



AAHKS

AMERICAN ASSOCIATION OF
HIP AND KNEE SURGEONS

FINAL

SCIENTIFIC PROGRAM

Saturday—March 28, 2020

Orange County Convention Center

Tangerine Ballroom 1

Orlando, FL

General Program Information

The Mission of The Hip Society

The mission of The Hip Society is to advance the knowledge and treatment of hip disorders to improve the lives of our patients.

Meeting Objectives

The objectives of the Open (Winter) Meeting of The Hip Society and AAHKS are to provide up-to-date information on the treatment of hip conditions, including non-arthroplasty options, and the latest surgical techniques, as well as the current thinking on bearing surfaces. Other objectives address the difficult primary THA and complication management and include an update on revision THA.

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 Hip 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 this live activity for a maximum of **7.0 AMA PRA Category 1 Credits**[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Evaluation

Your opinion matters! Please complete your evaluation online at:

Photography

Please refrain from unauthorized photography and video recording of presentations. Your registration for, and attendance of, this session gives The Hip Society permission to capture images of session attendees and to use these images for internal and marketing purposes.

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Save the Date and Join Us in San Diego!



The AAOS 2021 Annual Meeting and Specialty Day

March 9-13, 2021

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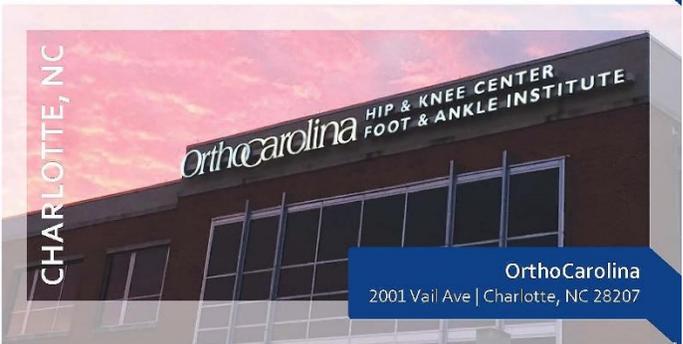
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February 21 – 24, 2021 • Park City, UT

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Congratulations: The 2020 Hip Society Scientific Award Winners

Session IV (11:02 am to 11:20 am)

The 2020 John Charnley Award

Bacteriophage-Derived Lysin Antimicrobial Potential in vitro and in Murine DAIR Model of Periprosthetic Joint Infection

Presenter: **Mathias P.G. Bostrom, MD**

Co-Authors: Branden Sosa, Yingzhen Niu, MD, Kathleen Turajane, Kevin Staats, MD, Vincentius J. Suhardi, MD, PhD, Vincent A. Fischetti, PhD, Xu Yang, MD

The 2020 Otto Aufranc Award

Malseating of Modular Dual Mobility Liners: Incidence and Implication

Presenter: **Joey Romero, MD**

Co-Authors: Amanda Wach, MS, Scott Silberberg, MA, Yu-Fen Chiu, MS, Geoffrey H. Westrich, MD, Timothy M. Wright, PhD, Douglas E Padgett, MD,

The 2020 Frank Stinchfield Award

Who Will Fail Following Irrigation and Debridement for Periprosthetic Joint Infection: A Machine Learning Based Validated Tool

Presenter: **Noam Shohat, MD**

Co-Authors: Karan Goswami, MD, Timothy L. Tan, MD, Michael Yayac, MD, Alex Soriano, Ricardo Sousa, Marjan Wouthuyzen-Bakker, MD, PhD, Javad Parvizi, MD, FRCS

The Hip Society's Traveling Fellowships

The Hip Society's Rothman-Ranawat Traveling Fellowship

At the core of the mission of The Hip Society is the promotion of the science of disease of the hip. Fundamental to science are the basic tenets of education and research. The ultimate benefactors of our knowledge are the patients. **The Hip Society Rothman-Ranawat Traveling Fellowship** is open to four (4) young orthopaedic surgeons, from North America, and throughout the world. The traveling Fellows will visit up to twelve (12) sites in North America as identified by The Hip Society. The ultimate goal of the fellowship is to offer the young surgeons an inspirational tour of state-of-the-art facilities providing exemplary surgical care of the hip joint throughout North America.

Congratulations, 2020 Rothman-Ranawat Traveling Fellows!



Suhel Kotwal, MD
Kansas City, MO
USA



Peter H.J. Cnudde, MD, PhD
Llanelli, Carmarthenshire
United Kingdom



Hiroyuki Ike, MD, PhD
Yokohama-Shi, Kanagawa
Japan



Claudio Diaz Ledezma, MD
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Chile

Those interested in applying for the **2021 Rothman-Ranawat Traveling Fellowship**, please visit The Hip Society's website www.hipsoc.org, click on the **Education** tab.

The deadline to apply for the 2021 Fellowship is August 15, 2020.



APRIL 30-MAY 2, 2020

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NOVEMBER 5-8, 2020

AAHKS
ANNUAL MEETING

PEER REVIEWED. PEERLESS INSIGHTS.

CALL FOR SUBMISSIONS

OPENS APRIL 1, 2020

Submit high-quality **scientific and socioeconomic abstracts** for consideration as podium or poster presentations. Abstracts are blind reviewed by the AAHKS Program Committee review team.

Submit **Symposium proposals** covering all aspects of arthroplasty and health policy. Proposals are reviewed by the AAHKS Program Committee.

SAVE THE DATE

NOVEMBER 5-8, 2020
DALLAS, TEXAS, USA
WWW.AAHKS.ORG/MEETING

**COMBINED SESSIONS I & II
WILL BE PRESENTED IN TANGERINE BALLROOM 1**

| | | |
|---|--|-----------|
| 7:55 – 8:00 AM | WELCOME / OPENING REMARKS Joshua J. Jacobs, MD, (Chicago, IL) <i>President of The Hip Society</i> and Mark W. Pagnano, MD, (Rochester, MN) <i>President of The Knee Society</i> | |
| 8:01 – 8:45 AM | COMBINED SESSION I: Patient Optimization <i>Moderator: C. Lowry Barnes, MD (Little Rock, AR)</i> | |
| 8:02 – 8:09 AM | Preoperative Optimization: Which Risk Factors Should I Try to Have My Patients Modify? <i>Gwo-Chin Lee, MD (Philadelphia, PA)</i> | <u>19</u> |
| 8:10 – 8:17 AM | Perioperative Infection Prevention <i>Thomas P. Vail, MD (San Francisco, CA)</i> | <u>22</u> |
| 8:18 – 8:25 AM | How to Establish an Optimization Program in Academic Practice <i>Richard Iorio, MD (Beverly, MA)</i> | <u>24</u> |
| 8:26 – 8:33 AM | How to Establish an Optimization Program in Private Practice <i>Michael J. Archibeck, MD (Albuquerque, NM)</i> | <u>28</u> |
| 8:34 – 8:48 AM | Discussion and Questions from the Audience | |
| 8:49 – 9:36 AM | COMBINED SESSION II: Outpatient TJA <i>Moderator: Adolph V. Lombardi Jr., MD (New Albany, OH)</i> | |
| 8:50 – 8:57 AM | Choosing Patients Wisely <i>R. Michael Meneghini, MD (Fishers, IN)</i> | |
| 8:58 – 9:05 AM | Pain Management in the Outpatient Setting <i>David F. Dalury, MD (Towson, MD)</i> | <u>31</u> |
| 9:06 – 9:13 AM | When Complications Occur in the ASC <i>Michael E. Berend, MD (Indianapolis, IN)</i> | |
| 9:14 – 9:21 AM | Is Outpatient Total Hip Arthroplasty Safe: What Does the Data Say <i>Craig J. Della Valle, MD (Chicago, IL)</i> | |
| 9:22 – 9:36 AM | Discussion and Questions from the Audience | |
| 9:37 – 9:47 AM | SPECIAL HIGHLIGHTS Health Policy: The Year in Review and What to Expect <i>Presenters: James I. Huddleston III, MD (Redwood, CA) and Michael P. Bolognesi, MD (Durham, NC)</i> | |
| 9:48 – 9:52 AM | Discussion and Questions from the Audience | |
| 9:53 – 9:55 AM | CCJR Winter 2020 Highlights <i>Daniel J. Berry, MD (Rochester, MN)</i> | |
| 9:55 – 10:10 AM | COFFEE BREAK | |
| REST OF THE DAY SESSIONS WILL BE HELD IN EACH SOCIETY'S ROOM | | |

HIP

TANGERINE BALLROOM 1

| | | |
|---------------------|---|-----------|
| 10:11 – 11:01 AM | SESSION III: Revision THA: A Case Based Discussion <i>Moderator: Don S. Garbuz, MD (Vancouver, BC)</i> <i>Faculty:</i> <i>Paul J. Duwelius, MD (Portland, OR)</i> <i>Allan E. Gross, MD (Toronto, ON)</i> <i>George J. Haidukewych, MD (Orlando, FL)</i> <i>Michael A. Mont, MD (New York, NY)</i> <i>Wayne G. Paprosky, MD (Winfield, IL)</i> <i>Michael D. Ries, MD (Reno, NV)</i> | |
| 10:51 – 11:01 AM | Discussion and Questions from the Audience | |
| 11:02 – 11:20 AM | SESSION IV: The Hip Society Awards <i>Moderator: Joshua J. Jacobs, MD (Chicago, IL)</i> | |
| 11:03 – 11:08 AM | The John Charnley Award <i>Presenter: Mathias P.G. Bostrom, MD (New York, NY)</i> | <u>33</u> |
| 11:09 – 11:14 AM | The Otto Aufranc Award <i>Presenter: Joey Romero, MD (Austin, TX)</i> | <u>34</u> |
| 11:15 – 11:20 AM | The Frank Stinchfield Award <i>Noam Shohat, MD (Tel Aviv, Israel)</i> | <u>35</u> |
| 11:21 – 11:26 AM | Discussion and Questions from the Audience | |
| 11:27 AM – 11:33 AM | SESSION V: Special Highlights <i>Moderator: Adolph V. Lombardi, Jr., MD (New Albany, OH)</i> Rothman Ranawat Traveling Fellowship British Hip Society Traveling Fellowship | |
| 11:34 – 11:54 AM | SESSION VI: Presidential Guest Speaker Embracing Big Data <i>J. Mark Wilkinson, PhD, FRCS (Tr&Orth) (Sheffield, UK)</i> | |
| 11:55 AM – 1:00 PM | LUNCH | |
| 1:01 – 1:48 PM | SESSION VII: The Hip-Spine Relationship <i>Moderator: Douglas E. Padgett, MD (New York, NY)</i> | |
| 1:01 – 1:09 PM | Understanding the X-Rays <i>Ran Schwarzkopf, MD, MSc (New York, NY)</i> | |
| 1:10 – 1:18 PM | How do I Prevent Them from Dislocating? <i>Arthur L. Malkani, MD (Louisville, KY)</i> | <u>36</u> |
| 1:19 – 1:27 PM | A Spine Surgeon's Perspective <i>Han Jo Kim, MD (New York City, NY)</i> | |
| 1:28 – 1:48 PM | Cases and Discussion | |

K N E E

TANGERINE BALLROOM 3

| | |
|----------------------------|--|
| 10:11 – 11:01 AM | SESSION III: How I Do A Primary TKA <i>Moderator: Thomas K. Fehring, MD (Charlotte, NC)</i> |
| | <i>Faculty:</i> <i>Robert L. Barrack, MD (St. Louis, MO)</i> <i>Keith R. Berend, MD (New Albany, OH)</i> <i>Henry D. Clarke, MD (Phoenix, AZ)</i> <i>Michael J. Dunbar, MD (Halifax, NS)</i> <i>William G. Hamilton, MD (Alexandria, VA)</i> <i>William B. Macaulay, MD (New York, NY)</i> |
| 10:51 – 11:01 AM | Discussion and Questions from the Audience |
| 11:02 – 11:22 AM | SESSION IV: Special Highlights <i>Moderator: Bryan D. Springer, MD (Charlotte, NC)</i> |
| 11:03 – 11:09 AM | John Insall Travelling Fellowship <i>W. Norman Scott, MD (New York, NY)</i> |
| 11:10 – 11:16 AM | Highlights of Closed Meeting of The Knee Society <i>Bryan D. Springer, MD (Charlotte, NC)</i> |
| 11:17 – 11:22 AM | Highlights of ORS <i>Timothy M. Wright, PhD (New York, NY)</i> |
| 11:23 AM – 11:48 AM | SESSION V: The Knee Society Awards <i>Moderators: Robert T. Trousdale, MD (Rochester, MN) and A. Seth Greenwald, D.Phil. (Oxon) (Cleveland, OH)</i> |
| 11:23 – 11:30 AM | Lifetime Achievement Awards <i>Presented by: Henry D. Clarke, MD (Phoenix, AZ) and Timothy M. Wright, PhD (New York, NY)</i> <i>Albert H. Burstein, PhD (Sarasota, FL) and Leo A. Whiteside, MD (St. Louis, MO)</i> |
| 11:31 – 11:36 AM | The John N. Insall, MD Award <i>Presenter: Michael Yayac, MD (Philadelphia, PA)</i> |
| 11:37 – 11:42 AM | The Chitranjan S. Ranawat, MD Award <i>Presenter: Hideki Ueyama, MD (Osaka, Japan)</i> |
| 11:43 – 11:48 AM | The Mark B. Coventry, MD Award <i>Presenter: JaeWon Yang (Chicago, IL)</i> |
| 11:49 – 11:54 AM | Discussion and Questions from the Audience |
| 11:55 AM – 1:00 PM | LUNCH |
| 1:01 – 1:48 PM | SESSION VI: Management of Early Osteoarthritis of The Knee <i>Moderator: Mark W. Pagnano, MD (Rochester, MN)</i> |
| 1:01 – 1:09 PM | Biologics <i>Fred D. Cushner, MD (New York, NY)</i> |
| 1:10 – 1:18 PM | Osteotomy <i>Tom Minas, MD, MS (West Palm Beach, FL)</i> |
| 1:19 – 1:27 PM | Meniscal Transplants <i>Brian Cole, MD (Chicago, IL)</i> |
| 1:28 – 1:35 PM | Cartilage Replacement <i>William D. Bugbee, MD (La Jolla, CA)</i> |
| 1:36 – 1:48 PM | Discussion and Questions from the Audience |

HIP

TANGERINE BALLROOM 1

| | | |
|-----------------------|--|-----------|
| 1:49 – 2:45 PM | SESSION VIII: Management and Early Osteoarthritis of the Hip <i>Moderator: John C. Clohisy, MD (St. Louis, MO)</i> | |
| 1:49 – 1:56 PM | Cortisone, Viscosupplementation, PRP and Stem Cells: What is Their Role? <i>Rafael J. Sierra, MD (Rochester, MN)</i> | <u>38</u> |
| 1:57 – 2:04 PM | The Role of Arthroscopy in Early Hip Arthritis: <i>Shane J. Nho, MD, MS (Chicago, IL)</i> | |
| 2:05 – 2:12 PM | Pelvic Osteotomies: Which Patients Benefit Most? <i>Michael P. Millis, MD (Boston, MA)</i> | <u>41</u> |
| 2:13 – 2:20 PM | Osteotomy vs “Early” THA <i>Christopher L. Peters, MD (Salt Lake City, UT)</i> | <u>44</u> |
| 2:21 – 2:45 PM | Clinical Cases and Discussion | |
| 2:45 – 3:00 PM | REFRESHMENT BREAK | |
| 3:01 – 3:36 PM | SESSION IX: How I Do A Primary THA <i>Moderator: Jay R. Lieberman, MD (Los Angeles, CA)</i> | |
| | <i>Faculty:</i> <i>Kevin L. Garvin, MD (Omaha, NE)</i> <i>William J. Hozack, MD (Philadelphia, PA)</i> <i>Joseph T. Moskal, MD (Roanoke, VA)</i> <i>Charles L. Nelson, MD (Philadelphia, PA)</i> <i>Vincent D. Pellegrini, MD (Lebanon, NH)</i> <i>Thomas P. Schmalzried, MD (Los Angeles, CA)</i> | |
| 3:36 – 3:46 PM | Discussion and Questions from the Audience | |
| 3:47 – 4:32 PM | SESSION X: Complex Primary THA: A Case Based Discussion <i>Moderator: David G. Lewallen, MD (Rochester, MN)</i> | |
| | <i>Faculty:</i> <i>C. Anderson Engh, MD (Alexandria, VA)</i> <i>Paul F. Lachiewicz, MD (Chapel Hill, NC)</i> <i>Scott M. Sporer, MD (Winfield, IL)</i> <i>Michael Tanzer, MD (Montreal, QC)</i> <i>Michael J. Taunton, MD (Rochester, MN)</i> <i>Leo A. Whiteside, MD (St. Louis, MO)</i> | |
| 4:23 – 4:32 PM | Discussion and Questions from the Audience | |
| 4:33 PM | ADJOURN | |

K N E E

TANGERINE BALLROOM 3

| | |
|-----------------------|--|
| 1:49 – 2:44 PM | SESSION VII: Periprosthetic Joint Infection <i>Moderator: Mathias P.G. Bostrom, MD (New York, NY)</i> |
| 1:49 – 1:56 PM | An Updates on Diagnosis of PJI <i>Javad Parvizi, MD (Philadelphia, PA)</i> |
| 1:57 – 2:04 PM | The Role of Irrigation and Debridement in 2020 <i>Matthew P. Abdel, MD (Rochester, MN)</i> |
| 2:05 – 2:12 PM | Is Two Exchange Stage Still the Gold Standard For PJI? <i>Arlen D. Hanssen, MD (Rochester, MN)</i> |
| 2:13 – 2:20 PM | One Stage Exchange for the Treatment of PJI: What Have We Learned and Need to Learn <i>Prof. Fares S. Haddad BSc (Hons) MBBS MD (Res) MCh (Orth) FRCS (Orth) FFSEM (London, UK)</i> |
| 2:21 – 2:28 PM | Current Concepts in Antibiotic Management <i>Barry D. Brause, MD (New York, NY)</i> |
| 2:29 – 2:44 PM | Discussion and Questions from the Audience |
| 2:45 – 3:00 PM | REFRESHMENT BREAK |
| 3:01 – 3:46 PM | SESSION VIII: Revision TKA: A Case Based Discussion <i>Moderator Daniel J. Berry, MD (Rochester, MN)</i> |
| | <i>Faculty:</i> <i>David Backstein, MD (Toronto, ON)</i> <i>James A. Browne, MD (Charlottesville, VA)</i> <i>David J. Mayman, MD (New York, NY)</i> <i>Denis Nam, MD (Chicago, IL)</i> <i>Thomas P. Sculco, MD (New York, NY)</i> |
| 3:36 – 3:46 PM | Discussion and Questions from the Audience |
| 3:47 – 4:32 PM | SESSION IX: Complex Primary TKA: A Case Based <i>Moderator: Steven J. MacDonald, MD (London, ON)</i> |
| | <i>Faculty:</i> <i>John J. Callaghan, MD (Iowa City, IA)</i> <i>Douglas A. Dennis, MD (Denver, CO)</i> <i>Stuart B. Goodman, MD (Redwood City, CA)</i> <i>William A. Jiranek, MD (Durham, NC)</i> <i>William J. Maloney, III, MD (Redwood City, CA)</i> <i>Giles R. Scuderi, MD (New York, NY)</i> |
| 4:23 – 4:32 PM | Discussion and Questions from the Audience |
| 4:33 PM | ADJOURN |

Preoperative Optimization: Which Risk Factors Should I Try to Have My Patients Optimize?

Gwo-Chin Lee, MD

The introduction of alternative payment models has shifted the focus of total hip and knee arthroplasty (THA/TKA) from survivorship and function to minimizing complications and readmissions within the first 90 days [1]. Wound complications and infection remain the most common cause for readmission and return to the operating room following THA/TKA and therefore, prevention of infection remains a key quality improvement initiative [2]. The causes of postoperative complications are multifactorial and complex but can generally be categorized into 1) host, 2) surgical, and 3) environmental factors. The purpose of this abstract to discuss the potentially modifiable patient risk factors and their influences on the infection risk following THA/TKA.

Optimization of modifiable risk factors have been shown to decrease the risk for infection and complications. While the individual contributions of factors such as body mass index (BMI), glycemic control, nutritional status, smoking, narcotic use, and MRSA colonization are unknown, together, they have been shown to influence infection risk [3]. Kee et al. showed that in a group of early failures following THA/TKA, nearly half of patients had at least 1 modifiable risk factor [4]. Consequently, patient optimization prior to surgery and risk stratification are critical to minimizing postoperative complications.

The appropriate management of obese patients undergoing THA/TKA remains controversial. While there is evidence that complication is significantly increased in patients with BMI > 40 kg/m², the best way to increase safety in this patient population remains unclear [5]. Springer et al. showed that restricting surgery alone may not be sufficient to incentivize weight loss [6]. Others have also demonstrated that weight loss and even bariatric surgery prior to THA/TKA may not be effective in mitigating postoperative complications [7-8]. Thus, the question remains whether obesity is truly a modifiable risk factor?

The nutritional status of the patient prior to surgery may be more predictive of complications compared to BMI [9]. Malnourished patients have been found to be 5-7 times more likely to develop wound complications following THA/TKA [10] and at increased risk for infections following revision arthroplasty [11]. Hypoalbuminemia has also been associated with increased hospital length of stay and readmissions [12]. However, the thresholds for malnutrition have not been well established in orthopedics. Morey et al. reported in a series of patients that an albumin level <3.5 g/dL and a total lymphocyte count <1500/mm³ was not predictive of infection [13]. Nutritional intervention prior to surgery may improve outcomes [14].

Good glycemic control of patients around the time of surgery has been shown to reduce the risk for infection. While hemoglobin A1c remains commonly used as a marker for glucose control, it is unreliable unless severely elevated because it not fully reflective of the patient's state [15]. Serum fructosamine has been shown to be more predictive of complications [16]. Finally, whether the patient is diabetic or not, a fasting blood glucose less than 200 mg/dL and blood glucose level <126 mg/dL during the first 90 days following surgery has been shown to most closely correlate with infection prevention [17].

Smoking affects wound healing due to the effects of nicotine on the vasculature leading to decreased oxygen

delivery to the soft tissues. Smokers are at increased risk of complications compared to non-smokers following THA/TKA [18]. Smoking cessation can mitigate the risk of complications but does not completely eliminate it. Duchman et al. reported that ex-smokers were still at increased risk of wound complications compared to controls [19]. However, in many ways, smoking is one of the few risk factors that is truly under a patient's control and therefore modifiable.

Methicillin Resistant Staphylococcus Aureus (MRSA) colonization is another optimizable risk factor. Patients colonized with MSSA/MRSA are at increased for Staphylococcal infections following THA/TKA and the isolated pathogen is often molecularly identical to the isolates in their nares [20]. Kim et al, reported a decrease in infections following the implementation of an institutional screening program [21]. However, 20% of patients may remain colonized following treatment. Barriers to success include patient compliance and/or antimicrobial resistance [22]. Consequently, decolonization protocols must be used in combination with other modalities (i.e. chlorhexidine wipes) to maximize success.

Finally, preoperative narcotic use has been shown to independently predict complications, length of stay and readmissions following THA/TKA [23]. The number of preoperative opioid prescriptions is predictive of postoperative use [24]. Kim et al. showed that opioid dose consumption > 12mg/d morphine equivalents over 3 months prior to surgery was predictive of chronic opioid use [25]. Whether patients who discontinue opioids prior to surgery can achieve equivalent results to opioid naïve patients is unknown. However, when possible, it is reasonable to attempt to wean patients prior to elective THA/TKA.

In summary, there are many factors that can influence the outcome of THA/TKA. While it is ideal to eliminate all of the risk factors that can potentially lead to complications, realistically, optimization of the whole patient is the best way to minimize complications. In many instances, the precise contributions and optimal thresholds of each risk factor have yet to be determined. Therefore, it is critical that surgeons take this into consideration in order not to withhold care from patients in need of THA/TKA.

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Patient Optimization: Perioperative Infection Prevention

Thomas P. Vail, MD, Kwesi St. Louis, MD

Nothing ruins the patient experience, the value proposition, or the hospital/provider balance sheet more quickly than an infection after a total joint arthroplasty. This presentation will focus on **patient optimization** relative to infection prevention, citing recent evidence to support a lower infection rate through “optimization” of some commonly encountered clinical scenarios.

Diabetes, HbA1c, and glucose.

HbA1c and perioperative glucose management have been the subject of many studies on patient optimization. In a recent systematic review Yang, *et al* found that elevated HbA1c and **perioperative random blood glucose** levels were both associated with a significantly elevated risk of developing a prosthetic joint infection.¹ Cancienne, *et al* when attempting to find a **threshold for HbA1c** in THA and TKA patients found that hip patients with values over 7.5mg/dL and knee patients over 8.0 mg/dl were at a significantly higher risk of developing a deep infection but had a poor predictive value of this test.^{2,3} Thus, recent evidence seems to support **glucose control** over HbA1c.

Chronic kidney disease (CKD), liver disease, heart disease.

Antoniak, *et al* found in an analysis of over 190,000 patients there was a 6.6% major complication rate and 0.2% mortality rate within 30 days of surgery associated with CKD.⁴ As with heart disease and liver disease, this **risk factor can be modified**, but not eliminated.

MRSA screening.

Sporer, *et al* found routine screening of elective joint patients (9690 patients) for MRSA and MSSA and then **selective treatment of positive screens** with mupirocin and chlorhexidine gluconate showers for 5 days resulted in decrease surgical infection rate by 69%.⁵ It is not clear whether routine screening is cost effective and clinically impactful in all clinical settings.

HCV treatment.

Evidence seems to strongly support **pre-treatment of HCV**. Bedair, *et al* found in a retrospective multicenter database query of 105 THA patients that the infection rate in untreated Hep C was 14.3% and 0% in treated cases, P= 0.1.⁶ A retrospective study by Schwarzkopf *et al* examining the infection rates in TKA for treated vs untreated Hep C found the rates to be 4.3% vs 15.5%; p=0.03⁷

Dental health.

Though it was postulated that active periodontal disease may lead to an increase PJI rate, Sonn, *et al* found **no significant association** with preop dental evaluation and extraction on overall complication rate or PJI rate. They found a higher complication rate in patients that underwent tooth extractions preoperatively.⁹

Obesity.

Shohat, *et al* performed a retrospective analysis of 18,173 TJA patients with the goal of identifying PJI within 90 days of surgery, a BMI threshold of 33kg/m² had a AUC of 0.58, making it no better than random chance. It was noted that patients **over BMI 40 kg/m²** had a 3-fold increased risk of developing a PJI (OR 3.09,

p=0.003)¹⁰ The mitigating effect of bariatric surgery and weight loss is not clear.¹¹

RA and DMARDs.

The International Consensus Meeting on PJI recommended that DMARDs should be **halted prior** to an elective total joint arthroplasty based on their half-life.¹²

Antibiotic prophylaxis

In a study of 20,682 primary TJA patients looking at single versus multiple antibiotic doses, the PJI rate at 1 year was 0.6% in the single dose and 0.88% in the multiple dose group and no significant difference was found.¹³ Wyles, *et al* showed a **32% lower risk of PJI in patients treated with cefazolin** (p< 0.001) and strongly recommended having patients with penicillin or cephalosporin allergies tested preop.¹⁴ Rondon, *et al* showed in their retrospective analysis of 17,393 primary TJA patients that **under dosing** of cefazolin resulted in a higher rate of PJI at 1 year (1.51% vs 0.86%, P= 0.002). This was especially true in patients in over 120kg, who should get 3 grams.¹⁵

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How to Establish an Optimization Program in an Academic Medical Center

Richard Iorio, MD

Although some risk factors are non-modifiable, such as age and gender, it is important that healthcare organizations emphasize medical optimization of TJA candidates with modifiable risk factors (MRF) to prevent hospital readmissions and improve outcomes. **MRFs that influence readmission include hospital length of stay (LOS), respiratory conditions, body mass index (BMI), diabetes, cardiovascular diseases, hepatic disease, chronic renal disease, venous thromboembolic (VTE) disease, tobacco use, substance abuse, psychiatric conditions, and fall risk.** Various risk stratification instruments exist, such as the American Society of Anesthesiologist (ASA) score, however they include both non-MRFs and MRFs. Furthermore, they are unable to guide medical optimization protocols, and instead simply categorize patients at risk for perioperative complications. The Perioperative Orthopaedic Surgical Home (POSH) program, which includes a Readmission Risk Assessment Tool (RRAT), was developed to better stratify and optimize TJA candidates (**see below**). With the help of this program, and the alignment of the hospital, patient, payer, and surgeon can concurrently be addressed and provide cost-effective, high quality care and improved patient outcomes.

It is well recognized that unplanned readmissions following total joint arthroplasty (TJA) are more prevalent in patients with comorbidities. However, few investigators have delayed surgery and medically optimized patients prior to surgery. In its previous form, the Perioperative Orthopaedic Surgical Home (POSH) was a surgeon-led screening and optimization initiative targeting eight common modifiable comorbidities. Currently at Brigham and Women's Hospital, we have placed the optimization program under the direction of a senior physician's assistant. The Perioperative Arthroplasty Optimization Coordinator for the Department of Orthopaedic Surgery will serve in capacity for the following:

- Receive direct referrals from total joint attendings and eventually other attendings (GIM, Rheumatology etc) for patients who need optimization prior to TJA procedures (i.e. patients not *yet* medically appropriate for surgery due to comorbid medical conditions, who may proceed to surgery once their issues are under better control, or patients that may benefit from optimization and thus delay the need for TJA); the expectation is that the patient will eventually be optimized to proceed to a surgical procedure or delay their procedure
- Coordinate the optimization referrals and follow the patients until they meet the criteria for surgery and then send back to referring attending
- Be available in clinic to help total joint attendings see patients when clinic volume is light and screen clinic lists for possible optimizable patients
- Be available to see add on patients that other PAs aren't available for (eg: wound checks or follow ups) on an urgent basis when clinic volume is light
- Work with the Weiner Center to identify at risk patients with modifiable risk factors that have been overlooked, try to optimize before surgery or before Weiner Center appointment. Discuss with attending the need for optimization and delay vs the benefit and risk of surgery.
- Work with the Weiner Center to standardize MRSA decolonization protocols and antibiotic regimens

Proposed Hard Stops (Hard Stop means consideration before surgery) with Modifiable Risk Factors include (at your discretion):

- Sub-optimally controlled diabetes and hyperglycemia
- malnutrition
- obesity
- smoking
- alcohol abuse
- anemia
- poor dentition/periodontal disease
- skin colonization (MRSA/MSSA)
- Opioid use, chronic pain and pain management issues
- Frailty (work with Dr. Javedan)
- Fall risk prevention

Other risk factors under consideration, at the surgeon's discretion, include: vitamin D deficiencies, and impaired renal function, among others.

Once patients are identified, a referral may be placed in EPIC:

“Ambulatory Referral to BWH Orthopedics”.

Select the optimization coordinator from the list of providers. If possible, indicate any specific recommendations in the referral or by email notification (for example, reduce weight to x-pounds/BMI or a hemoglobin A1C particular target value).

The call center will reach out to the patient for scheduling (there is no admin assistant assigned).

Patients will still require referrals to other departments (nutrition, smoking cessation, endocrine, etc) for the actual intervention but the coordinator will monitor their progress and determine when the patient may be optimized for surgical scheduling consideration. The additional referrals may be placed either by the Orthopaedic surgeon/PA or deferred until the optimization appointment. This will include referrals, as indicated, to nutrition, smoking cessation, pain management, substance abuse/alcohol, endocrine, and bariatric surgery, among others. If the optimization coordinator thinks that additional referrals are necessary, then they will coordinate with the attending additional referrals.

An initial face-to-face encounter will occur but further management may include telephone and/or telehealth visits, as indicated, until the patient is optimized for surgical intervention. Please let the patient know that this may incur an additional cost but it is necessary to successfully prepare them for surgery.

The surgeon/PA team will be kept updated regarding the patient's progress and notified when they are approaching their target(s).

Conclusions: The identification and medical optimization of comorbidities prior to surgical intervention may enhance the value of care TJA candidates receive. A standardized multi-disciplinary approach to the medical optimization of high-risk TJA candidates may improve patient engagement and perioperative outcomes, while reducing cost associated with TJA. **Historically, surgical risk stratification methods emphasized the appraisal of non-modifiable risk factors, which have incentivized ‘cherry picking’ and ‘lemon dropping’ behaviors. Only recently has medical optimization of high-risk TJA candidates demonstrated improved outcomes by reducing hospital readmissions when patients undergo TJA after optimization.**

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Readmission Risk Assessment Tool (RRAT)

Patients undergoing TJA may be risk stratified for the risk of readmission using the above RRAT tool. Modifiable risk factor categories are listed in the left column with their respective risk factors in the three adjacent columns. Risk factors are graded based upon severity (columns 1, 2 and 3) and total score is summed. RRAT scores ≥ 3 should result in a hard stop until the patient is optimized. Stop hand indicates hard stop until modifiable risk factor is resolved.

*Patient has a history of coronary artery disease, cerebrovascular accident, peripheral vascular disease or venous thromboembolic disease, age ≥ 60 years and at least 21 cardiac risk factors; renal insufficiency (CrCl < 60 ml/min); diabetes; COPD; hypertension; recent smoker (< 30 days); cancer; heart failure

**Has VTED risk factors: cerebrovascular accident, COPD, BMI ≥ 40 , coronary artery disease, peripheral vascular disease, thrombophilia (activated protein C resistance, elevated factor VIII and lipoprotein A)

| | 1 | 2 | 3 |
|--|--|--|--|
| Infection | Not Applicable | Not Applicable | (+) MRSA - Decolonize (+) HIV - Viral load undetectable (+) HCV - Antiviral treatment/cure |
| Smoking | History of Smoking Enroll in Smoking Cessation Program 4 to 8 Weeks Prior to Surgery | Not Applicable | Not Applicable |
| Obesity | BMI 30-34.9 Nutritional Counseling Program | BMI 35-39.9 Nutritional Counseling + Acute Weight Loss Program |  BMI ≥ 40 Nutritional Counseling + Long-term Weight Loss + Bariatric Consult |
| Cardiovascular Disease | History of CVD* Enroll into cardiac optimization program | Not Applicable | Not Applicable |
| Venous Thromboembolic Disease | VTE Risk Factors** | History of PE or DVT IVC Filter or Aggressive VTED Management | Not Applicable |
| Neurocognitive Psychological Behavioral | Neurocognitive Deficits or ≥ 7 catastrophizing, PHQ-9 | Alcohol Abuse or Chronic Active Narcotic Dependency | Not Applicable |
| Physical Deconditioning | Frailty or Physical Function/Ambulation | Nonambulatory or Requires Transfer Assistance | Not Applicable |
| Diabetes | Well Controlled | HgbA1c ≥ 8 Refer to Endocrinologist |  Fasting Glucose > 180 mg/dl Must correct prior to surgery |
| Risk Factor Subtotal | | | |
| Figure Legend  HARD STOP | Total _____ | | |

How to Establish an Optimization Program in Private Practice

Michael J. Archibeck, MD

1. Patient Optimization
 - a. Optimize or modify what can be altered to increase the chance of a successful surgery
 - i. Good outcome
 - ii. Minimize complications
 - iii. Minimize readmissions
 - b. Not a list of hard stops without support.
 - c. Requires
 - i. Buy-in from interested parties
 1. Patient
 2. Surgeon
 3. Hospital
 4. Anesthesia
 5. Payer?
 - ii. Resources beyond the surgeon
2. Factors Potentially Unique to Private Practice
 - a. Often multiple surgical locations
 - i. Preop education
 - ii. Differing payors
 - iii. Different pre-anesthesia screening
 - b. Limited “team members”
 - i. Differing availability of specialties
 - c. Different “pressures”
 - i. Adequate volume
 - ii. Pay for performance or risk sharing arrangements
 - d. Different leadership structure
 - i. Obtaining consensus and compliance challenge
3. Guidelines for establishing a program
 - a. Establish a formal “joint replacement program” at your highest volume hospital
 - i. Leadership structure
 1. Include hospital administration
 2. Include surgeons
 3. Include anesthesia
 - ii. Regular meeting (monthly)
 - iii. Data driven.
 - iv. Consider application for Center of Excellence
 - b. Incorporate parties with aligned motivation for outcome optimization and reduced readmission rate
 - i. Other surgeons
 - ii. Hospital
 - iii. Payers
 - iv. Patient
 - v. Anesthesia
 - c. Identify risk factors to start with (surgeon consensus)

- i. MRSA screening and decolonization program
 - ii. Smoking cessation programs
 - iii. Obesity (BMI)
 - iv. Diabetes (HbA1c)
 - v. Preoperative anemia
- d. Other factors
 - i. Morbid obesity
 - ii. Diabetes
 - iii. Smoking
 - iv. Preop education
 - v. Preoperative anemia
 - vi. Cardiovascular
 - vii. Chronic pain medication/substance abuse
 - viii. Peripheral vascular disease
 - ix. Deconditioning
 - x. HIV, Hep C
 - xi. Catastrophizing behavior, depression, anxiety
 - xii. Clotting disorders screening in patient with DVT history
- e. Develop infrastructure to spread the work
 - i. Pre-anesthesia clinic (Perioperative Home)
 - 1. HbA1c
 - 2. Anemia
 - 3. MRSA screening
 - 4. Medical clearance
 - ii. Hospital
 - 1. Preoperative education class
 - a. "required"
 - 2. Pre-anesthesia clinic 3-4 weeks before surgery
 - iii. Surgeon/PA/RN/NP
 - 1. Consensus
 - 2. Roles to initiate each treatment
 - iv. Payors
 - 1. May assist with criteria for payment
- 4. Develop Resources to assist patients with Hospital/Payers
 - a. Weight loss, bariatric program
 - b. Smoking cessation program
 - c. Anemia treatment
- 5. Value of Joint Commission Center of Excellence Designation
 - a. Preparation for site visit identified some shortcomings
 - b. Reporting data encourages ongoing evaluation
 - c. Site visit is educational
 - d. Can be used to get hospital support and encourage surgeon consensus
- 6. Central Point of Patient Contact
 - a. Preoperative Anesthesia Clinic (PHO)
 - b. Required for all patients
 - c. Determine labs and studies needed
 - d. Determine need for specialty consultation
 - e. Run MRSA program (Bactroban)
 - f. Added testing
 - i. HbA1c, Hematocrit, nutritional screening, smoking
- 7. Expand, as resources allow, to more challenging issues
 - a. Chronic pain medication use
 - b. Neuropsychiatric disorders
 - c. Substance Abuse

- d. Preoperative strength training
- e. Nutritional supplementation
- 8. Harness the motivation for successful surgery
 - a. Patient – safety and success
 - b. Financial
 - i. Patient
 - ii. Payor
 - iii. Hospital
 - iv. Surgeon (risk sharing)
 - c. Surgeon accountability (public reporting)
 - i. Joy of work and sustainability
- 9. Lessons Learned
 - a. Every setting is different
 - b. Develop a hospital based structured program/leadership with administrative support.
 - c. Consider application for COE
 - d. Involve all interested/vested parties
 - e. Identify “modifiable risk factors” to start with, then expand
 - f. Patient education important
 - g. Centralize program at a common touch point of all patients
 - i. Preanesthesia clinic (POH)
 - ii. Spread the work
 - h. Easy to add risk factors or other programs (LOS, Discharge disposition) once infrastructure in place and trust has been established.

Pain Management in the Outpatient Setting

David F. Dalury, MD

Pain control following total joint surgery is an important consideration for both surgeons and patients. The outpatient setting presents several unique challenges due to the fact that, by definition, the patient will not have available in-hospital options such as rescue parenteral narcotics nor the ability to treat urinary retention once discharged. Limitations on Anesthetic options and back up as well as limited pharmacies are also to be considered in ASCs.

A critical decision is who is a candidate for a TJR as an outpatient. Grading systems have been developed. Obviously, avoiding those patients with multiple co-morbidities, a history or chronic narcotic usage or difficult anesthetic histories, for instance, makes sense.

Pain management in the outpatient TJR begins with good patient education. A clear understanding of the usual post-operative course will help align the patient's expectations. Patients also need to hear a consistent message of safety and access to care post discharge.

Most surgeons in both ASCs as well as hospitals use a multi modal pain management oral protocol both pre and post operatively. This consists of regular Acetaminophen, a NSAID if tolerated and occasionally Gabapentin. There is good evidence that starting the NSAID a day or two prior to surgery can begin the process of pre-emptive analgesia. A peri op and post op protocol that focuses on limiting narcotics is important and even more so in the ASC as patients with PONV will need extended stays in the PACU and once discharged will not have access to parenteral antiemetics. Giving patients with a history of PONV a prescription for oral ondansetron is a good idea.

Several large studies have documented the advantages of Spinal over General anesthesia. Spinal anesthetics have superior outcomes, lower morbidities and fewer complications. Anesthetic choice in the ASC may be limited by the particular Anesthesiologist covering the case. If a Spinal anesthetic is to be used, it should be short acting as longer acting spinals are associated with longer PACU times (limited in the ASC) as well as post op urinary retention (POUR). Limiting IV fluid administration has been shown to help decrease POUR.

Current modern pain protocols utilize either local infiltrative analgesia (LIA) or some form of a peripheral block. The most popular block currently is the adductor canal block (ACB). Both of these have been shown to be very effective in pain management. The advantage of LIA is that it can be done by the surgeon and so there are distinct cost advantages. A recent metanalysis showed LIA to be superior to ACB and another recent paper showed little advantage to utilizing both.

There are many different "cocktails" that have been shown to be effective in LIA. A consideration in the ASC is that these may not be readily available due to a lack on an onsite pharmacy so they must be transported to the center or an alternative type of injection will have to be used.

As outpatient total joint replacements become more commonplace, it is important that surgeons develop a protocol beginning with patient education. Pain control is a central concern of patients and the fact that they will not be in the hospital requires an extra level of care. Efforts to avoid POUR and PONV are important. Utilizing well proven concepts such as preemptive analgesia, short acting spinal anesthetics, LIA as well as a

multimodal, narcotic-sparing post op pain protocol will enable patients to successfully undergo outpatient TJR

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SESSION IV: The Hip Society Awards

11:03 – 11:08 AM

The John Charnley, MD Award

Bacteriophage-Derived Lysin Antimicrobial Potential in vitro and in Murine DAIR Model of Periprosthetic Joint Infection

Mathias P.G. Bostrom, MD, Branden Sosa, Yingzhen Niu, MD, Kathleen Turajane, Kevin Staats, MD, Vincentius J. Suhardi, MD, PhD, Vincent A. Fischetti, PhD, Xu Yang, MD

Aim: Current treatments of periprosthetic joint infection (PJI) are minimally effective against *S. aureus* biofilm. A murine PJI model of debridement, antibiotics, and implant retention (DAIR) was used to test the hypothesis that PlySs2, a bacteriophage-derived lysin, can target *S. aureus* biofilm and address the unique challenges presented in this periprosthetic environment.

Methods: PlySs2 was compared to vancomycin for ability to kill biofilm and colony forming units (CFU) on orthopedic materials using *in vitro* models. *In vivo*, a murine PJI model of DAIR, was utilized to assess the efficacy of PlySs2 and vancomycin combination treatment on periprosthetic bacterial load.

Results: PlySs2 treatment reduced 99% more CFU and 75% more biofilm compared to vancomycin *in vitro*. PlySs2 and vancomycin combination treatment *in vivo* reduced the number of CFU on the implant surface by 92% and in the periprosthetic tissue by 88%.

Conclusion: PlySs2 lysin was able to reduce biofilm, target planktonic bacteria, and work synergistically with vancomycin in our *in vitro* models. PlySs2 and vancomycin combination treatment also reduced bacterial load in the periprosthetic tissue and implant in a murine model of DAIR treatment for established PJI.

Malseating of Modular Dual Mobility Liners: Incidence and Implications

*Joey Romero, MD, Amanda Wach, MS, Scott Silberberg, MA, Yu-Fen Chiu, MS,
Geoffrey H. Westrich, MD, Timothy M. Wright, PhD, Douglas E Padgett, MD*

Modular dual mobility (MDM) was introduced to reduce instability but concerns regarding incomplete seating of the modular liner have been raised. We reviewed 551 consecutive primary THR's using an MDM construct from a single manufacturer over a 2 year period. Orthogonal radiographs obtained at a minimum of 6 weeks postoperatively demonstrated 32 liners (5.8%) to be malseated but the clinical impact is not fully understood.

To study the impact of malseating upon fretting and corrosion, we designed a simulated corrosion chamber. Six pristine implants with cobalt-chrome liners and titanium hemispherical shells were tested: three implants were properly engaged and three liners canted at 6 degrees off complete seating. The chamber was filled with phosphate buffered saline and set up as a threeelectrode configuration with the output measure of current during testing. The liner-shell couples then underwent compressive cyclic loading of increasing magnitudes using a uniaxial load frame (MTS, Eden Prairie, MN). The cyclic load was applied at 3 Hz, with 540 cycles at each

magnitude, ranging from 100N to 3400N, R=0.1. The current was measured throughout testing at 20 Hz. The onset of fretting load was determined by analyzing the increase in average current. Well seated liners showed significantly lower fretting current values at all peak compressive loads greater than 800 N. Liner-shell couples with canted liners demonstrated a fretting onset load of 2400 N, and fretting currents at greater than 2400 N were significantly larger than those at lower peak compressive loads(P<0.05).

Modular liner malseating remains a clinical issue. The onset of fretting and increased fretting current throughout loading cycles suggests disruption of the passive oxide layer on the implant surface making it susceptible to crevice corrosion. These results support our hypothesis that malseated liners may be at risk for fretting corrosion. Clinicians should be aware of this phenomena.

Who Will Fail Following Irrigation and Debridement for Periprosthetic Joint Infection: A Machine Learning Based Validated Tool

*Noam Shohat, MD, Karan Goswami, MD, Timothy L. Tan, MD, Michael Yayac, MD,
Alex Soriano, Ricardo Sousa, Marjan Wouthuyzen-Bakker, MD, PhD, Javad Parvizi, MD, FRCS*

Background: Failure rates of irrigation and debridement (I&D) for periprosthetic joint infection (PJI) vary greatly and are unpredictable. We aimed to develop and validate a practical, easy to use tool that may accurately predict outcome following surgery.

Methods: This was an international, multicentre retrospective study of 565 revision total hip arthroplasties (THA) undergoing I&D for PJI from 2005-2017. PJI was defined using the Musculoskeletal Infection Society (MSIS) criteria. Fifty-two variables including demographics, comorbidities, as well as clinical and laboratory findings were evaluated using random forest machine learning analysis. The algorithm was then validated through cross-validation.

Results: Of the 565 that were included in the study, 197 patients (36.8%) failed treatment. Using random forest analysis, an algorithm that provides the probability for failure for each specific patient was created. By order of importance, the ten most important variables associated with failure were higher C-reactive protein levels, indication for index surgery other than osteoarthritis, positive blood cultures, use of cement in index surgery, wound leakage, use of immunosuppressive medication, methicillin resistant *S. aureus* infections, overlying skin infection, ischemic heart disease and older age. The algorithm had good discriminatory capability (area under the curve = 0.74). Cross-validation showed similar probabilities comparing predicted and observed failures indicating high accuracy of the model

Conclusion: This is the first study in the orthopedic literature to use machine learning as a tool for predicting outcomes following surgery. The developed algorithm provide surgeons with a tool that can aid in everyday clinical decision making and improve patient care.

How do I prevent them from dislocating?

Arthur L. Malkani, MD

Hip instability is one of the leading etiologies of failure resulting in revision hip surgery [1]. Patients with prior lumbar spine fusion (LSF) are a known high-risk group with increased risk of instability following primary THA [2-4]. Gwan et al. reviewed a total of 258,461 revisions THA's and found dislocation to be the major etiology leading to revision surgery [5]. A Medicare database study identified a 7.4% incidence of dislocation in patients with prior LSF undergoing primary THA [6].

Lumbar spine fusion leads to an alteration in the normal spinopelvic biomechanics. During the standing position, the pelvis tilts forward with increased sacral slope and decreased acetabular anteversion [7]. During the seated position, the pelvis tilts posteriorly with decreased sacral slope and increased acetabular anteversion [8]. The normal compensatory pelvic parameters following lumbar spine fusion such as pelvic tilt and acetabular version during sitting and standing are altered which can restrict pelvic motion necessitating increased femoral motion leading to possible impingement and instability following primary THA [9-11].

There is growing evidence that adjustment of cup placement from its anatomic baseline position should be based on the type of spinal fusion and extent of the residual spinal deformity and spinopelvic flexibility [12]. Until we have a better understanding of the ideal functional acetabular cup position for the individual patient with prior LSF along with intraoperative technologic tools to confirm placement of the cup at the specific parameters, at present additional steps are required to minimize the risk of instability in this high risk group of patients.

These steps include first identifying the patient at risk. Patients with a history of prior LSF or an arthritic spine scheduled for primary THA should obtain a standing and sitting x-ray in the sagittal plane to determine the extent of pelvic stiffness or loss of normal dynamic spino-pelvic parameters. A patient with a change in sacral slope (SS) of $\ll 10$ degrees between standing and sitting is considered to have a stiff spino-pelvic junction. Once a high-risk patient has been identified, we need to determine at what position is the patient at greatest risk of dislocation either standing or sitting.

The combined sagittal index (CSI) is the sum of the pelvic femoral angle (PFA), an angle formed by the sagittal position of the femur and pelvis, and the sagittal acetabular cup angle (AI). Normal standing CSI is 218 degrees and 180 degrees when sitting. Heckmann et al. concluded that patients with combined sagittal index (CSI) $\gg 243$ degrees are at increased risk of anterior dislocation during standing and those with CSI less than 151 degrees during sitting are at greater risk of anterior impingement and posterior dislocation [13]. Patients who have lost their normal posterior pelvic tilt during sitting ("stuck standing", CSI less than 151, loss of compensatory acetabular anteversion) will require greater femoral flexion to sit and risk anterior impingement and subsequent posterior dislocation. In these patients, a cup placed slightly more vertical and anteverted can minimize the risk of instability.

Patients who have lost their normal anterior pelvic tilt during standing ("stuck sitting", CSI $\gg 243$, loss of compensatory anterior pelvic tilt to provide greater femoral head coverage during standing) will require greater hip extension during standing to obtain sagittal balance and are at risk for posterior impingement (acetabular cup, greater trochanter) and subsequent anterior dislocation. In these patients, a cup placed slightly more

horizontal and avoiding excessive femoral stem anteversion may help minimize dislocation. The so-called “safe zone” is clearly “tighter” for the high-risk patient with LSF undergoing primary THA. Despite having knowledge of the technical steps and ideal cup placement angles needed to minimize dislocation through preoperative sagittal plane radiographs, executing the surgical plan can be challenging without advanced intraoperative technology to inform the surgeon of the exact cup position. The use of dual mobility cups has also been advocated to help minimize the risk of instability in patients with LSF. Dual mobility cups provide increased jump height and greater arc of motion prior to impingement and dislocation. Nessler et al. in a multicenter series of 93 consecutive patients with prior instrument LSF undergoing primary THA using a dual mobility cup demonstrated no dislocations at an average 2.7 years follow up [15].

In summary, high-risk patient with prior LSF need to be identified preoperatively. Radiographs should include sagittal standing and sitting views to determine if there is loss of normal posterior pelvic tilt during sitting (“stuck standing”, CSI less than 151, loss of compensatory acetabular anteversion) or loss of normal anterior pelvic tilt during standing (“stuck sitting”, CSI >>243, loss of compensatory anterior pelvic tilt to provide greater femoral head coverage during standing). Once the exact pathomechanics of the spino-pelvic relationship has been identified in the LSF patient, slight alterations in anatomic cup position and femoral component version to help compensate of the loss of this dynamic spino-pelvic relationship along with the use of dual mobility cups can help minimize the risk of instability. These high risk patients require a “tighter safe zone” along with a thorough intraoperative range of motion with trial implants to check for impingement and instability prior to insertion of the final implants.

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Nonoperative Management for Hip OA: Cortisone, PRP, Stem Cells and Some Other Forms

Rafael J. Sierra, MD

I. Prevalence: How often will I see it?

- A) Hip osteoarthritis: most common cause of hip pain in older adults.
- B) Rates from 0.4% to 27%
 - a. Hip OA primarily affects middle aged and elderly people.
 - b. Gender: Men have slightly higher prevalence of hip OA (3.2% compared to 3%)
 - i. 90% of young adult hips (<55 years of age) have either hip dysplasia or impingement as a risk factor.

II. Clinical guidelines.

- 1) Anti-inflammatory agents: NSAIDS, COX-2 inhibitors and steroid injections are part of the multidisciplinary treatment approach to hip OA.
 - a. NSAIDS: randomized trials showing benefit. Must weigh the risk and benefits with increased GI bleed and potential risk of hypertension. Table Below from Cutolo et al Seminars in Rheumatism 2015.

Table 3

Recommendations for the selection of non-steroidal anti-inflammatory drugs (NSAIDs) for the treatment of osteoarthritis (OA) according to patients' risk factors

| | |
|--------------------------------|--|
| Normal GI risk | Non-selective NSAIDs with PPI Cox-2-selective NSAIDs (consider PPI) |
| Increased GI risk ^a | Cox-2-selective NSAIDs with PPI Avoid non-selective NSAIDs |
| Increased CV risk | Prefer naproxen Avoid high-dose diclofenac and ibuprofen (if on low-dose aspirin) Caution with other non-selective NSAIDs Avoid Cox-2-selective NSAIDs |
| Increased renal risk | Avoid NSAIDs ^b |

Cox-2, cyclo-oxygenase-2; CV, cardiovascular; GI, gastrointestinal; NSAID, non-steroidal anti-inflammatory drug; OA, osteoarthritis; PPI, proton pump inhibitor.

^a Including use of low-dose aspirin.

^b With glomerular filtration rate < 30 cc/min; caution in other cases GI.

- 2) **Hip cortisone injections.** There is evidence to support its use for short-term. A recent placebo controlled trial confirmed corticosteroid injection can be an effective treatment for hip pain, benefits lasting up to 3 months.
- 3) **Glucosamine:** Mixed results. Positive results for short-term improvement in pain and function.
- 4) **Chondroitin:** Symptomatic benefit is minimal or non-existent.

- 5) Visco-supplementation with hyaluronic acid: NOT FDA approved for the hip. May be best for mild to moderate hip OA. Recent published meta-analysis suggests the benefit of hyaluronan for treatment of hip OA.
- 6) **Patient Education:** is shown to be beneficial in decreasing pain, improving function and reducing stiffness and fatigue and also decreasing medicine use. Meta-analysis has shown patient education can provide on average 20% more pain relief when compared to NSAIDS alone.
- 7) **Assistive Device:** Reduce pain and activity limitations. A cane in the contralateral hand and choosing to carry loads on the ipsilateral hand has been shown to be effective in reducing hip abductor muscle activity.
- 8) **Physical therapy** that includes functional, gait and balance training.
 - a. Functional training consisting of exercises simulating activities of daily living such as gait, rising from a chair, reaching, stepping and squatting has been shown to improve function associated with weightbearing activities.
 - b. Manual therapy should not be used in patients with severe OA but in patients with less severe osteoarthritis to improve hip range of motion. Not Durable results according to randomized trial
 - c. Flexibility, strengthening and endurance exercises. Range of motion, muscle strengthening exercises and aerobic conditioning and endurance exercises are commonly used. Range of motion and strengthening exercises have been advocated by many authors. In a recent meta-analysis hip strengthening exercises showed a beneficial effect in reducing pain and improving function in patients with hip OA.
 - d. Hydrotherapy. A randomized trial comparing aquatic therapy with no therapy showed improved pain levels and improved physical function.
- 9) Acupuncture. There is not enough evidence to suggest that acupuncture is greatly beneficial in patients with hip osteoarthritis.

III. The AAOS guideline for Hip OA from 2017: Limited Data

NON-NARCOTIC MANAGEMENT

Strong evidence supports that NSAIDs improve short-term pain, function, or both in patients with symptomatic osteoarthritis of the hip.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

A.

GLUCOSAMINE SULFATE

Moderate strength evidence does not support the use of glucosamine sulfate because it did not perform better than placebo for improving function, reducing stiffness and decreasing pain for patients with symptomatic osteoarthritis of the hip.

Strength of Recommendation: Moderate Evidence 

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

B.

INTRAARTICULAR INJECTABLES

a) Strong evidence supports the use of intraarticular corticosteroids to improve function and reduce pain in the short-term for patients with symptomatic osteoarthritis of the hip.

Strength of Recommendation: Strong Evidence 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

b) Strong evidence does not support the use of intraarticular hyaluronic acid because it does not perform better than placebo for function, stiffness, and pain in patients with symptomatic osteoarthritis of the hip.

Strength of Recommendation: Strong Evidence 

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

C. No Data in Guideline about PRP or Stem Cells

- i. A number of ongoing trials using BMAC, umbilical cord stem cells, with early results. Further research is needed.

D. AAHKS Position Statement



The screenshot shows the AAHKS (American Association of Hip and Knee Surgeons) website. At the top, there is a navigation bar with the text "Educate. Advocate. Investigate." followed by dropdown menus for "Journals", "Newsroom", and "Join AAI". Below this is a blue header with the text "Position Statements". The main content area is a light gray box containing the following text: "An increasing number of facilities and physicians have begun to offer intraarticular injections of stem cells and platelet rich plasma (PRP) as a therapeutic intervention to patients with advanced hip and knee arthritis. It is our position that biologic therapies, including stem cell and PRP injections, cannot currently be recommended for the treatment of advanced hip or knee arthritis. This position statement has been endorsed by The Hip Society and The Knee Society."

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5. AAOS WEBSITE: HIP OA GUIDELINES 2017

Osteotomy

Michael B Millis, MD

- I. Structural/mechanical etiology for most osteoarthritis of the hip
 - A. Regional variations in specific etiology
 - B. Dysplasia is most common single etiology in much of the world
 - 1. Japan: 80+% (Takatori 2001)
 - 2. Europe, North America 40+% (Aronson 1986)
 - C. DDH>Idiopathic Cam FAI>Perthes>SCFE as etiologies of OA
 - 1. In North America (Clohisy 2011)
- II. Understanding the pathomechanics in the at-risk hip is essential for successful hip preservation
 - A. Conceptual: Instability, femoroacetabular impingement (FAI), and combinations of Instability and FAI seem responsible for progressive damage in most hips which develop OA
 - B. Practical:
 - 1. Accurate analysis of the young adult patient with hip disease
 - a. Interview to assess symptoms, needs, expectations
 - b. Physical exam
 - c. Imaging
 - d. Synthesis of information; treatment selection
 - e. Shared decision-making??
- III. Indications for hip preservation surgery
 - A. Correctable mechanical factor(s) predisposing to dysfunction/OA
 - B. More upside than downside
 - 1. Duration of improved function in the preserved hip
 - 2. "Match the expected lifetime of the operation to the expected lifetime of the patient." -Heinz Wagner
- IV. Indications for realignment osteotomy for hip preservation
 - A. Deformity or malalignment correctable by osteotomy
- V. Published outcomes
 - A. Dysplasia
 - 1. PAO
 - 30 years Lerch (Ganz-Bern),
1/3 still doing well
 - 18-20 yrs Wells/Matheney/Millis (Boston 50+% 0-min symptoms; ~25% symptoms but still have native hip; ~25% THR or high pain)
 - Wells/Clohisy (St Louis)
 - Troelsen/Soballe (Aarhus)
 - 2. RAO
 - Takatori, others

Negative predictive factors for hip preservation success

Patient-related: Older age; high preop pain, poor preop motion, cartilage damage, psychosocial

stressors

Surgery-related: imprecise correction: postop residual or iatrogenic instability or impingement

- B. FAI
Longterm results not yet available
- C. SCFE
Iowa results the classic
Progressive decline in function over time for all treatment groups
Uncorrected FAI and FAI-related damage likely the cause of OA
Contemporary treatment have only short-term outcomes available
- D. Perthes
Intraarticular surgery offers new hope for improved results
- E. AVN
ITO's
Asia: Transtrochanteric rotational osteotomy

V. Pearls to pick up: Tips for success in hip osteotomy surgery

- A. Precise mechanically-based analysis
 - 1. 3D and dynamic assessment will become routine
- B. Precision treatment the ideal
 - 1. Combinations of realignment, +/-intraarticular surgery, +/-adjuvant cartilage work
- C. Clear treatment program worked out preop
 - 1. Multimodal support
 - a. PT
 - b. Peer and other psychosocial support as needed
- D. Close followup
 - 1. Short-term
 - 2. Long-term

VI. Pitfalls to avoid in hip osteotomy surgery

- A. Expectations, needs>>>expected outcomes
- B. Unclear/uncorrectable pathomechanics
- C. Imperfect match between patient and treatment team

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Osteotomy vs “Early” THA

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The concept that structural hip disease such as acetabular dysplasia and femoral acetabular impingement is associated with pain and dysfunction, and is a risk factor for early progression to hip osteoarthritis, has gained substantial traction over the past several decades. Over the same time period, early intervention in patients with structural hip disease via arthroscopic or open technique has grown substantially, as has the demand for hip arthroplasty in young active patients whose hips have progressed to a point where hip preservation is no longer possible.

In the decision to preserve or replace the structurally abnormal hip, a number of factors deserve critical consideration. Patient factors such as age, activity level, and knowledge base, radiographic imaging related factors, surgeon disease understanding, surgeon skill and clinical experience all become critical in the decision making process. A clear understanding of the Tonnis classification of osteoarthritis is vitally important.

The specific factors associated with failure of hip preservation in femoral acetabular impingement include joint space narrowing to less than 2mm, Tonnis grade >2 OA, age >40, size of cam lesion, residual structural deformity, and chondrolabral injury treatment. In acetabular dysplasia, factors associated with failure of hip preservation include age >35-40, Tonnis grade 2-3 OA, joint incongruency, subchondral cyst formation, acetabular chondral damage usually documented by MRI.

It is important to take into consideration that total hip arthroplasty in the very young (<30 years of age) has been shown to be a very successful operation from a pain relief standpoint and return to functional activity standpoint. In these patients cementless fixation has proven to be durable and most failures are attributed to bearing surface issues. Modern day ceramic on highly crosslinked polyethylene bearings show good results in this young patient population at 10 year follow-up.

In summary, in patients with structural hip disease, hip preservation, particularly in patients less than 40 years old with Tonnis grade 0-1 osteoarthritis on hip radiographs, is extremely successful. Patient selection and surgical decision making is critical. Total hip arthroplasty in young patients who are not candidates for hip preservation is an excellent option. Continued advancement in quantitative magnetic resonance imaging could help decision making in this challenging group of patients.

CME Accreditation Statement

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 Hip Society. The American Academy of Orthopaedic Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

Credit Hours

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of **7.0 AMA PRA Category 1 Credits™**. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Goals and Objectives

The objectives of the Open Meeting of The Hip Society are to provide up-to-date information on the treatment of hip problems including arthroplasty and non-arthroplasty options and surgical techniques. Interactive symposia will be utilized.

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

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

FDA Statement

Some pharmaceuticals and/or medical devices at the Specialty Day Meeting have not been cleared by the U.S. Food and Drug Administration (FDA) or have been cleared by the FDA for specific purposes only. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each pharmaceuticals and/or medical devices he or she wishes to use in clinical practice.

The Hip Society policy provides that “off label” uses of a device or pharmaceutical may be described in The Hip Society’s CME activities so long as the “off-label” status of the device or pharmaceutical is also specifically disclosed (i.e. that the FDA has not approved labeling the device for the described purpose). Any device or pharmaceutical is being used “off label” if the described use is not set forth on the product’s approved label.

To obtain information regarding the clearance status of a device or pharmaceutical refers to the product labeling or call the FDA at 1-800-638-2041 or visit the FDA internet site at

<http://www.fda.gov/cdrh/510khome.html>

Financial Disclosure

Each participant in The Hip Society/AAHKS Meeting has been asked to disclose if he or she has received something of value from a commercial company, which relates directly or indirectly to the subject of their presentation. These responses reflect the answers from a series of questions submitted by all persons participating in the Academy’s overall online Disclosure Program, which is available to all Academy members at www.aaos.org/disclosure. The Hip Society does not view the existence of these disclosed interests or commitments as necessarily implying bias or decreasing the value of the author’s participation in the meeting.

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American Joint Replacement Registry: Board or committee member DJO Surgical: IP royalties; Paid consultant Hip Society: Board or committee member Osteoremedies: IP royalties; Paid consultant SLACK Incorporated: Publishing royalties, financial or material support Stryker: Research support Zimmer: IP royalties; Research support

Kevin Staats, MD: (This individual reported nothing to disclose); Submitted on: 06/03/2019

Kwesi St. Louis, MD (This individual reported nothing to disclose); Submitted on: 06/12/2019

Vincentius J Suhardi, MD, PhD: (This individual reported nothing to disclose); Submitted on: 06/02/2019

Timothy Tan, MD: (This individual reported nothing to disclose); Submitted on: 05/24/2019

Kathleen Turajane, BS: (This individual reported nothing to disclose); Submitted on: 01/22/2020

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AAOS: Board or committee member Canadian Arthroplasty Society: Board or committee member EMS Surgery Journal: Editorial or governing board Journal of Arthroplasty: Editorial or governing board Recent Advances in Arthroplasty: Editorial or governing board Stryker: Paid presenter or speaker; Research support

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AAOS: Board or committee member American Association of Hip and Knee Surgeons: Board or committee member DePuy, A Johnson & Johnson Company: Research support DJ Orthopaedics: IP royalties; Paid consultant Journal of Arthroplasty: Editorial or governing board Mid America Orthopedic Association: Board or committee member Stryker: Research support

Thomas Parker Vail, MD, FAAOS: Submitted on: 12/20/2019

DePuy, A Johnson & Johnson Company: IP royalties; Paid consultant Hyalex Orthopaedics: Stock or stock Options

Amanda Wach, MS: (This individual reported nothing to disclose); Submitted on: 10/09/2019

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Zimmer: Unpaid consultant

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Eastern Orthopedic Association: Board or committee member Exactech, Inc: IP royalties; Paid consultant; Paid presenter or speaker; Research support Knee Society: Board or committee member Mallinckrodt Pharmaceuticals: Paid presenter or speaker Stryker: IP royalties; Paid consultant; Paid presenter or speaker; Research support

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Clinical Orthopaedics and Related Research: Editorial or governing board Journal of Arthroplasty: Editorial or governing board Journal of Orthopaedics and Traumatology: Editorial or governing board Signal Medical Corp: Paid consultant Smith & Nephew: IP royalties

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Amgen Co: Research support; Bone and Joint Research: Editorial or governing board; Journal of Orthopaedic Research: Editorial or governing board; National Institute for Health and Care Excellence (NICE): Board or committee member; National Joint Registry for England, Wales, and Northern Ireland: Board or committee member; Orthopaedic Research Society: Board or committee member

Timothy M Wright, PhD: Submitted on: 10/04/2019

American Joint Replacement Registry: Board or committee member Exactech, Inc: IP royalties Knee Society: Board or committee member Lima: IP royalties Lima Corporate: Research support Mathys Ltd: IP royalties Orthobond: Stock or stock Options Orthopaedic Research and Education Foundation: Board or committee member

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