD.
- Goldstein reported that preoperative perceived LLD must be documented, as majority of the patients improve in their perception of LLD after TKA.
- We noted that perceived LLD is seen in more number of patients in preoperative period and it improves after TKA.

Conclusion:
- There is no significant difference in radiographic LLD between unilateral and bilateral TKA.
- The functional outcome is adversely affected by radiographic LLD of ≥10mm.
- Age, sex, BMI, pre-op LLD and difference in deformity angle do not affect the LLD.
- About one-third of patients perceive LLD in the preoperative period, which improves significantly after TKA.

Conflict of interest disclosure: none
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