



# Western Orthopaedic Association

**77<sup>th</sup> Annual Meeting**  
July 31–August 3, 2013  
The Resort at Squaw Creek  
Lake Tahoe, California

---

## 2013 Meeting Program

---

**Chuck Freitag**

*Executive Director, Data Trace Management Services, a Data Trace Company*

**Cynthia Lichtefeld**

*Director of Operations, Data Trace Management Services, a Data Trace Company*

WOA Central Office, Data Trace Management Services • 110 West Road, Suite 227  
• Towson, MD 21204

Phone: 866-962-1388 • Fax: 410-494-0515 • Email: [info@woa-assn.org](mailto:info@woa-assn.org)

Visit us @ [www.woa-assn.org](http://www.woa-assn.org)

*Please notify the WOA Central Office of any changes in your home or office address.*

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and the Western Orthopaedic Association.

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 25.75 *AMA PRA Category 1 Credits*<sup>™</sup>. Physicians should claim only the credit commensurate with the extent of their participation in the activity.



Cover Design by Lauren Murphy.  
Copyright © 2013 by Data Trace Publishing Company,  
Towson, MD. All rights reserved.



---

## *President's Message*

---

*Dear Colleagues,*



*Ellen M. Raney, MD*

I am honored to welcome all of you to the 78th Annual Meeting of the Western Orthopaedic Association. We proudly offer an outstanding academic program in luxurious surroundings of Lake Tahoe and the Resort at Squaw Creek with a plethora of opportunities for family activities. In keeping with changing standards, our organization continues to increase the hours of education available. We have worked hard to also provide activities to balance your time.

The Program Committee, chaired by Steve Morgan, has put together 25.75 credits of education on timely topics. The symposia topics promise to provide fodder for lively discussion and controversy. The lead-off symposium will feature patient safety; followed by sports-revision ACL, fracture tips and tricks, hip arthroplasty, rotator cuff and pediatric pearls.

Don't forget to sign up for your **Self-Assessment Exams**. This is a rare opportunity to fill **10 Scored** credits in an interactive environment. The questions will be reviewed with the experts in afternoon sessions. This was truly a group effort headed by Nitin Bhatia and Jeff Krygier. We are fortunate to have so many dedicated, talented members of our society who worked hard as authors, reviewers and organizers of these exams.

We anticipate a wide range of original research papers to highlight what our colleagues have been studying. Awards will be given for top young investigator and research papers presented in special sessions. There will be scientific posters and multimedia education sessions available throughout the meeting.

Two internationally renowned authors will be joining us. The Presidential Guest Speaker will be Augustus A. White III, MD, author of *Seeing Patients, Unconscious Bias in Health Care*, addressing what Dr. Martin Luther King, Jr. would want us to know about health care disparities. The Howard Steel Lecturer, Shankar Vedantam, author of *The Hidden Brain*, will discuss how our subconscious takes short cuts we are not aware of to make decisions. We will also welcome Joshua Jacobs, MD, President of the American Academy of Orthopaedic Surgeons.

To keep us all energized there are many activities: the golf tournament, golf clinics for beginners and children, Vikingsholm Castle in Emerald Bay, nature hikes and, my personal favorite, white water rafting! Fishing, sailing, kayaking, horseback riding and much more are available through the hotel.

That energy will carry us into the evening events starting with the Welcome Reception at the top of the aerial tram with panoramic views. Friday we will take time to socialize at the Exhibitor Reception while the kids have movies and arts & crafts. Saturday's Gala Dinner Dance is planned for outside. Stacy Wald is adding new activities while I write this so please check what else is available! Thank you Stacy and all the Data Trace staff!

Thank you for attending this year's meeting. Welcome to Lake Tahoe!

Sincerely,

*Ellen Raney*

Ellen M. Raney, MD  
President, Western Orthopaedic Association

---

## *Table of Contents*

---

### **General Information**

Meeting-at-a-Glance . . . . .	4
Scientific Program Agenda . . . . .	7
Activities Information . . . . .	9
Meeting Information . . . . .	11
Howard Steel Lecturer . . . . .	12
President/Past Presidents . . . . .	13
WOA Leadership . . . . .	14
WOA New Members . . . . .	15
WOA Contributions . . . . .	16
Exhibitor/Grantor Acknowledgments . . . . .	17
Exhibitor/Grantor Information . . . . .	18
First Business Meeting . . . . .	23
Second Business Meeting . . . . .	25

---

### **Scientific Program Information**

Past Program Chairs . . . . .	28
Program Chairman . . . . .	29
Past Guest Speakers . . . . .	30
Presidential Guest Speaker . . . . .	31
Award Winners . . . . .	32
Financial Disclosure Information . . . . .	33
Accreditation Information . . . . .	38
Scientific Program . . . . .	40
Presenters and Moderators Index . . . . .	51
Scientific Program Abstracts . . . . .	53
Thursday . . . . .	53
Friday . . . . .	72
Saturday . . . . .	90

---

### **Scientific Poster Exhibits**

Poster Presenters Index . . . . .	98
Scientific Poster Abstracts . . . . .	99

---

### **Multimedia Education Sessions**

List of Available Titles . . . . .	112
Multimedia Disclosure Information . . . . .	116

---

### **CME Forms**

2013 CME Multimedia Credit Record . . . . .	119
2013 CME Scientific Program Credit Record . . . . .	121
2013 CME Poster Credit Record . . . . .	123
2013 Overall Scientific Evaluation . . . . .	125
2014 Needs Assessment Survey . . . . .	127

---

Future WOA Meetings . . . . .	Inside Back Cover
-------------------------------	-------------------

---

---

## *Meeting-at-a-Glance*

---

*Times and locations are subject to change.  
Badges or wrist bands are required for admittance to all social events.*

### **WEDNESDAY, JULY 31, 2013**

12:00 pm–5:00 pm	<b>Meeting Registration</b> ( <i>Grand Sierra Ballroom</i> )
12:00 pm–5:00 pm	<b>Exhibit Setup</b> ( <i>Grand Sierra Ballroom</i> )
12:00 pm–5:00 pm	<b>Scientific Poster Setup</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
12:00 pm–5:00 pm	<b>Speaker Ready Room</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
12:30 pm–5:00 pm	<b>Board of Directors Meeting</b> ( <i>Tinker's Knob</i> )

---

### **THURSDAY, AUGUST 1, 2013**

5:45 am–2:15 pm	<b>Meeting Registration</b> ( <i>Grand Sierra Ballroom</i> )
6:00 am–6:30 am	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) Note: Presenters will be available to answer questions.
6:00 am–2:15 pm	<b>Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing</b> ( <i>Grand Sierra Ballroom</i> )
6:00 am–5:00 pm	<b>Speaker Ready Room</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
6:30 am–2:15 pm	<b>Scientific Sessions and Symposia</b> ( <i>Alpine Ballroom</i> )
7:00 am–7:10 am	<b>First Business Meeting</b> ( <i>Alpine Ballroom</i> )
8:50 am–2:15 pm	<b>Concurrent General Session</b> ( <i>Emigrant Peak</i> )
9:00 am–10:30 am	<b>Spouse/Children's Hospitality*</b> ( <i>Montagna Restaurant</i> )
11:40 am–12:15 pm	<b>Presidential Guest Speaker</b> ( <i>Alpine Ballroom</i> )
12:15 pm–1:15 pm	<b>Industry Sponsored Workshop Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec*</b> ( <i>Alpine Ballroom</i> ) *CME credit not available
1:00 pm–5:00 pm	<b>High Camp Hike (Advanced)*</b> ( <i>Meet in Lobby</i> )
1:30 pm–5:00 pm	<b>Shirley Lake Hike (Moderate)*</b> ( <i>Meet in Lobby</i> )
2:15 pm–3:15 pm	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) Note: Presenters will be available to answer questions.
2:30 pm–3:15 pm	<b>Nature Hike (Beginners)*</b> ( <i>Meet in Lobby</i> )
3:15 pm–4:15 pm	<b>Multimedia Education Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
4:15 pm–5:00 pm	<b>SAE Review — Sports Knee</b> ( <i>Alpine Ballroom</i> )
4:15 pm–5:15 pm	<b>New Member Reception*</b> ( <i>Montagna Restaurant</i> )
5:25 pm–10:00 pm	<b>Welcome Reception at High Camp*</b> ( <i>Meet in Lobby</i> )

---

\* See Activities Information on pages 9-10 for more details.

**FRIDAY, AUGUST 2, 2013**

6:00 am–6:30 am	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) Note: Presenters will be available to answer questions.
6:00 am–7:00 am	<b>Regional and AAOS President’s Breakfast Meeting with State Presidents and Board of Councilors</b> ( <i>Tinker’s Knob</i> )
6:00 am–2:00 pm	<b>Meeting Registration</b> ( <i>Grand Sierra Ballroom</i> )
6:00 am–2:00 pm	<b>Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing</b> ( <i>Grand Sierra Ballroom</i> )
6:00 am–5:00 pm	<b>Speaker Ready Room</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
6:30 am–2:00 pm	<b>Scientific Sessions and Symposia</b> ( <i>Alpine Ballroom</i> )
8:35 am–2:00 pm	<b>Concurrent General Sessions</b> ( <i>Emigrant Peak</i> )
9:00 am–10:00 am	<b>Golf Clinic for Beginner Adults*</b> ( <i>Meet in Lobby</i> )
10:05 am–10:45 am	<b>Howard Steel Lecture</b> ( <i>Alpine Ballroom</i> )
10:15 am–11:15 am	<b>Children’s Golf Clinic*</b> ( <i>Meet in Lobby</i> )
10:30 am–3:30 pm	<b>Guided Vikingsholm Tour*</b> ( <i>Meet in Lobby</i> )
12:00 pm–1:00 pm	<b>Industry Sponsored Workshop Luncheon — CeramTec Medical Products</b> ( <i>Alpine Ballroom</i> ) *CME credit not available
12:45 pm–5:30 pm	<b>Golf Tournament*</b> ( <i>Meet in Lobby</i> )
2:00 pm–3:00 pm	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) Note: Presenters will be available to answer questions.
3:00 pm–4:00 pm	<b>Multimedia Education Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
4:00 pm–5:00 pm	<b>SAE Review — Trauma &amp; Total Hip</b> ( <i>Alpine Ballroom</i> )
5:30 pm–7:30 pm	<b>Exhibitor Reception*</b> ( <i>Grand Sierra Ballroom</i> )
5:30 pm–7:30 pm	<b>Kids’ Movie Night with Arts &amp; Crafts and Dinner*</b> ( <i>Monument Room</i> )

**SATURDAY, AUGUST 3, 2013**

6:00 am–6:30 am	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) Note: Presenters will be available to answer questions.
6:00 am–6:55 am	<b>WOA Board Meeting w/Breakfast</b> ( <i>Tinker’s Knob</i> )
6:00 am–12:45 pm	<b>Meeting Registration</b> ( <i>Grand Sierra Ballroom</i> )
6:00 am–12:45 pm	<b>Technical Exhibits, Continental Breakfast, Coffee Breaks and Daily Drawing</b> ( <i>Grand Sierra Ballroom</i> )
6:00 am–12:45 pm	<b>Scientific Sessions and Symposia</b> ( <i>Alpine Ballroom</i> )
6:00 am–4:00 pm	<b>Speaker Ready Room</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
7:00 am–7:15 am	<b>Second Business Meeting</b> ( <i>Alpine Ballroom</i> )
10:05 am–10:45 pm	<b>WOA Presidential Address</b> ( <i>Alpine Ballroom</i> )
12:45 pm–1:45 pm	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) Note: Presenters will be available to answer questions.

\* See Activities Information on pages 9-10 for more details.

1:00 pm–3:00 pm	<b>White Water Rafting*</b> ( <i>Meet in Lobby</i> )
1:45 pm–2:45 pm	<b>Multimedia Education Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
4:00 pm–5:00 pm	<b>SAE Review — Pediatrics</b> ( <i>Alpine Ballroom</i> )
7:00 pm–11:00 pm	<b>WOA Family Gala Dinner Dance*</b> ( <i>Pavilion</i> )

---

\* See Activities Information on pages 9-10 for more details.

---

***Scientific Program Agenda***

**Alpine Ballroom (unless otherwise specified)**

*Presenters and times are subject to change.*

---

**THURSDAY, AUGUST 1, 2013**

- 6:00 am–6:30 am      **Scientific Poster Session** (*Grand Sierra Ballroom Pre-Function Area*)  
(Poster Presenters Available)
- 6:30 am–7:00 am      **General Session 1 — Case Presentations Review (Salvage of Failed Proximal Femur Fractures Fixation)**
- 7:00 am–7:10 am      **First Business Meeting**
- 7:15 am–8:30 am      **Symposium I — Patient Safety**
- 8:30 am–8:50 am      *Break — Please visit exhibitors and posters*
- 8:50 am–10:00 am      **Concurrent Session 2 — Sports**
- 8:50 am–10:00 am      **Concurrent Session 3 — Pediatric** (*Emigrant Peak*)
- 10:00 am–11:15 am      **Symposium 2 — Sports Knee: Revision of Failed ACL Surgery**
- 11:15 am–11:35 am      *Break — Please visit exhibitors and posters*
- 11:35 am–12:15 pm      **General Session 4 — BOC Report and Presidential Guest Speaker**
- 12:15 pm–1:15 pm      **Industry Sponsored Workshop Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec**  
\*CME credit not available
- 1:15 pm–2:15 pm      **Concurrent Session 5 — Foot and Ankle & Upper Extremity**
- 1:15 pm–2:15 pm      **Concurrent Session 6 — General Topics** (*Emigrant Peak*)
- 2:15 pm–3:15 pm      **Scientific Poster Session** (*Grand Sierra Ballroom Pre-Function Area*)  
(Poster Presenters Available)
- 3:15 pm–4:15 pm      **Multimedia Education Session** (*Grand Sierra Ballroom Pre-Function Area*)
- 4:15 pm–5:00 pm      **SAE Review — Sports Knee**

---

**FRIDAY, AUGUST 2, 2013**

- 6:00 am–6:30 am      **Scientific Poster Sessions** (*Grand Sierra Ballroom Pre-Function Area*)  
(Poster Presenters Available)
- 6:30 am–7:00 am      **General Session 7 — Case Presentations Review (Total Joints)**
- 7:00 am–8:15 am      **Symposium 3 — Trauma: Common Fracture Tips and Tricks**
- 8:15 am–8:35 am      *Break — Please visit exhibitors and posters*
- 8:35 am–9:30 am      **Concurrent Session 8 — Total Joints**
- 8:35 am–9:30 am      **Concurrent Session 9 — Trauma** (*Emigrant Peak*)
- 9:30 am–9:50 am      *Break — Please visit exhibitors and posters*
- 9:50 am–10:45 am      **General Session 10 — AAOS Report and Howard Steel Lecture**
- 10:45 am–12:00 pm      **Symposium 4 — Hip Arthroplasty**

12:00 pm–1:00 pm	<b>Industry Sponsored Workshop Luncheon — CeramTec Medical Products</b> *CME credit not available
1:00 pm–2:00 pm	<b>Concurrent Session 11 — Tumor &amp; Basic Science</b>
1:00 pm–2:00 pm	<b>Concurrent Session 12 — Spine</b> ( <i>Emigrant Peak</i> )
2:00 pm–3:00 pm	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) (Poster Presenters Available)
3:00 pm–4:00 pm	<b>Multimedia Education Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
4:00 pm–5:00 pm	<b>SAE Review — Trauma &amp; Total Hip</b>

---

**SATURDAY, AUGUST 3, 2013**

6:00 am–6:30 am	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) (Poster Presenters Available)
6:30 am–7:00 am	<b>General Session 13 — Case Presentations Review (Pediatrics &amp; Trauma)</b>
7:00 am–7:15 am	<b>Second Business Meeting</b>
7:15 am–8:30 am	<b>Symposium 5 — Sports Shoulder Rotator Cuff</b>
8:30 am–8:55 am	<i>Break — Please visit exhibitors and posters</i>
8:55 am–10:00 am	<b>General Session 14 — Resident Awards</b>
10:00 am–10:45 am	<b>General Session 15 — OREF and Presidential Address</b>
10:45 am–11:00 am	<i>Refreshment Break/Change Rooms</i>
11:00 am–12:15 pm	<b>Symposium 6 — Pediatric Pearls for the General Orthopaedist</b>
12:15 pm–12:45 pm	<b>General Session 16 — WOA/OREF Young Investigator Awards</b>
12:45 pm–1:45 pm	<b>Scientific Poster Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> ) (Poster Presenters Available)
1:45 pm–2:45 pm	<b>Multimedia Education Session</b> ( <i>Grand Sierra Ballroom Pre-Function Area</i> )
4:00 pm–5:00 pm	<b>SAE Review — Pediatrics</b>

## *Activities Information*

*Badges or wrist bands are required for admittance to all social events.*

**Thursday, August 1, 2013**

### Spouse/Children's Hospitality

9:00 am–10:30 am (*Montagna Restaurant*)

Join your friends and meet new spouses while enjoying a continental breakfast.

**Price:** *Included in registration fee or \$40 per unregistered adult guest; \$20 per unregistered child (5-17)*

### Industry Sponsored Workshop Luncheon — Cadence Pharmaceuticals Inc. and ConvaTec

12:15 pm–1:15 pm (*Alpine Ballroom*)

***Advances in Peri-Operative Care of the Hip & Knee Patient: Management of Surgical Site Infection & Acute Pain***

*Presented by: Todd A. Swenning, MD, Tulsa Orthopedic Trauma Specialists, Tulsa, OK*

*Louis Kwong, MD, FACS, Harbor-UCLA Medical Center, Torrance, CA*

- Risk Mitigation of Infection in Total Joint Arthroplasty
- Recent Advances in Post-Operative Wound Management
- Perioperative Pain Management for Orthopedic Surgery

Not for CME Credit

**Price:** *Included in registration fee; lunch is served*

### High Camp Hike (Advanced)

1:00 pm–5:00pm (*Meet in Lobby*)

This guided hike will follow the Shirley Canyon Trail to Shirley Lake. Upon reaching the lake you will head straight up granite cliff faces of Squaw Valley to reach High Camp. The views from the top are outstanding! You will take a cable car back to the bottom. (Bring your own water and snacks.)

**Price:** *\$35 per person (minimum 6 people)*

### Shirley Lake Hike (Moderate)

1:30 pm–5:00 pm (*Meet in Lobby*)

Most popular wildflower hiking option! The guided hike starts at the trail head at the base of Squaw Valley. This hike will include waterfalls at elevations 6,200 to 8,000 feet and beautiful views of the peaks above and the valley below. (Bring your own water and snacks.)

**Price:** *\$30 per person (minimum 6 people)*

### Nature Hike (Beginners)

2:30 pm–3:15 pm (*Meet in Lobby*)

Take a guided stroll along the nature trail that starts at the base of the chairlift and ends at the Village at Squaw Valley. (Bring your own water and snacks.)

**Price:** *\$20 per person (minimum 6 people)*

### New Member Reception

4:15 pm–5:15 pm (*Montagna Restaurant*)

All WOA new members are invited to attend.

**Price:** *Included in registration fee*

### Welcome Reception at High Camp

5:25 pm–10:00 pm (*Meet in Lobby*)

It begins with a spectacular and leisurely ride in the scenic aerial tram 2,000 vertical feet to High Camp. The panoramic views of the Squaw Valley meadow, beautiful Lake Tahoe and the surrounding Sierra Nevada mountain range are spectacular. Take a trip back in time and learn about the 1960 Winter Olympics that took place at Squaw Valley. The Olympic Museum showcases a unique collection of memorabilia and news articles detailing the many magical moments that took place at Squaw Valley. You will enjoy food delicacies and drinks while chatting with friends and colleagues amid the untouchable views. Bring a wrap, it does get chilly!

Attire: Resort Casual (May want to bring sweater due to mountain weather.)

**Price:** *Included in registration fee or \$100 per unregistered adult guest*

**Friday, August 2, 2013**

### Regional and AAOS President's Breakfast Meeting with State Presidents and Board of Councilors

6:00 am–7:00 am (*Tinker's Knob*)

**Price:** *Included in registration fee*

### Golf Clinic for Beginner Adults

9:00 am–10:00 am (*Meet in Lobby*)

Learn the fundamentals from the pro. Full swing clinic will use woods and irons. Must wear golf attire: collared shirt, Bermuda shorts, sneakers.

**Price:** *\$22 per person (minimum 5 people)*

### Children's Golf Clinic

10:15 am–11:15 am (*Meet in Lobby*)

Learn the fundamentals from the pro. Full swing clinic will use woods and irons. Must wear golf attire: collared shirt, Bermuda shorts, sneakers.

**Price:** \$20 per child (minimum 5 people)

### Guided Vikingsholm Tour

10:30 am–3:30 pm (*Meet in Lobby*)

Vikingsholm is located at the head of Emerald Bay in Lake Tahoe, California. This magnificent "castle" is a unique blend of Nature's spectacular beauty and man's architectural ingenuity. A steep, one-mile, but well defined, trail leads from the parking lot to Vikingsholm. Many scenic views can be enjoyed during this walk. This is a steep trail at an elevation of over 6,300 feet. After the tour you will experience Truckee, a quaint mountain town in which you will enjoy perusing the boutique shops and having a wonderful lunch.

**Price:** \$115 per person (minimum 20 people)

### Industry Sponsored Workshop Luncheon — CeramTec Medical Products

12:00 pm–1:00 pm (*Alpine Ballroom*)

**Ceramics Today — What are the Key Issues?**

Subjects:

- Improving the reliability of ceramic components in THR: What a surgeon can do
- Metal ion generation with modular junctions can be minimized by using ceramic components
- Reduced wear when ceramic components articulate against polyethylene (PE & XPE)
- Open discussion

Not for CME Credit

**Price:** Included in registration fee; lunch is served

### Golf Tournament

12:45 pm–5:30 pm (*Meet in Lobby*)

Surrounded by six majestic Sierra peaks, Resort at Squaw Creek's 18-hole championship golf course sits serenely at the base of Squaw Valley. This magnificent, links-style course is the culmination of 10 years of extensive planning and careful handling of the environment. Renowned golf course architect Robert Trent Jones Jr. designed the course to preserve the unique beauty, natural wetlands, and wildlife habitat of Squaw Valley. The spectacular result is a natural golf course that blends with its beautiful mountain

surroundings. The tournament will begin at 1:00 pm with a shotgun start and a scramble format.

**Price:** \$165 per person (includes greens fee, lunch, beverage cart and WOA hat)

### Exhibitor Reception

5:30 pm–7:30 pm (*Grand Sierra Ballroom*)

Before you go to dinner, start your evening off with drinks and hors d'oeuvres with WOA.

**Price:** Included in registration fee or \$75 per unregistered adult guest

### Kids' Movie Night with Arts & Crafts and Dinner

5:30 pm–7:30 pm (*Monument Room*)

Dinner and a movie—fun!!! Watch a great movie and nibble on snacks and treats with your friends! If younger than 5 years old, must be accompanied by an adult.

**Price:** Included in registration fee or \$25 per unregistered child (5-17)

**Saturday, August 3, 2013**

### White Water Rafting

1:00 pm–3:00 pm (*Meet in Lobby*)

An experienced guide will lead you to discover the scenery and adventure found on the river. Your guide will teach you all you want to know about river safety, rafting skills, area natural history and more. You will experience The Boca Run, Class III tour from Boca to Floriston. This tour starts gently, then the rapids build to an exciting finish in the Floriston Gorge. Dress in layers of synthetic clothing (fleece, polartec, poly-pro, etc.), avoiding cotton if at all possible. You should wear your own athletic shoes or secure river sandals. You will get wet!!

**Price:** \$65 per adult; \$55 per child 7-12 years old (minimum 15 people)

### WOA Family Gala Dinner Dance

7:00 pm–11:00 pm (*Pavilion*)

Enjoy the sunset, then the stars and let's get the party started! This is the night to let your hair down and have some fun with your friends and colleagues. There will be a fabulous band, dinner and drinks, and don't forget to bring your dance moves. Bring a wrap, it does get chilly!

Attire: Resort Casual (no coat required but a sweater or jacket is recommended due to mountain weather)

**Price:** Included in registration fee or \$125 per unregistered adult guest

\*Sailing, boat rentals, water skiing, horseback riding, kayaking, fly fishing, fly casting, and more activities to enjoy are available through the hotel! Call the concierge to book recreational activities 530-581-6610.

---

## *Meeting Information*

---

**FORMAT**

The educational sessions will be held Thursday, Friday, and Saturday, August 1–3, 2013, from approximately 6:00am until 2:00pm, at The Resort in Squaw Creek in Lake Tahoe, CA.

**TARGET AUDIENCE**

The 77<sup>th</sup> Annual Meeting of the Western Orthopaedic Association has been developed primarily for orthopaedic and trauma surgeons and allied health professionals with a practice profile that is exclusively musculoskeletal.

**SPEAKER READY ROOM**

The Speaker Ready Room is available 24 hours a day. Please contact Hotel Security for access during unscheduled times.

**BADGES/WRIST BANDS**

Badges or wrist bands must be worn. They are proof of registration and are required for admittance to all functions and social events.

**REGISTER FOR THE EXHIBITORS****DRAWING**

Registered physicians will receive a raffle ticket every day during the meeting to register with the exhibitors and sponsors. Place your ticket in the raffle box for a chance to win. Drawings will take place on Thursday and Friday at the end of the second break and on Saturday at the end of the first break in the exhibit area.

**CME ACCREDITATION**

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 25.75 *AMA PRA Category 1 Credits*<sup>™</sup>. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

- \* 18.25 CME credits for Scientific Program
- \* 4.5 CME credits for Scientific Poster Sessions
- \* 3 CME credits for Multimedia Education Sessions

*To ensure correct CME credit is awarded, please complete the form in the back of this program, indicating the Sessions you attended or go online to [www.woa-assn.org](http://www.woa-assn.org) to complete the WOA 2013 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.*

**PHYSICIAN REGISTRATION FEE**

Registration covers the Scientific Program, Syllabus, Daily Continental Breakfasts and Coffee Breaks, General Meeting Expenses, Multimedia Educational Sessions, Poster Sessions, Welcome Reception, Exhibitor Reception, and Family Gala Reception and Dinner Dance.

**MANAGEMENT**

The Western Orthopaedic Association is managed by Data Trace Management Services, a Data Trace Company, Towson, MD.

---

*The meeting function areas, including the registration area and meeting rooms, are designated non-smoking throughout the course of the meeting. Smoking is limited to areas where not prohibited by fire department regulations.*

***Please be considerate and silence your cell phones during the Scientific Program.***

## *2013 Howard Steel Orthopaedic Foundation Lecturer*



Shankar Vedantam

W OA is pleased to have Shankar Vedantam as this year's Howard Steel Lecturer. He is an author and science correspondent at National Public Radio, based in Washington, DC.

Mr. Vedantam was formerly a national correspondent and columnist for the *Washington Post*. He has won several journalism awards and was a 2010 Nieman Fellow at Harvard University. He is interested in how insights from psychology and the social sciences can change the way we think about ordinary events in our lives, as well as news events.

His book *The Hidden Brain*, is about the effects of unconscious thought processes in everyday life, influencing our most important decisions. It explores everything from how small children form biases to how nations go to war, from why people choose particular candidates in an election to how they respond to emergency warnings. It does not assert that conscious intention does not exist; it merely argues that conscious intention plays a much smaller role in everyday life than most of us imagine.

## 2013 President

**Ellen M. Raney, MD**

*Portland, Oregon*

### WOA Past Presidents

1933 James T. Watkins, MD	San Francisco, CA	1974 William H. Gulledge, MD	Honolulu, HI
1934 Steele F. Stewart, MD	Honolulu, HI	1975 Harry R. Walker, MD	Oakland, CA
1935 Lionel D. Prince, MD	San Francisco, CA	1976 Thomas H. Taber Jr., MD	Phoenix, AZ
1936 Charles L. Lowman, MD	Los Angeles, CA	1977 Lloyd W. Taylor, MD	San Francisco, CA
1937 Roger Anderson, MD	Seattle, WA	1978 Robert E. Florence, MD	Tacoma, WA
1938 Sylvan L. Haas, MD	San Francisco, CA	1979 Harold LaBriola, MD	Los Angeles, CA
1939 John Dunlop, MD	Pasadena, CA	1980 John S. Smith, MD	Honolulu, HI
1940 Ernest W. Cleary, MD	San Mateo, CA	1981 Rodney K. Beals, MD	Portland, OR
1941 Maynard C. Harding, MD	San Diego, CA	1982 George E. Omer Jr., MD	Albuquerque, NM
1942 Donald M. Meekison, MD	Vancouver, B.C.	1983 Wallace Hess, MD	Salt Lake City, UT
1943 Howard H. Markel, MD	San Francisco, CA	1984 Philip H. Dickinson, MD	San Diego, CA
1944 – 1946 INACTIVE: WORLD WAR II		1985 Richard E. Eppright, MD	Houston, TX
1947 Alfred E. Gallant, MD	Los Angeles, CA	1986 George C. Beattie, MD	Burlingame, CA
1948 Merril C. Mensor, MD	San Francisco, CA	1987 Ralph L. Cotton, MD	Wheat Ridge, CO
1949 Harold E. Crowe, MD	Los Angeles, CA	1988 Donald A. Jones, MD	Honolulu, HI
1950 Harry C. Blair, MD	Portland, OR	1989 Sanford H. Anzel, MD	Orange, CA
1951 William F. Holcolomb, MD	Oakland, CA	1990 Lorence W. Trick, MD	San Antonio, TX
1952 Vernon P. Thompson, MD	Los Angeles, CA	1991 C. Harold Willingham, MD	Tucson, AZ
1953 John F. LeCocq, MD	Seattle, WA	1992 William W. Tipton Jr., MD	Sacramento, CA
1954 Leonard Barnard, MD	Oakland, CA	1993 St. Elmo Newton III, MD	Seattle, WA
1955 J. Warren White, MD	Honolulu, HI	1994 Charles R. Ashworth, MD	Los Angeles, CA
1956 James Lytton-Smith, MD	Phoenix, AZ	1995 Thomas G. Grace, MD	Albuquerque, NM
1957 Samuel S. Matthews, MD	Los Angeles, CA	1996 Thomas B. Grollman, MD	Lihue, HI
1958 Joe B. Davis, MD	Portland, OR	1997 Michael T. Phillips, MD	Twin Falls, ID
1959 William F. Stanek, MD	Denver, CO	1998 James K. Weaver, MD	Fruita, CO
1960 Fraser L. Macpherson, MD	San Diego, CA	1999 Richard F. Santore, MD	San Diego, CA
1961 Marvin P. Knight, MD	Dallas, TX	2000 Vincent J. Russo, MD	Phoenix, AZ
1962 Donald E. King, MD	San Francisco, CA	2001 Richard B. Welch, MD	San Francisco, CA
1963 Darrell G. Leavitt, MD	Seattle, WA	2002 Robert E. Eilert, MD	Denver, CO
1964 Paul E. McMaster, MD	Beverly Hills, CA	2003 Kent A. Reinker, MD	San Antonio, TX
1965 Boyd G. Holbrook, MD	Salt Lake City, UT	2004 Blair C. Filler, MD	Los Angeles, CA
1966 John R. Schwartzmann, MD	Tucson, AZ	2005 Richard J. Haynes, MD	Houston, TX
1967 Ivar J. Larsen, MD	Honolulu, HI	2006 Lawrence R. Housman, MD	Tucson, AZ
1968 Abraham B. Sirbu, MD	San Francisco, CA	2007 Gerard L. Glancy, MD	Denver, CO
1969 Harry C. Hughes, MD	Denver, CO	2008 Ramon L. Jimenez, MD	San Jose, CA
1970 Lawrence Noall, MD	Portland, OR	2009 Linda J. Rasmussen, MD	Kailua, HI
1971 G. Wilbur Westin, MD	Los Angeles, CA	2010 William C. McMaster, MD	Orange, CA
1972 Robert A. Murray, MD	Temple, TX	2011 Theodore L. Stringer, MD	Colorado Springs, CO
1973 Milo A. Youel, MD	San Diego, CA	2012 Peter J. Mandell, MD	Burlingame, CA

## WOA 2012 - 2013 LEADERSHIP

---

### *Board of Directors*

---

*PRESIDENT*

**Ellen M. Raney, MD**

*FIRST VICE PRESIDENT*

**Valerae O. Lewis, MD**

*SECOND VICE PRESIDENT*

**Paul C. Collins, MD**

*PAST PRESIDENT*

**Peter J. Mandell, MD**

*SECRETARY*

**Brian A. Jewett, MD**

*TREASURER*

**Jeffrey M. Nakano, MD**

*MEMBERS AT LARGE*

**Omer A. Ilahi, MD**

**William J. Maloney III, MD**

**Kevin L. Smith, MD**

*JUNIOR MEMBERS*

**Nitin N. Bhatia, MD**

**Michael R. Dayton, MD**

**Payam Tabrizi, MD**

**Lisa A. Taitsman, MD**

*2013 PROGRAM CHAIRMAN*

**Steven J. Morgan, MD, FACS**

*2013 MEMBERSHIP CHAIR*

**Cynthia M. Kelly, MD**

*MANAGING DIRECTOR*

**Lawrence R. Housman, MD**

*WOA BOC REPRESENTATIVE*

**Robert R. Slater Jr., MD**

---

### *2012-2013 Committees*

---

*BYLAWS COMMITTEE*

**Lawrence R. Housman, MD,  
Chair**

**Alberto A. Bolanos, MD**

**Robert E. Eilert, MD**

**Kevin L. Smith, MD**

*COMMITTEE ON COMMITTEES*

**Valerae O. Lewis, MD, Chair**

**Paul C. Collins, MD**

**Richard F. Santore, MD**

*CONTINUING EDUCATION COMMITTEE*

**Nitin N. Bhatia, MD, Chair**

**Ellen M. Raney, MD**

**Steven J. Morgan, MD, FACS**

**Lawrence R. Housman, MD**

*FINANCE COMMITTEE*

**Jeffrey M. Nakano, MD, Chair**

**Theodore L. Stringer, MD**

**Valerae O. Lewis, MD**

**Peter J. Mandell, MD**

**Nitin N. Bhatia, MD**

**Omer A. Ilahi, MD**

**Lawrence R. Housman, MD,  
ex officio**

*MEMBERSHIP COMMITTEE*

**Cynthia M. Kelly, MD, Chair**

**Paul C. Collins, MD**

**Jeffrey M. Nakano, MD**

**Donn Fassero, MD**

**Tim Bonatus, MD**

**Alberto A. Bolanos, MD**

**James P. Duffey, MD**

**Michael Klassen, MD**

*NOMINATING COMMITTEE*

**Peter J. Mandell, MD, Chair**

**Kim L. Furry, MD**

**David D. Teuscher, MD**

**Cynthia M. Kelly, MD**

**Dick Welsh, MD**

**Robert E. Eilert, MD**

*PROGRAM COMMITTEE*

**Steven J. Morgan, MD, FACS,  
Chair**

**Melvyn A. Harrington, MD**

**Brian A. Jewett, MD**

**Payam Tabrizi, MD**

**Bryan S. Moon, MD**

*WEBSITE COMMITTEE*

**Omer A. Ilahi, MD, Chair**

**Lisa Taitsman, MD**

**Bryan S. Moon, MD**

---

**WOA New Members**


---

**Ashok Baburam, MD**  
*Alberta, Canada*

**Andrea S. Bauer, MD**  
*Sacramento, CA*

**Timothy G. Berney, MD**  
*Tucson, AZ*

**Justin E. Bird, MD**  
*Houston, TX*

**David M. Black, MD**  
*Longview, WA*

**Antony R. Boody, MD**  
*Placerville, CA*

**Erica Burns, MD**  
*Spokane, WA*

**George T. Calvert, MD**  
*Monrovia, CA*

**Judd Cummings, MD**  
*Scottsdale, AZ*

**Michael T. Daines, MD**  
*Pueblo, CO*

**Ian C. Duncan, MD**  
*Visalia, CA*

**Jeff Feinblatt, MD**  
*Oregon City, OR*

**Reza Firoozabadi, MD**  
*Seattle, WA*

**John Froelich, MD**  
*Aurora, CO*

**Steven Gammon, MD**  
*Grand Junction, CO*

**Gabriel Garcia-Diaz, MD**  
*Merced, CA*

**Vlad Gendelman, MD**  
*Encino, CA*

**Theodore K. Gregorius, MD**  
*Colton, CA*

**Michael R. Hayman, MD**  
*Phoenix, AZ*

**Craig Hogan, MD**  
*Aurora, CO*

**Timothy Judkins, MD**  
*Montrose, CO*

**Erin Kawasaki, DO**  
*Aberdeen, WA*

**Waqar B. Khan-Farooqi, MD**  
*Grand Junction, CO*

**Suezie Kim, MD**  
*San Clemente, CA*

**Elly S. Laroque, MD**  
*San Francisco, CA*

**Cassandra A. Lee, MD**  
*Sacramento, CA*

**Rickland Likes, DO**  
*Pueblo, CO*

**Andrew P. Mahoney, MD**  
*Tucson, AZ*

**Robert E. Mayle Jr., MD**  
*San Francisco, CA*

**Michael J. McDermott, MD**  
*Santa Rosa, CA*

**Eric Meinberg, MD**  
*San Francisco, CA*

**Alexander K. Meininger, MD**  
*Moab, UT*

**Jared Michalson, MD**  
*Denver, CO*

**Robert B. Murphy, MD**  
*Oceanside, CA*

**C. T. Nicholas, MD**  
*Martinez, CA*

**James L. Pace, MD**  
*Los Angeles, CA*

**Todd W. Peters, MD**  
*Irvine, CA*

**Vincent Phan, MD**  
*Sugar Land, TX*

**James Policy, MD**  
*Berkeley, CA*

**Kristi K. Posey, PA-C**  
*Manvel, TX*

**Walter Pyka, MD**  
*San Mateo, CA*

**Edgar K. Ragsdale, MD**  
*Vancouver, WA*

**D. Daniel Rotenberg, MD**  
*San Diego, CA*

**Janmeet S. Sahota, DO**  
*Kennewick, WA*

**Star Schreier, MD**  
*Ann Arbor, MI*

**Ran Schwarzkopf, MD**  
*Orange, CA*

**Timothy Schweitzer, MD**  
*Portland, OR*

**Daniel R. Stephenson, MD**  
*Manhattan Beach, CA*

**Faustin Stevens, MD**  
*Kennewick, WA*

**Matthew Tweet, MD**  
*Sacramento, CA*

**Jennifer van Warmerdam, MD**  
*San Francisco, CA*

**Carole Webb, RN**  
*Baker City, OR*

**William W. Whang, MD**  
*Modesto, CA*

**Kinston William**  
*Woodside, NY*

**Ronald Wyatt, MD**  
*Alamo, CA*

**Edward Yian, MD**  
*Anaheim, CA*

---

*Western Orthopaedic Association  
Contributions — May 2012 to May 2013*

---

**Platinum — \$5,000 to \$10,000**

C. Harold Willingham, MD

**Gold — \$1,500 to \$3,000**

William J. Maloney, MD

**Silver — \$1,000 to \$1,499**

Michael W. Abdalla, MD  
Paul C. Collins, MD  
Peter J. Mandell, MD

**Bronze — \$500 to \$999**

Mrs. Darlene J. Anzel  
Nitin N. Bhatia, MD  
James G. Brooks Jr., MD  
Michael R. Dayton, MD  
Lawrence R. Housman, MD  
Omer A. Ilahi, MD  
Brian A. Jewett, MD

Cynthia M. Kelly, MD  
Valerae O. Lewis, MD  
Jeff M. Nakano, MD  
Ellen M. Raney, MD  
Samuel R. Rosenfeld, MD  
Larry J. Sanders, MD

Robert R. Slater, MD  
Kevin Smith, MD  
Payam Tabrizi, MD  
Lisa A. Taitzman, MD  
Daniel C. Valdez, MD  
Richard Welch, MD

**Copper — \$100 to \$499**

COL Kent A. Reinker, MD  
Mr. James H. Webb Jr.

*Thank you for your generous contributions!*

---

***Exhibitor/Grantor Acknowledgements***

---

The Western Orthopaedic Association is grateful for the support of its educational grantors and exhibitors. Thank you for your participation and commitment to the WOA.

**GOLD**

Cadence Pharmaceuticals Inc.  
ConvaTec  
Zimmer — *Grantor*

**BRONZE**

Medtronic Advanced Energy  
Stryker Orthopaedics — *Grantor*

**COPPER**

Auxilium Pharmaceuticals, Inc.  
BioMarin Pharmaceutical Inc.  
CeramTec Medical Products  
DePuy Synthes Joint Reconstruction  
DePuy Synthes Mitek Sports Medicine  
Exactech, Inc.  
Ferring Pharmaceuticals Inc.  
Innovative Medical Products, Inc.  
Lima USA  
MAKO Surgical Corp.

Maxx Health, Inc.  
Medtronic, Inc. — *Grantor*  
Paramed Medical Systems  
Quill™Angiotech  
RTI Biologics, Inc.  
Smith & Nephew, Inc.  
SuccessEHS  
SunMedica Inc.  
Synthes

**EXHIBITORS**

ACIGI RELAXATION  
American Academy of Orthopaedic Surgeons  
B. Braun Medical, Inc.  
Biocomposites  
ChartLogic, Inc.  
Cobalt Health, Inc.  
ConforMIS  
Emdat, Inc.  
EOS Imaging  
Exscribe, Inc.  
Medical Protective

MEDSTRAT, INC.  
OREF  
Orthofix, Inc.  
Ortho-Preferred  
Pacira Pharmaceuticals, Inc.  
Planmed  
ProScan Reading Services  
Symbionix-USA  
VirtaMed AG  
Wright Medical Technology, Inc.

---

## *Exhibitor/Grantor Information*

---

### **ACIGI RELAXATION**

4399 Ingot Street  
Fremont, CA 94538  
888-266-1618  
www.drufuji.com

Fuji Cyber Relax Chair, The No. 1 massage chair, show special.

### **American Academy of Orthopaedic Surgeons (AAOS)**

6300 North River Road  
Rosemont, IL 60018  
800-346-AAOS  
www.aaos.org

AAOS is the preeminent provider of musculoskeletal education to orthopaedic surgeons and others in the world. Our continuing medical education activities include a world-renowned Annual Meeting, multiple CME courses held around the country and at the Orthopaedic Learning Center, and various medical and scientific publications, digital media and online resources. Purchase the latest educational resources and learn more about your AAOS member benefits at our booth.

### **Auxilium Pharmaceuticals, Inc.**

40 Valley Stream Parkway  
Malvern, PA 19355  
484-321-5900  
www.xiaflex.com

Auxilium Pharmaceuticals, Inc. is a specialty biopharmaceutical company committed to providing innovative solutions for unmet medical needs which are often undiagnosed or undertreated.

### **B. Braun Medical, Inc.**

824 12<sup>th</sup> Avenue  
Bethlehem, PA 18018  
949-923-8176  
www.bbraun.com

B. Braun, the market leader in Regional Anesthesia, advocates and educates for the appropriate use of Regional Anesthesia and Acute Pain Management for orthopedic procedures. Regional Anesthesia can significantly improve both patient experience and outcomes, leading to greater patient satisfaction and increased referrals. Please visit the B. Braun booth to learn how a regional anesthesia and peripheral nerve block program can benefit your practice.

### **Biocomposites**

700 Military Cutoff Road, Suite 320  
Wilmington, NC 28405  
910-350-8015  
www.biocomposites.com

Biocomposites is a British biomaterials company that develops, manufactures and markets one hundred percent pure synthetic calcium based composite devices for bone regeneration. The com-

pany offers a full-line of FDA registered, fully resorbable synthetic bone graft substitutes, including Stimulan and geneX with ZPC™.

### **BioMarin Pharmaceutical Inc.**

105 Digital Drive  
Novato, CA 94949  
954-224-3542  
www.bmrn.com

BioMarin develops and commercializes innovative biopharmaceuticals for serious diseases and medical conditions. Approved products include the first and only enzyme replacement therapies for MPS I and MPS VI and the first and only FDA-approved medication for PKU.

### **Cadence Pharmaceuticals Inc.**

12481 High Bluff Drive, Suite 200  
San Diego, CA 92130  
858-436-1400  
www.cadencepharm.com

Cadence Pharmaceuticals is a biopharmaceutical company focused on in-licensing, developing and commercializing proprietary product candidates principally for use in the hospital setting. The company is currently marketing OFIRMEV® (intravenous acetaminophen) for the treatment of acute pain and fever.

### **CeramTec Medical Products**

Medical Products Division  
Plochingen, Germany  
864-682-3215  
www.ceramtec.com

CeramTec is the world's leading manufacturer of ceramic products for use in hip arthroplasty. It has been at the forefront in the development of innovative ceramic products that offer the highest reliability with the lowest articulation wear for Total Hip Replacement. Technological advances such as the introduction of our Alumina Matrix Composite (BioloX® delta) will further increase the reliability of our products. Every 30 seconds a BioloX® component is surgically implanted around the world.

### **ChartLogic, Inc.**

3995 South 700 East, Suite 200  
Salt Lake City, UT 84107  
800-686-9651  
www.chartlogic.com

For nearly 20 years, ChartLogic has provided easy-to-use charting solutions to orthopedic surgeons. ChartLogic is a leader in the industry due to its innovative and time-saving EHR software. The company was also the first in the nation to certify for meaningful use, and is one of the top 10 vendors for orthopedic meaningful use attestations.

**Cobalt Health, Inc.**

1514 17th Street, Suite 202  
Santa Monica, CA 90404  
877-262-2588  
www.cobalthealth.com

Cobalt Health is a cutting edge medical billing company with innovative technology to scrub claims to prevent problems and a payment adjudication engine to catch underpayments from payers. Cobalt Health — we improve the health of your bottom line.

**ConforMIS**

28 Crosby Drive  
Bedford, MA 01730  
781-345-9119  
www.conformis.com

ConforMIS develops and commercializes medical devices for the treatment of osteoarthritis and joint damage. The company's patented "image-to-implant" technology enables the creation of patient-specific implants and instruments that are precisely sized and shaped to match the 3D topography of a patient's anatomy. To date, ConforMIS has developed a line of award winning personalized knee solutions to address all stages of osteoarthritis.

**ConvaTec**

100 Headquarters Park Drive  
Skillman, NJ 08558  
800-422-8811  
www.convatec.com

ConvaTec develops and markets innovative medical technologies that help improve the lives of millions of people in Ostomy Care, Wound Therapeutics, Continence and Critical Care, and Infusion Devices.

**DePuy Synthes Joint Reconstruction**

PO Box 988  
Warsaw, IN 46581  
800-473-3789  
www.depuy.com

DePuy Synthes Joint Reconstruction is the world's oldest and largest orthopaedic company and is a leading designer, manufacturer, and distributor of orthopaedic devices and supplies.

**DePuy Synthes Mitek Sports Medicine**

325 Paramount Drive  
Raynham, MA 02767  
800-227-6633  
www.depuyssynthes.com

DePuy Synthes Mitek Sports Medicine is a global leader in orthopaedic sports medicine devices and products used in the treatment of joint injuries related to sports and physical activity. The company's portfolio includes a wide range of arthroscopic and non-surgical solutions that help patients return to active lifestyles. DePuy Synthes Mitek Sports Medicine is part of DePuy Synthes Companies of Johnson & Johnson, the largest provider of orthopaedic and neurological solutions in the world.

**Emdat, Inc.**

328 East Lakeside Street  
Madison, WI 53715  
608-270-6400  
www.emdat.com

Emdat, Inc. is a leading supplier of web-based medical documentation solutions. Empowering over 20,000 clinicians, Emdat's sophisticated technology decreases cost and maximizes efficiency of the dictation process. Medical facilities trust Emdat to provide robust, mobile, user-friendly and cost-effective solutions that streamline workflow and complement the use of your EHR.

**EOS Imaging**

185 Alewife Brook Parkway, Suite 410  
Cambridge, MA 02138  
678-564-5400  
www.eos-imaging.com

Born from a technology awarded the Nobel Prize for Physics, the EOS® system is the first imaging solution designed to capture simultaneous bilateral long length images, full body or localized, of patients in a weight bearing position, providing a complete picture of the patient's skeleton at very low dose exposure. EOS enables global assessment of balance and posture as well as a 3D bone-envelope image in a weight bearing position, and provides automatically over 100 clinical parameters to the orthopedic surgeon for pre- and post-operative surgical planning.

**Exactech, Inc.**

2320 NW 66th Court  
Gainesville, FL 32653  
352-377-1140  
www.exac.com

Based in Gainesville, Fla., Exactech develops and markets orthopaedic implant devices, related surgical instruments and biologic materials and services to hospitals and physicians.

**Exscribe, Inc.**

5 West Fourth Street  
Bethlehem, PA 18015  
610-419-2050  
www.exscribe.com

Exscribe's E-Record EHR provides Orthopaedic practices with an extensive Orthopaedic knowledge base, flexible workflow and documentation options reducing dictation and transcription, and is certified for "Meaningful Use" by the Drummond Group. Exscribe offers the option of using its own Practice Management System, or HL7 Integration with leading PM systems. Options include e-prescribing, patient portal for online history submissions, voice recognition, and integration with PACS & fax systems. Founded and led by practicing Orthopaedic surgeons, for more than a decade, Exscribe has provided products and services tailored to meet the unique needs of busy Orthopaedic practices.

### **Ferring Pharmaceuticals Inc.**

4 Gatehall Drive, Third Floor  
Parsippany, NJ 07054  
646-932-3075  
www.euflexxa.com

Ferring Pharmaceuticals Inc. is a research based biopharmaceutical company that offers treatment for patients with osteoarthritis (OA) of the knee. EUFLEXXA is a highly purified hyaluronan, also called Hyaluronic Acid (HA). It is the first bioengineered HA approved in the US for the treatment of OA knee pain.

### **Innovative Medical Products, Inc.**

87 Spring Lane  
Plainville, CT 06062  
800-467-4944  
www.impmedical.com

Innovative Medical Products, Inc. (IMP) is focused on developing and marketing innovative patient positioning products to benefit and improve efficiency in the operating room and hospital clinics where patient stability and positioning are required.

### **Lima USA**

2106 West Pioneer Parkway, Suite 126  
Arlington, TX 76013  
817-342-0237  
www.lima.it

Lima Corporate is a global medical device company providing reconstructive orthopaedic solutions to surgeons who face the challenges of improving their patient's quality of life. Lima Corporate designs, develops, manufactures and markets joint replacement and repair solutions that include large joint implants for hip and knee and systems for the restoration of the extremities focusing on disorders of the shoulder and traumatic injuries.

### **MAKO Surgical Corp.**

2555 Davie Road  
Ft. Lauderdale, FL 33317  
866-647-6256  
www.makosurgical.com

MAKO Surgical Corp.® is proud to support surgeons' efforts to restore patient mobility and lifestyle by offering MAKOpasty.® MAKOpasty® is empowered by robotic arm technology to bring a new level of precision and confidence to total hip and partial knee surgery. For a hands-on demonstration, please stop by our booth.

### **Maxx Health, Inc.**

531 Plymouth Road, Suite 526  
Plymouth Meeting, PA 19642  
484-598-3291  
www.maxxhealthinc.com

Maxx Health, Inc. is an innovative knee & hip replacement company. It is part of the 'Maxx' group involved in the development & design of tomorrow's generation of total joint products, including: Total Knee Arthroplasty & Revision; Unicodylar Knee; Total Hip – Primary & Revision; Total Shoulder.

### **Medical Protective**

5814 Reed Road  
Fort Wayne, IN 46835  
800-463-3776 (800-4MEDPRO)  
www.medpro.com

Medical Protective, a Warren Buffett Berkshire Hathaway Company, protects the reputation and assets of healthcare providers with four levels of unmatched protection — strength, defense, solutions, since 1899.

### **MEDSTRAT, INC.**

1901 Butterfield Road, Suite 600  
Downers Grove, IL 60515  
800-882-4224  
www.medstrat.com

In 1996, Medstrat designed the industry's first Orthopedic Specific PACS (echoes™) geared to meet the needs & workflow of an Orthopedic Surgeon's private practice. Today, Medstrat remains the only PACS company 100% dedicated to Orthopedics. Medstrat products are compatible with both Windows and Mac based systems. We offer our own Pre-Surgical planning / Templating software and services like Hippa / HiTech compliant Cloud Dicom Image Storage.

### **Medtronic Advanced Energy**

180 International Drive  
Portsmouth, NH 03801  
603-842-6219  
www.medtronic.com

Medtronic Advanced Energy develops and manufactures advanced energy devices that deliver proprietary TRANSCOLLATION® technology, a combination of radio frequency (RF) energy and saline, to provide haemostatic sealing of soft tissue and bone. The company's AQUAMANTYS® System was designed to reduce blood loss in a broad range of orthopaedic procedures.

### **Medtronic, Inc.**

2600 SofamorDanek Drive  
Memphis, TN 38132  
800-876-3133  
www.medtronic.com

### **OREF**

6300 North River Road, Suite 700  
Rosemont, IL 60018  
847-698-9980  
www.oref.org

OREF is an independent, 501(c)(3) organization that raises funds to support research and education on diseases and injuries of bones, joints, nerves, and muscles. OREF-funded research and education enhance clinical care, leading to improved health, increased activity, and a better quality of life for patients.

**Orthofix, Inc.**

3451 Plano Parkway  
 Lewisville, TX 75056  
 800-BONEFIX or 800-266-3349  
 www.orthofix.com

Orthofix is a diversified, global medical device company focused on developing and delivering innovative repair and regenerative solutions to the spine and orthopedic markets.

**Ortho-Preferred**

110 West Road, Suite 227  
 Towson, MD 21204  
 877-304-3565  
 www.Ortho-Preferred.com

Take advantage of the next evolution in professional liability insurance with the Ortho-Preferred Program. When you choose the Ortho-Preferred Program you not only receive comprehensive professional liability insurance coverage at competitive rates through Medical Protective, but also additional benefits above and beyond your coverage through DT Preferred Group, LLC, a risk purchasing group. Choose the Ortho-Preferred Program and find out how much you could save on your professional liability insurance today!

**Pacira Pharmaceuticals, Inc.**

5 Sylvan Way  
 Parsippany, NY 07054  
 973-254-3560  
 www.pacira.com

Pacira Pharmaceuticals, Inc. is an emerging specialty pharmaceutical company focused on the development, commercialization and manufacture of new pharmaceutical products, based on its proprietary DepoFoam® drug delivery technology, for use in hospitals and ambulatory surgery centers. The Pacira Approach: Controlling post-surgical pain is the key to improving patient outcomes, yet up to 80% of patients report pain that is moderate to extreme in intensity after surgery.

**Paramed Medical Systems**

Oakton Business Plaza  
 O6204 W. Oakton Street  
 Morton Grove, IL 60053  
 847-470-0580  
 www.paramedmedicalsystems.com

Paramed Medical Systems is a leading developer, manufacturer, and supplier of MRI systems, from the MRO Superconductive System, to the “latest” In-Office MRJ3300; these systems provide the greatest range of clinical applications to the ease of installation.

**Planmed**

100 North Gary Avenue, Suite A  
 Roselle, IL 60172  
 630-894-2200  
 www.planmed.com

Planmed, a trusted leader in imaging solutions, designs, manufactures and markets equipment for healthcare professionals to over 100

countries worldwide. Planmed systems are well known for imaging performance, user-friendliness and excellent ergonomics. The Planmed Verity Cone Beam CT scanner for extremities delivers detailed diagnostics with ortho-3D imaging. The motorized gantry with adjustable height and tilt allows the patient to be imaged in a more relaxed manner than conventional CT and at a lower x-ray dose.

**ProScan Reading Services**

5400 Kennedy Avenue  
 Cincinnati, OH 45213  
 877-PROSCAN  
 www.proscan.com

ProScan Reading Services — Teleradiology for your Practice: Our team of board-certified, fellowship-trained (MSK MRI) radiologists support the launch and growth of your imaging division. ProScan Reading Services is committed to improving the quality of care through education, access, expertise and technology. ProScan Teleradiology—Everything you need, we deliver!

**Quill™ Angiotech**

100 Dennis Drive  
 Reading, PA 19606  
 877-991-1110  
 www.quilldevice.com

The Quill Knotless Tissue-Closure Device is designed to evenly distribute tension along a closure by replacing knots with running closures. Tiny barbs on the suture provide immediate tissue hold on placement, making soft tissue approximation faster and easier. Quill™ helps enable surgeons to reshape, remold, lift, quilt, close, and secure tissue.

**RTI Biologics, Inc.**

11621 Research Circle  
 Alachua, FL 32615  
 386-418-8888  
 www.rtix.com

RTI Biologics, Inc. prepares donated human tissue through screening, testing and sterilization processes such as BioCleanse®, Tuto-plast®, and Canceled® SP.

**Simbionix-USA**

7100 Euclid Avenue, Suite 180  
 Cleveland, OH 44103  
 services@simbionix.com  
 866-746-2466

Simbionix is a world leader in medical education and surgical simulation solutions. The ARTHRO Mentor provides advanced training simulation on **Knee and Shoulder** arthroscopic surgical procedures. Anatomical models, haptic sensation, 3D images, and a realistic set of tools including an arthroscopic camera to help reduce training time and considerably improve the learning curve of complex surgery techniques. This true-to-life hands-on experience is available in a demo in the Simbionix booth.

### **Smith & Nephew, Inc.**

150 Minuteman Road  
Andover, MA 01810  
978-749-1000  
[www.smith-nephew.com](http://www.smith-nephew.com)

Smith & Nephew is committed to helping people regain their lives by repairing and healing the human body. Our two divisions—Advanced Surgical Devices and Advanced Wound Management—are dedicated to developing innovative, cost effective products and techniques that deliver significant advantages and make life better for our customers and their patients.

### **Stryker Orthopaedics**

325 Corporate Drive  
Mahwah, NJ 07430  
800-447-7836  
[www.stryker.com](http://www.stryker.com)

Stryker is one of the world's leading medical technology companies and is dedicated to helping healthcare professionals perform their jobs more efficiently while enhancing patient care. The Company offers a diverse array of innovative medical technologies including reconstructive implants, medical and surgical equipment, and neuro-technology and spine products to help people lead more active and more satisfying lives.

### **SuccessEHS**

One Metroplex Drive, Suite 500  
Birmingham, AL 35209  
888-879-7302  
[www.ehsmed.com](http://www.ehsmed.com)

SuccessEHS is a nationally acclaimed vendor providing a single solution Practice Management and Electronic Health Record with Integrated Medical Billing Services. SuccessEHS delivers an innovative blend of clinical, operational and financial software paired with a suite of specialized integrated success services. SuccessEHS understands the needs of orthopedists, and serves hundreds of orthopedists who use the SuccessEHS solution to provide better care with less risk and more results.

### **SunMedica Inc.**

1661 Zachi Way  
Redding, CA 96003  
530-229-1600  
[www.sunmedica.com](http://www.sunmedica.com)

For the last 25 years, SunMedica has developed an excellent industrial reputation for new innovations in the areas of surgical orthopaedics, wound management, cold therapy and sports medicine. Request to try any of our products for FREE.

### **Synthes**

1302 Wrights Lane East  
West Chester, PA 19380  
800-523-0322  
[www.synthes.com](http://www.synthes.com)

Synthes is a leading global medical device company. We develop, produce and market instruments, implants and biomaterials for the

surgical fixation, correction and regeneration of the skeleton and its soft tissues.

### **VirtaMed AG**

Rütistrasse 12  
CH-8952 Schlieren, Zurich  
Switzerland  
+41 44 500 96 90  
[www.virtamed.com](http://www.virtamed.com)  
[www.youtube.com/user/VirtaMed](http://www.youtube.com/user/VirtaMed)

VirtaMed, a Swiss-based company, develops virtual reality simulators of highest realism. These simulators provide teaching and training of diagnostic and therapeutic interventions in endoscopic surgery.

### **Wright Medical Technology, Inc.**

5677 Airline Road  
Arlington, TN 38002  
800-238-7188  
[www.wmt.com](http://www.wmt.com)

Wright Medical Technology is a global manufacturer and distributor of reconstructive joint devices and bio-orthopaedic materials. We provide a wide variety of knee, extremity and biologic products for our customers. With over 50 years in business, Wright Medical provides a trusted name in orthopaedics.

### **Zimmer**

1800 W. Center Street  
Warsaw, IN 46581  
800-631-6131  
[www.zimmer.com](http://www.zimmer.com)

Zimmer is a world leader in musculoskeletal health. We're creators of innovative and personalized joint replacement technologies. Founded in 1927, we remain true to our purpose of restoring mobility, alleviating pain, and helping millions of people around the world find renewed vitality. Zimmer has operations in more than 25 countries around the world, sells products in more than 100 countries and is supported by the efforts of more than 8,000 employees.

---

***WOA First Business Meeting***

---

**Western Orthopaedic Association**

**Alpine Ballroom  
The Resort at Squaw Creek  
Lake Tahoe, California**

Thursday, August 1, 2013

7:00 am–7:10 am

Ellen M. Raney, MD, President, Presiding

**AGENDA**

- I. Call to Order
- II. Report of the President, Ellen M. Raney, MD
- III. Report of the Secretary, Brian A. Jewett, MD
- IV. Report of the Treasurer/Historian, Jeffrey M. Nakano, MD  
(Includes list of Deceased Members)
- V. Report of the Membership Committee, Cynthia M. Kelly, MD  
(Includes list of New Members)
- VI. Report of the Bylaws Committee, Lawrence R. Houseman, MD
- VII. Report of the 2013 Nominating Committee and Proposed Slate of Officers for 2013- 2014,  
Peter J. Mandell, MD
- VIII. Election of the 2013-2014 Nominating Committee

**Nominating Committee.** The Nominating Committee shall be composed of seven (7) members. It shall consist of the outgoing members and Immediate Past-President of the Board of Directors and remaining members elected from the floor at the First Business Session of the Annual Meeting. Each nominee shall be present at the meeting. Members of the Association who serve on the Nominating Committee are ineligible for re-election to the Committee in the succeeding year.

2013-2014 - Ineligibles

Peter J. Mandell, MD  
Kim L. Furry, MD  
David D. Teuscher, MD  
Steven J. Morgan, MD  
Cynthia M. Kelly, MD  
Dick Welsh, MD  
Robert E. Eilert, MD

2013-2014 Committee

Ellen M. Raney, MD, *Chair*  
Kevin L. Smith, MD  
Nitin N. Bhatia, MD  
Lisa A. Taitsman, MD  
1. Nominee  
2. Nominee  
3. Nominee

- IX. Old Business
- X. New Business
- XI. Announcements
- XII. Adjournment

---

*Minutes of the 2012 First Business Meeting  
of the Western Orthopaedic Association*

---

Grand Ballroom II, The Hilton Portland  
Portland, Oregon  
Thursday, June 14, 2012

**Peter J. Mandell, MD, President, presiding**

**CALL TO ORDER**

Dr. Peter Mandell, President, called to order the first business meeting of the Western Orthopaedic Association. The meeting took place in Grand Ballroom II, Hilton Portland, Portland, Oregon. The meeting began at 7:00am.

**REPORT OF THE SECRETARY**

Dr. Kim Furry Reported that the WOA board completed their interim meeting in January and met earlier in the week at the WOA annual meeting and all went well.

**ACTION: A motion was made to approve the minutes of the 1<sup>st</sup> Business Meeting from the previous year, 2011. The motion was passed.**

**REPORT OF THE TREASURER/HISTORIAN**

Dr. Jeffrey Nakano reported that the net income for the WOA is down at this time from 2011 – which can mostly be attributed to decreased membership. Dr. Nakano also reported that 4 members passed away in the previous year and a moment of silence was observed.

**REPORT OF THE MEMBERSHIP COMMITTEE**

Dr. Paul Collins reported that membership has been steadily decreasing over the past 9 years, not for lack of trying to increase it. Dr. Collins encouraged everyone to find a colleague to encourage to join WOA. He reminded everyone of the Ortho-Preferred insurance program and its mandatory association enrollment, which is a positive, but it is not enough to drive membership.

**NEW BUSINESS**

Dr. Ted Stringer, the Nominating Committee Chairman reported that the Nominating Committee proposed the following Slate of Officers for 2013:

President	Ellen Raney, MD
First President Elect	Valerae O. Lewis, MD
Second President Elect	Paul Collins, MD
Secretary	Brian Jewett, MD
Treasurer	Jeffrey Nakano, MD
Member-at-Large	Omer Ilahi, MD
Junior Board Members	Michael Dayton, MD PayamTabrizi, MD
Membership Chair	CindyKelly, MD

**ACTION: It was moved and seconded to accept the Report of the Nominating Committee. The motion carried.**

Dr. Ted Stringer called for nominations for the 2013 Nominating Committee and the following were nominated:

Cindy Kelly, MD  
Dick Welsh, MD  
Robert E. Eilert, MD

**ADJOURNMENT**

The meeting was adjourned at 7:11am.

---

***WOA Second Business Meeting***

---

**Western Orthopaedic Association**

**Alpine Ballroom  
The Resort at Squaw Creek  
Lake Tahoe, California**

Saturday, August 3, 2013

7:00 am–7:15 am

Ellen M. Raney, MD, President, Presiding

**AGENDA**

- I. Call to Order
- II. Presentation of the Proposed Slate of Officers for 2013-2014, Peter J. Mandell, MD
- III. Election of Officers, Ellen M. Raney, MD
- IV. Old Business
- V. New Business
- VI. Announcements
- VII. Installation of Valerae O. Lewis, MD, 2013-2014 by President, Ellen M. Raney, MD
- VIII. Adjournment

---

*Minutes of the 2012 Second Business Meeting  
of the Western Orthopaedic Association*

---

Grand Ballroom II, The Hilton Portland  
Portland, Oregon  
Saturday, June 16, 2012

**Peter J. Mandell, MD, President, presiding**

**CALL TO ORDER**

Dr. Peter Mandell, President, called to order the second business meeting of the Western Orthopaedic Association. The meeting took place in Grand Ballroom II, Hilton Portland, Portland, Oregon. The meeting began at 7:00am.

**ELECTION OF NOMINATING COMMITTEE**

The proposed slate for the nominating committee was reviewed.

Chairman:	Peter J. Mandell, MD
	Kim L. Furry, MD
	David D. Teuscher, MD
	Steven J. Morgan, MD
	Cindy Kelly, MD
	Dick Welsh, MD
	Robert E. Eilert, MD

**ACTION: It was moved and seconded that the proposed slate for the nominating committee be approved. The motion carried.**

**ELECTION OF OFFICERS**

Dr. Ted Stringer presented for approval the proposed slate of officers for 2012-2013.

President	Ellen Raney, MD
First President Elect	Valerae O. Lewis, MD
Second President Elect	Paul Collins, MD
Secretary	Brian Jewett, MD
Treasurer	Jeffrey Nakano, MD
Past President	Peter Mandell, MD
Members-at-Large	Omer Ilahi, MD
	Kevin Smith, MD
	William Maloney, MD

Junior Board Members	Michael Dayton, MD
	Payam Tabrizi, MD
	Lisa Taitzman, MD
	Nitin Bhatia, MD
BOC Representative	Robert Slater, MD
Membership Chair	Cindy Kelly, MD

**ACTION: It was moved and seconded that the Slate be approved. The motion carried.**

**REPORT OF THE 2012 ANNUAL MEETING**

Dr. Peter Mandell presented Dr. Ellen Raney as the next WOA president. Dr. Raney thanked Dr. Mandell for a great year, a great meeting and his service to the WOA. She presented Dr. Mandell with a presidential pin. Dr. Raney encouraged everyone to attend the 2013 WOA meeting in Lake Tahoe. Dr. Mandell presented Dr. Raney with the presidential medal and thanked everyone for attending the WOA meeting in Portland this year.

**ADJOURNMENT**

Dr. Peter Mandell adjourned the meeting at 7:03am.



# Western Orthopaedic Association

---

## Scientific Program

August 1-3, 2013

---

The Resort at Squaw Creek  
Lake Tahoe, California

*Please be considerate and silence your cell phones during the Scientific Program.*

## 2013 Program Chairman

**Steven J. Morgan, MD, FACS**

*Englewood, Colorado*

---

### WOA Past Program Chairs

---

1940	Wilbur C. Cox, MD	San Francisco, CA	1978	St. Elmo Newton III, MD	Seattle, WA
1941	Harold E. Crowe, MD	Los Angeles, CA	1979	Marvin H. Meyers, MD	Los Angeles, CA
1942	Delbert Hand, MD	San Francisco, CA	1980	Donald A. Jones, MD	Honolulu, HI
1943	UNKNOWN		1981	John A. Neufeld, MD	Portland, OR
1944 – 1946	INACTIVE: WORLD WAR II		1982	Robert S. Turner, MD	Albuquerque, NM
1947	Alfred E. Gallant, MD	Los Angeles, CA	1983	Harold K. Dunn, MD	Salt Lake City, UT
1948	Keene O. Haldeman, MD	San Francisco, CA	1984	William C. McDade, MD	San Diego, CA
1949	Vernon P. Thompson, MD	Los Angeles, CA	1985	John A. Murray, MD	Houston, TX
1950	Eldon G. Chuinard, MD	Portland, OR	1986	W. Dilworth Cannon Jr., MD	San Francisco, CA
1951	Leonard Barnard, MD	Oakland, CA	1987	Jerome D. Wiedel, MD	Denver, CO
1952	J. Vernon Luck, MD	Los Angeles, CA	1988	Thomas B. Grollman, MD	Honolulu, HI
1953	Ernest M. Burgess, MD	Seattle, WA	1989	William C. McMaster, MD	Orange, CA
1954	Francis J. Cox, MD	San Francisco, CA	1990	James D. Heckman, MD	San Antonio, TX
1955	Ivar J. Larsen, MD	Honolulu, CA	1991	Lawrence R. Housman, MD	Tucson, AZ
1956	John R. Schwartzmann, MD	Tucson, AZ	1992	Daniel R. Benson, MD	Sacramento, CA
1957	Howard A. Mendelsohn, MD	Beverly Hills, CA	1993	Charles A. Peterson, MD	Seattle, WA
1958	Donald E. Moore, MD	Portland, OR	1994	Saul M. Bernstein, MD	Van Nuys, CA
1959	Harry C. Hughes, MD	Denver, CO	1995	Thomas A. DeCoster, MD	Albuquerque, NM
1960	R. G. Lambert, MD	San Diego, CA	1996	Morris Mitsunaga, MD	Honolulu, HI
1961	Robert A. Murray, MD	Temple, TX	1997	Paul C. Collins, MD	Boise, ID
1962	Verne T. Inman, MD	San Francisco, CA	1998	Robert Hunter, MD	Aspen, CO
1963	Ernest M. Burgess, MD	Seattle, WA	1999	Richard Coutts, MD	San Diego, CA
1964	Homer C. Pheasant, MD	Los Angeles, CA	2000	Christopher Beauchamp, MD	Scottsdale, AZ
1965	Paul A. Pemberton, MD	Salt Lake City, UT	2001	William A. McGann, MD	San Francisco, CA
1966	Thomas H. Taber Jr., MD	Phoenix, AZ	2002	Gerard L. Glancy, MD	Denver, CO
1967	Lawrence H. Gordon, MD	Honolulu, HI	2003	Linda J. Rasmussen, MD	Honolulu, HI
1968	John J. Niebauer, MD	San Francisco, CA	2004	Thomas Schmalzried, MD	Los Angeles, CA
1969	William H. Keener, MD	Denver, CO	2005	Robert R. Slater Jr., MD	Roseville, CA
1970	Rodney K. Beals, MD	Denver, CO	2006	James B. Benjamin, MD	Tucson, AZ
1971	Leon L. Wiltse, MD	Long Beach, CA	2007	Jeffrey M. Nakano, MD	Grand Junction, CO
1972	Michael M. Donovan, MD	Houston, TX	2008	Valerae O. Lewis, MD	Houston, TX
1973	Philip H. Dickinson, MD	San Diego, CA	2009	Stuart K. Wakatsuki, MD	Kailua, HI
1974	Donald A. Jones, MD	Honolulu, HI	2010	Nitin N. Bhatia, MD, FACS	Orange, CA
1975	Taylor K. Smith, MD	Oakland, CA	2011	Michael P. Dohm, MD	Grand Junction, CO
1976	C. Harold Willingham, MD	Tucson, AZ		James P. Duffey, MD	Colorado Springs, CO
1977	William E. Gamble, MD	Denver, CO	2012	Brian A. Jewett, MD	Eugene, OR

---

***2013 Program Chairman***

---



**Steven J. Morgan, MD, FACS**  
*Englewood, Colorado*

Steven J. Morgan, MD, FACS graduated from the University of Colorado and received his medical degree from The Kech School of Medicine University of Southern California. His residency training took place at the Los Angeles County University of Southern California Medical Center and was followed by an Orthopaedic trauma fellowship at Carolinas Medical Center, Charlotte, North Carolina. He served for over a decade as a faculty member at the University of Colorado and was the Residency Program Director before proceeding to a non-academic practice at Swedish Medical Center, Englewood, Colorado. Dr. Morgan is a Fellow of the American Academy of Orthopaedic Surgeons and the American College of Surgeons. He serves in various leadership roles in the Orthopaedic Trauma Association and the Western Orthopaedic Association.

## 2013 Presidential Guest Speaker

**Augustus A. White III, MD, PhD**

*Cambridge, Massachusetts*

---

### WOA Past Guest Speakers

---

1954	Jack W. Wickstrom, MD	New Orleans, LA	1986	William R. Murray, MD	San Francisco, CA
1955	Paul R. Lipscomb, MD	Davis, CA		Clement B. Sledge, MD	Boston, MA
1956	Carroll B. Larson, MD	Iowa City, IA	1987	Rocco A. Calandruccio, MD	Memphis, TN
1957	John Saunders, MD	San Francisco, CA		Maj. Gen. Maurice C. Padden, USAF	Colorado Springs, CO
	Rutherford S. Gilfillan, MD	San Francisco, CA	1988	Quinn H. Becker, MD	Thurmont, MD
1961	George Eggers, MD	Galveston, TX		Wu Shou-Yi, MD	Shanghai, Peoples Republic of China
1964	D. L. Griffiths, FRCS	Manchester, England	1989	David L. Hamblen, PhD, FRCS	Glasgow, Scotland
1965	Don H. O'Donoghue, MD	Oklahoma City, OK		Hon. Justice Burton B. Roberts	Bronx, NY
1966	George J. Garceau, MD	Indianapolis, IN	1990	Benjamin E. Bierbaum, MD	Boston, MA
1967	H. Relton McCarroll, MD	St. Louis, MO		Thomas Taylor, FRCS	Sydney, Australia
1968	William T. Green, MD	Boston, MA	1991	Professor René K. Marti	Amsterdam, The Netherlands
1969	Leonard F. Peltier, MD	Tuscon, AZ	1992	Ian D. Learmonth, FRCS	Cape Town, South Africa
1970	James W. Harkess, MD	Louisville, KY	1993	Christian Gerber, MD	Fribourg, Switzerland
1971	Peter F. Williams, FRCS	Parkville, Australia	1994	Ian G. Kelly, BSc, MD, FRCS	Glasgow, Scotland
	O. Ross Nicholson, FRCS, FRACS	Auckland, New Zealand	1995	O. Ross Nicholson, FRCS	Auckland, New Zealand
1972	James A. Nicholas, MD	New York, NY	1996	John Leong	Hong Kong, China
	Joseph A. Boyes, MD	Los Angeles, CA		M. Mark Hoffer, MD	Los Angeles, CA
1973	Lowell Peterson, MD	Rochester, MN	1997	Anthony Pohl	Adelaide, Australia
	Charles J. Sedgewick, DVM	San Diego, CA		Harold K. Dunn, MD	Salt Lake City, UT
1974	Gerald S. Laros, MD	Chicago, IL	1998	Lars Engebretsen, MD	Oslo, Norway
1975	J. William Fielding, MD	New York, NY	1999	Donald Howie, MBBS	Adelaide, Australia
1976	W. Robert Harris, MD	Toronto, Canada	2000	Lennart Hovelius, MD	Gavle, Sweden
1977	Federico Labbe, MD	Guatemala City, Guatemala	2001	Chitranjan S. Ranawat, MD	New York, NY
	Thomas E. Whitesides Jr., MD	Atlanta, GA	2002	Klaus Parsch, MD	Stuttgart, Germany
1978	Edward H. Simmons, MD	Toronto, Canada	2003	Charles A. Rockwood Jr., MD	San Antonio, TX
1979	Ejnar Eriksson, MD	Stockholm, Sweden	2004	Joseph A. Buckwalter, MD	Iowa City, IA
1980	Ralph B. Cloward, MD	Honolulu, HI	2005	Robert H. Cofield, MD	Rochester, MN
	Cheng Hsu-His, MD	Beijing, China	2006	Marvin Tile, MD, BSc (Med), FRCS(C)	Toronto, Canada
1981	Wayne O. Southwick, MD	New Haven, CT	2007	Robert E. Eilert, MD	Denver, CO
	Stanley W. Jacob, MD	Portland, OR	2008	Douglas W. Jackson, MD	Long Beach, CA
1982	Henry J. Mankin, MD	Boston, MA	2009	Frederick A. Matsen III, MD	Seattle, WA
	Richard J. Smith, MD	Boston, MA	2010	James D. Heckman, MD	Needham, MA
1983	M. Freeman, MD, FRCS	London, England	2011	G. Paul DeRose, MD	Durham, NC
	Stephen C. Jacobsen, PhD	Salt Lake City, UT	2012	Kevin J. Bozic, MD, MBA	San Francisco, CA
1984	Henry W. Apfelbach, MD	Lake Forest, IL			
	William H. Harris, MD	Boston, MA			
1985	C. McCollister Evarts, MD	Rochester, NY			
	Harlan J. Spjut, MD	Houston, TX			

---

## *2013 Presidential Guest Speaker*

---



Augustus A. White III, MD, PhD

WOA is very pleased to announce that Dr. Augustus A. White III is the 2013 Presidential Guest Speaker for its 77<sup>th</sup> Annual Meeting. He is the Ellen and Melvin Gordon Distinguished Professor of Medical Education and Professor of Orthopaedic Surgery at Harvard Medical School and former Professor in the Health Science and Technology Program at the Massachusetts Institute of Technology. For the past decade Dr. White has been a leader in the national fight for equality in health care. This is the subject of his new book (with David Chanoff) *Seeing Patients: Unconscious Bias in Health Care*.

White grew up in Memphis, Tennessee during the era of hard core segregation. He attended the Mt. Hermon School for Boys in northeastern Massachusetts, where he and four other boys “of color” were accepted in 1949. From there White attended Brown University, where he was the first black president of his traditionally white fraternity, and graduated from Stanford Medical School, where he was student body President and that institution’s first African American student. Subsequently he trained at Yale Medical Center becoming the first black surgical resident and, later, Yale’s first African American professor of surgery.

White served as a combat surgeon in Vietnam, was decorated with a Bronze Star, and earned a doctorate doing advanced spine research at Sweden’s University of Gothenburg and Karolinska Institute. In 1978 White was tapped to head the orthopaedic surgery department at Boston’s Beth Israel Hospital, now Beth Israel Deaconess Medical Center. This made him the first African American Department chief in a major Harvard teaching hospital.

As one of the world’s leading spine specialists, White has written over 250 articles and book chapters. He has also authored the definitive textbook, *Clinical Biomechanics of the Spine* (with Manohar Panjabi) and a book, for back pain sufferers, *Your Aching Back: A Doctor’s Guide To Relief* (with Preston Phillips, MD), now in its third edition. He was the founder and first President of the J. Robert Gladden Orthopaedic Society, Past President of the Cervical Spine Research Society and First Chairman of the American Academy of Orthopaedic Surgeon’s committee on diversity. He is the recipient of the Academy’s Tipton Award for Outstanding Leadership, Stanford Medical School’s Lifetime Achievement Award for Exceptional Contributions to Medicine, and has received other awards and honorary degrees.

White met his wife, Anita, during his PhD studies in Sweden. They have three daughters and four grandchildren.

---

## 2013 WOA Award Winners

---

### 2013 WOA Resident/Fellow Award Recipients

Congratulations to the following 2013 WOA Resident/Fellow Award Recipients. The award papers will be presented during the Scientific Program on Saturday 8:55 am–10:00 am.

**Timothy Alton, MD**

*Spinal Epidural Abscesses: Risk Factors, Medical vs Surgical Management, A Retrospective Review of 128 Cases*

9:19 am–9:27 am

**Orrin I. Franko, MD**

*Functional Significance of Distal Brachioradialis Tendon Release: A Biomechanical Study*

9:35 am–9:43 am

**Joshua S. Griffin, MD**

*\*Presented by Donavan K. Murphy, MD*

*What Is the Impact of Age on Reoperation Rates for Femoral Neck Fractures Treated with Closed Reduction Percutaneous Pinning and Hemiarthroplasty?*

9:27 am–9:35 am

**Calvin C. Kuo, MD**

*Biomechanical Demands on Posterior Fusion Instrumentation During Lordosis Restoration Procedures*

9:11 am–9:19 am

**Philipp Leucht, MD**

*Comparison of Cup Position and Limb Length in Primary THA Performed Through the Anterior Supine and Posterolateral Approaches*

9:43 am–9:51 am

**Scott Montgomery, MD**

*A Novel Osteogenic Oxysterol Compound for Therapeutic Development to Promote Bone Growth: Activation of Hedgehog Signaling and Osteogenesis Through Smoothened Binding*

9:03 am–9:11 am

**Jared A. Niska, MD**

*Tigecycline and Rifampin Combination Therapy Have Increased Efficacy Against an Experimental Staphylococcus Aureus Prosthetic Joint Infection*

8:55 am–9:03 am

### 2013 WOA/OREF Young Investigator Award Recipients

Congratulations to the following 2013 WOA Young Investigator Award Recipients. The award papers will be presented during the Scientific Program on Saturday, 12:15 pm–12:45 pm.

**Raffi S. Avedian, MD**

*The Effect of Anti-Rotation Pins on Stability of the Bone Prosthetic Interface of a Novel Compressive Osseointegration Implant Used for Limb Salvage Surgery: A Biomechanical Study with Clinical Outcomes*

12:23 pm–12:31 pm

**John G. Costouros, MD**

*Inhibition of Chondrocyte and Synovial Cell Death Following Exposure to Commonly Used Anesthetics*

12:15 pm–12:23 pm

**Reza Omid, MD**

*Biomechanical Comparison of the Lower Trapezius Transfer versus Latissimus Dorsi Tendon Transfer for Irreparable Massive Posterosuperior Rotator Cuff Tears*

12:31 pm–12:39 pm

**The Lloyd Taylor, Vernon Thompson, Harold and Nancy Willingham, Sanford and Darlene Anzel, and Resident Award Winners will be announced Saturday evening at the WOA Family Gala Dinner Dance.**

## *Financial Disclosure Information*

Western Orthopaedic Association has identified the options to disclose as follows.

The following participants have disclosed whether they or a member of their immediate family:

1. Receive royalties for any pharmaceutical, biomaterial, or orthopaedic product or device;
  2. Within the past twelve months, served on a speakers' bureau or have been paid an honorarium to present by any pharmaceutical, biomaterial, or orthopaedic product or device company;
  - 3a. Paid Employee for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;
  - 3b. Paid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;
  - 3c. Unpaid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;
  4. Own stock or stock options in any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier (excluding mutual funds);
  5. Receive research or institutional support as a principal investigator from any pharmaceutical, biomaterial, orthopaedic device and equipment company, or supplier;
  6. Receive any other financial/material support from any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier.
  7. Receive any royalties, financial/material support from any medical and/or orthopaedic publishers;
  8. Serve on the editorial or governing board of any medical and/or orthopaedic publication;
  9. Serve on any Board of Directors, as an owner, or as an officer on a relevant committee of any health care organization (e.g., hospital, surgery center, medical);
- n. No conflicts to disclose.

The Academy 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.

Geoffrey D. Abrams, MD ( <i>n.</i> )
Reid A. Abrams, MD ( <i>3c. TriMed; 8. Journal of Hand Surgery, JBJS; 9. UCSD Ambulatory Surgery Center</i> )
Mark R. Adams, MD ( <i>n.</i> )
Julie Agel, MA ( <i>n.</i> )
Zahab Ahsan, MS ( <i>n.</i> )
Christopher F. Ake, PhD ( <i>n.</i> )
Abigail Allen, MD ( <i>n.</i> )
Timothy B. Alton, MD ( <i>n.</i> )
Carlos M. Alvarado, MD ( <i>n.</i> )
Derek F. Amanatullah, MD, PhD ( <i>4. Merck, Stryker; 6. AONA, Synthes, TriMed, Acumed</i> )
Christopher P. Ames, MD ( <i>1. AESCULAP, LANX; 3a. UCSF; 3b. DePuy, Medtronic, Stryker; 4. Doctors Research Group, Trans1, Visualase; 5. Trans1</i> )
Harlan C. Amstutz, MD ( <i>1. Wright Medical Technologies, Inc.</i> )
Cassandra M. Andreychik ( <i>n.</i> )

Alexandre Arkader, MD ( <i>n.</i> )
Raffi S. Avedian, MD ( <i>n.</i> )
Anita Bagley, PhD, MPH ( <i>n.</i> )
Glen O. Baird ( <i>n.</i> )
Steven L. Barnett, MD ( <i>2. DePuy Orthopaedics; 3b. DePuy Orthopaedics; 5. DePuy Orthopaedics, Stryker Orthopedics; 9. Hoag Orthopaedic Institute</i> )
Tracey Bastrom, MA ( <i>n.</i> )
Andrea S. Bauer, MD ( <i>8. Journal of Bone &amp; Joint Surgery, Techniques in Hand and Upper Extremity Surgery</i> )
Manuel Bayona, MD, PhD ( <i>n.</i> )
Anthony W. Behn, PhD ( <i>n.</i> )
Anthony W. Behn, MS ( <i>n.</i> )
Carlo Bellabarba, MD ( <i>8. Journal of Orthopaedic Trauma</i> )
Michael J. Bellino, MD ( <i>n.</i> )
Steven K. Benirschke, MD ( <i>n.</i> )
Roger Bentley, MD ( <i>n.</i> )
Nicholas M. Bernthal, MD ( <i>2. Biomet; 3b. Biomet</i> )

*Disclosures in bold indicate members of the WOA Program Committee and/or contributing staff.*

Siddharth Bhola, MD (n.)
Justin Bird, MD (2. DePuy Synthes Spine; 3b. DePuy Synthes Spine)
Julius A. Bishop, MD (n.)
Cale W. Bonds, MD (n.)
Christopher R. Boone, MD (2. Synthes)
Thomas R. Bowen, MD (n.)
Patrick J. Brandner, MD (9. Specialty Health, Inc.)
Richard J. Bransford, MD (2. AO Spine; 5. Synthes, DePuy)
Hillary J. Braun (n.)
Kindyle L. Brennan, PhD (n.)
Michael L. Brennan, MD (n.)
Justin G. Brothers (n.)
Raoul J. Burchette, MS (3b. Jaleva, Inc.)
Keith Burnett, MD (n.)
Trevor R. Call, MS (n.)
George T. Calvert, MD (n.)
Brendan Carvalho, MBBCh, FRCA (n.)
Paul M. Caskey, MD (n.)
Anthony Catalano, BS (n.)
Jens R. Chapman, MD (1. AO Spine, Synthes; 3b. Synthes USA; 4. Renovis Medical; 5. Hans Joerg Wyss Foundation, Medtronic, AO Spine North America; 8. Spine, Global Spine Journal, Evidence-Based Spinecare Journal; 9. AO Spine North America, AO Spine Foundation)
Christopher Chaput, MD (5. Spinesmith, Nuvasive, Globus, Medtronic; 6. Facet-Link; 9. North American Spine Society)
Suzy Chen, BS (n.)
Timothy Chen, BS (n.)
Ivan Cheng, MD (1. Nuvasive; 3b. Stryker Spine, Nuvasive; 4. Nuvasive; 8. Spine, Spine Journal; 9. Cervical Spine Research Society)
Margaret Chilvers, MD (n.)
Alexander C. Ching, MD (2. DePuy; 3b. Atlas Spine)
Leera Choi, BA (n.)
Paul D. Choi, MD (2. Stryker; 3b. Stryker, Integra)
Bryant Chu, MS (n.)
Theodore J. Clark, MD (8. Journal of Patient Safety in Surgery; AAOS Now; 9. Colorado Orthopedic Society, PIAA, Colorado Concern, DMCC)
Sheldon Coleman, MD (n.)
Garet Comer, MD (n.)
Ronda D. Cordill, RN (n.)
Andrew Cornelius, MD (n.)
John G. Costouros, MD (1. Arthrex, Tornier, Shoulder Options, Inc.; 3b. Arthrex, Tornier, Zimmer, DePuy-Mitek, Shoulder Options, Inc.; 8. Journal of Shoulder and Elbow Surgeons; 8. Orthopaedic Society, Northern California Orthopaedic Society)
Seth H. Criner, DO (n.)
Martha K. Crist, RN (3a. Sanofi; 4. Sanofi)
Catherine M. Curtin, MD (8. Journal of Hand Surgery)
Jon R. Davids, MD (n.)
Alan J. Dayan, MD (n.)

Michael R. Dayton, MD (1. Smith & Nephew Orthopaedics; 3b. Smith & Nephew Orthopaedics; 8. Orthopedics; 9. WOA)
Brian Deegan (n.)
Rachel M. Deering (n.)
Gregory L. DeSilva, MD (n.)
Bobby Dezfuli, MD (n.)
Mark T. Dillon, MD (n.)
Emil Dionysian, MD (8. Journal of Hand Surgery)
Lisa A. DiPonio, MD (n.)
Josh Doan, MEng (n.)
Li Dong, MD (n.)
H. Gene Dossett, MD, MBA (8. Federal Practitioner Advisory Board)
Blythe Durbin-Johnson, PhD (n.)
Jonathan Eastman, MD (n.)
Eric W. Edmonds, MD (2. Arthrex)
Christopher J. Edwards, PharmD, BCPS (n.)
Monica Evans, RN (n.)
Marybeth Ezaki, MD (n.)
J. Dominic Femino (n.)
Eric Ferkel, MD (n.)
John J. Finneran IV, MD (n.)
Reza Firoozabadi, MD, MA (n.)
Wolfgang Fitz (1. Conformis, Inc.; 3b. Conformis, Inc.; 4. Conformis, Inc.; 5. Igetbetter, Inc.; 8. JBJS-Am., Clinical Orthopaedics and Related Research, International Orthopaedics)
David A. Forsh, MD (n.)
Kevin P. Francis, PhD (n.)
Orrin I. Franko, MD (8. American Journal of Orthopedics)
Anna M. Freemyer, BS (n.)
<b>Chuck Freitag (7. Data Trace Publishing Company; 8. Data Trace Publishing Company; 9. Data Trace Publishing Company)</b>
Tadashi T. Funahashi, MD (n.)
Kimberly L. Furry, MD (5. Emerge Surgical; 9. AAOS, Colorado Ortho Society)
Grant H. Garcia, MD (n.)
Christian Gerber, MD (1. Zimmer; 3b. Zimmer)
Anna Ghambaryan, MD, PhD (n.)
Narbeh Ghazarian, DO (n.)
Michael Githens, MD (n.)
Diana Glaser, PhD (4. Nuvasive, MAKO, MannKind; 5. DePuy, EOS Imaging)
Joseph Gondusky, MD (n.)
Robert S. Gorab, MD (3b. DePuy; 5. DePuy; 9. Hoag Orthopedic Institute)
Kaoru Goshima, MD (7. UpToDate)
Joshua S. Griffin, MD (n.)
Nikhil Gupta, BS (n.)
Sharon L. Hame, MD (9. Forum)
Mathew Hamula, BSc (n.)

Disclosures in bold indicate members of the WOA Program Committee and/or contributing staff.

Emily C. Harnden (n.)
<b>Melvyn A. Harrington, MD (3b. Zimmer; 9. J. Robert Gladden Orthopaedic Society, Houston Arthritis Foundation)</b>
Alex S. H. Harris, PhD (n.)
Thomas G. Harris, MD (1. Arthrex; 2. Arthex, Extremity Medical, Trimed; 3b. Arthex, Extremity Medical, Trimed; 3c. Integra Lifesciences; 7. Lippincott Williams Wilkins; 8. JBJS, Foot & Ankle International)
Robert A. Hart (1. DePuy, Seaspine; 2. DePuy; 3b. DePuy, Medtronic, Lilly; 4. Spine Connect; 6. Medtronic, DePuy, Synthes, OREF; 8. Spine; 9. AAOA, AOA, CSRS, LSRS, OAO, OREF, SRS)
Nusrat Harun (n.)
Liska Havel, BA (n.)
Nathanael D. Heckmann, BS (n.)
Eric R. Hentzen, MD, PhD (n.)
Ronald W. Hillock, MD (9. Tenaya Surgery Center, Nevada Orthopedic and Spine Center)
Alan M. Hirahara, MD, FRCS (3b. Arthrex Inc., SonoSite, Inc.)
Kirby Hitt, MD (1. Stryker Orthopedics; 2. Stryker Orthopedics; 3b. Stryker Orthopedics; 5. Stryker Orthopedics)
Craig A. Hogan, MD (8. Orthopaedics Journal)
Daniel J. Holtzman, MD (n.)
Daniel S. Horwitz, MD (1. Biomet, DePuy; 2. DePuy, Stryker, Synthes; 3b. DePuy, Stryker; 5. Synthes; 8. Wolters Kluwer Health - Lippincott Williams & Wilkins; 9. AAOS Foundation for Orthopaedic Trauma)
Michael Howard, MD (n.)
Stephen M. Howell, MD (1. Biomet Sports Medicine; 2. Biomet Sports Medicine; 3b. Biomet Sports Medicine; 8. American Journal of Sports Medicine)
Heather G. Huddleston, MD (4. Porosteon)
James I. Huddleston III, MD (1. Zimmer, Exactech; 2. Biomet, Zimmer, Stryker; 3b. Zimmer, Biomet, Stryker, Smith & Nephew; 3c. Porosteon; 4. Porosteon; 5. Biomet; 8. Journal of Arthroplasty)
Kenneth Hunt, MD (n.)
David Hunter, MD (n.)
Meghan Imrie, MD (n.)
Maria C. S. Inacio, MD (n.)
Kaan Irgit, MD (n.)
John M. Itamura, MD (2. Acumed, Tornier, Arthrex; 3b. Acumed, Tornier; 5. Acumed)
Joshua J. Jacobs, MD (4. Implant Protection; 5. Medtronic, Sofamor Danek, Nuvasive, Zimmer)
Jason Jancosko, DO, MPT (n.)
Joseph Jankiewicz, MD (2. Stryker; 3b. Stryker, Don Joy)
David S. Jevsevar, MD, MBA (2. Medacta USA; 4. Omni Life Sciences; 5. Medacta USA; 9. AAOS)
<b>Brian A. Jewett, MD (n.)</b>
Ramon L. Jimenez, MD (3b. Zimmer; 8. AAOS ORTHOINFO.ORG Orthopaedics Today; 9. OREF)
Alicia J. Johnson, BA (n.)
Tyler R. Johnston (n.)
Matthew Jordan, MD (n.)

Daniel C. Jupiter, PhD (n.)
Satoshi Kawaguchi, MD (n.)
Robert Kay, MD (n.)
Cynthia M. Kelly, MD (n.)
John D. Kelly IV, MD (n.)
Naila Khalaf, MD (n.)
David H. Kim, MD (3b. Pioneer; 7. Journal of Bone and Joint Surgery (Am); 8. The Spine Journal)
Laszlo N. Kiraly (n.)
Eric Klineberg, MD (2. DePuy, Synthes; 5. DePuy, Synthes, OREF, AO Spine)
Gregory P. Kolovich MD, MPH (n.)
Dimitry Kondrashov, MD (2. SI-Bone; 3b. SI-Bone, LifeSpine, SpineArt; 5. SI-Bone, AO Foundation; 9. San Mateo Surgery Center)
Suhel Kotwal, MD (n.)
Adrian Koziak, MSc (n.)
James C. Krieg, MD (1. Synthes CMF, Seaburg Medical; 3b. Synthes, Acumed; 4. Domain Surgical, Trice Medical)
Jacqueline Krumrey, MD (2. Acumed)
Jeffrey E. Krygier, MD (n.)
Calvin C. Kuo, MD (n.)
Brian Kwon, MD (2. Medtronic, Stryker Spine; 3b. Medtronic, Stryker Spine, DePuy Spine, ETEX; 4. ETEX, Johnson & Johnson; 8. JSDT; 9. KASS)
Nancy E. Lane, MD (n.)
Thomas M. Large, MD (4. The Orthopaedic Implant Company)
Jeremi M. Leasure, MSEng (5. Medtronic, DePuy, Arthrex, SI Bone, Cotera, Impactwear, ConforMIS, Synthes, Ivy Sports Medicine, Centinel Spine; 9. The Taylor Collaboration)
Justin B. Ledesma, MD (n.)
Michel Le Duff, MA (n.)
Cassandra A. Lee, MD (n.)
Christopher Lee, MD (n.)
Mark Lee, MD (2. DePuy Synthes, Zimmer; 3b. Synthes, Zimmer, Biomet; 5. Synthes, SpineSmith; 9. OTA, AO Trauma North America)
Michael J. Lee, MD (2. AOSpine; 3b. Stryker Spine, L&K Biomed)
Thay Q. Lee, PhD (3b. Conmed, DePuy, Corentec, Eleven Blade; 5. Arthrex, Corentec, Arthrocare, Acumed, Stryker, Tornier, U&I, BBraun, Cellcotec; 8. JSES; 9. ASES)
Philipp Leucht, MD (n.)
Valerae O. Lewis, MD (n.)
Ling Li, MPH (n.)
<b>Cynthia Lichtefeld (n.)</b>
Kate Liddle, BS (n.)
Richard L. Lieber, PhD (3b. Allergan, Inc.; 5. Allergan, Inc.; 6. Allergan, Inc.; 7. Lippincott Williams & Wilkins)
Nina Lightdale-Miric, MD (n.)
Patrick P. Lin, MD (n.)
Felix Liu, MA (n.)
<b>Liz Loeffler (n.)</b>
Nilsa I. Loyo-Berrios, PhD (n.)
Kali Luker, MD (n.)

Disclosures in bold indicate members of the WOA Program Committee and/or contributing staff.

John K. Lynch, PhD (n.)
Nancy M. Major, MD (n.)
Gregory Maletis, MD (n.)
Danica Marinac-Dabic, MD, PhD (n.)
Audrey Martin, Eng (n.)
Richard A. Marder, MD (n.)
Lynn M. Marshall (n.)
Julia Martha, MPH (n.)
Dean K. Matsuda, MD (1. Arthrocare, Smith & Nephew; 8. Arthroscopy, Orthopedics Today; 9. AAOS, Orthopaedics Overseas)
Joel L. Mayerson, MD (5. Millenium Pharmaceuticals; 8. Journal of Surgical Oncology)
Timothy R. McAdams, MD (n.)
David R. McAllister, MD (2. Conmed Linvatec/MTF; 3b. Conmed Linvatec/MTF; 3c. Smith & Nephew; 8. AJSM)
Mark McBride, MD (2. ArthroSurface)
John C. McConnell, MD (9. First Surgery Suites)
Mitchell McDowell, DO (n.)
Michelle H. McGarry, MS (3a. Alphatec Spine; 5. Alphatec Spine)
Vicente Meliton (n.)
Jared L. Michalson, MD (n.)
Lloyd S. Miller, MD, PhD (3b. Stemnion, Pfizer, GSK; 4. Stemnion; 5. Pfizer, Medtronic)
Janith K. Mills, MPAS, PA-C (n.)
Kyong S. Min, MD (n.)
Alexander Miric, MD (n.)
Faisal M. Mirza, MD, FRCSC, FAAOS, FAOSSM (n.)
Raffy Mirzayan, MD (7. Wolters Kluwers, Thieme)
Amirhossein Misaghi, MD (n.)
Lance K. Mitsunaga, MD (n.)
David G. Mohler, MD (n.)
Scott Montgomery, MD (n.)
<b>Bryan S. Moon, MD (n.)</b>
<b>Steven J. Morgan, MD, FACS (4. Johnson &amp; Johnson, Emerge Medical; 8. Journal of Orthopaedic Trauma)</b>
Donavan K. Murphy, MD (n.)
<b>Lauren Murphy (n.)</b>
David A. Muzykewicz, MD (n.)
Karen S. Myung, MD, PhD (n.)
Sigrid Nachtergaele (n.)
Jeffrey M. Nakano, MD (9. Colorado Orthopedic Society)
Robert S. Namba, MD (1. Innomed)
Ronald A. Navarro, MD (n.)
Elisha M. Nelson (n.)
Michael Nevitt, PhD, MPH (n.)
Jacqueline Nguyen, MD (n.)
Lowell T. Niebaum, MD (n.)
Steven Nishiyama, DO, PhD (n.)

Jared A. Niska, MD (n.)
Betsy M. Nolan, MD (n.)
Wesley M. Nottage, MD (4. Johnson & Johnson; 7. Arthrex, ConMed Linvatec, Smith & Nephew; 9. Surgery Center Board)
Frederick P. Oldenburg, MD (9. Maine State Orthopaedic Society)
Reza Omid, MD (8. JBJS-Am)
Doug T. Ota, MD, PhD (n.)
Ariel Palanca, MD (5. Covidien; 6. Covidien)
Nirav K. Pandya, MD (9. POSNA)
Farhad Parhami (3c. MAX BioPharma, Inc.; 4. MAX BioPharma, Inc.)
Neeta Parimi, MS (n.)
Min Jung Park, MD, MMSc (n.)
Amit Patel, MD (n.)
Jay Patel, MD (n.)
Andrew T. Pennock, MD (n.)
Frank A. Petrigliano, MD (n.)
Joseph Pirolo, MD (n.)
Debra J. Popejoy, MD (8. The Journal of Bone and Joint Surgery, Journal of the American Academy of Orthopedics)
Brian T. Ragel (n.)
Romela I. S. Ramos, BS (n.)
Ellen M. Raney, MD (9. AAP SoOR)
Allison J. Rao (n.)
Shashank Ravi, BS (n.)
Eric J. Rebich, BS (n.)
Lee M. Reichel, MD (n.)
John Reilly, MPH (n.)
Charles A. Reitman, MD (8. Clinical Orthopedics and Related Research; 9. NASS)
Tal Rencus, MD (n.)
Raveesh D. Richard, MD (n.)
Michael D. Ries, MD (1. Smith & Nephew; 3b. Smith & Nephew, Stryker; 4. OrthAlign; 8. Foundation for Advancement of Research in Medicine)
Rolando F. Roberto, MD (n.)
Carola Romero, PA-C (n.)
Milton L. Routt Jr., MD (n.)
Caitlin M. Rugg, MS, BA (n.)
Robert L. Satcher, MD (n.)
Andrew Schannen, MD (n.)
Thomas J. Scharschmidt, MD (8. Journal of Surgical Oncology)
Sandy Schwartz, MD (1. Zimmer; 3a. Zimmer; 4. Zimmer)
Ran Schwarzkopf, MD, MSc (n.)
Art Sedrakyan, MD, PhD (n.)
J. Anthony Seibert (n.)
Brian Sennett MD (n.)
Jonathan H. Shahbazian, BS (n.)
Behnam Sharareh, BS (n.)
Jeremy D. Shaw, MD (5. DePuy)

*Disclosures in bold indicate members of the WOA Program Committee and/or contributing staff.*

Matthew C. Shillito, MD (n.)
Anshuman Singh, MD (n.)
Avreetta Singh, BS (n.)
Mitell Sison-Williamson, MS (n.)
David L. Skaggs, MD (1. <i>Biomet, Medtronic</i> ; 2. <i>Biomet, Medtronic, Stryker, BeachBody LLC</i> ; 3b. <i>Biomet, Medtronic, BeachBody LLC</i> ; 5. <i>Medtronic</i> ; 6. <i>Biomet, Medtronic, Stryker, BeachBody LLC</i> ; 9. <i>Pediatric Orthopaedic Society of North America, Growing Spine Study Group, Scoliosis Research Society, Growing Spine Foundation</i> )
<b>Heather Skinner (n.)</b>
Patricia J. Skolnik (n.)
Robert R. Slater Jr., MD (1. <i>Folsom Surgery Center, Instrument Specialists, Inc.</i> ; 2. <i>Auxilium</i> ; 3c. <i>Instrument Specialists, Inc.</i> ; 4. <i>Zimmer, Inc., Pfizer, Inc.</i> ; 9. <i>Board of Councilors, American Academy of Orthopaedic Surgeons, WOA, American Society for Surgery of the Hand</i> )
Joel N. Smith, MD (n.)
Jordan L. Smith, MD (n.)
R. Lane Smith, PhD (n.)
Nimrod Snir, MD (n.)
Jeffrey F. Sodl, MD (n.)
Paul R. Stafford (n.)
Frank Stappenbeck (n.)
Heather A. Stone, MPH (n.)
Jason W. Stoneback, MD (n.)
Patrick St Pierre, MD (1. <i>DJO Surgical</i> ; 2. <i>DJO Surgical, DePuy Mitek</i> ; 3b. <i>DJO Surgical, DePuy Mitek</i> ; 3c. <i>Medshape</i> ; 4. <i>Medshape</i> ; 7. <i>Lippincott, Williams and Wilkens</i> ; 8. <i>Shoulder and Elbow</i> ; 9. <i>Desert Orthopedic Center</i> )
Paola A. Suarez, MPH (n.)
Michael Suk (3b. <i>Stryker, Synthes</i> ; 6. <i>Synthes</i> ; 8. <i>American Journal of Orthopedics, Military Medicine, Journal of Trauma Management and Outcomes</i> ; 9. <i>Orthopaedic Trauma Association, AO International</i> )
Pamela L. Sulzicki, MS, ATC (n.)
Tao Sun, MD (n.)
Britta L. Swanson, PhD (5. <i>Arthrex</i> ; 6. <i>Arthrex</i> )
Kyle E. Swanson, MD (5. <i>Arthrex</i> )
Stephan J. Sweet, MD, MPH (n.)
Alan K. Swenson (n.)
Stephanie Swensen, MD (n.)
<b>Payam Tabrizi, MD (n.)</b>
Lisa A. Taitsman, MD (2. <i>Smith &amp; Nephew</i> ; 8. <i>Journal of Orthopaedic Trauma, Geriatric Orthopaedic Surgery &amp; Rehabilitation</i> )
Connor J. Telles (n.)
Rodney D. Terrell, MD (n.)
Timothy F. Tirrell, BS (n.)
Fotios Tjounakaris, MD (n.)
Marko Tomov, BS (n.)
Bryan J. Tompkins, MD (n.)
Kevin L. Troyer, PhD (n.)
Lisa M. Truchan, MD (n.)

Bradford Tucker, MD (n.)
Aniebiet-Abasi Udofia, MD, MBA (n.)
James Van den Bogaerde, MD (n.)
C. Thomas Vangsness, MD (n.)
Shankar Vedantam (2. <i>Zimmer</i> )
John S. Vorhies, MD (n.)
Dean Wang, MD (n.)
Jeffrey C. Wang, MD (1. <i>Biomet, Seaspine, Medtronics, Stryker, Synthes, Alphatech, Osprey, Amedica</i> ; 4. <i>Bone Biologics, Axiomed, Amedica, Corespine, Expanding Ortho, Pioneer, Axis, Syndicom, VG Innovations, Pearldriller, Flexuspine, Axis, Fziomed, Benvenue, Promethean, Nexgen, Electrocore, Surgitech</i> ; 8. <i>Global Spine Journal, Evidence Based Spine Surgery, JAAOS, Spine, The Spine Journal, The Journal of Spinal Disorders and Techniques</i> ; 9. <i>NASS, Cervical Spine Research Society, AO Spine</i> )
Lawrence Wang, MPH (n.)
Tim Wang, MD (n.)
Tibor T. Warganich, MD (n.)
Andrew Wassef, MD (n.)
Mitchell Weksler, MS II (n.)
Augustus A. White III, MD, PhD (3a. <i>Zimmer</i> ; 4. <i>Zimmer</i> ; 6. <i>Zimmer</i> )
James C. Widmaier (2. <i>Synthes</i> )
Laura Wiegand, MD (n.)
Arsani William, BSc (n.)
Barton L. Wise, MD (n.)
Theodore S. Wolfson, MD (n.)
Philip R. Wolinsky, MD (2. <i>Zimmer</i> ; 3b. <i>Biomet</i> ; 5. <i>AO North America</i> ; 8. <i>J Ortho Trauma</i> )
Anthony H. Woodward, MD (n.)
Adam N. Wooldridge, MD, MPH (n.)
Hao-Hua Wu, BS (n.)
Ronald Wyatt, MD (n.)
Arthur Yang (n.)
Jeffrey Yao, MD (n.)
Michael G. Yerosian, MD (n.)
Edward Yian, MD (n.)
Brad Yoo, MD (n.)
Jung U. Yoo (1. <i>Osiris Therapeutics</i> )
Jeffrey L. Young, MD (n.)
Benjamin Zellner, MD (n.)
Natalie L. Zusman (n.)

Disclosures in bold indicate members of the WOA Program Committee and/or contributing staff.

---

## *Accreditation Information for the Scientific Program*

---

### **PROGRAM COMMITTEE**

The Western Orthopaedic Association gratefully acknowledges these orthopaedic surgeons for their contribution to the development of the scientific program:

Steven J. Morgan, MD, FACS, *Program Chair*

Melvyn A. Harrington, MD

Brian A. Jewett, MD

Payam Tabrizi, MD

Bryan S. Moon, MD

### **MISSION**

The Western Orthopaedic Association (WOA) is a physician organization composed of orthopaedic surgeons in practice in the western region of the United States. Its mission is to help ensure that people in the western region of the United States receive high quality ethical care by providing orthopaedists with educational programs, opportunities to foster collegiality and ways to influence health policy.

### **PURPOSE**

Exchange of scientific information is vital to continuing professional development; therefore the Program Committee of the WOA has selected multiple research papers and invited nationally respected speakers to present practice-related techniques and findings in orthopaedic surgery that cover a variety of topics in all orthopaedic specialty areas.

### **WOA OBJECTIVES**

Educational objectives in Basic Science, Pediatrics, Total Joint Arthroplasty, Foot and Ankle, Spine, Trauma, Infection, Sports Medicine, Tumors, and Upper Extremity areas will be addressed through a combination of general scientific sessions and symposia offering discussions, guest lectures and paper presentations. After reviewing the needs assessment and the 2012 program evaluation, the program committee of the WOA has created a program for 2013 that will afford orthopaedic physicians the opportunity to:

- Discuss the current trends in total hip arthroplasty;
- Discuss the current trends in total knee arthroplasty;
- Compare and contrast the delivery of orthopaedic care to pediatric patients in the south pacific to the treatment of pediatric orthopaedic conditions in North America;

- Recognize and discuss common orthopaedic pediatric conditions and the available surgical and non-surgical management of these conditions;
- Describe and employ in your practice tips and tricks for common orthopaedic traumatic conditions that make fracture reduction and fixation easier for the general orthopaedist;
- Understand the importance of generating an orthopaedic culture that embraces techniques and tactics that promote patient safety and improve patient outcomes;
- Discuss current trends in the reconstruction of common adult shoulder conditions;
- To exchange ideas between the presenters, the faculty and the participants through paper presentations, instructional courses, guest lectureships, symposia, multimedia educational sessions, case presentations and poster exhibits;
- To discuss the issues surrounding healthcare disparities, how subconscious stereotyping influences doctor patient interactions, diagnosis, treatment, and ideas for exploring the implications for improving healthcare in a diverse twenty-first century America;
- To explore challenges and stimulate participation in developing processes to improve healthcare in areas of underserved orthopaedic care.

### **SCIENTIFIC POSTER PRESENTATIONS**

Scientific Posters are an important feature of the WOA Annual Meeting. Posters will be on display along with their presenters each day of the Scientific Program. Poster Presenters will also be available to answer questions before and after the Scientific Program on Thursday, Friday, and Saturday, August 1-3. Please plan to visit the Scientific Posters.

### **MULTIMEDIA EDUCATION**

Multimedia education materials will be offered on Thursday, Friday, and Saturday, August 1-3. A comprehensive selection of AAOS DVDs will be available for your individual education.

### **CME ACCREDITATION**

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation

Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons and the Western Orthopaedic Association. The American Academy of Orthopaedic Surgeons is accredited by the ACCME to sponsor continuing medical education for physicians.

The American Academy of Orthopaedic Surgeons designates this live activity for a maximum of 25.75 *AMA PRA Category I Credits*<sup>™</sup>. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

- \* 18.25 CME credits for Scientific Program
- \* 4.5 CME credits for Scientific Poster Sessions
- \* 3 CME credits for Multimedia Education Sessions

***To ensure correct CME credit is awarded, please complete the form in the back of this program, indicating the Sessions you attended or go online to [www.woa-assn.org](http://www.woa-assn.org) to complete the WOA 2013 Annual Meeting CME Credit Records. CME Certificates will be awarded to all registered participants.***

## CEC CREDIT

Physicians Assistants can receive up to 25.75 credit hours toward Continuing Education Credits. AAPA accepts American Medical Association Category I, Level 1 CME credit for the Physician's Recognition Award from organizations accredited by the ACCME.

## CME NOTE

To receive CME credit, you are required to turn in your completed CME Record Form at the end of your participation in the Sessions; otherwise your CME credits cannot be certified. **(CME Credit Record, Needs Assessment, and Course Evaluation Forms are in the back of this program.)**

Attendees are requested to complete a course evaluation for use in developing future WOA Annual Meeting Scientific Programs and to meet the unique educational requirements of orthopaedic surgeons.

This program design is based on participants' responses from the last Annual Meeting and expressed educational goals of the WOA. This program is designed specifically for the educational needs of the practicing orthopaedist. Others in the medical profession (such as Physician Assistants) or with an interest in orthopaedics will benefit from the program.

## DISCLAIMER

The material presented at the WOA Annual Meeting has been made available by the Western Orthopaedic Association for educational purposes only. This material is not intended to represent the only, nor necessarily best, method or procedure

appropriate for the medical situations discussed, but rather is intended to present an approach, view, statement, or opinion of the faculty which may be helpful to others who face similar situations.

The WOA disclaims any and all liability for injury or other damages resulting to any individuals attending a session for all claims, which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by a physician or any other person.

No reproductions of any kind may be made of the presentations at the WOA Annual Meeting. The WOA reserves all of its rights to such material, and commercial reproduction is specifically prohibited.

## FDA STATEMENT

Some pharmaceuticals or medical devices demonstrated at the WOA Annual Meeting have not been cleared by the FDA or have been cleared by the FDA for specific purposes only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of the pharmaceutical or medical device he or she wishes to use in clinical practice.

Academy policy provides that "off label" uses of a pharmaceutical or medical device may be described in the Academy's CME activities so long as the "off label" use of the pharmaceutical or medical device is also specifically disclosed (*i.e.*, it must be disclosed that the FDA has not cleared the pharmaceutical or medical device for the described purpose). Any pharmaceutical or medical device is being used "off label" if the described use is not set forth on the product's approval label.

---

## 2013 Scientific Program

---

**Thursday, August 1, 2013**

*(Presenters and times are subject to change)*  
Disclosure Information listed on pages 33-37.

6:00 am–6:30 am **Scientific Poster Session** (Poster Presenters Available)  
*(Grand Sierra Ballroom Pre-Function Area)*

### General Session 1 — Case Presentations Review

**Moderator:** Jason W. Stoneback, MD

6:30 am–7:00 am Salvage of Failed Proximal Femur Fracture Fixation

7:00 am–7:10 am **First Business Meeting**

7:10 am–7:15 am **Welcome**  
*Steven J. Morgan, MD, FACS, Program Chair*  
*Ellen M. Raney, MD, President*

### Symposium 1 — Patient Safety

**Symposium Chair:** Theodore J. Clark, MD

7:15 am–7:30 am Tools to Ensure a Safe Patient Outcome  
*Jeffrey M. Nakano, MD, Grand Junction, CO*

7:30 am–7:45 am The Patient Perspective  
*Patricia J. Skolnik, Executive Director, Citizens for Patient Safety*

7:45 am–8:00 am Rescuing Failed Prior Therapy  
*Cynthia M. Kelly, MD, Denver Clinic, Denver, CO*

8:00 am–8:15 am Judgment  
*Michael R. Dayton, MD, Denver, CO*

8:15 am–8:30 am Discussion

8:30 am–8:50 am **Break — Please visit exhibitors and posters**

### Concurrent Session 2 — Sports (*Alpine Ballroom*)

**Moderator:** James Van den Bogaerde, MD

8:50 am–8:56 am Outpatient UKA — Is It Safe?  
*Mark McBride, MD, Sharp Rees-Stealy Medical Group, San Diego, CA*

8:56 am–9:02 am Long Term Outcome of All Arthroscopic Revision Rotator Cuff Repair  
*Jason Jancosko, DO, MPT, The Sports Clinic Orthopedic Medical Associates, Inc., Laguna Hills, CA*  
*\*Presented by Wesley M. Nottage, MD*

### Concurrent Session 3 — Pediatric (*Emigrant Peak*)

**Moderator:** Debra J. Popejoy, MD

8:50 am–8:56 am Proximal Junctional Kyphosis Occurs in More than Half of Distraction Based Growing Rods  
*Christopher Lee, MD, Children's Hospital Los Angeles, Los Angeles, CA*

8:56 am–9:02 am Silent Compartment Syndrome in Children  
*Nina Lightdale-Miric, MD, Children's Hospital Los Angeles/USC Keck School of Medicine, Los Angeles, CA*

*(Location listed by an author's name indicates the institution where the research took place.)*

# Thursday, August 1, 2013

(Presenters and times are subject to change)  
Disclosure Information listed on pages 33-37.

## Concurrent Session 2 continued

- 9:02 am–9:08 am Effects of Prior Knee Surgery on Participation, Injury, and Intervention in NCAA Collegiate Athletes  
*Caitlin M. Rugg, MS, BA, David Geffen School of Medicine at UCLA, Los Angeles, CA*
- 9:08 am–9:14 am Arthroscopic Surgery for Global Versus Focal Femoroacetabular Impingement: Are the Outcomes Different?  
*Dean K. Matsuda, MD, Kaiser West Los Angeles, Los Angeles, CA*  
*\*Presented by Nikhil Gupta, BS*
- 9:14 am–9:20 am Increased Concentration of White Blood Cells in PRP Weakens Rotator Cuff Tendons When Used for PASTA Repairs  
*Alan M. Hirahara, MD, FRCSC, Sacramento, CA*
- 9:20 am–9:26 am The Costs of Preoperative Evaluation of Rotator Cuff Tears Prior to Surgical Repair  
*Frank A. Petrigliano, MD, David Geffen School of Medicine at UCLA, Los Angeles, CA*  
*\*Presented by Michael G. Yerasian, MD*
- 9:26 am–9:32 am Factors Associated with Meniscus Repair in Patients Undergoing Anterior Cruciate Ligament Reconstruction  
*Kate Liddle, BS, Kaiser Permanente, Walnut Creek, CA*
- 9:32 am–9:38 am Operative Findings in Patients Undergoing Primary and Then Revision Anterior Cruciate Ligament Reconstruction  
*Ronald Wyatt, MD, Kaiser Permanente, Walnut Creek, CA*
- 9:38 am–9:44 am Marcus Stewart's Test as an Alternative to Pivot-Shift Testing for Partial ACL Injuries; Case Report: Injury During Pivot Shift Testing  
*John C. McConnell, MD, McConnell Orthopedic Clinic, Greenville, TX*

## Concurrent Session 3 continued

- 9:02 am–9:08 am Assessment of Pediatric Fracture Information in Pediatric and Emergency Medicine Textbooks and Online Resources  
*Kali Luker, MD, Stanford University, Palo Alto, CA/University of California San Francisco, San Francisco, CA/University of California Davis, Sacramento, CA*
- 9:08 am–9:14 am Height Gain in Surgically Treated Adolescent Idiopathic Scoliosis  
*Meghan Imrie, MD, Lucile Packard Children's Hospital at Stanford, Palo Alto, CA*
- 9:14 am–9:20 am Control of Walking Speed in Children with Cerebral Palsy  
*Suzy Chen, BS, Shriners Hospitals for Children, Sacramento, CA*
- 9:20 am–9:26 am Some Connectors in Distraction-Based Growing Rods Fail More than Others  
*Christopher Lee, MD, Children's Hospital Los Angeles, Los Angeles, CA*
- 9:26 am–9:32 am Risk Factors for Avascular Necrosis After Closed Reduction for DDH  
*Christopher Lee, MD, Children's Hospital Los Angeles, Los Angeles, CA*
- 9:32 am–9:38 am Effectiveness of MRSA Nasal Screening in Pediatric Orthopaedic Surgery  
*Kyong Min, MD, Shriners Hospitals for Children, Spokane, WA*

(Location listed by an author's name indicates the institution where the research took place.)

## Thursday, August 1, 2013

(Presenters and times are subject to change)  
Disclosure Information listed on pages 33-37.

### Concurrent Session 2 continued

9:44 am–10:00 am **Discussion**

### Concurrent Session 3 continued

9:38 am–9:44 am Obesity in Children with Brachial Plexus Birth Palsy  
*Avreet Singh, BS, Shriners Hospital for Children Northern California, Sacramento, CA/Texas Scottish Rite Hospital for Children, Dallas, TX*

9:44 am–10:00 am **Discussion**

### Symposium 2 — Sports Knee: Revision of Failed ACL Surgery

**Symposium Chair:** Richard A. Marder, MD

10:00 am–10:15 am Revision ACL Reconstruction — Causes of Failure and Diagnostic Work Up  
*Cassandra Lee, MD, University of California Davis Medical Center, Sacramento, CA*

10:15 am–10:30 am Pre-Operative Considerations in ACL Revision Surgery  
*James Van den Bogaerde, MD, University of California Davis Medical Center, Sacramento, CA*

10:30 am–10:45 am Revision ACL Reconstruction: Evaluation and Single-Stage Options  
*Timothy R. McAdams, MD, Stanford University, Stanford, CA*

10:45 am–11:00 am Revision ACL — The Two-Stage Approach  
*Stephen M. Howell, MD, Sacramento, CA*

11:00 am–11:15 am **Discussion**

11:15 am–11:35 am **Break** — Please visit exhibitors and posters

### General Session 4 — BOC Report and Presidential Guest Speaker

**Moderator:** Ellen M. Raney, MD

11:35 am–11:40 am **BOC Report**  
*Robert R. Slater Jr., MD, Folsom, CA*

11:40 am–12:15 pm **Presidential Guest Speaker**  
What Dr. Martin Luther King Jr. Would Want Us to Know About Health Care Disparities  
*Augustus A. White III, MD, PhD, Harvard Medical School, Cambridge, MA*

12:15 pm–1:15 pm **Industry Sponsored Workshop Luncheon**  
*Cadence Pharmaceuticals Inc. and ConvaTec (Not for CME credit)*

## Thursday, August 1, 2013

(Presenters and times are subject to change)  
Disclosure Information listed on pages 33-37.

### Concurrent Session 5 — Foot and Ankle & Upper Extremity (Alpine Ballroom)

**Moderators:** Andrea S. Bauer, MD  
Kim L. Furry, MD

- 1:15 pm–1:21 pm Immediate Weightbearing After Ankle Fracture Fixation  
*Reza Firoozabadi, MD, MA, Harborview Medical Center, University of Washington, Seattle, WA*
- 1:21 pm–1:27 pm Operative Versus Non-Operative Treatment of Jones Fractures: A Decision Analysis Model  
*Julius A. Bishop, MD, Stanford University, Palo Alto, CA*
- 1:27 pm–1:33 pm Incidence of Failure of Continuous Peripheral Nerve Catheters for Post-Operative Analgesia in Orthopaedic Surgery  
*Zahab Ahsan, MS, Stanford University Medical Center, Stanford, CA*
- 1:33 pm–1:39 pm Incidence of Dorsal Wrist Ganglia Recurrence After Arthroscopic Excision with Color-Aided Visualization  
*Zahab Ahsan, MS, Stanford University Medical Center, Stanford, CA*
- 1:39 pm–1:45 pm Does Shoulder Arthroplasty Increase Risk for Post-Operative Symptomatic Compressive Neuropathies of the Upper Extremity?  
*Edward Yian, MD, Kaiser Permanente Orange County, Anaheim, CA*
- 1:45 pm–1:51 pm The Role of CT Scans in Intra-Articular Distal Humerus Fractures  
*Eric Ferkel, MD, University of Southern California, Los Angeles, CA*  
*\*Presented by Aniebiet-Abasi Udofia, MD, MBA*

### Concurrent Session 6 — General Topics (Emigrant Peak)

**Moderator:** Jason W. Stoneback, MD

- 1:15 pm–1:21 pm Level of Billing as a Function of Resident Documentation and Orthopaedic Subspecialty at an Academic Multispecialty Orthopaedic Surgery Practice  
*Bobby Dezfuli, MD, University of Arizona Medical Center, Tucson, AZ*
- 1:21 pm–1:27 pm Case Report: Interscalene Brachial Plexus Catheter Migration as Cause of Postoperative Phrenic Nerve Palsy  
*Seth H. Criner, DO, Good Samaritan Regional Medical Center, Corvallis, OR*
- 1:27 pm–1:33 pm Effectiveness of Telemedicine Follow-Up Care Among Total Joint Replacement Patients  
*Behnam Sharareh, BS, University of California Irvine, Orange, CA*
- 1:33 pm–1:39 pm An Additional Financial Burden on the Orthopaedic Trauma Surgery Service at a Level I Trauma Center: When Our County Will Longer Pay for Services Rendered  
*Derek F. Amanatullah, MD, PhD, University of California Davis Medical Center, Sacramento, CA*  
*\*Presented by David A. Forsh, MD*
- 1:39 pm–1:45 pm Pilot Project: Euflexxa with Platelet Rich Plasma Intra-Articular Knee Injection  
*Ronald W. Hillock, MD, Nevada Orthopedic and Spine, Las Vegas, NV*
- 1:45 pm–1:51 pm Mobile Device Trends in Orthopaedic Surgery: Current Obstacles and Future Implications  
*Orrin I. Franko, MD, University of California San Diego, San Diego, CA*

## Thursday, August 1, 2013

*(Presenters and times are subject to change)*  
Disclosure Information listed on pages 33-37.

### Concurrent Session 5 continued

1:51 pm–1:57 pm Distal Radius Fracture Hematoma Block with Combined Lidocaine and Bupivacaine Can Induce Seizures While Within Therapeutic Window: A Case Report  
*Bobby Dezfuli, MD, University of Arizona Medical Center, Tucson, AZ*

1:57 pm–2:15 pm **Discussion**

### Concurrent Session 6 continued

1:51 pm–1:57 pm The Use of Functional Outcome Instruments in Articles Published in the Journal of Bone and Joint Surgery (American Volume) Over a Ten-Year Period  
*Raveesh D. Richard, MD, Geisinger Health System, Danville, PA*

1:57 pm–2:15 pm **Discussion**

---

2:15 pm–3:15 pm **Scientific Poster Session** (Poster Presenters Available)  
*(Grand Sierra Ballroom Pre-Function Area)*

3:15 pm–4:15 pm **Multimedia Education Session** *(Grand Sierra Ballroom Pre-Function Area)*

4:15 pm–5:00 pm **SAE Review — Sports Knee**  
*Richard A. Marder, MD, University of California Davis, Sacramento, CA*

*(Location listed by an author's name indicates the institution where the research took place.)*

## Friday, August 2, 2013

(Presenters and times are subject to change.)  
Disclosure Information listed on pages 33-37.

6:00 am–6:30 am **Scientific Poster Session** (Poster Presenters Available)  
(Grand Sierra Ballroom Pre-Function Area)

### General Session 7 — Case Presentations Review

**Moderator:** Ran Schwarzkopf, MD, MSc

6:30 am–7:00 am Total Joints

### Symposium 3 — Trauma: Common Fracture Tips and Tricks

**Symposium Chair:** Lisa A. Taitsman, MD

7:00 am–7:15 am Femoral Neck Fractures in the Elderly  
*Steven J. Morgan, MD, FACS, MOTUS, Englewood, CO*

7:15 am–7:30 am Ankle Fracture Controversies  
*Brad Yoo, MD, University of California Davis Medical Center, Sacramento, CA*

7:30 am–7:45 am Proximal Humerus Fracture Challenges  
*Sandy Schwartz, MD, University of California San Diego, San Diego, CA*

7:45 am–8:00 am Extreme Nailing  
*Mark Lee, MD, University of California Davis Medical Center, Sacramento, CA*

8:00 am–8:15 am **Discussion**

8:15 am–8:35 am **Break — Please visit exhibitors and posters**

### Concurrent Session 8 — Total Joints (Alpine Ballroom)

**Moderators:** Jared L. Michalson, MD  
Ran Schwarzkopf, MD, MSc

8:35 am–8:41 am Simultaneous Bilateral Direct Anterior Total Hip Arthroplasty  
*Joseph Gondusky, MD, Hoag Orthopedic Institute, Irvine, CA*  
\*Presented by *Steven L. Barnett, MD*

8:41 am–8:47 am Outcomes of Total Joint Arthroplasty in Human-Immunodeficiency Virus-Positive Patients  
*Ran Schwarzkopf, MD, MSc, Assistant Clinical Professor, University of California, NYU Hospital for Joint Diseases, New York, NY*

8:47 am–8:53 am The Effect of Chronic Renal Disease on Primary Total Hip Arthroplasty: An Evaluation of Perioperative Morbidity and Implant Longevity  
*Alexander Miric, MD, Southern California Permanente Medical Group, Los Angeles, CA*

### Concurrent Session 9 — Trauma (Emigrant Peak)

**Moderator:** Payam Tabrizi, MD

8:35 am–8:41 am Operative Versus Non-Operative Treatment of Femoral Fractures in Spinal Cord Injury Patients  
*Julius A. Bishop, MD, Stanford University, Palo Alto, CA*

8:41 am–8:47 am Hemiarthroplasty for Undisplaced and Stable Femoral Neck Fractures  
*Raveesh D. Richard, MD, Geisinger Health System, Danville, PA*

8:47 am–8:53 am A Comparison of Sural vs. Perforator Fasciocutaneous Flaps for Coverage of Distal Medial Leg and Ankle Wounds  
*Andrew Schannen, MD, University of Arizona, Tucson, AZ*

8:53 am–8:59 am Anterolateral Versus Medial Plating of Extra-Articular Distal Tibia Fractures: A Biomechanical Model  
*Joseph Pirolo, MD, Stanford University Medical Center, Palo Alto, CA*

(Location listed by an author's name indicates the institution where the research took place.)

## Friday, August 2, 2013

(Presenters and times are subject to change.)  
Disclosure Information listed on pages 33-37.

### Concurrent Session 8 continued

- 8:53 am–8:59 am Is the Function of Kinematically-Aligned TKA Better than Mechanically-Aligned TKA?  
*H. Gene Dossett, MD, MBA, Phoenix VA Health Care System, Phoenix, AZ*
- 8:59 am–9:05 am Arthroscopic Lysis of Adhesions for Stiff Total Knee Replacement: Does It Work?  
*Ran Schwarzkopf, MD, MSc, Assistant Clinical Professor, University of California, Brigham and Womens Hospital, Boston, MA*
- 9:05 am–9:11 am Implementation of a Clinical Process Model in Patients with Total Knee Replacement Improves Clinical Efficiency and Inpatient Cost  
*David S. Jevsevar, MD, MBA, Dixie Regional Medical Center, St. George, UT*
- 9:11 am–9:17 am Direct Anterior Total Hip Arthroplasty: A Learning Curve Study  
*Jay Patel, MD, Orthopaedic Specialty Institute, Orange, CA*  
*\*Presented by Steven L. Barnett, MD*
- 9:17 am–9:30 am **Discussion**
- 9:30 am–9:50 am **Break — Please visit exhibitors and posters**

### Concurrent Session 9 continued

- 8:59 am–9:05 am Biomechanical Evaluation of Plate vs. Lag Screw Only Fixation of Distal Fibula Fractures  
*Amirhossein Misaghi, MD, Rady Children's Hospital, San Diego, CA*
- 9:05 am–9:11 am The Effects of Elevation, Simulated Injury, and Immobilization on Muscle Perfusion  
*Ariel Palanca, MD, Stanford Hospital and Clinics, Stanford, CA*
- 9:11 am–9:17 am Internal Fixation in a Combat Theater Hospital  
*Thomas M. Large, MD, Harborview Medical Center, University of Washington, Seattle, WA*  
*\* Presented by Cale W. Bonds, MD*
- 9:17 am–9:23 am Tibial Plateau Fractures in Alpine Skiing  
*Joel N. Smith, MD, Barton Lake Tahoe Sports Medicine Fellowship, Zephyr Cove, NV*  
*\*Presented by Kyle E. Swanson, MD*
- 9:23 am–9:30 am **Discussion**
- 9:30 am–9:50 am **Break — Please visit exhibitors and posters**

### General Session 10 — AAOS Report and Howard Steel Lecture

**Moderator:** Ellen M. Raney, MD

- 9:50 am–10:05 am **AAOS Report**  
*Joshua J. Jacobs, MD, President, American Academy of Orthopaedic Surgeons*  
*Rush University Medical Center, Chicago, IL*
- 10:05 am–10:45 am **Howard Steel Lecture**  
The Hidden Brain  
*Shankar Vedantam, Washington, DC*

### Symposium 4 — Hip Arthroplasty

**Symposium Chair:** Michael R. Dayton, MD

- 10:45 am–11:00 am Update on the Use of Metal on Metal in Hip Arthroplasty: Wear, Survivability, and Adverse Reaction?  
*Harlan Amstutz, MD, Los Angeles, CA*
- 11:00 am–11:15 am The Young Active Patient with Degenerative Hip Disease: What Are the Best Bearing Surfaces?  
*Craig A. Hogan, MD, Denver, CO*

(Location listed by an author's name indicates the institution where the research took place.)

## Friday, August 2, 2013

(Presenters and times are subject to change.)

Disclosure Information listed on pages 33-37.

- |  |   |
|--|---|
| <p>11:15 am–11:30 am Viability of Current Highly Cross Linked UHMWPE Liners in Total Hip Arthroplasty: A Concern?<br/><i>Michael D. Ries, MD, San Francisco, CA</i></p> <p>11:30 am–11:45 am Evaluation of the Young Hip at Risk: Save the Hip!<br/><i>Michael R. Dayton, MD, Denver, CO</i></p> | <p>11:45 am–12:00 pm Case Presentation and Panel Discussion</p> <p>12:00 pm–1:00 pm <b>Industry Sponsored Workshop Luncheon</b><br/><i>CeramTec Medical Products</i><br/>(Not for CME credit)</p> |
|--|---|

### Concurrent Session 11 — Tumor/Basic Science (*Alpine Ballroom*)

**Moderator:** Cynthia M. Kelly, MD

- 1:00 pm–1:06 pm Non-Invasive Expandable Endoprostheses Used for Limb Salvage of Lower Extremity Malignant Bone Tumors in Skeletally Immature Patients  
*George T. Calvert, MD, City of Hope National Medical Center, Duarte, CA*  
\*Presented by J. Dominic Femino
- 1:06 pm–1:12 pm Total Humerus Endoprosthetic Replacement Following Resection of Malignant Bone Tumors  
*Suhel Kotwal, MD, MD Anderson Cancer Center, Houston, TX*  
\*Presented by Bryan S. Moon, MD
- 1:12 pm–1:18 pm Ifosfamide Therapy for Dedifferentiated Chondrosarcoma  
*Satoshi Kawaguchi, MD, MD Anderson Cancer Center, Houston, TX*
- 1:18 pm–1:24 pm Prognosticators of Local Recurrence in High-Grade Soft Tissue Sarcomas: Hydrogen Peroxide as a Local Adjuvant  
*Adam N. Wooldridge, MD, MPH, Ohio State University Wexner Medical Center, Columbus, OH*  
\*Presented by Gregory P. Kolovich, MD, MPH
- 1:24 pm–1:30 pm A Comparison of Insertional Torque and Pullout Strength between Cortical and Cancellous Screws  
*Julius A. Bishop, MD, Stanford University, Palo Alto, CA*

### Concurrent Session 12 — Spine (*Emigrant Peak*)

**Moderator:** Justin Bird, MD

- 1:00 pm–1:06 pm Orthopaedic Patients Admitted Through the Emergency Room Are Less Satisfied with Physician Performance than Those Admitted Through Other Pathways  
*John S. Vorhies, MD, Stanford University Medical Center, Stanford, CA*
- 1:06 pm–1:12 pm Patient and Surgeon Radiation Exposure Varies Widely in Orthopaedic Spine Surgery: Fluoroscopy, Radiography and Intra-Operative CT  
*Eric Klineberg, MD, University of California Davis, Sacramento, CA*  
\*Presented by Elisha M. Nelson
- 1:12 pm–1:18 pm A Biomechanical Comparison of Shape Design and Positioning of Transforaminal Lumbar Interbody Fusion Cages  
*Garet Comer, MD, Stanford University Medical Center, Redwood City, CA*
- 1:18 pm–1:24 pm Changes in Foraminal Geometry with Anterior Decompression Versus Keyhole Foraminotomy in the Cervical Spine: A Biomechanical Investigation  
*Jacqueline Nguyen, MD, St. Mary's Medical Center, San Francisco, CA*
- 1:24 pm–1:30 pm Hypotension as a Risk Factor for PTSD Symptoms  
*Liska Havel, BA, Oregon Health & Science University, Portland, OR*

(Location listed by an author's name indicates the institution where the research took place.)

## Friday, August 2, 2013

(Presenters and times are subject to change.)  
Disclosure Information listed on pages 33-37.

### Concurrent Session 11 continued

- 1:30 pm–1:36 pm Hypovitaminosis D in an Urban, Diverse Trauma Population  
*Benjamin Zellner, MD, Baylor College of Medicine, Houston, TX*
- 1:36 pm–1:42 pm Quantification of the Roles of JNK, p70 and p38 in Skeletal Muscle Mechanotransduction in Response to Passive Stretch  
*Orrin I. Franko, MD, University of California San Diego, San Diego, CA*
- 1:42 pm–1:48 pm Interobserver Reliability in the Measurement of Lower Leg Compartment Pressures  
*Thomas M. Large, MD, Harborview Medical Center, University of Washington, Seattle, WA*  
*\*Presented by Daniel J. Holtzman, MD*
- 1:48 pm–2:00 pm **Discussion**

### Concurrent Session 12 continued

- 1:30 pm–1:36 pm Microbiology of Surgical Site Infection Occurring in a Complex Spinal Surgery Practice  
*Rolando F. Roberto, MD, University of California Davis, Sacramento, CA*
- 1:36 pm–1:42 pm Are Systematic Reviews Useful for Practitioners  
*Anthony H. Woodward, MD, Portland, OR*
- 1:42 pm–1:48 pm Pulmonary Function Testing and Risk of Perioperative Pulmonary Complications in Patients with Cervical Myelopathy and Myelomalacia  
*Jeremy D. Shaw, MD, New England Baptist Hospital, Boston, MA*
- 1:48 pm–2:00 pm **Discussion**

- 2:00 pm–3:00 pm **Scientific Poster Session**  
(Poster Presenters Available)  
(Grand Sierra Ballroom Pre-Function Area)
- 3:00 pm–4:00 pm **Multimedia Education Session**  
(Grand Sierra Ballroom Pre-Function Area)
- 4:00 pm–5:00 pm **SAE Review — Trauma & Total Hip**  
*Michael R. Dayton, MD, UC Denver, Denver, CO*  
*Lisa A. Taitsman MD, Harborview Medical Center, University of Washington, Seattle, WA*

(Location listed by an author's name indicates the institution where the research took place.)

## Saturday, August 3, 2013

(Presenters and times are subject to change.)

Disclosure Information listed on pages 33-37.

6:00 am–6:30 am **Scientific Poster Session**  
(Poster Presenters Available)  
(Grand Sierra Ballroom Pre-Function Area)

Hedgehog Signaling and Osteogenesis Through Smoothed Binding  
*Scott Montgomery, MD, University of California Los Angeles, Los Angeles, CA*

### General Session 13 — Case Presentations Review

**Moderator:** Steven J. Morgan, MD, FACS

6:30 am–7:00 am Pediatric & Trauma

7:00 am–7:15 am **Second Business Meeting**

### Symposium 5 — Sports Shoulder Rotator Cuff

**Symposium Chair:** Raffy Mirzayan, MD

7:15 am–7:35 am Single vs. Double Row Rotator Cuff Repair. When and Why? When to use Slides and Releases for Complex Tears  
*Patrick St Pierre, MD, Palm Springs, CA*

7:35 am–7:55 am Arthroscopic Revision Rotator Cuff Repair  
*Wesley M. Nottage, MD, Laguna Hills, CA*

7:55 am–8:15 am Salvage Procedures for Irreparable Cuff Tears  
*John M. Itamura, MD, Los Angeles, CA*

8:15 am–8:30 am **Discussion**

8:30 am–8:55 am **Break — Please visit exhibitors and posters**

### General Session 14 — Resident Awards

**Moderator:** Steven J. Morgan, MD, FACS

8:55 am–9:03 am Tigecycline and Rifampin Combination Therapy Have Increased Efficacy Against an Experimental Staphylococcus Aureus Prosthetic Joint Infection  
*Jared A. Niska, MD, University of California Los Angeles, Los Angeles, CA*

9:03 am–9:11 am A Novel Osteogenic Oxysterol Compound for Therapeutic Development to Promote Bone Growth: Activation of

9:11 am–9:19 am Biomechanical Demands on Posterior Fusion Instrumentation During Lordosis Restoration Procedure  
*Calvin C. Kuo, MD, The Taylor Collaboration St. Mary's Medical Center, San Francisco, CA*

9:19 am–9:27 am Spinal Epidural Abscesses: Risk Factors, Medical vs Surgical Management, A Retrospective Review of 128 Cases  
*Timothy B. Alton, MD, Harborview Medical Center, University of Washington, Seattle, WA*

9:27 am–9:35 am What Is the Impact of Age on Reoperation Rates for Femoral Neck Fractures Treated with Closed Reduction Percutaneous Pinning and Hemiarthroplasty?  
*Joshua S. Griffin, MD, Scott and White Memorial Hospital, Temple, TX*  
*\*Presented by Donovan K. Murphy, MD*

9:35 am–9:43 am Functional Significance of Distal Brachioradialis Tendon Release: A Biomechanical Study  
*Orrin I. Franko, MD, University of California San Diego, San Diego, CA*

9:43 am–9:51 am Comparison of Cup Position and Limb Length in Primary THAs Performed Through the Anterior Supine and Posterolateral Approaches  
*Philipp Leucht, MD, Stanford University Medical School, Stanford, CA*

9:51 am–10:00 am **Discussion**

### General Session 15 — OREF and Presidential Address

**Moderator:** Steven J. Morgan, MD, FACS

10:00 am–10:05 am **OREF Update**  
*Ramon L. Jimenez, MD, Monterey, CA*

(Location listed by an author's name indicates the institution where the research took place.)

## Saturday, August 3, 2013

(Presenters and times are subject to change.)  
Disclosure Information listed on pages 33-37.

10:05 am–10:45 am **Presidential Address**  
Pediatric Orthopaedic Care in the South  
Pacific: Challenges and Triumphs  
*Ellen M. Raney, MD, Shriners Hospitals  
for Children, Portland, OR*

10:45 am–11:00 am **Refreshment Break**

### Symposium 6 — Pediatric Pearls for the General Orthopaedist

**Symposium Chair:** Meghan Imrie, MD

11:00 am–11:15 am Pediatric Forearm Fractures  
*Jeffrey L. Young, MD, Stanford  
University, Stanford, CA*

11:15 am–11:30 am Supracondylar Humerus Fractures  
*Abigail Allen, MD, Mt. Cedars-Sinai  
Medical Center, Los Angeles, CA*

11:30 am–11:45 am Medial Epicondylar Fractures  
*Eric W. Edmonds, MD, Rady Children's  
Hospital, San Diego, CA*

11:45 am–12:00 pm Evaluation and Treatment of the Limping  
Child  
*Nirav K. Pandya, MD, University of  
California San Francisco,  
San Francisco, CA*

12:00 pm–12:15 pm **Discussion**

### General Session 16 — WOA/OREF Young Investigator Awards

**Moderator:** Steven J. Morgan, MD, FACS

12:15 pm–12:23 pm Inhibition of Chondrocyte and Synovial  
Cell Death Following Exposure to  
Commonly Used Anesthetics  
*John G. Costouros, MD, Stanford  
University, Stanford, CA*

12:23 pm–12:31 pm The Effect of Anti-Rotation Pins on  
Stability of the Bone Prosthetic Interface  
of a Novel Compressive Osseointegra-  
tion Implant Used for Limb Salvage  
Surgery: A Biomechanical Study with  
Clinical Outcomes  
*Raffi S. Avedian, MD, Stanford Univer-  
sity Medical Center, Palo Alto, CA*

12:31 pm–12:39 pm Biomechanical Comparison of the Lower  
Trapezius Transfer Versus Latissimus-  
Dorsi Tendon Transfer for Irreparable  
Massive Posterosuperior Rotator Cuff  
Tears  
*Reza Omid, MD, University of Southern  
California Keck School of Medicine, Los  
Angeles, CA*

12:39 pm–12:45 pm **Discussion**

12:45 pm–1:45 pm **Scientific Poster Session**  
(Poster Presenters Available)  
(Grand Sierra Ballroom Pre-Function  
Area)

1:45 pm–2:45 pm **Multimedia Education Session**  
(Grand Sierra Ballroom Pre-Function  
Area)

4:00 pm–5:00 pm **SAE Review — Pediatrics**  
*Meghan Imrie, MD, Stanford University,  
Stanford, CA*

## 2013 WOA Presenters and Moderators

	Page(s)
Zahab Ahsan, MS	65
Abigail Allen, MD	50
Timothy B. Alton, MD	92
Harlan Amstutz, MD	46
Raffi S. Avedian, MD	94
Steven L. Barnett, MD	72, 76
Andrea S. Bauer, MD	63
Justin Bird, MD	85
Julius A. Bishop, MD	64, 76, 83
Cale W. Bonds, MD	80
Suzy Chen, BS	60
Theodore J. Clark, MD	40
Garet Comer, MD	86
John G. Costouros, MD	94
Seth H. Criner, DO	68
Michael R. Dayton, MD	40, 46, 47, 48
Bobby Dezfuli, MD	67
H. Gene Dossett, MD, MBA	74
Eric W. Edmonds, MD	50
J. Dominic Femino	81
Reza Firoozabadi, MD, MA	63
David A. Forsh, MD	69
Orrin I. Franko, MD	70, 84, 93
Kimberly L. Furry, MD	63
Nikhil Gupta, BS	54
Liska Havel, BA	87
Ronald W. Hillock, MD	69
Alan M. Hirahara, MD, FRCSC	55
Craig A. Hogan, MD	46
Daniel J. Holtzman, MD	84
Stephen M. Howell, MD	42
Meghan Imrie, MD	50, 60
John M. Itamura, MD	49
Joshua J. Jacobs, MD	46
David S. Jevsevar, MD, MBA	75
Ramon L. Jimenez, MD	49
Satoshi Kawaguchi, MD	82
Cynthia M. Kelly, MD	40, 81
Gregory P. Kolovich, MD, MPH	82

	Page(s)
Calvin C. Kuo, MD	91
Cassandra Lee, MD	42
Christopher Lee, MD	58, 61
Mark Lee, MD	45
Kate Liddle, BS	56
Nina Lightdale-Miric, MD	59
Philipp Leucht, MD	93
Kali Luker, MD	59
Richard A. Marder, MD	42, 44
Timothy R. McAdams, MD	42
Mark McBride, MD	53
John C. McConnell, MD	58
Jared L. Michalson, MD	72
Kyong S. Min, MD	62
Alexander Miric, MD	73
Raffy Mirzayan, MD	49
Amirhossein Misaghi, MD	79
Scott Montgomery, MD	90
Bryan S. Moon, MD	81
Steven J. Morgan, MD, FACS	40, 45, 49, 90, 94
Donavan K. Murphy, MD	92
Jeffrey M. Nakano, MD	40
Elisha M. Nelson	86
Jacqueline Nguyen, MD	87
Jared A. Niska, MD	90
Wesley M. Nottage, MD	49, 53
Reza Omid, MD	95
Ariel Palanca, MD	79
Nirav K. Pandya, MD	50
Joseph Pirolo, MD	78
Debra J. Popejoy, MD	58
Ellen M. Raney, MD	40, 42, 46, 50
Raveesh D. Richard, MD	70, 77
Michael D. Ries, MD	46
Rolando F. Roberto, MD	88
Caitlin M. Rugg, MS, BA	54
Andrew Schannen, MD	78
Sandy Schwartz, MD	45

	Page(s)
Ran Schwarzkopf, MD MSc	45, 72, 74
Behnam Sharareh, BS	68
Jeremy D. Shaw, MD	89
Avreetta Singh, BS	63
Patricia J. Skolnik	40
Robert R. Slater Jr., MD	42
Jason W. Stoneback, MD	40, 67
Patrick St Pierre	49
Kyle E. Swanson, MD	80
Payam Tabrizi, MD	76
Lisa A. Taitsman, MD	45, 48
Aniebiet-Abasi Udofia, MD, MBA	66

	Page(s)
James Van den Bogaerde, MD	42, 53
Shankar Vedantam	46
John S. Vorhies, MD	85
Augustus A. White III, MD, PhD	42
Anthony H. Woodward, MD	88
Ronald Wyatt, MD	57
Michael G. Yerosian, MD	56
Edward Yian, MD	66
Brad Yoo, MD	45
Jeffrey L. Young, MD	50
Benjamin Zellner, MD	83

**2013 Scientific Program  
Abstracts — Thursday**

(An asterisk (\*) by an author's name indicates the presenter.)

**Thursday, August 1, 2013**

**Concurrent Session 2 — Sports**

**Moderator: James Van den Bogaerde, MD**

8:50 am–8:56 am

**Outpatient UKA — Is It Safe?**

Mark McBride, MD  
Carola Romero, PA-C  
Joseph Jankiewicz, MD

**Introduction:** Over the past several decades, numerous surgical procedures have been perfected in the inpatient hospital setting and then evolved into outpatient procedures. This has been shown to be a safe and economical transition for many orthopedic procedures. A prime example is ACL reconstruction. We report here our early experience with our initial consecutive series of outpatient UKA's done in a free standing ASC (ambulatory surgery center).

**Materials and Methods:** From 8/26/2008 to 5/20/12 there were 60 UKA's performed as outpatient procedures at a free standing ASC. Average patient age was 57.7 years. All patients had general anesthesia with periarticular injection of the involved knee (25 cc's of bupivacaine hydrochloride with epinephrine 1:100,000) and an intraarticular injection after closure of the capsule with 25 cc of bupivacaine hydrochloride with epinephrine mixed with 5 cc of morphine sulfate. Patients without allergy to sulfa were given 200mg of celecoxib bid for three days and hydrocodone/acetaminophin 10/325 1-2 tabs q4 hours prn pain. Patients were discharged home when stable, ambulating with aids as needed, with length of stay ranging from 60-180 minutes (average of 85 minutes).

**Results:** No patients required admission to the hospital for any reason. There was one hemarthrosis in a medial UKA which developed on postoperative day 4. There was uneventful resolution of this event and an excellent result was achieved. The vast majority of patients were ambulating well

and without walking aids at the 2 week postoperative evaluation.

**Conclusion:** Outpatient UKA was found to be a safe, efficient, and effective method for the management of unicompartmental osteoarthritis of the knee in this relatively healthy cohort of patients. It is now our routine approach for patients undergoing UKA, with inpatient hospitalization being reserved for those patients who are at higher postoperative risk due to multiple medical comorbidities.

*\*The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 39).*

**Notes:**

8:56 am–9:02 am

**Long Term Outcome of All Arthroscopic Revision Rotator Cuff Repair**

Jason Jancosko, DO, MPT  
\*Wesley M. Nottage, MD

**Introduction:** This study is one of very few in the literature that has reported on the outcomes of a series of revision arthroscopic rotator cuff repairs performed. A recent systematic review of the existing literature by Ladermann demonstrated improvements in postoperative motion and functional scores with revision arthroscopic rotator cuff repair at mean follow-up ranging from 23.4-59 months. The purpose of this article is to report the long term outcomes of revision all arthroscopic rotator cuff repairs a mean follow-up of 69.5 months.

**Methods:** A data based review was performed identifying all rotator cuff repairs, (1230 cases in 843 patients). 59 shoulders were identified to be revision rotator cuff repairs, and after inclusion and exclusion criteria we applied, 26 shoulders were available for follow-up in 22 patients. A thorough shoulder

examination including forward flexion ROM & strength were obtained during the evaluation, as well as University of California Los Angeles (UCLA) & American Shoulder & Elbow Society (ASES) scores.

**Results:** Average age of patient at last follow-up was 70.1 years (range 57.3-81 years). The mean follow-up from time of revision surgery was 69.5 months (range 12-165 months). The average UCLA score was 29.5 (range 20-35), statistically significant. Average ASES score was 87.9 (range 65-100). 22 of 22 (100%) patients were satisfied with the procedure. Follow-up mean active forward flexion was 156.70, and mean active external rotation was 44.70.

**Conclusion:** The UCLA scores demonstrate 19% excellent, 54% good (63% good and excellent), 19% fair, and 7% poor results which compares favorably to the five year follow-up 50% good and excellent results as reported in the literature. Our current study supports the previous reviews and has demonstrated that patients can maintain these outcomes on an average at least 69.5 months (5.8 years) after the index procedure, and may be durable over time.

**Notes:**

9:02 am–9:08 am

## Effects of Prior Knee Surgery on Participation, Injury, and Intervention in NCAA Collegiate Athletes

Caitlin M. Rugg, MS, BA  
Dean Wang, MD  
Pamela L. Sulzicki, MS, ATC  
Sharon L. Hame, MD

**Introduction:** Earlier studies in previously injured high school and professional athletes have shown decreased career length and greater risk for reinjury compared to non-injured peers. Little data exist with respect to intercollegiate athletes. The purpose of this study is to determine the effect of prior knee surgery in Division I NCAA athletes.

**Methods:** Division I athletes who began participation in collegiate athletics from 2003 -2007 for ten sports were identified. Athletes with prior orthopaedic surgery were identified

through pre-participation evaluation forms. Pre-college surgery, seasons played, games played, injuries sustained during college, days missed, orthopaedic surgeries and medical imaging received during college were collected through medical and athletic training room records and compared to athletes with no prior history of surgery.

**Results:** Between 2003 and 2007, 456 athletes completed pre-participation evaluation forms. One hundred and four athletes (22.8%) had a history of orthopaedic surgery. Of those athletes, 48 (46.1%) had a history of knee surgery, 16 (15.4%) had a history of ACL reconstruction, and 28 (26.9%) had a history of multiple surgeries. Average career length was not significantly different for the Knee group (2.5 seasons), ACL group (2.38 seasons), or Multiple group (2.42) compared to controls (2.86 seasons). Percentage of games played was not significantly different between any of the groups. Days missed per season due to any injury and due to knee injury were increased for all groups compared to controls. Risk of knee injury and risk of knee surgery during college were increased for all surgery groups.

**Discussion and Conclusion:** Although athletes who have knee surgery prior to participation in collegiate athletics have similar career lengths and number of missed games, they have an increased risk of knee injury and surgery per season.

**Notes:**

9:08 am–9:14 am

## Arthroscopic Surgery for Global Versus Focal Femoroacetabular Impingement: Are the Outcomes Different?

Dean K. Matsuda, MD  
\*Nikhil Gupta, BS  
Raoul J. Burchette, MS

**Introduction:** Pincer femoroacetabular impingement occurs in two forms: focal and global, the latter considered more severe and often treated with open surgical dislocation. We use a multicenter prospective design to investigate if any differences in arthroscopic surgical outcome are seen between these two subtypes.

**Methods:** A prospective design comparing global (center-edge angle 40+) versus focal pincer cohorts with 2 year minimum follow-up using the nonarthritic hip score (NAHS) and patient satisfaction was implemented at 3 community hospitals. Pre-operative clinical and radiographic findings, intra-operative findings and surgical procedures, and post-operative NAHS at 3-, 12- and 24-post-operative months were obtained and inter-group comparisons were made. Complications, revision surgeries, and conversion hip arthroplasties were compared between groups. A multivariable model was created for analysis.

**Results:** The Global cohort consisted of 15 patients (18 hips, 66.7% male) of mean age 37.2 years (18.1 to 55.2 years). The NAHS was 51.5 (19 to 94) before surgery and 64.2, 66.0, and 74.1 at 3, 12, and 24+ months post-surgery of which the change in final NAHS (preop to 24+ months) was significant. Mean satisfaction on a Likert scale (1= very dissatisfied to 5 = very satisfied) was 3.3 at 24 mos. There was 1 THA conversion (5.5%), no revision FAI surgeries or complications. The Focal cohort consisted of 129 patients (134 hips, 47.8 % male) of mean age 40.2 years (13.0 to 73.6 years). The NAHS was 54.8 (9 to 93) before surgery and 68.3, 76.0, and 76.9 at 3, 12, and 24+ months post-surgery of which the change in final NAHS (preop to 24+ months) was significant. Mean satisfaction on a Likert scale (1= very dissatisfied to 5 = very satisfied) was 3.6 at 24 mos. There were 11 THA conversions (8.5%), 3 complications (2 heterotopic ossification, 1 transient pudendal-neuropathia 2.3%), and 2 revision FAI surgeries (1.6%). Comparison between cohorts revealed no statistically significant difference in 3, 12, or 24+ month NAHS. Comparison between cohorts revealed no statistically significant difference in 3, 12, or 24+ month satisfaction. Comparison between cohorts revealed no statistically significant difference in 3, 12, or 24+ month THA conversion rate. Moreover, of the variables we investigated (i.e., age, gender, BMI, Tonnis grade, and time to surgery from pain onset), no variable was found to be a statistically significant predictor of poorer outcomes in the change from pre-op to 24 months model.

**Discussion and Conclusion:** There were no significant differences in arthroscopic surgical outcome for global versus focal pincer FAI. Both groups had significant improvement and moderate satisfaction with few complications. Arthroscopic surgery for global deformities may be safely performed using arthroscopic techniques with outcomes comparable to those with lesser focal deformities. The historical need for open sur-

gical dislocation for the surgical treatment of global deformities may be respectfully challenged.

**Notes:**

9:14 am–9:20 am

### Increased Concentration of White Blood Cells in PRP Weakens Rotator Cuff Tendons When Used for PASTA Repairs

Alan M. Hirahara, MD, FRCSC

**Introduction:** To evaluate the method of failures of repairs of articular-sided partial-thickness rotator cuff (PASTA lesions) repairs without platelet-rich plasma (PRP), with PRP with concentrated white blood cells (WBC's), and with PRP with reduced WBC's.

**Methods:** We retrospectively evaluated our PASTA repairs from 2007 – 2012 for a single surgeon. Three groups had repair of a PASTA lesion using a trans-tendon technique with suture anchors. Fourteen patients were repaired without use of PRP (Group 1); seventy-two patients received PRP with concentrated WBC's (Group 2); and forty-four patients were repaired with PRP with reduced WBC's (Group 3), placed arthroscopically during repair of a PASTA lesion.

**Results:** All groups improved in both VAS and ASES scores with no significant difference (Group 1: 7.2 to 2.9 / 38.1 to 74.6; Group 2: 7.3 to 2.3 / 40.6 to 76.4; Group 3: 6.6 to 2.2 / 44.6 to 78.2, respectively). Two (14.3%) Group 1 patients resulted in non-healing of the repair and required revision surgery. In Group 2, ten (13.9%) patients on repeat surgery showed healing of the repaired partial tear, but revealed the sutures cutting through the tendon in a longitudinal fashion; two (2.8%) patients showed non-healing of the repair. In Group 3, one (2.2%) patient showed a different, new delamination tear on MRA, and one (2.2%) patient needed repair of a non-healed tear.

**Conclusions:** This study shows that PRP with concentrated WBC's can result in tear through by the sutures. The literature suggests the application of PRP with WBC's can result in a weakening of tissue. This phenomenon may explain the

increased rate of tear through from the sutures. This study also suggests that PRP improves healing in PASTA repairs as we saw healing of the primary lesion improved with PRP use.

*\*The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 39).*

**Notes:**

9:20 am–9:26 am

### The Costs of Preoperative Evaluation of Rotator Cuff Tears Prior to Surgical Repair

Frank A. Petrigliano, MD  
\*Michael G. Yerasosian, MD  
Rodney D. Terrell, MD  
Jeffrey C. Wang, MD  
David R. McAllister, MD

**Introduction:** Rotator cuff tears are a common cause of shoulder pain. Patients who undergo operative repair typically have a diagnostic evaluation and trial of non-operative therapy for a period of time prior to surgery. Recent studies evaluated the cost-effectiveness of rotator cuff repair. None, however, attempted to estimate the costs associated with the preoperative evaluation. This study utilized available data to examine the major expenditures related to the diagnostic and therapeutic measures performed during the period prior to surgical repair.

**Methods:** A search was conducted using a database of insurance records of orthopaedic patients to identify those undergoing rotator cuff repair from 2004 to 2009. Patients were identified by the common CPT codes for rotator cuff repair. The associated charge codes for the 90-day period prior to surgery were categorized as outpatient physician visits, diagnostic imaging studies, injections, physical therapy, laboratory and other preoperative studies, prior surgeries, and miscellaneous. The frequency of each code and percentage of patients for whom that code was submitted were noted, as were the associated charges.

**Results:** In total, 101,747 patients were identified who underwent rotator cuff repair in the study time period. A total of \$199,921,398 was charged during the 90-day preoperative period, for an average of \$1,965 per patient. Diagnostic imaging charges totaled \$119,475,239 (65%), injections \$5,125,296 (3%), outpatient visits \$33,029,425 (18%), physical therapy \$16,440,131 (8.9%), preoperative studies \$8,289,334 (4.5%), and miscellaneous \$1,495,727 (<1%).

**Discussion and Conclusions:** The costs of the preoperative evaluation of rotator cuff tears are substantial and the majority of the costs are associated with MRI. To help reduce costs, future studies should be directed at describing the factors that predict which patients might fail non-operative management and benefit from early surgical intervention. Additionally, MRI should perhaps be reserved for patients who have failed conservative therapy and are considering surgery

**Notes:**

9:26 am–9:32 am

### Factors Associated with Meniscus Repair in Patients Undergoing Anterior Cruciate Ligament Reconstruction

Kate Liddle, BS  
Ronald Wyatt, MD  
Maria C. S. Inacio, MS  
Gregory Maletis, MD

**Introduction:** Meniscus injury is common in patients with anterior cruciate ligament (ACL) tears. The factors affecting prevalence of meniscus repair in patients undergoing ACL reconstruction (ACLR) by community-based orthopedic surgeons have not been fully studied. The purpose of this study was to identify factors associated with a higher likelihood of meniscus repair in patients undergoing ACLR.

**Methods:** A cross-sectional study using data from a large community-based ACLR Registry was performed. Patients with a meniscus injury and primary ACLR between 02/2005

and 06/2010 were included in the study. Meniscus repair rates by patient, surgeon, and injury characteristics were described. Associations were evaluated using generalized linear models.

**Results:** Of 9195 ACLR patients registered during this period, 5712 (62.1%) had a meniscus tear. In 4248 (74.4%) patients there was one torn meniscus and in 1464 (25.6%) both menisci were torn. Meniscus repair was performed in 1192 (31.2%) of 3818 medial meniscus tears and in 893 (26.6%) of 3358 lateral meniscus tears. The prevalence of meniscus repair was statistically significantly different by certain patient, surgeon, and injury characteristics. Adjusted generalized linear models showed that for each year increase in patient age, the likelihood of a meniscus repair decreased by 4% (95%CI 4%-5%) and for each BMI unit increase, the likelihood decreased by 3% (95%CI 2%-4%). A higher likelihood of meniscus repair was associated with fellowship training (OR 1.46 95%CI 1.24-1.71), higher surgeon case volume (OR 2.56 95%CI 1.46-4.50), higher hospital volume (OR 1.69 95%CI 1.09-2.62), and medial meniscus tears (OR 3.70 95%CI 3.11-4.41).

**Discussion and Conclusion:** Younger age, lower BMI, surgeon fellowship training, higher surgeon case volume, high site volume, and medial meniscus tears were associated with a higher likelihood of meniscus repair in patients undergoing primary ACLR in a sample from a large community based ACLR Registry.

**Notes:**

9:32 am–9:38 am

### Operative Findings in Patients Undergoing Primary and Then Revision Anterior Cruciate Ligament Reconstruction

Ronald Wyatt, MD  
Gregory Maletis, MD  
Maria C. S. Inacio, MS  
Kate Liddle, BS  
Tadashi T. Funahashi, MD

**Introduction:** Previous studies have found differences in meniscus and cartilage injury rates between groups of pri-

mary and revision anterior cruciate ligament reconstruction (ACLR) patients. This study examined a cohort of individual patients who underwent primary and subsequent revision ACLR to determine cartilage and meniscus disease progression.

**Methods:** Patients who had primary and then revision ACLR from February 2005 to September 2011 were identified using a community based registry. Patient and procedure characteristics were obtained and descriptive statistics were used to evaluate the study sample.

**Results:** There were 261 registry patients who underwent primary and then subsequent revision ACLR. The median age was 18 at primary ACLR and 20 at revision. Revision ACLR was for instability in 256 patients (98%) and infection in 5 patients (2%). The prevalence of cartilage injury in these patients increased from 14.9% at primary ACLR to 31.8% at revision. The prevalence of meniscus injury decreased from 55% at primary to 44% at revision surgery. Lateral meniscus injury prevalence was 37% in primary cases but only 18% at revision, while medial meniscus injury prevalence was the same at primary and revision (33%). Patients who underwent meniscus injury treatment at primary ACLR had a 71% prevalence of meniscus injury at revision.

**Discussion and Conclusions:** In this community based cohort followed from primary to revision ACLR, the prevalence of articular cartilage injuries increased while the prevalence of meniscus injuries decreased. The higher prevalence of articular cartilage injury at revision may represent new injury or disease progression. The lower incidence of meniscus injury at revision may be due to susceptible menisci being injured and treated at the primary surgery, or to changes in knee kinematics or injury exposure patterns.

**Notes:**

9:38 am–9:44 am

### Marcus Stewart's Test as an Alternative to Pivot-Shift Testing for Partial ACL Injuries; Case Report: Injury During Pivot Shift Testing

John C. McConnell, MD

**Purpose:** Partial ACL injuries are commonly missed by history, standard physical exam, MRI, and even arthroscopy. Pivot shift testing techniques vary between examiners and are unpleasant to patients. Pivot shift testing is not universally considered useful in identifying partial ACL injuries. This study illustrates that pivot-shift testing can injure patients and describes as a preferable alternative Marcus Stewart's Test which is capable of identifying ACL laxity/dysfunction following partial ACL injury in a clinical setting without specialized equipment.

**Methods:** This paper documents a case of ACL and meniscus injury following pivot-shift testing of an asymptomatic previously repaired patient during a required medical exam. Marcus Stewart's Test was used as an alternative to pivot shift testing in cases in which ACL laxity/dysfunction following partial ACL injury was suspected in 312 patients between 1/1/2007 and 5/31/10. ACL laxity/dysfunction following partial ACL injuries was confirmed arthroscopically

**Results:** Marcus Stewart's Test correctly identified ACL laxity consistent with partial ACL injury in 310 of 312 cases. In most cases the lesion was an incomplete interstitial disruption of fibers of the posterolateral bundle near the femoral attachment following a non-sports-related low-energy injury in which a mechanism of hyperextension (often with torsion) could be identified. Combination of careful history taking plus physical exam led to correct preoperative diagnosis in 312 of 312 cases.

**Discussion/Conclusion:** ACL dysfunction following partial ACL injury is very different from complete ACL injuries familiar to sports medicine in terms of history, physical exam, MRI, and arthroscopy. A high index of suspicion coupled with careful history taking and precise physical exam correlates well with findings documented arthroscopically. Marcus Stewart's Test is preferable to pivot-shift testing in identifying these patients.

**Notes:**

Thursday, August 1, 2013

Concurrent Session 3 — Pediatric

Moderator: Debra J. Popejoy, MD

8:50 am–8:56 am

### Proximal Junctional Kyphosis Occurs in More than Half of Distraction Based Growing Rods

Christopher Lee, MD  
Karen S. Myung, MD, PhD  
David L. Skaggs, MD

**Introduction:** This study examines the rate of proximal junctional kyphosis (PJK) in distraction based growing rods.

**Summary of Background Data:** Distraction based growing rods have a high rate of reported complications. PJK is one of many complications found when using distraction based implants, though appears to be underreported.

**Methods:** A retrospective review of 32 consecutive cases with growing rods for early onset scoliosis was performed. Average age at initial surgery was 4 years (range, 1-10), with diagnoses of congenital scoliosis (15), neuromuscular (11), idiopathic (4), and other (2) included. Minimum follow up was 24 months (mean, 52; range, 24-88). PJK was defined as fulfilling 2 criteria: 1. An angle  $>10^\circ$  between the endplates of the vertebrae two levels cephalad to the upper instrumented vertebrae and two vertebrae caudal to the upper instrumented vertebrae. 2. This angle must be at least  $10^\circ$  greater than preoperative values. Z-test was performed to compare rates.

**Results:** Of the 32 patients, 18 (56%) developed PJK. 8/18 patients (44%) with PJK had upper anchor failure, with 7 requiring unplanned revision surgery. In comparison, 5/14 patients (36%) without PJK had upper anchor failure ( $p=0.89$ ). In the 4 patients with PJK that underwent final fusion, 3 (75%) underwent fusion and instrumentation to levels cephalad to the growing rod construct, compared to 0/2 (0%) without PJK ( $p=0.4$ ). PJK trended towards being more common in patients with dual rods (10/16; 62%) than single rods (5/13; 38%) ( $p=0.36$ ), and in spine-to-spine constructs (10/17; 59%) compared to hybrid constructs (upper hooks on ribs) (5/12; 42%) ( $p=0.59$ ).

**Discussion and Conclusion:** With a mean follow-up of 4 years, 56% of patients with distraction based growing rods

developed PJK. The final fusion is likely to involve additional cephalad vertebrae than the original growing rod construct.

*\*The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 39).*

**Notes:**

8:56 am–9:02 am

**Silent Compartment Syndrome in Children**

Nina Lightdale-Miric, MD  
 Christopher Lee, MD  
 Robert Kay, MD

**Introduction:** Compartment syndrome does not always present classically in the pediatric population making clinical diagnosis uniquely challenging. The purpose of this study is to identify signs and symptoms of compartment syndrome that may risk stratify pediatric patients upon presentation as well as report outcomes of cases with “silent” compartment syndrome in children.

**Methods:** A retrospective review of cases of “silent” compartment syndrome at a level I pediatric trauma center between 2000 and 2010 was conducted. Patient demographics and clinical data were reviewed, including complications and patient outcomes. Radiographs at presentation, intraoperative fluoroscopy, and post-operative follow-up imaging were reviewed for fracture type and severity and outcomes analysis.

**Results:** Five patients were found to have compartment syndrome without the presence of excessive pain at rest or on passive range of motion. There were three male and two female patients with a mean age of 7 years. Three upper extremity and two lower extremity fractures were involved. Mean time from presentation to surgery was 14 hours. At presentation, 3/5 (60%) patients had muscle paralysis, while at diagnosis of compartment syndrome, 4/5 (80%) had paralysis. Of the classic 5 P’s, a maximum of 2 was found at diagnosis. Mean clinical follow up was 11 months (2-26). Long-term complications from CS were found in 1/5 patients (20%), who at most recent follow up continued to be debilitated.

**Discussion and Conclusion:** This study reviews a series of cases of “silent” compartment syndrome and confirms its presence in the pediatric population. It is recommended that caution be used when assessing fractures with high risk for compartment syndrome in children, especially those complicated by nerve injury, as they do not always present in the classic fashion.

**Notes:**

9:02 am–9:08 am

**Assessment of Pediatric Fracture Information in Pediatric and Emergency Medicine Textbooks and Online Resources**

Kali Luker, MD  
 Julius A. Bishop, MD

**Introduction:** Emergency medicine and pediatric physicians often provide initial pediatric fracture care. Therefore, basic knowledge of the various treatment options is essential. The purpose of this study was to determine the accuracy of information commonly available to these physicians in textbooks and online regarding the management of pediatric supracondylar humerus and femoral shaft fractures.

**Methods:** The AAOS Clinical Practice Guidelines (CPG) for pediatric supracondylar humerus and femoral shaft fractures were used to assess the content of top selling emergency medicine and pediatric textbooks as well as the top returned websites after a Google search. Only guidelines that addressed initial patient management were included. Information provided in the texts was graded as consistent, inconsistent, or omitted.

**Results:** Five emergency medicine textbooks, four pediatric textbooks and five websites were assessed. For supracondylar humerus fractures, emergency medicine textbooks provided information consistent with the relevant points of the AAOS CPG in 65% of cases. None of the information was inconsistent and 35% was omitted. Pediatric textbooks provided 8% consistent information, no inconsistent information, but had a 92% omission rate. Online resources contained 40% consistent information, no inconsistent information with 60% of CPG points omitted. For femoral shaft fractures, emergency

medicine textbooks provided information consistent with the AAOS CPG in 14% of cases, 19% inconsistent information and 67% omissions. Pediatric textbooks provided 29% consistent and 7% inconsistent information with 64% omitted. Online resources imparted 72% consistent and 14% inconsistent information with 14% of CPG points omitted.

**Conclusion:** Pediatric supracondylar humerus and femoral shaft fracture information in emergency medicine and pediatric textbooks as well as online is variable, with both inaccuracies and omissions being common. This lack of high quality information could compromise patient care. Additional resources should be committed to ensuring accurate and complete information is readily available to all physicians providing pediatric fracture care.

**Notes:**

9:08 am–9:14 am

## Height Gain in Surgically Treated Adolescent Idiopathic Scoliosis

Meghan Imrie, MD

**Purpose:** To examine the impact curve correction and spinal fusion have on immediate and ultimate patient height.

**Methods:** A retrospective review of patients with AIS treated with spinal fusion at one institution was conducted. Charts were reviewed for pre-operative, immediate post-operative and final post-operative heights, thoracic Cobb angles, and lumbar Cobb angles. Pre-operative Risser sign was recorded. Menarche status was noted in 5 patients where Risser sign was not available.

**Results:** 53 patient had charts available and height data at all three visits. Age at surgery averaged 14 years (range 11-18 yrs) with an average of 10 levels fused. “Immediate” height gain averaged 2.9 cm (range 0-9 cm) at an average of 2.6 months post-op as compared to “final” height gain average of 4.1 cm (range 0 to 15 cm) at an average 30 months post-op. Risser 0 and Risser 1-3 groups gained more height between initial and final than the Risser 4-5 group. Initial Cobb correction<sup>o</sup> was a predictor of initial height increase (R<sup>2</sup>=0.18), with an average of 0.5 ± 0.2 mm increase per

degree correction. Maturity was the most significant predictor of growth between immediate and final visits (R<sup>2</sup>=0.35), patients with growth remaining had continued increase of 0.4± 0.2 mm per month of follow-up. The modest increase between initial and final for the Risser 4-5 patients was not significant.

**Conclusion:** Despite neutralizing vertebral growth centers by spinal fusion, patients with AIS gain height post-operatively due to immediate straightening of a curved spine and through continued growth of the lower extremities and unfused sections of the spine. This information can be used to help counsel patients and their families as to what to expect following spinal fusion for AIS.

**Notes:**

9:14 am–9:20 am

## Control of Walking Speed in Children with Cerebral Palsy

Suzy Chen, BS

Anita Bagley, PhD, MPH

Mitell Sison-Williamson, MS

Jon R. Davids, MD

**Introduction:** The ability to control gait speed is important for a wide range of functional activities. Children with cerebral palsy (CP) vary in their capacity to change gait speed on demand. The purpose of this study was to determine the strategies that children with CP utilize to increase walking speed and whether there are significant differences in these strategies between Gross Motor Function Classification System (GMFCS) levels I-III.

**Methods:** Temporo-spatial parameters (normalized to age), GMFCS level, and demographic data were obtained through retrospective review of a convenience sample of 212 individuals (119 male, 93 female) with cerebral palsy, GMFCS levels I-III (I=80, II=91, III=41). Two-way repeated measures analysis of variance was used to determine differences between GMFCS levels and between free and fast walking conditions.

**Results:** Three subjects of GMFCS level I (4%), one subject of level II (1%), and 27 subjects of level III (66%) could not

increase their walking speed above minimum clinically important differences (MCID). On average for all subjects, speed increased 43%, stride length 16%, and cadence 27%. For both free and fast walking, speed significantly decreased with increasing impairment as defined by GMFCS level. Stride length also significantly decreased. There were no statistically significant differences in cadence between GMFCS levels. The change in normalized velocity between free and fast speeds was comparable between GMFCS levels.

**Discussion and Conclusion:** The ability to increase gait velocity above the MCID is significantly compromised by greater level of motor function impairment. Stride length is a greater discriminating variable than cadence across the GMFCS levels at free and fast velocities. The differences within and between GMFCS levels in temporo-spatial parameters were not greater at fast relative to free walking, suggesting an underlying physiologic boundary based upon gait efficiency.

**Notes:**

**Results:** Of 98 connectors, there were 12 connector failures (12.2%) in 9 patients. In all failures, the set screw loosened, resulting in rod slippage. On average, failures occurred 25.5 months after the index procedure, and after the 3rd lengthening. Simple side-to-side closed connectors with circular slots had the highest rate of slippage, 41% (7/17). Side-to-side connectors with V-Groove slots that mechanically lock the rod had 10 times fewer failures, 4% (1/27) (p=0.006). Only one longitudinal connector failed, 3% (1/34) (p=0.002). The average T1-S1 gain during growth was 6.5 mm/year for patients with a connector failure and 9.0 mm/year for those who did not (p=0.25). Connectors failed in dual rods 33% (6/18) and single rods 40% (6/15) at similar rates (p=0.97).

**Discussion and Conclusion:** Connector failure in distraction based growing rods is associated with 28% less T1-S1 gain. Side-to-side connectors with circular slots had a failure rate of 41% compared to side-to-side connectors with V-Groove slots (4%). Longitudinal connectors had a failure rate of 4%.

**Notes:**

9:20 am–9:26 am

### Some Connectors in Distraction-Based Growing Rods Fail More than Others

Christopher Lee, MD  
 Karen S. Myung, MD, PhD  
 David L. Skaggs, MD

**Introduction:** This study examines the rate of failure of various types of spinal rod connectors in distraction-based growing rod constructs for early onset scoliosis.

**Summary of Background Data:** Distraction-based growing rods have a high rate of reported complications.

**Methods:** A retrospective review of a single surgeon's consecutive cases with growing rod constructs for early onset scoliosis was performed. Connector failure was defined as loosening of the connector-rod interface which resulted in shortening of the construct and loss of distractive force. Thirty patients with average age of 5 years (1-10 years) with diagnoses of congenital scoliosis (15), neuromuscular (10), idiopathic (4), and other (1) were included. Minimum follow up was 2 years, with a mean follow-up of 49 months (24-83 months).

9:26 am–9:32 am

### Risk Factors for Avascular Necrosis After Closed Reduction for DDH

Christopher Lee, MD  
 Alexandre Arkader, MD  
 Anthony Catalano, BS  
 Paul Choi, MD

**Introduction:** Closed reduction, plus spica cast application, has been widely reported to be successful in the treatment for developmental dysplasia of the hip (DDH). Complication rates, however, have been reported as high as 79%, and avascular necrosis (AVN) has proven to be particularly problematic with reported incidences up to 73%. The purpose of this study was to identify and evaluate the risk factors for AVN after closed treatment for DDH.

**Methods:** A retrospective review of all children diagnosed with DDH at one tertiary-care children's hospital between 1986 and 2009 was performed. Inclusion criteria were children with diagnosis of DDH who underwent closed reduction and spica cast application, followed by CT evaluation, and had a minimum of 1-year radiographic and clinical follow-up.

Exclusion criteria included teratologic and neuromuscular hips, and open reduction as initial treatment. Hips were assessed for the presence of AVN according to Salter's classification system.

**Results:** 124 affected hips in 100 children with an average age of 9.5 months at closed reduction (range: 0.5- 31 months) met inclusion criteria. Patients were followed for a mean of 4 years (range, 1-18 years). 44/124 (35%) affected hips developed AVN. The presence of an ossific nucleus ( $p=0.02$ ) decreased the risk of AVN, while pre-operative Pavlik harness or brace trial ( $p=0.98$ ) and pre-reduction traction ( $p=0.21$ ) had no effect. Overall, the degree of abduction did not affect the rate of AVN ( $p=0.12$ ). However, in patients treated with closed reduction within 6 months of age, the rate of AVN was increased with abduction  $\geq 50^\circ$  (13/32, 41%) compared to abduction.

**Conclusions:** The risk of AVN (35%) following closed reduction and spica casting for DDH is high. The degree of abduction in spica casts appears to be a risk factor, in particular in patients younger than 6 months. The authors recommend that abduction in spica casts should be limited to less than  $50^\circ$  in children within 6 months of age.

**Notes:**

9:32 am–9:38 am

## Effectiveness of MRSA Nasal Screening in Pediatric Orthopaedic Surgery

Kyong S. Min, MD  
Paul M. Caskey, MD  
Bryan J. Tompkins, MD  
Ronda D. Cordill, RN  
Glen O. Baird

**Introduction:** Post-operative surgical site infections are known complications for all procedures. The consequence of surgical site infections include revision surgery, delayed wound healing, increased use of antibiotics and increased length of hospital stay. The majority of surgical site infections can be treated with surgical debridement and standard antibiotics; but Methicillin Resistant Staphylococcus aureus (MRSA) is resistant to standard treatment. MRSA is a growing problem in the medical community and many hospitals

are moving towards screening all patients with nasal swab cultures; however, there is a paucity of research to support this universal screening. The purpose of this study is to present the prevalence of MRSA colonization and its association with post-operative infections in pediatric orthopaedic patients.

**Methods:** We conducted a prospectively gathered retrospective review of all pediatric orthopaedic procedures conducted at a single institution between January 2010 and December 2011. During the study period, our institution implemented a universal screening protocol for MRSA. All patients undergoing an elective orthopaedic procedure had nasal cultures taken during their preoperative appointment. Patients who tested positive for Methicillin-Resistant Staphylococcus aureus were managed with intranasal 2% mupirocin ointment, which was applied to the interior of each nares twice daily for 5 days, and a shower with 2% chlorhexidine, which was performed once daily for 5 days. A surgical site infection was considered to be present if the following criteria was met: 1) the surgical site infection was within 30 days of the initial procedure or 1 year if there was retained hardware; 2) the wound drained purulent material, the wound culture yielded a pathogen or a physician documented a surgical site infection. The rates of surgical site infection during the universal screening period were compared with those observed during a no screening period (January 2005 to December 2005), and a period with screening of at risk patients only (January 2007 to December 2008). Those patients identified as at risk were patients undergoing spine, hip or pectus procedures; patients who were previously hospitalized within 3 months of the procedure; or patients with implantable devices (e.g. G-Tube, PICC Line).

**Results:** During the study period from January 2010 to December 2011, 1496 procedures were performed; 1377 of the 1496 procedures were screened for MRSA, for a screening rate of 92%. Eleven cases of surgical site infections were identified (1 MRSA infection), for a surgical site infection rate of 0.74%. Among the patients that were screened for MRSA, 29 patients were identified as MRSA carriers (2.1%). The 1 patient with an MRSA surgical site infection was not identified as a MRSA carrier during pre-operative screening. There was no significant difference in surgical site infection when comparing the universal screening period with the no screening period ( $P$  value $>0.99$ ), universal screening period with the at risk screening period ( $P$  value=0.85), and at risk screening period with no screening period ( $P$  value=0.59). Comparing MRSA carriers with non-carriers, there were no cases of

surgical site infections with MRSA carriers and 11 cases of surgical site infection with non-carriers. There was no statistically significant difference in surgical site infection rates among MRSA carriers and non-carriers (P value>0.99).

**Conclusion:** Although there is some evidence to support universal screening for MRSA in adult orthopaedic patients, the implementation of a universal screening program for MRSA does not reduce rate of surgical site infection in pediatric orthopaedic patients. Patients identified as MRSA carriers at preoperative screening were not at increased risk of developing a surgical site infection.

**Notes:**

9:38 am–9:44 am

### Obesity in Children with Brachial Plexus Birth Palsy

Avreetta Singh, BS  
 Andrea S. Bauer, MD  
 Janith K. Mills, MPAS, PA-C  
 Marybeth Ezaki, MD

**Introduction:** Brachial plexus birth palsy (BPBP) occurs in approximately 1.5 per 1000 live births within the United States. Fetal macrosomia (birth weight 4500 grams or more) is associated with a 14-fold increased risk of BPBP. Furthermore, fetal macrosomia may be an independent predictor of obesity in childhood. This study sought to identify the relationships between BPBP, fetal macrosomia, and childhood obesity, and to interpret their effects on quality of life.

**Methods:** We collected demographics, injury severity, birth weight, current height and weight, and quality of life (as measured by the Pediatric Outcomes Data Collection Instrument (PODCI)). The Body Mass Index (BMI) for age percentile was used to measure obesity.

**Results:** Seventy-three children from Hospital A and 141 from Hospital B were included. The average age was 8 years, 48% were boys, and 53% had a Narakas 1 type BPBP (C5 and C6 roots affected). Obesity differed between hospitals, with a

higher rate of overweight (25%) and obesity (32%) at Hospital B. Overall, 49% of children were normal weight, 22% overweight, and 29% obese. Of the children with a history of fetal macrosomia, 41% were obese; a statistically significant increase over those with birth weights less than 4500 grams. In a multivariate analysis of PODCI scores, obesity was related to increases in the domains of Upper Extremity Function and Mobility at Hospital B, and decreases in the domains of Sports and Physical Function and Global Function at Hospital A.

**Discussion and Conclusion:** The obesity rate in our BPBP population (29%) was higher than the national average of 17%, and children with both BPBP and fetal macrosomia had a greatly increased rate of obesity at 41%. The effect of obesity on PODCI scores was conflicting.

**Notes:**

Thursday, August 1, 2013  
 Concurrent Session 5 — Foot and Ankle & Upper Extremity  
 Moderators: Andrea S. Bauer, MD  
 Kimberly L. Furry, MD

1:15 pm–1:21 pm

### Immediate Weightbearing After Ankle Fracture Fixation

Reza Firoozabadi, MD, MA  
 Emily C. Harnden  
 James C. Krieg, MD

**Introduction:** Most physicians advocate a period of protected weight bearing post ankle fixation surgery. The objective of this study was determine if a certain subset of ankle fracture surgical patients can be weightbearing as tolerated immediately following surgery. Immediate weight bearing as tolerated (IWBAT) allows patients to return to ambulation and activities of daily living faster, and may facilitate rehabilitation. To our knowledge this is the first study to assess IWBAT after fixation of unstable ankle fracture.

**Methods:** Retrospective study of prospectively gathered orthopaedic trauma data at a Level 1 trauma center was used to identify a total of 136 skeletally mature patients who underwent ORIF of an ankle fracture by the senior author; 33 were allowed IWBAT. Patients were not made IWBAT for the following reasons: syndesmotic disruption, polytrauma, plafond injury, open fracture with soft tissue concerns, and bone loss. Twenty six patients were included, having at least six weeks of follow up.

**Results:** Mean age was 48 (range 20-95); 20 males and 6 females. Twenty-five patients had intraoperative post fixation radiographs that displayed symmetric joint space around the talus. One patient had 1.7mm increased lateral joint space compared to medial and superior clear space. Only 1/26 patients was noted to have loss of fixation. This was found at the 6 week follow up and was attributed to a missed syndesmotic injury. Two patients had peri-incisional erythema that resolved with a short course of oral antibiotics. Twenty patients were wearing normal shoes and 6 patients continued to wear the CAM Boot for comfort at 6 weeks. At the last clinic follow up, 3 patients had persistent ankle stiffness, 1 patient had symptoms consistent with peroneal subluxation, which resolved with physical therapy, and one patient required removal of medial malleolar fixation secondary to symptomatic hardware.

**Discussion and Conclusion:** IWBAT in a certain subset of patients with stable osteosynthesis following an ankle fracture is a safe alternative to a period of protected weight bearing. Earlier weight bearing has been associated with better mobility, shorter hospital stay, and earlier return to work. Potential candidates for IWBAT are patients with closed ankle fractures, without syndesmotic disruption, no involvement of the tibial plafond, in whom stable fixation has been achieved.

**Notes:**

1:21 pm–1:27 pm

## Operative Versus Non-Operative Treatment of Jones Fractures: A Decision Analysis Model

Julius A. Bishop, MD  
Hillary J. Braun  
Kenneth Hunt, MD

**Introduction:** Optimal management of Jones fractures remains controversial. Intramedullary screw fixation is thought to increase union rates and accelerate return to sports but exposes the patient to the morbidities of surgery. Non-operative treatment has been associated with difficult fracture healing. Decision analysis is a methodological tool based on gaming theory that allows for the quantitative analysis of decision-making. The purpose of this study was to better understand the determinants of decision-making and the optimal treatment strategy for Jones fractures using such a model.

**Methods:** Outcome probabilities after Jones fractures were determined from a systematic review of the literature. Patient preferences for these various outcomes were obtained via questionnaire. A decision tree was constructed and analysis performed.

**Results:** Non-operative treatment was associated with a value of 7.74 and operative treatment with an IM screw a value of 7.88, making operative treatment the optimal management strategy. When parameters were varied in sensitivity analysis, it was noted that when the utility value for uncomplicated surgery falls below 8.04 or when the utility for healing with non-operative treatment rises above 8.49, non-operative treatment is the preferred strategy. Non-operative treatment was also favored when the likelihood of healing with non-operative treatment rose above 82% or when the probability of healing after surgery fell below 92%.

**Discussion and Conclusion:** In this decision analysis model, IM screw fixation was the preferred management strategy, but the model was very sensitive to small changes in several determinants of decision-making. In clinical settings where the likelihood of healing with non-operative treatment is high, when an informed patient is averse to surgery, or when the patient accepts the possibility that late surgery may be required to treat non-union, non-operative treatment may optimize outcome. This decision analysis model can be incorpo-

rated into a shared decision making process between surgeon and patient.

**Notes:**

1:27 pm–1:33 pm

**Incidence of Failure of Continuous Peripheral Nerve Catheters for Post-Operative Analgesia in Orthopaedic Surgery**

Zahab Ahsan, MS  
 Jeffrey Yao, MD  
 Brendan Carvalho, MBCh, FRCA

**Introduction:** Continuous peripheral nerve blockade (CPNB) has shown to be a valuable method of post-operative analgesia. CPNB provides the potential benefits of pain management with reduced risk of opioid-related side effects including respiratory depression, nausea/emesis, sedation, pruritus, and substance dependence. Premature failure of CPNB is a concern as patients are subjected to unexpected pain of sudden onset. This study aims to address the incidence of failure of CPNB for upper and lower extremity orthopaedic surgery procedures.

**Methods:** A retrospective review of 426 patients who underwent post-operative CPNB at a single academic institution was performed. Patient data was obtained from the regional anesthesia database for clinical informatics for the study of functionality and efficacy of post-operative pain management. Documented information included a 24-hour postoperative survey of pain scores at rest and activity, patient-reported time of return of sensation, problems with pain control, failure of infusion pump, and appearance of the catheter site. This data was compiled and further stratified into upper and lower extremity procedures and incidence of failure was calculated.

**Results:** A total of 426 patients who received CPNB were identified (207 patients who underwent upper extremity surgery and 219 patients who underwent lower extremity surgery) In the upper extremity, a 20.8% incidence of postoperative CPNB failure was noted at the 24-hour mark. In

the lower extremity, a 13.7% incidence of postoperative CPNB failure was documented.

**Discussion and Conclusion:** Although CPNB improve post-operative pain management, decreased opioid supplementation, decreased opioid-related side effects, and increase patient satisfaction, the technique is associated with significant failure rates, which vary based on the site of catheter placement. Therefore, it important to establish patient expectations prior to surgery based on the potential of failure of CPNB and resulting breakthrough pain upon recovery from the primary nerve block, especially with some upper extremity blocks.

**Notes:**

1:33 pm–1:39 pm

**Incidence of Dorsal Wrist Ganglia Recurrence After Arthroscopic Excision with Color-Aided Visualization**

Zahab Ahsan, MS  
 Jeffrey Yao, MD

**Introduction:** Dorsal wrist ganglia (DWG) remain the most common benign soft-tissue tumors of the wrist, representing up to 70% of wrist masses. Many DWG are managed with non-operative treatment. Due to the high incidence of DWG, excision is amongst the most common procedures performed by hand surgeons. This procedure can be accomplished via open or arthroscopic techniques, and both are readily employed. We aimed to evaluate recurrence and complications after arthroscopic excision of dorsal wrist ganglia (DWG) with a novel technique that involves intralesional injection of inert dye to improve visualization of the stalk and ganglion resection.

**Methods:** Upon IRB approval, a retrospective chart review was performed identifying 22 patients who had undergone arthroscopic excision of a DWG with the dye-aided technique at our institution with a minimum follow-up duration of 12 months. Intraoperative findings were reviewed. Patients were contacted to investigate for incidence of recurrence.

**Results:** Of the 22 patient cohort, recurrence was identified in 1 patient, an incidence of 4.5%. No complications were identified in this patient cohort.

**Discussion and Conclusion:** The color-aided technique for arthroscopic DWG visualization was found to be a safe and valuable tool for surgeons performing arthroscopic DWG resection. Patients responded well with a low incidence of recurrence and without complications.

**Notes:**

1:39 pm–1:45 pm

### Does Shoulder Arthroplasty Increase Risk for Post-Operative Symptomatic Compressive Neuropathies of the Upper Extremity?

Edward Yian, MD  
Jeffrey F. Sosl, MD  
Ronald A. Navarro, MD  
Anshuman Singh, MD  
Mark T. Dillon, MD  
Christopher F. Ake, PhD  
Emil Dionysian, MD

Incidence of post-operative compressive peripheral neuropathy (CPN) after shoulder arthroplasty is not known. Intra-operative positioning, post-operative swelling, sling and repetitive range-of-motion rehabilitation may increase nerve pressures distally. This study's purpose was to determine risk for symptomatic CPN (i.e., cubital tunnel syndrome and carpal tunnel syndrome) following shoulder replacement. Retrospective analysis compared incidence of symptomatic CPN within one year after shoulder replacement to similar 1:1 age/gender matched non-operative control population with shoulder arthritis diagnosis. 606 shoulder replacements from regional shoulder arthroplasty registry between 2007-2010 were analyzed. This included 319 primary total shoulder replacements (TSR), 168 hemiarthroplasties, 31 humeral resurfacings, 71 reverse arthroplasties, and 17 revision arthroplasties. Exclusion criteria included prior non-arthroplasty surgery/fracture of affected limb, prior diagnosis of cervical radiculopathy or stroke (CVA), prior electromyography/nerve conduction (EMG/NCS) documenting symptomatic ipsilateral CPN before diagnosis of shoulder arthritis

(control group) or replacement surgery (study group). Diagnosis of post-operative CPN was obtained if patient had positive EMG/NCS results for new onset post-operative symptoms and underwent nerve release. All patient charts were validated by the study authors. Study variables included shoulder replacement type, patient age, gender, body mass index, diagnosis, diabetes status, thyroid abnormalities, EMG/NCS results, operative side, anesthesiology (ASA) score. Statistical analysis was performed to identify risk factors for CPN. The surgery group had 12 cases (2.0%) of post-operative CPN (8 carpal tunnel syndrome, 4 cubital tunnel syndrome). This included 4 TSR, 5 hemiarthroplasties, 2 revision TSR and 1 reverse shoulder replacement. Diagnoses included 7 osteoarthritis, 4 rotator cuff arthropathy and 1 chondrolysis. Control group had 8 cases (1.3%) of CPN (8 carpal tunnel syndrome, 1 cubital tunnel syndrome). The difference between groups was not statistically significant ( $p=0.37$ ), even after controlling for diabetes and thyroid conditions. Age, gender, body mass index, ASA score, operative side, diagnosis and procedure were not significant predictors of post-operative CPN (all  $p>0.05$ ). There was no significant difference of post-operative CPN incidence after shoulder arthroplasty compared to non-operative patients. Diabetes mellitus and thyroid abnormalities were not independent risk factors for CPN symptoms. This finding is important when counseling patients with symptoms after surgery.

**Notes:**

1:45 pm–1:51 pm

### The Role of CT Scans in Intra-Articular Distal Humerus Fractures

Eric Ferkel, MD  
\*Aniebiet-Abasi Udofia, MD, MBA  
Betsy M. Nolan, MD  
Stephan J. Sweet, MD, MPH  
John M. Itamura, MD

**Introduction:** A CT scan is frequently obtained to evaluate intra-articular distal humerus fracture patterns, but increases cost and radiation exposure. We hypothesize that the addition of CT changes classification and treatment for these fractures; and that CT improves inter-observer reliability for classification and treatment.

**Methods:** Nine blinded orthopaedic surgeons evaluated thirty consecutive fractures for classification and surgical approach. Two rounds of evaluation were performed: plain radiographs alone, and the same radiographs with the addition of CT. Statistical analysis was performed using Kappa correlation coefficient and Cramer V testing.

**Results:** Intra-observer reliability was fair (0.393) for classification and moderate (0.426) for treatment. Inter-observer reliability did not improve with CT. For classification,  $k=0.21$  without CT and 0.2 with CT. For treatment,  $k=0.28$  without CT and 0.27 with CT. When classifying the fractures, attending surgeons chose the multi-planar fracture pattern 25.6% of the time without CT, and remained consistent at 23.3% with CT. Trainees chose this fracture pattern much less often without CT than when CT was added. CT changed treatment for multi-planar fractures (73.7% lateral approach versus 51.9% posterior approach with olecranon osteotomy).

**Discussion and Conclusions:** CT changes classification and treatment plans when added to plain radiographs. Inter-observer reliability does not improve with CT. Less experienced surgeons are more likely to identify multi-planar fracture patterns with CT. We recommend obtaining a CT scan on all intra-articular distal humerus fractures.

**Notes:**

1:51 pm–1:57 pm

**Distal Radius Fracture Hematoma Block with Combined Lidocaine and Bupivacaine Can Induce Seizures While Within Therapeutic Window: A Case Report**

Bobby Dezfuli, MD  
 Christopher J. Edwards, PharmD, BCPS  
 Gregory L. DeSilva, MD

**Introduction:** Hematoma blocks are effective pain management modalities for closed reduction of distal radius fractures. Complications of hematoma blocks are associated with systemic reaction to anesthetic used.

**Methods:** We present a case report of an elderly patient who received a hematoma block of lidocaine and bupivacaine for a

distal radius fracture and subsequently developed a generalized tonic clonic seizure.

**Results:** The dose of both lidocaine and bupivacaine were well within the suggested dose limit.

**Discussion and Conclusion:** We conclude that hematoma blocks with a combination of anesthetics may decrease the threshold to neurologic complications, especially in elderly patients.

**Notes:**

Thursday, August 1, 2013  
 Concurrent Session 6 — General Topics  
 Moderator: Jason W. Stoneback, MD

1:15 pm–1:21 pm

**Level of Billing as a Function of Resident Documentation and Orthopaedic Subspecialty at an Academic Multispecialty Orthopaedic Surgery Practice**

Bobby Dezfuli, MD  
 Jordan L. Smith, MD

**Introduction:** Documentation, coding, and billing for physician-patient encounters have evolved over time and have significant variability. Appropriate and complete documentation of these encounters can contribute to the financial viability of both private and academic medical centers. The objectives of this study were to assess the financial impact of documentation on billing and to compare our institution’s distribution of billing level compared to Medicare normative data.

**Methods:** Four separate orthopaedic surgery subspecialty clinics were evaluated at a university outpatient clinic over a one-year period. A single full day clinic per week was used for each subspecialty. Residents dictated the majority of reports. All reports were transcribed by medical transcriptionists and coded by certified professional coders.

**Results:** The sports medicine subspecialty generated the highest volume of patient clinic visits, followed by foot & ankle, trauma, and spine ( $P < 0.01$ ). The majority of reports

billed at level 3 ( $P < 0.05$ ). There were significant differences between subspecialty and percentage distribution of billing level ( $P < 0.05$ ). Compared to Medicare aggregates, there were a significantly greater percentage of level 3 reports by the orthopaedic practice and lower percentage of level 2 and 4 reports ( $P < 0.01$ ). The estimated loss of revenue from the fewer level 4 reports was \$81,281.11 for one year.

**Discussion and Conclusion:** These findings highlight the need for greater educational interventions to improve provider documentation, coding, and billing.

**Notes:**

1:21 pm–1:27 pm

### Case Report: Interscalene Brachial Plexus Catheter Migration as Cause of Postoperative Phrenic Nerve Palsy

Seth H. Criner, DO  
Jacqueline Krumrey, MD

**Introduction:** Interscalene brachial plexus catheters have become common practice for patients who are undergoing upper extremity surgery. Paralysis of the hemidiaphragm is a known complication of brachial plexus blocks.

**Case Report:** A 56 year old male underwent surgery for a proximal humerus fracture. Past medical history included smoking, alcoholism, and malnutrition. Preoperatively he had placement of brachial plexus catheter postoperative pain control. During surgery, the patient desaturated briefly. Immediately after surgery a chest x-ray was obtained which showed only mild prominence of vascular markings and the diaphragm at the 11th intercostal space. The patient was admitted by the hospitalist service for observation. On postoperative day 2, he started having shortness of breath and delirium. Chest x-ray at that time showed a pleural effusion and likely diaphragmatic paralysis. The diaphragm's maximal excursion was now at the 7th intercostal space. The brachial plexus catheter was removed immediately. On postoperative day 5 the left hemidiaphragm once again was at the same level as the right hemidiaphragm. On postoperative day 7 he was intubated due to acute respiratory distress and pneumonia.

Unfortunately he was removed from life support and succumbed to ARDS on postoperative day 8.

**Discussion and Conclusion:** This is the first published case report of a patient with delayed paralysis of the hemidiaphragm following placement of a brachial plexus catheter. Paralysis of the hemidiaphragm is a known complication of interscalene brachial plexus blocks. This case report is a reminder of why a history of significant pulmonary issues is a relative contraindication to a brachial plexus block or catheter.

**Notes:**

1:27 pm–1:33 pm

### Effectiveness of Telemedicine Follow-Up Care Among Total Joint Replacement Patients

Behnam Sharareh, BS  
Ran Schwarzkopf, MD, MSc

**Introduction:** Post-operative care is a critical component of recovery following total joint replacement surgery. We hypothesized that a post-operative clinical telemedicine tool will increase patient satisfaction, reduce unscheduled clinic calls and visits, and reduce hospital re-admission rates.

**Methods:** A total of 38 patients who underwent total joint replacement were asked to communicate with their surgeon post-operatively via an internet video chat on 5 added encounters in addition to their scheduled clinic appointments. All internet video sessions were conducted on the same day of the week which comprised of a 30 minute window that varied in length depending on the number of telemedicine appointments. 17 patients (44.7%) underwent at least one telemedicine appointment during the initial 90-day post-operative period whereas 21 patients (55.3%) did not have appropriate electronic devices to undergo telemedicine or did not wish to take part.

**Results:** The average internet video call was 3.31 minutes (range 1.12-7.02min). The average length of the weekly internet video session was 16.15 minutes (range 1.74 - 26.53min) and varied depending on the number of operations on a given

week as well as each patient’s post-operative access to an appropriate electronic device. While there was no statistical difference between hospital re-admissions rates, patients who underwent at least one post-operative telemedicine followup had a statistically lower number of unscheduled clinic calls and appointments at 90 days compared to those without any telemedicine followup. Furthermore, patients who participated in telemedicine followup reported higher satisfaction with their post-operative care compared to patients who did not undergo telemedicine followup.

**Discussion:** Telemedicine postoperative interactions between patients and their surgeon are effective measures in improving patient satisfaction and reducing unscheduled visits and calls following TJR surgery. In addition, we feel that implementation of telemedicine in an orthopedic clinical setting is attractive due to its time and cost saving potential.

**Notes:**

1:33 pm–1:39 pm

**An Additional Financial Burden on the Orthopedic Trauma Surgery Service at a Level I Trauma Center: When Our County Will Longer Pay for Services Rendered**

Derek F. Amanatullah, MD, PhD  
 \*David A. Forsh, MD  
 Sheldon Coleman, MD  
 Philip R. Wolinsky, MD

**Background:** We examined the financial ramifications on the Division of Orthopaedic Trauma after the decision by our county medical system to stop payments to our institution for the medical treatment of county indigent patients. Our institution is the only level I trauma located within the county. Prior to mid-2009, county insurance eligible patients treated at our institution had their healthcare paid for by the county. After mid-2009 the county decided to no longer reimburse our institution for any care provided.

**Methods:** A retrospective review was carried out on the 653 county patients treated at our institution by the four orthopaedic trauma surgeons over a 4 year period that

included the 2 years prior to the loss of county payments as well as the 2 year period following the loss of payment. The data collected included: demographics, admitting service, injuries treated, length of stay, and surgeon billing and reimbursement. We also classified the urgency of care that was rendered into one of 3 categories: emergent, urgent, or elective.

**Results:** There was a higher frequency of emergent and urgent procedures and a lower frequency of elective cases performed in the non-contracted period versus the contracted period. During the contracted period we billed and collected \$1,161,036. After loss of reimbursement from the county we billed \$870,590 and were paid zero dollars. County reimbursements made up 33.5% of total professional fees billed. There was a 20% net drop in total billing during the non-contracted period of which the money not reimbursed by the county accounted for 31%.

**Conclusion:** Despite lack of county payment, our institution continues to provide care to the indigent population. This lack of payment may have significant long-term economic ramifications for Orthopaedic Trauma Surgeons, as well as our institution. The financial burden preferentially falls on the “safety net” level I trauma centers and the physicians who take care of patients with urgent and emergent injuries. This burden may be unsustainable in the future.

**Notes:**

1:39 pm–1:45 pm

**Pilot Project: Euflexxa with Platelet Rich Plasma Intra-Articular Knee Injection**

Ronald W. Hillock, MD  
 Patrick J. Brandner, MD  
 Lowell T. Niebaum, MD

**Introduction:** Osteoarthritis (OA) is one of the most common complaints of adults in the world. OA affects approximately 6% of the adult population in the United States. The purpose of this study is to evaluate the efficacy of sodium hyaluronate intra articular injection combined with Platelet Rich Plasma (PRP) injection into the human knee for treatment of pain due to OA.

**Methods:** Patients with objective evidence of OA enrolled in this open trial study received a series of three injections of both sodium hyaluronate and PRP into an arthritic knee in order to determine a measurable reduction in pain. Patients submitted to a pain evaluation telephone interview on week 4. Post-injection pain evaluations occurred during weeks 6, 12, 16 and 26; at this time, 50ft. 100mm walk test Visual Analogue Scale (VAS) scores were recorded for both study and non-study knees. Additionally, acetaminophen usage for pain rescue was noted.

**Results:** At baseline, the median VAS score of study knee (60) was significantly greater than the non-study knee (27.5). Over the course of three injections, immediate post-injection data suggests no significant adverse reaction to the sodium hyaluronate /PRP injections. 100% of patients reported improvement by week 4. By week 6, the median VAS score of the study knee (12.5) was not significantly different from the non-study knee. These results were consistent throughout the remainder of the study.

**Discussion and Conclusion:** VAS score results over the 26 week study period demonstrated significant pain-level reduction for all patients enrolled. According to this research, sodium hyaluronate /PRP injections have led to improvement in life quality for individuals suffering from OA of the knee. As a pilot study, further research is necessary in order to corroborate these findings.

**Notes:**

1:45 pm–1:51 pm

## Mobile Device Trends in Orthopaedic Surgery: Current Obstacles and Future Implications

Orrin I. Franko, MD  
David A. Muzykewicz, MD

**Introduction:** For many orthopaedic surgeons, mobile devices have become integral to their daily practice. Data regarding current trends and future implications are lacking.

**Methods:** We conducted a prospective internet-based survey over three time points from April 2011 to August 2012 at all

nationwide ACGME-accredited programs. Results were compared among orthopaedic surgeons, trainees, and non-orthopaedic providers.

**Results:** In total, 3304, 2965, and 5828 responses were received at the three time points (622, 329, and 223 orthopaedic caregivers, respectively). Mobile device use in the clinical setting increased across all fields and levels of training, but was greatest for orthopaedic trainees (50 to 73% and 23 to 36% for clinical smartphone and tablet use, respectively). Over 84% of orthopaedic trainees and 60% of attendings ( $p < 0.001$ ) felt that mobile devices made them better physicians. Similarly, 90% felt that institutions should support device integration, whereas only 51% believed that support to currently exist. Of all respondents, 67% supported incorporation of mobile device training into medical education. Major obstacles to use included lack of funds (49%), security concerns (45%), and a lack of institutional support (33%). A large majority of respondents reported using non-validated apps, whereas only a small minority recognized lack of peer-review/validation as a potential barrier to use.

**Discussion and Conclusion:** Clinical mobile device use presents unique opportunities to both improve and streamline orthopaedic care, but significant challenges remain and care must be taken to ensure proper education and prudent implementation.

**Notes:**

1:51 pm–1: 57 pm

## The Use of Functional Outcome Instruments in Articles Published in the Journal of Bone and Joint Surgery (American Volume) Over a Ten-Year Period

Raveesh D. Richard, MD  
Michael Suk  
Daniel S. Horwitz, MD

**Introduction:** Orthopaedic journals have the responsibility of choosing manuscripts for publication based on scientific merit and sound design but these studies often utilized nonvalidated functional outcome instruments. The purpose of this investigation was to observe the trends in functional outcome instru-

ments in articles accepted for publication in The Journal of Bone and Joint Surgery (American Volume).

**Methods:** A total of 2660 manuscripts that were published in The Journal of Bone and Joint Surgery (American Volume) from January 1, 2000 to December 31, 2009 were reviewed, with 1207 studies meeting the inclusion criteria. Manuscripts were examined for the use of functional outcome instruments, and the instruments were validated with a standardized reference (AO Handbook). Data was analyzed by year and subspecialty and expressed as percentages and averages.

**Results:** The average number of articles per year that reported functional outcome measures was 60% (range, 51 to 66%). The average nonvalidated, validated and generic measures per year were 10% (range, 4 to 20%), 76% (range, 68 to 86%), and 13% (range, 8 to 19%), respectively. The average overall score for the validated outcome measures per year was 6.1 out of 10 (range, 5.6 to 6.5). The category with the least percentage of validated scores was “Oncology” (17%) while the most was “Upper Extremity Joints” (88%). The category with the least percentage of validated scores appropriately used for the original populations of interest was “Oncology” (0%) while the most was “Lower Extremity Joints” (98%). The lowest score (5.3) was “Hand” and the highest score (6.9) was “Sports Medicine”.

**Discussion and Conclusion:** Of the articles that do employ functional outcome measures, the use of validated instruments are even less. The “overall” score of these instruments has only slightly improved over time and within each subspecialty. Additionally, the use of validated instruments does not necessarily equate to a well-designed study, as these instruments may have been originally validated for a different subspecialty, making interpretation of the outcomes difficult.

**Notes:**

## 2013 Scientific Program Abstracts — Friday

(An asterisk (\*) by an author's name indicates the presenter.)

Friday, August 2, 2013

### Concurrent Session 8 — Total Joints

Moderators: Jared L. Michalson, MD  
Ran Schwarzkopf, MD, MSc

8:35 am–8:41 am

### Simultaneous Bilateral Direct Anterior Total Hip Arthroplasty

Joseph Gondusky, MD  
\*Steven L. Barnett, MD  
Naila Khalaf, MD  
Jay Patel, MD  
Leera Choi, BA  
Robert S. Gorab, MD

**Introduction:** Simultaneous bilateral total hip arthroplasty (THA) has been performed successfully with good outcomes and low complication rates reported. Most published studies on the topic utilized anterolateral or posterior surgical approaches. The direct anterior approach (DAA) for THA is performed with the patient supine, obviating the need for patient re-positioning for bilateral surgery. We report our experience with simultaneous bilateral direct anterior THA.

**Methods:** Our institution has prospectively collected data on patients undergoing THA via the DAA. We analyzed data for all patients undergoing simultaneous bilateral THA via the DAA with a minimum three-month follow-up. Perioperative records were retrospectively reviewed to obtain relevant perioperative and postoperative data.

**Results:** Over the time period 2007-2012, 72 patients (144 hips) underwent simultaneous bilateral DAA THA. Mean follow-up for the cohort was 28 months, with a range of 3 months to 5 years. 55% of the patients were male. Average BMI was 29. Average age was 59. The complications observed included one trochanteric fracture. Average surgical time was 138 minutes. Mean blood loss was 450 ml. 45% of patients required postoperative transfusion. Mean hospital

length of stay was 2.3 days. Postoperative day one ambulation averaged 150 feet. 73% of patients were discharged to home. The average Harris Hip Score improved from 51 to 97. No readmissions within 30-days, infections, PE, or deaths were observed.

**Discussion and Conclusion:** The DAA for THA has the advantage of a single supine patient position for bilateral simultaneous surgery. The DAA may also minimize muscular damage and allow for more predictable component positioning and limb length equality during THA. Little outcomes data exists for the DAA for simultaneous bilateral THA. Our study shows that the DAA for simultaneous bilateral THA can yield low complication rates and excellent clinical outcomes.

#### Notes:

8:41 am–8:47 am

### Outcomes of Total Joint Arthroplasty in Human-Immunodeficiency Virus-Positive Patients

Ran Schwarzkopf, MD, MSc  
Nimrod Snir, MD  
Theodore S. Wolfson, MD  
Stephanie Swensen, MD  
Carlos M. Alvarado, MD  
Mathew Hamula, BSc  
Alan J. Dayan, MD

**Introduction:** There is a growing population of patients infected with human immunodeficiency virus (HIV) that are candidates for total joint arthroplasty (TJA). Since the advent of highly active antiretroviral therapy (HAART) in 1996, advances in the treatment of HIV have led to a dramatic increase in life expectancy among HIV-positive patients. Today, patients with HIV live long enough to develop chronic degenerative and HIV-associated joint disease. Within this aging population there

is a mounting demand for TJA. We hypothesize that despite HIV infection, reasonable rates of infection and complications will be observed in this population.

**Methods:** A total of forty-six joints in thirty-three HIV-positive non-hemophilic patients were included in the study. Medical records were reviewed for demographic characteristics, operative details, and pre-operative and post-operative clinical and radiographic data. HIV-positive status at the time of surgery was confirmed, and details of infection and treatment were collected. Intra-operative and post-operative complications, reoperations, and revisions were carefully studied. The most recent CD4+ T-cell count and HIV viral load prior to surgery were gathered from each chart.

**Results:** Overall, eight patients (17%) had temporary wound drainage, none of which went on to develop a surgical site infection. Within the THA cohort, two patients (5%) had a post-operative pulmonary embolus (PE) that resolved with anticoagulation. In-hospital medical complications were reported in 11% of cases, all of which resolved prior to discharge. The overall deep infection rate was 7%.

**Conclusion:** Our results suggest that low rates of complications and revision can be achieved in the HIV-positive, non-hemophilic population. Patients should be informed of the increased risk of complications and counseled on ways to improve outcomes. We believe that with careful patient selection, TJA may improve the quality of life in the HIV-positive population.

**Notes:**

8:47 am–8:53 am

### The Effect of Chronic Renal Disease on Primary Total Hip Arthroplasty: An Evaluation of Perioperative Morbidity and Implant Longevity

Alexander Miric, MD  
 Maria C. S. Inacio, MD  
 Robert S. Namba, MD

**Introduction:** The prevalence of chronic kidney disease (CKD) is rising worldwide. Patients with CKD are more likely

to have associated medical problems and are at greater risk for postoperative morbidity and mortality. The purpose of this study was to evaluate patient characteristics and risk of revision, surgical site infection, thromboembolic events, mortality and readmission of patients with CKD undergoing total hip arthroplasty (THA).

**Methods:** A retrospective analysis of prospectively collected data by a Total Joint Replacement Registry was conducted. All primary THA performed from 1/1/2006 to 12/31/2010 were included. Patient characteristics, co-morbidities and general health status were evaluated. Cox proportional hazard regressions and logistic regressions were used to evaluate the associations of CKD with outcomes while adjusting for confounders.

**Results:** 20,720 primary THA cases were included. 1,269 (6.1%) THA procedures were among CKD patients, with the majority of these in CKD stage 3 (850, 70.0%). The cohort was on average 66 years old and the majority were female (57.5%). The median follow-up was 2.1 years. CKD patients were older, had poorer general health and had a higher prevalence of co-morbidities. After adjustment for age, gender, race, general health, and diabetes, CKD patients were at 1.4 (95% confidence interval (CI) 1.1-1.8) increased risk of readmission within 90 days. The risks for overall revision, aseptic revision, septic revision, surgical site infection (superficial, deep, all), deep vein thrombosis, pulmonary embolism, and mortality (30-day, 90-day, ever) were not statistically significantly different between patients with CKD and those without.

**Discussion and Conclusion:** Our results suggest that CKD patients undergoing THA do not experience significantly increased morbidity. However, an increase in risk of 90-day readmission was observed in the CKD group, underscoring that CKD patients are a fundamentally different population with a greater likelihood of serious associated diagnoses.

**Notes:**

8:53 am–8:59 am

## Is the Function of Kinematically-Aligned TKA Better than Mechanically-Aligned TKA?

H. Gene Dossett, MD, MBA

**Introduction:** Kinematically-aligned TKA is a new alignment method. We conducted a randomized, controlled trial to determine whether kinematically-aligned TKA provides better function than mechanically-aligned TKA 2 years postoperatively.

**Methods:** Eighty-eight patients received either kinematically-aligned (N=44) or mechanically-aligned TKA (N=44). The kinematically-aligned TKA was performed with patient-specific instrumentation and the mechanically-aligned TKA was performed with conventional instrumentation. Patients, radiographic evaluator, and clinical evaluator were blinded to the surgical technique. Radiographic measurements were made from long-leg CT scanograms.

**Results:** At two years the average WOMAC score (0 best and 96 worst) of 13 in the kinematically-aligned group was 13 points better than the mechanically-aligned group. The average Oxford Score (0 is best and 48 is worst) of 7 in the kinematically-aligned group was 8 points better than the mechanically-aligned group. The average combined Knee Society Score (200 is best and 0 worst) of 163 in the kinematically-aligned group was 29 points better than the mechanically-aligned group. The average flexion of 125° in the kinematically-aligned group was 10° better than in the mechanically aligned group. The hip-knee-ankle angle (0.3° difference) and anatomic angle of the knee (0.8° difference) were similar in the two groups. In the kinematically-aligned group, the angle of the femoral component was 2.4° more valgus and the angle of the tibial component was 2.3° more varus than the mechanically-aligned group.

**Conclusion:** At two years, kinematically-aligned TKA provided better function (WOMAC, Oxford, combined Knee Society Scores) and better flexion than the mechanically aligned TKA and restored the same average limb and knee alignment. The obliquity of the joint line was more anatomic in the kinematically aligned TKA.

*\*The FDA has not cleared this drug and/or medical device for the use described in the presentation. (Refer to page 39).*

**Notes:**

8:59 am–9:05 am

## Arthroscopic Lysis of Adhesions for Stiff Total Knee Replacement: Does It Work?

Ran Schwarzkopf, MD, MSc  
Arsani William, BSc  
Rachel M. Deering  
Wolfgang Fitz

**Introduction:** Arthrofibrosis of the knee can be extremely debilitating to patients who have undergone total knee arthroplasty (TKA). Arthroscopic lysis typically involves the release of adhesions in the suprapatellar pouch, notch, and the medial and lateral gutters. Our hypothesis is that there is no correlation with respect to patients' documented pre-operative knee scores, BMI > 30 or body height.

**Methods:** We retrospectively examined 19 patients who underwent arthroscopic lysis of adhesions following TKA due to poor ROM, our criteria for lysis was the inability to flex to 90° at 3 months. All patients were followed for at least 2 years after the lysis in-order to evaluate ROM. Patient demographics, pre-surgical and follow-up ROM, number of prior surgeries and knee scores were collected.

**Results:** ROM increased from an average of 75.37° to 98.95° postoperatively. We found an association between preoperative knee scores and change in ROM between the pre-arthroscopically lysis and ROM at final follow-up. When we examined the relation between the patients' BMI and change in ROM we found that patients with a BMI>30 had a change of 26.44° compared to patients with a BMI<30 whom had a change of only 8.75°. A strong association was found between the patients' height and the change in ROM and final ROM achieved (p=0.0062, p=0.0032).

**Conclusion:** We report a successful outcome among the patients that were reported in this study, furthermore we found an association between patients' height, BMI and preoperative knee scores and the improvement achieved after arthroscopic lysis of adhesions following a TKA. Our results are comparable to published results. We recommend arthroscopic lysis of adhesions as a treatment options for stiff knees after TKA who have failed at least 3 months of non-surgical treatment.

**Notes:**

9:05 am–9:11 am

## Implementation of a Clinical Process Model in Patients with Total Knee Replacement Improves Clinical Efficiency and Inpatient Cost

David S. Jevsevar, MD, MBA  
Li Dong, MD

**Introduction:** Total knee replacement (TKR) can be an effective treatment for patients with severe knee osteoarthritis and is one of the most commonly performed surgical procedures in the United States. According to the American Academy of Orthopedic Surgeons, about 500,000 TKR procedures are performed in the US each year. A multi-center study showed wide variations across healthcare systems in operative times, hospital length of stay and inpatient cost for patients undergoing TKR. Evidence based clinical care process models (CPM) have been shown to reduce unnecessary variation in clinical practice and to improve clinical outcomes in numerous patient populations. Beginning in 2008, and over the course of a couple of years, Dixie Regional Medical Center (DRMC), a community-based hospital operated by Intermountain Healthcare, developed a standardized CPM and conducted a pilot study in patients undergoing total knee replacement. The objective of this quality improvement project was to maximize clinical efficiency as indicated by standard utilization metrics and to improve patient outcomes.

**Methods:** In 2010, the original flow chart developed in 2008, was reformed and implemented at DRMC. Several key elements either newly implemented or improved upon were made to the existing CPM including: 1. Patients we required to attend education classes prior to surgery to help them prepare for their surgery and to recovery and actively participate in their care. 2. Standardize pre-operative functional and cardiac testing was specified in order to reduce unnecessary tests and lower cost. 3. Streamlined operating room preparation process and improved teamwork using checklists. 4. Work with orthopedic surgeons to standardize and consolidate approved prosthetic devices and instruments from central processing and 5. Standardized use and duration of antibiotic prophylaxis as recommended by professional societies and the published evidence. Along with the design and implementation of the CPM, a timely and accurate data report or dashboard was provided to physicians detailing their personal and aggregate performance and compliance with the CPM. To evaluate the impact of the CPM, a retrospective study cohort was created consisting of osteoarthritis

patients 18 years old or older who underwent single primary total knee replacement (ICD-9-CM procedure code 81.54) from 2007 to 2011. Patients who had bilateral TKR or TKR revision were excluded from the study. The primary outcomes of interest were surgery time (cut to close), operating room time (wheels into and out of OR) and total inpatient cost for the index admission and surgery. T-Test were used to assess a difference between means before and after implementation of the CPM. Generalized linear regression model (GLM) was used to evaluate the association between primary outcomes before and after the study phase controlling for age and co-morbidities using the Charlson Comorbidity Index Score (CCIS).

**Results:** A total of 3,173 patients (2008-2009 = 1,849 and 2010-2011 = 1,324) with osteoarthritis underwent single primary total knee replacement during the study period with a mean age of  $67.6 \pm 9.5$  years. Compared to 2007-2009 baseline, surgery time was reduced from  $71.4 \pm 18.0$  minutes to  $68.0 \pm 17.5$  minutes ( $p$  less than 0.0001), operating room time was decreased from  $116.3 \pm 20.1$  minutes to  $106.8 \pm 19.6$  minutes ( $p$  less than 0.0001) and adjusted total inpatient cost (inflation adjustment into 2007 dollar) was reduced from  $\$13,309.1 \pm 2,488.1$  to  $\$12,600.1 \pm 3,445.9$  ( $p$  less than 0.0001) GLM also demonstrated reduced surgery time and adjusted inpatient cost after implementation of TKR CPM when controlling for age and CCIS ( $p = 0.0111$ ,  $p$  less than 0.001 respectively), but not with operating room time ( $p = 0.1918$ ).

**Discussion and Conclusion:** Even a high performing facility in delivering TKR care process can achieve further improvements in surgery time and operating room time when following TKR CPM. Implementation of the TKR care process model is associated with reduced OR time and lower inpatient cost. In our experience, improved clinical outcomes are tightly linked to physician engagement and physician engagement is fundamental to a high performing accountable health care delivery system. Process standardization and quality improvement are effective tools to change healthcare practice and culture. Aggressive steps should be made by healthcare organizations to apply standard quality improvement theory and tools to common and costly clinical processes.

**Notes:**

9:11 am–9:17 am

## Direct Anterior Total Hip Arthroplasty: A Learning Curve Study

Jay Patel, MD

\*Steven L. Barnett, MD

Leera Choi, BA

Joseph Gondusky, MD

Robert S. Gorab, MD

**Introduction:** The direct anterior approach (DAA) for total hip arthroplasty (THA) is a muscle sparing approach which has been demonstrated to have reliable implant positioning, low dislocation rates, low postoperative pain, and early return to function. The surgical technique for the DAA is technically challenging and some have reported high complication rates. This study aims to demonstrate that the DAA learning curve can be done in a safe and effective manner.

**Methods:** The study is a retrospective review of the first 250 DAA THA cases for each of 2 surgeons done between 2006 and 2009. The technique involved use of a table and fluoroscopic guidance. The patient's demographic information (age, gender, body mass index, and preoperative Harris Hip Score) was obtained from medical record. Outcomes recorded included surgical time, estimated blood loss (EBL), length of hospital stay (LOS), pain medication usage, blood transfusion, ambulatory distance on postoperative day 1 (POD 1), and complications.

**Results:** Comparison of the demographics of patients for cases 1-50 and 201-250 demonstrated an increase in age (64.9 vs. 66.3 years), no significant change in BMI (27.22 vs. 27.14), and increase in percentage of males (45 vs 48%). Significant improvements in surgical time (92.4 vs. 88.0 minutes), EBL (381 mL vs. 304 mL), LOS (2.89 vs. 2.18 days), blood transfusion (1.46 vs. 0.90 units), morphine equivalent pain medication usage (15.05 vs. 13.86 mg), ambulatory distance on POD 1 (120 vs. 231 feet), were noted. The combined mean rate of complications improved from 1.5% in the first 50 cases (1 calcar fracture, 1 femoral perforation, 1 dislocation) to 1.0% in the last 50 cases (1 calcar fracture).

**Discussion and Conclusion:** The DAA for THA is demonstrated to have a safe learning curve period as demonstrated in this retrospective case review. A systematic approach to surgical education and patient selection should be performed to

minimize complications during the learning curve for this technically challenging surgery.

Notes:

**Friday, August 2, 2013**

**Concurrent Session 9 — Trauma**

**Moderator: Payam Tabrizi, MD**

8:35 am–8:41 am

## Operative Versus Non-Operative Treatment of Femoral Fractures in Spinal Cord Injury Patients

Julius A. Bishop, MD

Paola A. Suarez, MPH

Lisa A. DiPonio, MD

Doug Ota, MD, PhD

Catherine M. Curtin, MD

**Introduction:** People with spinal cord injury (SCI) are frequently osteoporotic and have an increased risk of lower extremity fracture, with the femur being most frequently affected bone. Historically, these fractures have been treated non-operatively due to high rates of morbidity associated with surgery. However, non-operative treatment is also associated with complications, including soft tissue breakdown, infection, vascular injury and even loss of limb. These problems with non-operative management have led to ongoing interest in surgical treatment with several contemporary case series demonstrating acceptable results. The goal of this study was to compare peri-operative morbidity and mortality after operative and non-operative treatment of femur fractures in a large cohort of femur fracture patients with and without SCI.

**Methods:** This was a retrospective cohort study in the Veterans Affairs (VA) hospital system comparing femur fracture patients with and without spinal cord injury over a 5-year period (2001-2006). Demographic, fracture pattern and morbidity and mortality data were extracted and analyzed.

**Results:** We identified 396 veterans with femur fracture and SCI during the study period compared to 13,350 veterans with

femur fracture but without SCI. The SCI group was younger and had more distal fractures compared to the non-SCI group. In the SCI group, 37% of patients had their fractures managed surgically compared to 78% in the non-SCI group. In the non-SCI group, mortality was higher in patients managed non-operatively as were rates of respiratory failure and thromboembolic events. Bleeding complications were more common in patients managed surgically. In the SCI group, the only significant difference in morbidity between operatively and non-operatively treated patients was in the development of decubitus ulcers, with the non-operative group being more frequently affected. There was no difference in mortality between SCI patients treated with or without surgery.

**Discussion and Conclusion:** This study did not find increased rates of morbidity or mortality amongst SCI patients treated surgically for femur fractures. On the contrary, the only significant difference in adverse events between SCI groups was a higher rate of pressure ulcers in those who did not have surgery. These findings suggest that surgery may be the treatment of choice for some femoral fractures in the SCI patient population. Surgical treatment optimizes nursing care, physical therapy and patient mobilization, minimizing the risks of prolonged bed-rest and immobilization. When modern surgical techniques are coupled with meticulous and individualized peri-operative management, surgery can be safe and effective.

**Notes:**

8:41 am–8:47 am

### Hemiarthroplasty for Undisplaced and Stable Femoral Neck Fractures

Raveesh D. Richard, MD  
 Kaan Irgit, MD  
 Andrew Cornelius, MD  
 Thomas R. Bowen, MD  
 Cassondra M. Andreychik  
 Daniel S. Horwitz, MD

**Introduction:** The incidence of hip fractures in the United States and Europe is high and continues to increase. The best treatment for femoral neck fractures is still under debate. The purpose of the study was to compare the complication, reoperation and mortality rates of hemiarthroplasty and osteosynthe-

sis in patients with impacted/stable osteoporotic femoral neck fractures.

**Methods:** We retrospectively compared the complication, reoperation and mortality rates between two groups which were matched in age, gender, BMI and ASA scores. All included patients sustained Garden I or II femur neck fractures. Either hemiarthroplasty or osteosynthesis was performed based on surgeon preference. Osteosynthesis was performed with three parallel cannulated screws. The minimum follow up was 24 months. All patients were over 60 years old. The primary outcomes were complications of surgery and the need for revision surgery. A secondary outcome of the study was the cost of the primary surgery.

**Results:** The mean age of the 98 patients in the osteosynthesis group was 82 (range, 60-104) and 80 (range, 60-90) in the 38 patients treated with hemiarthroplasty. Mean follow up was 44 ± 1.4 months (range, 24- 92 months). Overall complication, reoperation and one year mortality rates were similar in both groups. Infection was significantly higher in the hemiarthroplasty group. In a logistic regression model analysis, the complication, reoperation and one year mortality rates were similar between patients over and under 80 years old, in both the hemiarthroplasty and osteosynthesis groups. Intraoperative blood loss and length of stay were significantly lower in the osteosynthesis group. The hemiarthroplasty group had a much higher cost of surgery.

**Discussion and Conclusion:** Hemiarthroplasty has no benefit in decreasing complications and reoperations for stable femoral neck fractures in the elderly. The costs of surgery and infection rates are higher with hemiarthroplasty as compared to osteosynthesis for these stable fracture patterns.

**Notes:**

8:47 am–8:53 am

## A Comparison of Sural vs. Perforator Fasciocutaneous Flaps for Coverage of Distal Medial Leg and Ankle Wounds

Andrew Schannen, MD  
Gregory L. DeSilva, MD  
Kaoru Goshima, MD  
Roger Bentley, MD  
Lisa M. Truchan, MD

**Introduction:** Traditionally, distal wounds of the leg and ankle region with exposed bone or metal implants require free tissue transfer. However, with an increasing knowledge of vascular anatomy, more local pedicled flaps are available for coverage of these challenging wounds. We present our experience with two pedicled fasciocutaneous flaps for the coverage of 14 traumatic and post-traumatic wounds of the distal medial leg and ankle region. This series compares 7 patients who had a suralfasciocutaneous flap (Group 1) for coverage of a distal leg or medial malleolar wound to 7 patients who underwent coverage by a perforator flap based on the posterior tibial artery (Group 2).

**Results:** The average age of the groups were 57 and 50 years old. The average size of the wounds were similar for both groups: 23 cm<sup>2</sup>. All flaps healed with no evidence of partial flap necrosis. In all cases, the underlying fracture healed prior to requiring implant removal. All patients were able to return to normal shoe wear.

**Discussion** This series presents our experience using two different pedicled flaps for a similar wound frequently encountered by orthopedic surgeons. These wounds were of same size between the two groups: 23 cm<sup>2</sup>. These two flaps, a pedicled suralfasciocutaneous and a septal perforator fasciocutaneous flap, were equally effective for these comparable wounds. The sural flap requires prone positioning and may require two surgeries for staging and maturation of blood flow while the perforator flap can be done supine in one sitting but requires ultrasound expertise to identify an adequate perforator vessel. In both options, patients do not require anticoagulation nor intensive flap monitoring. Both flaps offer excellent coverage of a common wound while avoiding the need for microsurgery and can be performed by an orthopaedic surgeon.

**Notes:**

8:53 am–8:59 am

## Anterolateral Versus Medial Plating of Extra-Articular Distal Tibia Fractures: A Biomechanical Model

Joseph Pirolo, MD  
Anthony W. Behn, MS  
Geoffrey D. Abrams, MD  
Julius A. Bishop, MD

**Introduction:** Distal tibia fractures can be difficult to treat due to complex fracture patterns and a tenuous soft tissue envelope. Both medial and anterolateral plate applications have been described for the treatment of these injuries, each with distinct advantages and disadvantages. The objective of this study was to compare the biomechanical properties of medial and anterolateral plates used to stabilize simulated varus and valgus fracture patterns of the distal tibia.

**Methods:** 16 4th generation synthetic tibia bone models were used to simulate varus and valgus Orthopedic Trauma Association (OTA) 43-A1.2 distal tibia fractures. The osteotomies were reduced and plated using a precontoured medial or anterolateral distal tibial locking plate. The specimens were potted in polymethylmethacrylate cement (PMMA) using a customized jig and were tested under axial and torsional loading conditions. Statistical analysis was performed using the Student's t-test.

**Results:** Medial plating was stiffer in both compressive (953 +/- 82 N/mm vs. 600 +/- 197 N/mm) and torsional loading (internal rotation: 2.5 +/- 0.5 Nm/deg vs. 1.0 +/- 0.1 Nm/deg; external rotation: 3.8 +/- 0.4 Nm/deg vs. 2.5 +/- 0.3 Nm/deg) for the varus fracture pattern. There was no statistically significant difference between medial and anterolateral plating for the valgus fracture pattern in compressive (828 +/- 127 N/mm vs. 843 +/- 94 N/mm) or torsional (internal rotation: 1.7 +/- 0.4 Nm/deg vs. 1.4 +/- 0.1 Nm/deg; external rotation: 1.1 +/- 0.2 Nm/deg vs. 1.2 +/- 0.1 Nm/deg) testing.

**Discussion and Conclusion:** Medial plates had superior biomechanical performance compared to anterolateral plates when used to stabilize varus fracture patterns. For valgus fracture patterns, no biomechanical differences between anterolateral and medial plating were observed. In clinical practice, surgeons should take this biomechanical evidence into account and perform a plating that optimizes stability.

**Notes:**

8:59 am–9:05 am

### Biomechanical Evaluation of Plate vs. Lag Screw Only Fixation of Distal Fibula Fractures

Amirhossein Misaghi, MD  
Diana Glaser, PhD  
Josh Doan, MEng  
Tracey Bastrom, MA  
Andrew T. Pennock, MD

**Introduction:** Traditional fixation of unstable Weber type B/C ankle fractures consists of a lag screw coupled with a lateral or posterolateral neutralization plate. Several studies have demonstrated the clinical application and success of lag-screw-only fixation; however, to date no biomechanical comparison of the different constructs has been performed.

**Methods:** Standardized distal fibula osteotomies were created in 3 groups of 10 Sawbones, simulating a long oblique Weber B/C ankle fracture. Osteotomies were subsequently reduced utilizing (1) 2 bicortical lag screws, (2) 3 bicortical lag screws, or (3) a single 3.5mm lag screw coupled with a 1/3 tubular steel neutralization plate. All lag screws were placed 1 cm apart orthogonal to the osteotomy. The fibulae were secured with a custom rig to an MTS test frame for biomechanical testing. Construct stiffness in lateral bending (N/mm) rotation ( $\text{Nm}^\circ$ ) and failure torque (Nm) were evaluated.

**Results:** No significant difference was detected between the 3 fixation methods in lateral bending ( $p=0.30$ ) or rotational ( $p=0.70$ ) stiffness. All constructs were rotated to failure with no significant difference ( $p=0.52$ ) found in the failure torque.

**Discussion and Conclusion:** When compared to lag-screw-only fixation, plate fixation requires larger incisions, increases implant costs, and is more likely to be prominent necessitating implant removal. Despite the published clinical success of treating simple Weber B/C fractures with lag-screw-only fixation, many surgeons still hesitate to use this technique for stability concerns. For non-comminuted long oblique distal fibula fractures, lag-screw-only fixation techniques offer similar construct stiffness to traditional plate and lag screw fixation.

**Notes:**

9:05 am–9:11 am

### The Effects of Elevation, Simulated Injury, and Immobilization on Muscle Perfusion

Ariel Palanca, MD  
Arthur Yang  
Julius A. Bishop, MD

**Introduction:** A common orthopaedic practice is to elevate a traumatized lower extremity to reduce swelling. However, elevation may compromise arterial inflow, resulting in ischemia. Therefore, the ideal degree of elevation for an injured extremity remains controversial. The goal of this study was to quantify the direct effects of elevation, simulated injury and immobilization on muscle perfusion using near infrared spectroscopy.

**Methods:** 26 uninjured volunteers were enrolled. Muscle perfusion in the anterior compartment of the right leg was measured at 0, 30 and 60 cm of elevation using a near infrared spectroscopy unit. A standardized short leg splint and a tourniquet were then applied to the left lower extremity to simulate injury as established in a previous experimental protocol, and perfusion measures were repeated. Muscle perfusion values at various degrees of elevation with and without simulated injury were then compared.

**Results:** 18 males and 8 females with a mean age of 29.8 years were enrolled. The mean regional O<sub>2</sub> saturation (rSO<sub>2</sub>) of the control limb at 0 degrees elevation was 74.2%. Mean rSO<sub>2</sub> of the simulated injury limb was reduced by 7.65%, which was statistically significant. Mean rSO<sub>2</sub> of the control limbs at 0, 30 and 60 cm of elevation were 74.2%, 72.5%, and 70.6% respectively, while mean rSO<sub>2</sub> in the simulated injury group were 66.3%, 65.0%, and 63.3%. As elevation increased, rSO<sub>2</sub> decreased on average .06% per degree of elevation, which was statistically significant.

**Discussion and Conclusion:** Increasing levels of elevation in a human limb results in increasingly compromised muscle perfusion as measured by near infrared spectroscopy. This suggests that the clinical benefits of elevation must be balanced against the deleterious effects of compromised perfusion. Ongoing research is indicated in injured patients to better characterize the effects of elevation on ischemia in the setting of lower extremity trauma.

**Notes:**

9:11 am–9:17 am

## Internal Fixation in a Combat Theater Hospital

Thomas M. Large, MD  
\*Cale W. Bonds, MD  
Michael Howard, MD

**Introduction:** There are limited data available on internal fixation use in combat zone hospitals. The epidemiology of combat orthopaedic injuries during two deployments is reported with the results of patients treated with internal fixation devices during Operation Enduring Freedom at a level III theater hospital.

**Methods:** A retrospective review of 713 surgical cases during two deployments in 2007 and 2009-2010 was performed. All patients sustaining battlefield injuries were treated with a standardized damage control protocol which included a minimum of two operative debridements prior to internal fixation.

**Results:** The percentage of injuries from improvised explosive devices increased from 8.5% to 36.5% between deployments and the number of limbs injured per patient increased from 1.46 to 1.74. 117 internal fixation procedures on 92 patients were identified. Follow-up was available on 64 cases in 47 patients. 38 (59%) of these cases were open fractures: 5 (13%) were type II, 22 (58%) type IIIA, 3 (8%) IIIB, 2 (5%) IIIC, and 6 (16%) had inadequate documentation to be classified. Under the AO/OTA classification, there were 16 (25%) type A, 23 (36%) type B, and 24 (38%) type C fractures. 27 intramedullary nailing and 37 plate/screw procedures were performed. Nine patients received an antibiotic-impregnated calcium sulfate or cement spacer. Eight patients required split thickness skin grafts and three had rotational muscle flaps for soft tissue coverage. Six patients had fasciotomies for compartment syndrome. Average follow-up was 122 days. There were two infections (3%). Out of the 37 cases that had adequate follow-up to determine fracture healing, there were two delayed unions and one nonunion for a rate of 8%. There were a total of five cases (8%) that required additional procedures.

**Conclusion:** Judicious use of internal fixation under a damage control protocol in a combat theater hospital can be performed with acceptable complication rates.

**Notes:**

9:17 am–9:23 am

## Tibial Plateau Fractures in Alpine Skiing

Joel N. Smith, MD  
\*Kyle E. Swanson, MD  
Britta L. Swanson, PhD

**Introduction:** Alpine skiing is a sport enjoyed by participants of all ages and experience levels. While overall injury rates due to skiing have decreased over time, knee injuries have increased. Tibial plateau fractures are thought to be rare injuries observed in alpine skiers. The purpose of this study was to review tibial plateau fractures in alpine skiers, evaluate the inter-observer reliability of Schatzker classification, and to determine if patient outcomes are related to fracture type, age, or skill level. We hypothesize that most tibial plateau fractures will be low-energy fractures (Schatzker I-III) and occur in women and less-experienced skiers.

**Methods:** Charts and radiographs of patients who were treated for tibial plateau fractures caused by alpine skiing were evaluated. Patients who were treated less than two years prior were excluded. Qualifying patients were contacted to complete a questionnaire.

**Results:** The average age of skiers with tibial plateau fractures was 49 with 60% being male. There were 28 low-energy fracture patterns (Schatzker I-III) and 19 high-energy fracture patterns (Schatzker IV-VI) with a 95.7% inter-observer reliability. There was no correlation between patient age, experience, fracture type and overall pain level, influence of activity level, or ability to return to skiing.

**Discussion and Conclusion:** Contrary to the hypothesis, we observed that tibial plateau fractures sustained while alpine skiing occurred in older, experienced riders. Approximately 40% were high-energy fractures with no correlation between fracture pattern severity and final outcome pain.

**Notes:**

**Friday, August 2, 2013**

**Concurrent Session 11 — Tumor/Basic Science**

**Moderator: Cynthia M. Kelly, MD**

1:00 pm–1:06 pm

**Non-Invasive Expandable Endoprostheses Used for Limb Salvage of Lower Extremity Malignant Bone Tumors in Skeletally Immature Patients**

George T. Calvert, MD  
\*J. Dominic Femino

**Introduction:** Optimal treatment of malignant bone tumors about the knee in young patients remains controversial. Leg length inequality is a major challenge with limb salvage. Non-invasive expandable endoprostheses were introduced in hopes of reducing the morbidity associated with the multiple open procedures required with invasive expandable devices. Data on the outcomes of this technique are limited.

**Methods:** Fourteen consecutive limb salvage cases performed by the senior author using a non-invasive expandable tumor prosthesis were reviewed in an IRB approved retrospective study. One patient was lost to follow-up, and two patients died of their oncologic disease. Charts and radiographs of the remaining eleven patients were studied to determine their limb salvage rate, complication rate, functional outcomes, and length discrepancy at skeletal maturity.

**Results:** Eleven patients (5 male, 6 female; average age 9.6 years at surgery) were reviewed. Average follow was 72 months. There were 3 proximal tibia replacements and 8 distal femur replacements. The limb salvage rate was 7/11 (64%). Three patients required amputation due to infection, and a fourth has a functionless limb due to nerve palsy. Device specific complications included 2 failures of the expansion mechanism, 2 peri-prosthetic fractures, 1 implant fracture, and 1 aseptic loosening requiring early revision. Total prosthesis lengthening averaged 5.2 centimeters. Final length discrepancy averaged 1.8 centimeters, and only one patient uses a shoe lift. All seven successful limb salvage cases walk without assist device and do not require narcotic pain medication.

**Discussion:** Similar to other reports of this technique, a high complication rate was noted in this series. However, patients

with successful limb salvage had small length discrepancies and good function. Advances in surgical technique, lengthening protocols, and implant technology may improve upon these results.

**Notes:**

1:06 pm–1:12 pm

**Total Humerus Endoprosthetic Replacement Following Resection of Malignant Bone Tumors**

Suhel Kotwal, MD  
\*Bryan S. Moon, MD  
Patrick P. Lin, MD  
Robert L. Satcher, MD  
Valerae O. Lewis, MD

**Introduction:** To date, the reports on the functional and oncological outcome of patients who have undergone total humerus replacement for malignant bone tumors are isolated and sparse in literature. We describe our experience of employing this procedure for past two decades using both custom-made and modular total humeral endoprosthetic replacements.

**Methods:** Between January 1990 to December 2011, 20 patients underwent total humeral endoprosthetic reconstruction at our institution. Data was collected through retrospective analysis of medical records, imaging studies and questionnaires structured for measurement of patient-derived outcome. Of the 20 patients, 11 had this as a limb salvage procedure for primary humeral sarcoma, and 9 for metastatic disease. There were 10 males and 10 females, with a mean age of 40.9 years.

**Results:** The mean follow-up was 42.9 months for all patients. Eleven patients were alive at the time of review. Implant survival was 87.1% at 5 and 65.3% 10 year marks with the end-point being revision surgery for mechanical failure. Patient survival was 70.1% at 10 years. Overall the mean MSTS functional outcome score for all 20 patients at the time of their respective latest available follow-up was 71.5%. Of the 11 surviving patients available for evaluation, the mean score was 77.6%. Mean active shoulder flex-

ion and abduction was 12.5o. Mean elbow flexion was 103.5o.

**Discussion and Conclusion:** Total humeral endoprosthesis replacement is a valuable tool that offers the opportunity of limb salvage following extensive and total excision of the humerus. It carries a low complication rate, improved emotional acceptability and enhanced function for the operated extremity, with preservation of useful elbow and hand function. With careful selection and pre-operative counseling, with respect to limited active shoulder motion, this reconstructive modality is a valuable tool in the treatment of extensive malignant tumors of the humerus.

**Notes:**

1:12 pm–1:18 pm

## Ifosfamide Therapy for Dedifferentiated Chondrosarcoma

Satoshi Kawaguchi, MD  
Tao Sun, MD  
Patrick P. Lin, MD  
Nusrat Harun  
Valerae O. Lewis, MD

**Introduction:** Dedifferentiated chondrosarcoma (DDC) is a variant of chondrosarcoma characterized by two distinct histopathologic components. DDC remains a significant therapeutic challenge. The present study evaluated treatment outcomes and prognostic variables of patients with DDC, focusing in particular on the impact of ifosfamide-based chemotherapy.

**Methods:** Data from 41 patients with DDC diagnosed and treated at the author's institution from 1986 to 2010 were analyzed for demographics, treatments, oncologic outcomes and prognostic variables. Survival was estimated using Kaplan-Meier plots and analyzed by using the Cox proportional hazards model.

**Results:** The mean age at diagnosis was 58 years (range, 26-86 years). Seven patients had presented with metastasis. Surgical resection alone was performed in 11 patients; resection and chemotherapy in 26 patients; resection and radiotherapy in 2 patients; and resection, chemotherapy and radiotherapy in

2 patients. Ifosfamide-based regimens were used for 16 patients. Median follow-up was 68 months (range, 8-281 months). Disease-specific survival rate at 2 and 5 years were 33% and 15%, respectively. Univariate analysis revealed that pathologic fracture, treatment without ifosfamide-based chemotherapy, and presence of metastasis at diagnosis were significantly associated with poor disease-specific survival rate. In contrast, age, gender, location, size, initial incorrect diagnosis, positive margin, and treatment with any chemotherapy failed to show a significant association. Multivariate analysis revealed that treatment without ifosfamide-based chemotherapy was the sole independent negative prognostic factor for disease-specific survival. The 5-year disease-specific survival for patients, with localized disease treated with ifosfamide, was 32%.

**Discussion and Conclusion:** Ifosfamide-based adjuvant chemotherapy combined with margin-negative surgical resection appears to be the most efficacious strategy for management of DDC.

**Notes:**

1:18 pm–1:24 pm

## Prognosticators of Local Recurrence in High-Grade Soft Tissue Sarcomas: Hydrogen Peroxide as a Local Adjuvant

Adam N. Wooldridge, MD, MPH  
\*Gregory P. Kolovich, MD, MPH  
Martha K. Crist, RN  
Joel L. Mayerson, MD  
Thomas J. Scharschmidt, MD

**Introduction:** Soft-tissue sarcomas have a mortality rate of 40–60% with local recurrence being a poor prognostic factor for overall survival. 3% non-diluted hydrogen peroxide is hypothesized to be an effective local adjuvant. We sought risk factors for local recurrence in high-grade soft tissue sarcomas and asked whether hydrogen peroxide as a local adjuvant reduced the risk of local recurrence and surgical site infection.

**Methods:** Retrospective data were collected on 106 patients surgically treated for high-grade soft tissue sarcomas from 2002-2010. The primary endpoint was local recurrence. Multi-

variable logistic regression was utilized to determine significant predictors of local recurrence.

**Results:** There were 18 incident cases of local recurrence (16.98%). Predictors of local recurrence included margin status, estimated blood loss, and histology (MPNST) with hazard ratios of 4.44 (95% CI 1.32, 14.95), 1.19 (95% CI 1.06, 1.35), and 9.21 (2.11, 40.16), respectively. Hydrogen peroxide yielded a statistically insignificant improvement in local recurrence with a hazard ratio of 0.81 (95% CI 0.27, 2.48) and reduced risk of surgical site infection with a hazard ratio of 0.52 (95% CI 0.15, 1.81)

**Discussion and Conclusion:** Margin status, increased blood loss, and histologic subtype are associated with increased risk of local recurrence. The use of hydrogen peroxide improved local control and infection rates, but did not reach statistical significance.

**Notes:**

1:24 pm–1:30 pm

### A Comparison of Insertional Torque and Pullout Strength Between Cortical and Cancellous Screws

Julius A. Bishop, MD  
 Christopher R. Boone, MD  
 Tim Wang, MD  
 Justin B. Ledesma, MD  
 Anthony W. Behn, MS

**Introduction:** Cancellous screw design features a relatively small core diameter and a large pitch resulting in deeper screw threads but less thread density (more pitch) over a given length. In contrast, cortical screw design features shallower but more densely related screw threads (less pitch). While never proven biomechanically, the rationale for the cancellous design is to optimize fixation in metaphyseal environments where cortical bone may either be very thin or unavailable for fixation and where the cancellous bone density can be poor. The goal of our study was to compare insertional torque and pullout strength of cortical and cancellous screws from one manufacturer in osteoporotic and normal density foam blocks. Our hypothesis was that insertional torque and pullout strength would not be statistically significant.

**Methods:** Pullout strength and maximum insertional torque of 4.0 mm cancellous and cortical screws in normal and osteoporotic synthetic cancellous bone were measured using an established biomechanical model.

**Results:** In the osteoporotic block, there was no significant difference in pullout strength between cancellous and cortical screws. In the normal density block, pullout strength was significantly greater in cancellous screws. There were no significant differences in maximum insertional torque between the different screw designs.

**Conclusion:** Our study shows that current options of cortical and cancellous screws do not provide significant increased resistance to max insertional torque and pullout strength in either normal cortical or osteoporotic bone and that clinical failure is more likely related to improper fracture fixation and poor bone quality.

**Notes:**

1:30 pm–1:36 pm

### Hypovitaminosis D in an Urban, Diverse Trauma Population

Benjamin Zellner, MD  
 Charles A. Reitman, MD  
 Lee M. Reichel, MD

**Background:** Vitamin D is important for fracture healing as well as the maintenance of adequate bone and muscle structure and function. The purpose of this study was to determine the prevalence of hypovitaminosis D in an urban level 1 trauma center in Houston, TX.

**Methods:** We performed a prospective analysis of consecutive patients admitted to the orthopedic surgery service between July 2011 and March 2012 at a Level 1 hospital. Admission labs included measurement of 25-hydroxyvitamin D levels. The values of normal (>30 ng/ml), insufficient (20-20.9 ng/ml) and deficient (<20 ng/ml) were collected.

**Results:** 419 patients have been evaluated. 81 % were admitted for traumatic injuries and 17 % for infection, there was no significant difference between levels in fracture patients ver-

sus other injuries (laceration, infection). The average age of the subjects was 41.2 years, there was no significant difference between age categories. 74.9% of the subjects were Hispanic or African American and had significantly lower values of vitamin D. Males (n=285) had an average value of 21.2 ng/ml and female (n=134) 18.6 ng/ml. There were findings of insufficiency in 85%, deficiency in 53%, and levels less than 10 ng/ml were seen in 16%. Seasonal variation was significant, average 23.5ng/ml over the summer months and 16.3ng/ml over the winter months.

**Conclusion:** The prevalence of hypovitaminosis D is widespread. This may negatively affect outcomes for orthopedic patients but is easily correctable. Thus Vitamin D serologic analysis is recommended for all orthopedic trauma patients.

**Notes:**

1:36 pm–1:42 pm

### Quantification of the Roles of JNK, p70 and p38 in Skeletal Muscle Mechanotransduction in Response to Passive Stretch

Orrin I. Franko, MD  
John J. Finneran, IV, MD  
Matthew C. Shillito, MD  
Richard L. Lieber, PhD

**Introduction:** Skeletal muscles sense their mechanical environment and generally adapt appropriately; however, the mechanism by which muscles convert mechanical signals to cellular responses (mechanotransduction) has yet to be fully defined. To further characterize the mechanical parameter(s) that most strongly affect muscle adaptation, this study quantified signaling in mouse whole muscle after cyclic passive mechanical deformation under a variety of mechanical conditions.

**Methods:** Extensor digitorumlongus (EDL) muscles from 48 male mice (strain 129/SV) were each assigned to one of six passive stretch protocols, varying stretch number (240 vs. 480), total duration of stretching (4, 8, and 16 min), and time interval between stretches (0.5, 1, 2, and 4 seconds). Strain

rate and magnitude were constant across groups at 20% strain and 1 fiber length/sec. After stretching, phosphorylated levels of c-JNK, p38, and p70 proteins were quantified relative to contralateral muscles by immunoblotting. A 2x3, 2-way ANOVA was utilized with a  $p < 0.05$  accepted for statistical significance.

**Results:** Results demonstrated that p70 and p38 were affected by number of stretches ( $p=0.03$  and  $p=0.02$ ), but JNK was not ( $p=0.14$ ). Duration of stretch had no significant effect for JNK, p70, or p38 ( $p=0.98$ ,  $p=0.06$ , and  $p=0.64$ , respectively), nor did interval time ( $p=0.95$ ,  $p=0.18$ , and  $p=0.77$ , respectively). A 2x3 ANOVA revealed that p70 and p38 were significantly influenced by number of stretches, but that neither total stretch duration nor time interval had a significant effect ( $p < 0.05$ ).

**Discussion and Conclusion:** Prior studies have shown that JNK, p70 and p38 are implicated in the early intracellular signaling cascades of skeletal muscle mechanotransduction. These results further characterize the components of this system and reveal that p70 and p38 are influenced by stretch number, but that none of these three proteins are influenced by stretch duration or time interval. These results imply that skeletal muscles maintain a passive “counting” mechanism that operates via the p70 and p38 signaling pathways and responds to cyclic passive stretch but neither time between stretches nor frequency of stretching.

**Notes:**

1:42 pm–1:48 pm

### Interobserver Reliability in the Measurement of Lower Leg Compartment Pressures

Thomas M. Large, MD  
\*Daniel J. Holtzman, MD  
Julie Agel, MA  
Steven K. Benirschke, MD  
James C. Krieg, MD

**Introduction:** The interobserver reliability in measuring compartment pressures is unknown.

**Methods:** A consistent lower leg cadaveric compartment syndrome model was created (mean pressure=47 mmHg) and monitored with indwelling slit catheters and the authors' serial measurements (SD 2.8 mmHg). 38 residents, fellows, and attending physicians examined the limb assuming a diastolic blood pressure of 70 mmHg. They assembled the compartment pressure monitor and measured the four compartment pressures. They were observed for correct assembly of the monitor, reading the instructions, proper zeroing and flushing for each measurement, and anatomically correct measurements. The measurements were recorded and compared to the standard pressure measurements.

**Results:** 47% were concerned about compartment syndrome based on physical exam and 61% did not read the instructions. Of the 152 separate compartment measurements, 48 (31.6%) were made with proper technique, 45 (29.6%) were made with catastrophic errors, and 59 (38.8%) with lesser variations in technique. Participants' level of training, experience using the monitor, and reading the monitor's instructions did not have a significant effect on the likelihood of making a catastrophic error nor on accuracy to within 5 mmHg of the standard compartment pressure. Proper technique significantly improved accuracy: 60% of proper technique measurements were within 5 mmHg of the standard pressure versus 42% and 22% for the variant and catastrophic error groups, respectively. Proper technique measurements were a mean of 5.9 mmHg (SD 7.1) from the standard pressure while those with variant technique and catastrophic errors were 10.8 mmHg (SD 12.8) and 20.1 mmHg (SD 14.0), respectively. 41% of measurements could have resulted in a missed diagnosis.

**Discussion and Conclusion:** Variations and errors in technique were common and even with proper technique, 40% of measurements were at least 5 mmHg from the correct pressure. The measured compartment pressure must be seen as an approximation.

**Notes:**

**Friday, August 2, 2013**

**Concurrent Session 12 — Spine**

**Moderator: Justin Bird, MD**

1:00 pm–1:06 pm

### **Orthopaedic Patients Admitted Through the Emergency Room Are Less Satisfied with Physician Performance than Those Admitted Through Other Pathways**

John S. Vorhies, MD  
Julius A. Bishop, MD

**Introduction:** Survey-based patient satisfaction data is becoming increasingly important as a tool to guide performance improvement and influence physician and hospital reimbursement. However, the important variables that influence patient satisfaction remain poorly understood. Here we investigate the influence of emergency versus elective admission on patients' perceptions of physician performance and overall satisfaction with care. We hypothesized orthopaedic patients admitted to the hospital through the emergency department would be less satisfied with their physicians and their overall care.

**Methods:** Over a three year period (11/2009-11/2012) satisfaction surveys were sent to all patients admitted to an academic level one trauma center. A satisfaction score from 0-100 was calculated based on responses to questions about physician and overall hospital performance. We compared the satisfaction scores of orthopaedic patients admitted through the emergency department to patients admitted through other pathways. Sample means were compared using the t-test and demographic controls were introduced using a logistic regression model.

**Results:** During the study period, 15,363 patient surveys were collected across the entire hospital system. 1624 of these were from patients admitted to an orthopaedic service. Amongst these patients, those admitted through the emergency department were significantly less satisfied with the performance of their physicians 84% vs 89.6% but rated their overall care similarly 88.2% vs 88.7%.

**Discussion and Conclusion:** In this study, orthopaedic patients admitted through the emergency department were less satisfied with their physicians when compared to patients

admitted through other pathways. As patient satisfaction data is included in algorithms for quality based reimbursement it will be important to adjust for factors beyond a hospital's or a physician's control that influence satisfaction so as not to penalize hospitals and physicians that provide trauma care. Ongoing research is indicated to improve our understanding of variables that influence patient satisfaction.

**Notes:**

1:06 pm–1:12 pm

### **Patient and Surgeon Radiation Exposure Varies Widely in Orthopaedic Spine Surgery: Fluoroscopy, Radiography and Intra-Operative CT**

Eric Klineberg, MD

\*Elisha M. Nelson

J. Anthony Seibert

**Methods:** Utilizing three common imaging modalities- a C-arm, portable (CR) machine and a Metronic O-arm, doses for radiology technologists, surgeons and anesthesiologists were obtained. A phantom of a patient with a body mass index of 27.4 was created using 30 sheets of 3/8-inch Lucite. Ionizing radiation exposure was measured using a calibrated RadcalAccu-pro #9096 control unit. The average kvp and maS for a typical L5-S1 pedicle screw operation at UCD Medical Center was obtained and approximated during the simulation.

**Results:** C-arm exposed the patient to the least radiation and the surgeon to the most. Surgeon position was critical as the detector side received 5.7mR per image while the tube side received 10x more (54 mR). Patient exposure for a single c-arm image was 120mR, XR is 28x higher, and O-arm exposed the patient to 43x radiation. Exposure doses to other personnel in the OR were negligible regardless of modality.

**Discussion and Conclusion:** Anesthesiologists and technicians are exposed to approximately the same amount of ionizing radiation during L5-S1 arthrodesis regardless of modality. Surgeons receive 10x the radiation when standing near the tube compared to the detector when using fluoroscopy (C-arm). XR and O-arm radiation was negligible for the surgeon, due to the distance from the source. Patients receive substan-

tially more radiation when using XR or O-arm. One XR and O-arm was equivalent to 28 and 43 c-arm images, respectively. The annual allotted occupational dose exposure per United States Nuclear Regulatory Commission is 5000mRem, or equivalent to only one O-arm spin. Surgeons and staff must be aware of the radiation dose that we are exposed to, as well as our patients. Imaging modality choice plays a significant role in radiation delivered to our patients.

**Notes:**

1:12 pm–1:18 pm

### **A Biomechanical Comparison of Shape Design and Positioning of Transforaminal Lumbar Interbody Fusion Cages**

Garet Comer, MD

Ivan Cheng, MD

Anthony W. Behn, PhD

Shashank Ravi, BS

**Introduction:** Transforaminal lumbar interbody fusion (TLIF) has become a popular technique in lumbar spine surgery with a wide variety of interbody cage designs. Despite the widespread use of these cages, there is a paucity of literature in regards to the optimal cage shape and location within the interbody space to place the cage.

**Methods:** Eighteen L2-3 and L4-5 lumbar motion segments from fresh cadavers were potted in polymethylmethacrylate and subjected to testing with a materials testing machine before and after unilateral facetectomy, discectomy, and interbody cage insertion. The three cage types were kidney-shaped, articulated, and straight bullet-nosed. Each cage type was placed in a common anatomic area within the interbody space before testing: kidney, center; kidney, anterior; articulated, center; articulated, anterior; bullet, center; bullet, lateral). Load-deformation curves were generated for axial compression, flexion, extension, right bending, left bending, right torsion, and left torsion. Lastly, load to failure was tested.

**Results:** For all applied loads there was a statistically significant decrease in the slope of the load-displacement curves for instrumented specimens compared to the intact

state with the exception of flexion. When the three cage types were inserted centrally, the only significant difference was the average amount of subsidence during load to failure with the articulating cage displacing the most (kidney – 4.68mm, articulated – 8.23mm, bullet – 3.92mm). When cage locations were compared within each cage type, there was no statistically significant change in stiffness or subsidence.

**Discussion and Conclusion:** Our results quantify the degree to which a lumbar motion segment is stabilized during the interbody portion of a TLIF. While supplemental posterior instrumentation is usually needed, we did not identify an ideal interbody cage shape or position.

**Notes:**

1:18 pm–1:24 pm

### Changes in Foraminal Geometry with Anterior Decompression Versus Keyhole Foraminotomy in the Cervical Spine: A Biomechanical Investigation

Jacqueline Nguyen, MD  
 Bryant Chu, MS  
 Calvin C. Kuo, MD  
 Jeremi M. Leasure, MSEng  
 Christopher P. Ames, MD  
 Dimitry Kondrashov, MD

**Introduction:** Anterior cervical discectomy and fusion (ACDF) with or without uncovertebral joint resection and posterior keyhole foraminotomy are both established operative procedures to treat patients with cervical disc disease and radiculopathy. Studies have demonstrated reliable results with each procedure, but none have compared the change in neuroforaminal area between the two methods. We aim to determine which cervical decompression method most consistently increases the neuroforaminal area.

**Methods:** Seven human cadaveric cervical spines at C5-6 and C6-7 underwent sequential decompression. Each level was randomly assigned to a surgical sequence. Four specimens underwent bilateral foraminotomies at C5-6 first, followed by ACDF without and then with resection, and lastly, bilateral foraminotomies at C6-7. Three specimens underwent the same

sequence; however, bilateral foraminotomies were first done at C6-7 and then at C5-6 last. The standard ACDF approach was completed using fibular strut allografts. Biomechanical testing was done after each procedure to measure the minimum cross-sectional area of each foramen, and the loading modes included neutral, flexion, and extension. The primary outcome measure was change in minimum cross-sectional area at C5-6 and C6-7, expressed as a percentage of the intact baseline of each anatomical position, with each level serving as its own control.

**Results:** For all three anatomical postures, foraminotomy resulted in the greatest increase in foraminal area (48.9 – 65.2% increase). ACDF with and without uncovertebral joint resection produced similar results, increasing the foraminal area to a lesser degree (25.8-39.0% and 21.0-44.5% increase, respectively). For all three procedures, the area was increased most in extension.

**Conclusion:** The greatest increase in cross-sectional neuroforaminal area was seen with foraminotomy in comparison to ACDF with or without resection, and this increase in area was maintained during extension. There was no statistically significant difference in the increase in area in ACDF with or without resection.

**Notes:**

1:24 pm–1:30 pm

### Hypotension as a Risk Factor for PTSD Symptoms

Liska Havel, BA  
 Alexander C. Ching, MD  
 Lynn M. Marshall  
 Natalie L. Zusman  
 Laszlo N. Kiraly  
 Brian T. Ragel  
 Alexander C. Ching, MD  
 Robert A. Hart  
 Jung U. Yoo

**Introduction:** Post-Traumatic Stress Disorder (PTSD) is a recognized anxiety disorder which causes difficulty with social, occupational, and other functioning. This study sought

to use vital signs obtained at hospital admission to determine the risk of developing PTSD symptoms following traumatic spine injury.

**Methods:** Adult spine trauma patients admitted to our Level One Trauma Center between October 2009 and September 2012 were studied. The first systolic and diastolic blood pressure (SBP, DBP), mean arterial pressure (MAP), heart and respiratory rate (HR and RR) were recorded, along with demographic factors, medical history, and Injury Severity Score (ISS) at admission from medical records. Data were analyzed using Chi-Square and T-Tests. We measured PTSD associated symptoms with two validated instruments: the PTSD Check List – Civilian (PCL-C) and Impact of Events Scale-Revised (IES-R). Responses were collected at 6 weeks and 6 months. Scores of  $\geq 35$  on the PCL-C or  $\geq 27$  on the IES-R at 6 weeks, 6 months, or both were used to define PTSD.

**Results:** Eighty-six patients completed the 6 month interview with PTSD symptom prevalence of 53% (46/86). MAP was inversely associated with PTSD; patients with a MAP  $\leq 90$ mmHg had 3.5 times the rate of PTSD symptoms than those  $>90$ mmHg (83% vs. 24%). SBP followed a similar pattern. HR and RR were not associated with PTSD. Adjusting for ISS, the relation between PTSD and both MAP and SBP was maintained. When pre-injury use of cardiac medications was adjusted for SBP or MAP there was no association between PTSD and cardiac medicine, which may be attributable to small sample size.

**Conclusion:** Prevalence of PTSD symptoms is high among patients who sustained spinal trauma and is associated with low mean arterial pressure and systolic blood pressure at hospital admission.

**Notes:**

1:30 pm–1:36 pm

### Microbiology of Surgical Site Infection Occurring in a Complex Spinal Surgery Practice

Rolando F. Roberto, MD  
Lance K. Mitsunaga, MD  
Marko Tomov, BS  
Monica Evans, RN  
Blythe Durbin-Johnson, PhD

In 2010 and 2011, 599 and 653 spinal operations were performed respectively by Orthopedic Spine Surgeons in a University Based Practice. In 2010, SSI occurred in 8 patients which required reoperation and in 2011 SSI occurred in 7 patients for an incidence of 1.3% and 1.1%. Bacterial species cultured were Staph aureus in 9 cases with 2/9 methicillin resistant species. Other bacterial pathogens identified included, Strep viridans, E. coli, Bacteroides fragilis, Pseudomonas, Proteus species, Enterococcus, Enterobacter cloacae and Serratia. SSI after operation occurs at a predictable rate varying between 0.1 and 10% across a broad range of institutions and spinal procedures. When they occur they result in significant economic burden, personal cost and extend hospitalizations. From a patient perspective, SSI can result in the need for reoperation with concomitant pain and prolonged disability. From a Health System standpoint, SSI will increase the cost of hospital care which may approach thousands to hundreds of thousands in health care cost required to achieve eradication of infection. Based upon the two year data, a universal SSI prevention protocol has been developed. 2 year comparative data are not yet available.

**Notes:**

1:36 pm–1:42 pm

### Are Systematic Reviews Useful for Practitioners

Anthony H. Woodward, MD

**Introduction:** Systematic reviews are considered the highest level of evidence for evidence-based medicine. This paper

examines the systematic reviews published in *Spine* in the past year for their practical utility.

**Methods:** Each systematic review was analyzed for the following items: Statement of the question to be answered. Criteria for the selection of studies, including completeness, and assessment of publication bias. Validity of the outcome measurement used. Accuracy of the reviewers' summary of the studies reviewed. Who were excluded in the studies reviewed. Assessment of possible biases in these study. Validity and strength of the answer to the review's question. Generalizability of the answer. Effect of any reports published since the last study in the review. Compatibility of the reviewers' conclusions with other orthopedic literature. And particularly the usefulness of the review for practicing orthopaedists.

**Results:** Twelve systematic reviews were found in *Spine* and 12 more in the Supplement on adjacent segment pathology.

**Discussion and Conclusion:** Systematic reviews are used to guide one's own practice, to develop guidelines for others, and to determine insurance coverage, authorization or payment. But before so using them, they require detailed analysis of their utility and relevance.

**Notes:**

1:42 pm–1:48 pm

## Pulmonary Function Testing and Risk of Perioperative Pulmonary Complications in Patients with Cervical Myelopathy and Myelomalacia

Jeremy D. Shaw, MD  
 Julia Martha, MPH  
 Ling Li, MPH  
 Tal Rencus, MD  
 David Hunter, MD  
 Brian Kwon, MD  
 David H. Kim, MD

**Introduction:** The association between traumatic cervical spinal cord injury (SCI) and pulmonary complications is well-established. A potential similar relationship between cervical myelopathy and cervical myelomalacia has not previously been examined. The purpose of this study was to prospec-

tively evaluate pulmonary function and the occurrence of adverse pulmonary events in patients with cervical myelopathy and myelomalacia.

**Methods:** Twenty-two consecutive patients undergoing surgical decompression for cervical spondylotic myelopathy were prospectively evaluated for pulmonary function (PFT). Patients were selected based on preoperative MRI cord signal changes. Myelopathy was graded with modified Japanese Orthopedic Association (mJOA) and Nurick scales. Pulmonary-related complications were noted including prolonged intubation, reintubation, respiratory failure, pneumonia, and atelectasis. MRIs were independently evaluated by two readers.

**Results:** Formal PFT revealed a mild but consistent impairment of pulmonary function based on forced vital capacity (FVC), forced expiratory volume (FEV1) as well as the FEV1/FVC ratio. There was, however, no association between the severity of myelopathy and PFT. Similarly, the severity of myelomalacia was not associated with PFT. No association was noted between cervical myelopathy, spinal stenosis, myelomalacia and the occurrence of adverse pulmonary events. However, patients with elevated BMI and more numerous medical comorbidities experienced an elevated rate of adverse pulmonary events following surgical decompression (BMI  $35.8 \pm 6.0$  vs.  $28.5 \pm 6.2$ ).

**Discussion and Conclusion:** This prospective study suggests that cervical stenosis and myelomalacia represent a form of SCI. Resultant neuromuscular weakness leads to measurable impairment of pulmonary function. The association between poor pulmonary performance and myelomalacia achieved near statistical significance. Underpowering in this small series may not have detected a true association. PFT was not found to be predictive of adverse perioperative pulmonary events. Obese patients and those with numerous medical comorbidities are at risk for an increased rate of adverse pulmonary events in the perioperative period following treatment for cervical myelopathy.

**Notes:**

## 2013 Scientific Program Abstracts — Saturday

(An asterisk (\*) by an author's name indicates the presenter.)

**Saturday, August 3, 2013**

**General Session 14 — Resident Awards**

**Moderator: Steven J. Morgan, MD, FACS**

8:55 am–9:03 am

### **Tigecycline and Rifampin Combination Therapy Have Increased Efficacy Against an Experimental Staphylococcus Aureus Prosthetic Joint Infection**

Jared A. Niska, MD  
Jonathan H. Shahbazian, BS  
Romela I. S. Ramos, BS  
Kevin P. Francis, PhD  
Nicholas M. Bernthal, MD  
Lloyd S. Miller, MD, PhD

**Introduction:** Treatment of prosthetic joint infections often involves a 2-stage exchange with implant removal and antibiotic spacer placement followed by systemic antibiotic therapy and delayed reimplantation. However, if antibiotic therapy can be improved, single-stage exchange or implant retention may be more feasible, thereby decreasing morbidity and preserving function. Due to its enhanced bone uptake, we hypothesized that tigecycline may have increased efficacy against these infections.

**Methods:** A mouse model of prosthetic joint infection was used in which Staphylococcus aureus was inoculated into a knee joint containing a surgically placed metallic implant extending from the femur. On postoperative day 7, tigecycline or vancomycin ± rifampin was administered for 6 weeks with implant retention. In vivo bioluminescence imaging, ex vivo CFUs, X-ray imaging and histologic analysis were evaluated.

**Results:** Tigecycline was more effective than vancomycin in reducing the bacterial burden and preventing bone damage. Combination treatment with rifampin provided a marked therapeutic benefit compared with vancomycin or tigecycline

alone. Remarkably, tigecycline plus rifampin resulted in no evidence of infection.

**Discussion and Conclusion:** Tigecycline alone and in combination with rifampin were highly effective in this model of prosthetic joint infection, suggesting the potential for enhanced efficacy against prosthetic joint infections in humans.

**Notes:**

9:03 am–9:11 am

### **A Novel Osteogenic Oxysterol Compound for Therapeutic Development to Promote Bone Growth: Activation of Hedgehog Signaling and Osteogenesis Through Smoothed Binding**

Scott Montgomery, MD  
Vicente Meliton  
Sigrid Nachtergaele  
Gil Weintraub  
Frank Stappenbeck  
Jeffrey C. Wang, MD  
Farhad Parhami

**Introduction:** Osteogenic factors are often used in orthopaedics to promote bone growth. Oxysterols are naturally occurring molecules that have been shown to induce osteogenic differentiation. The purpose of this study was to identify an osteogenic oxysterol with greater efficacy and more simplified synthesis compared to those previously reported, and evaluate its ability to promote osteogenic differentiation in vitro and spine fusion vivo.

**Methods:** Among a large number of oxysterol analogues synthesized, Oxy133 was selected for further study based on its ability to induce alkaline phosphatase activity. For in vitro

studies, mouse bone marrow stromal cells, embryonic fibroblasts, and primary human mesenchymal stem cells were treated with Oxy133 and the induced expression of osteogenic differentiation markers was measured by Q-RT-PCR. For the in vivo study, 8-week old male Lewis rats underwent posterolateral L4-L5 spine fusion using collagen sponges to deliver control, 5 ug BMP2, or 0.2, 2, or 20 mg Oxy133.

**Results:** Oxy133 induced the in vitro expression of osteogenic markers Runx2, osterix (OSX), alkaline phosphatase (ALP), bone sialoprotein (BSP), and osteocalcin (OCN). In vivo, bilateral fusion masses were observed on plain radiographs at 4 weeks and fusion was confirmed with micro-CT at 8 weeks in all animals treated with 20 mg Oxy133 (7/7) or BMP2 (8/8), compared to 50% (4/8) of animals treated with 2 mg Oxy133. Micro-CT analysis demonstrated an increased bone volume to tissue volume ratio in the Oxy133 fusion masses when compared to BMP2 fusion masses, indicating denser bone formation.

**Conclusion:** Synthesis and characterization of Oxy133 was performed successfully and treatment of osteoprogenitor cells with Oxy133 in vitro caused robust osteogenic differentiation. Additionally, spine fusion was promoted in vivo, demonstrating the potential of Oxy133 as an alternative to BMP2 for the surgical treatment of disorders requiring bone formation.

**Notes:**

9:11 am–9:19 am

## Biomechanical Demands on Posterior Fusion Instrumentation During Lordosis Restoration Procedure

Calvin C. Kuo, MD  
Audrey Martin, Eng  
Connor J. Telles  
Jeremi M. Leasure, MSEng  
Christopher P. Ames, MD  
Dimitriy Kondrashov, MD

**Introduction:** Restoration of lumbar lordosis in patients with preoperative sagittal imbalance is necessary to prevent postoperative sagittal decompensation. Corrective maneuvers impart

large forces that may lead to failure of instrumentation and inability to achieve correction. The goal of this study is to investigate the forces placed on posterior fusion instrumentation by three commonly used techniques to restore lumbar lordosis: (1) cantilever bending, (2) in situ bending, and (3) compression and/or distraction of screws along posterior fusion rods.

**Methods:** Seven cadaveric torsos were instrumented with pedicle screws at levels L1-L5. Screw pullout force was monitored with strain gauges mounted at each level. Specimens underwent each of the three lordosis restoration procedures. Peak loads experienced on the screws during surgery and resting loads after corrective maneuvers were measured. Loads were normalized with the corresponding degrees of correction noted on fluoroscopic imaging.

**Results:** In situ bending imparted the largest intra-operative loads with an average of  $485.5 \pm 154.3$  N per degree of correction (N/deg), followed by compression/distraction ( $431.1 \pm 125.3$  N/deg) and cantilever bending ( $343.6 \pm 237.9$  N/deg). A mean overall lordotic correction of  $10.9 \pm 4.7$  degrees was achieved. No statistically significant difference in lordotic correction was observed between restoration procedures or by level. In situ bending produced the largest post-operative loads at L1 ( $109.3 \pm 115.0$  N/deg.) while cantilever bending and compression/distraction produced comparable post-operative loads at L1 ( $31.3 \pm 32.5$  and  $21.6 \pm 18.3$  N/deg).

**Discussion and Conclusion:** In situ bending resulted in the highest mechanical demand on posterior lumbar instrumentation as well as the largest post-operative loads at L1. The results suggest that the forces generated with in situ bending have a greater chance of intraoperative instrumentation failure and post-operative proximal pedicle screw pullout when compared with the cantilever bending and/or compression/distraction techniques. The results of this study are aimed to optimize correction and fusion strategies in lordosis restoration cases.

**Notes:**

9:19 am–9:27 am

## Spinal Epidural Abscesses: Risk Factors, Medical vs Surgical Management: A Retrospective Review of 128 Cases

Timothy B. Alton, MD  
Amit Patel, MD  
Carlo Bellabarba, MD  
Richard J. Bransford, MD  
Michael J. Lee, MD  
Jens R. Chapman, MD

**Introduction:** Spinal epidural abscess (SEA) is a rare, serious and increasingly frequent condition. Ideal management remains controversial. This study assesses the impact of risk factors, organisms, location and extent of SEA on neurological outcome after medical management or surgery in combination with medical management.

**Methods:** Retrospective review of 128 consecutive spontaneous SEA from a single tertiary medical center, Jan/05-Sept/11. Demographics, presenting complaints, radiographic features, pre/post-treatment ASIA motor score ([MS] 0-100), treatment (medical vs. surgical) and follow-up were recorded.

**Results:** 128 patients, age 22-83 years (mean 52.9), average follow-up 241 days. Risk factors: history of IV drug abuse (39.1%), diabetes mellitus (21.9%), no risk factors (22.7%). Pathogen: MSSA (40%), MRSA (30%). Location, SEA extent and pathogen did not impact MS recovery. 51 patients were treated with antibiotics alone (group 1), 77 with surgery and antibiotics (group 2). Within group 1, 21 patients (41%) failed medical management (progressive MS loss or worsening pain) requiring delayed surgery (group 3). Irrespective of treatment, MS improved 3.37 points. 30 patients had successful medical management (MS: pre-treatment 96.5, post-treatment 96.8). 21 patients failed medical therapy (41%), (MS: pre-treatment 99.86, decreasing to 76.2 (mean change -23.67 points), post-surgery improvement to 85.0, net deterioration of -14.86 points). This is significantly worse than the mean improvement of immediate surgery (group 2) (MS: pre-treatment 80.32, post-treatment 89.84, recovery of 9.52 points). Diabetes, CRP >115, WBC >12.5 and positive blood cultures predict medical failure: 0 of 4 parameters: 8.3% failure; 1: 35.4% failure; 2: 40.2% failure; 3 or more: 76.9% failure.

**Conclusion:** Medical failure of SEA is common (41%), leads to worse neurological outcomes vs. early surgery, and the risk of medical failure can be predicted by diabetes, CRP >115, WBC >12.5, and bacteremia. Early surgical decompression,

irrigation, and debridement should be the mainstay of treatment for SEA.

Notes:

9:27 am–9:35 am

## What Is the Impact of Age on Reoperation Rates for Femoral Neck Fractures Treated with Closed Reduction Percutaneous Pinning and Hemiarthroplasty?

Joshua S. Griffin, MD  
\*Donavan K. Murphy, MD  
Michael L. Brennan, MD  
Kindyle L. Brennan, PhD  
Daniel C. Jupiter, PhD

**Introduction:** As the prevalence of hip fractures continues to increase, the preferred method of surgical intervention for femoral neck fractures (FNF) based on age remains a topic of debate. The primary aim of the study was to assess the effect of age on reoperation rates following FNF treated with closed reduction percutaneous pinning (CRPP) and hemiarthroplasty (HA).

**Methods:** A retrospective comparative study was performed at a level 1 trauma center at which electronic medical records and digital radiographs were reviewed for 949 FNF with minimum 2 year follow up. Age groups of 60-69, 70-79, and greater than or equal to 80 (octogenarians) were created within nondisplaced FNF treated with CRPP and displaced FNF treated with HA. For the primary outcome of reoperation based on age, Kaplan-Meier models were built and analysis applied.

**Results:** Three hundred thirty-four fractures were nondisplaced treated with CRPP, and 615 were displaced managed with HA. Overall, a total of 98 patients (10.33%) required reoperation. Increasing reoperation rates for CRPP was seen with each subsequent age group. The opposite was seen with HA in which increasing age groups showed lower reoperation rates. The relationship of reoperation rate with surgical choice and age group was found to be significant. In the octogenarian group, CRPP reoperation rates were significantly higher than HA at 6-month, 1-, 2-, and 3-year follow-up.

**Discussion and Conclusion:** Patients greater than or equal to 80 years old undergoing closed reduction percutaneous pinning showed a high reoperation rate and consideration of primary hemiarthroplasty should be made for nondisplaced femoral neck fractures in the octogenarian population.

**Notes:**

9:35 am–9:43 am

### Functional Significance of Distal Brachioradialis Tendon Release: A Biomechanical Study

Orrin I. Franko, MD  
Siddharth Bhola, MD  
Timothy F. Tirrell, BS  
Eric R. Hentzen, MD, PhD  
Reid A. Abrams, MD  
Richard L. Lieber, PhD

**Introduction:** Open reduction and internal fixation (ORIF) of distal radius fractures often necessitates release of the brachioradialis as it inserts on the radial styloid. However, this common procedure has the potential to decrease elbow flexion strength, an effect that has not been quantified. To determine the potential morbidity associated with brachioradialis release, we measured the change in elbow torque as a function of incremental release of the brachioradialis insertion footprint.

**Methods:** In upper extremity cadaveric specimens (n=5), the brachioradialis tendon was systematically released from the radius, and the resultant effect on brachioradialis elbow flexion torque was measured. Release distance was defined as the distance between the release point and the tip of the radial styloid.

**Results:** Brachioradialis elbow flexion torque dropped to only 95±2%, 90±2% and 86±3% of its original value at release distances of 27±4mm, 46±6mm, and 52±10mm, respectively. Importantly, brachioradialis torque remained above 80% of its original value at release distances up to 7 centimeters.

**Discussion and Conclusion:** Our data demonstrate that release of the brachioradialis tendon from its insertion has very minor effects on its ability to transmit force to the distal

radius. These data may imply that the common practice of release of the distal brachioradialis tendon during distal radius ORIF can be performed without expecting significant functional consequences with respect to elbow flexion torque. Even at large release distances, overall elbow flexion torque loss after brachioradialis release would be expected to be less than 5% due to the much larger contributions of the biceps and brachialis. Preserved elbow flexion torque after complete release also implies that harvesting the brachioradialis for use as a tendon transfer donor should not be limited due to concerns of elbow flexion loss and that the tendon could possibly be considered as a potential autograft donor.

**Notes:**

9:43 am–9:51 am

### Comparison of Cup Position and Limb Length in Primary THAs Performed Through the Anterior Supine and Posterolateral Approaches

Philipp Leucht, MD  
Heather G. Huddleston, MD  
Michael J. Bellino, MD  
James I. Huddleston III, MD

Reduction in limb length discrepancy (LLD) and improved cup positioning are purported benefits of using fluoroscopy for total hip arthroplasty (THA). We compared LLD and cup position in 200 patients (group I posterior approach without fluoroscopy, group II anterior supine approach with fluoroscopy) who underwent primary THA. Mean LLD was 2.7mm (SD 5.2mm, range 30.7mm) and 0.7mm (SD 3.7mm, range 22.4mm) for groups I and II, respectively (p=0.002). Seven percent of hips in group I had LLD >1 cm compared to 3% in group II. Mean cup inclination measured 40.8° (SD 5.0°, range 27.6°) in group I, and 43.4° (SD 5.6°, range 24.6°) in group II. Ninety-six percent of cups in group I exhibited inclination within 10° of the mean compared to 92% in group II (p=0.24). Mean anteversion measured 35.3° (SD 7.1°, range 42.9°) in group I and 25.9° (SD 8.2°, range 43.2°) in group II. Eighty-seven percent of hips in group I exhibited anteversion within 10° of the mean compared to 76% in group II (p=0.045). The anterior approach with intraoperative fluoros-

copy reduced LLD but did not improve the precision of cup positioning in primary THA.

**Notes:**

**Saturday, August 3, 2013**

**General Session 16 — WOA/OREF Young Investigator Awards**

**Moderator: Steven J. Morgan, MD, FACS**

12:15 pm–12:23 pm

### **Inhibition of Chondrocyte and Synovial Cell Death Following Exposure to Commonly Used Anesthetics**

John G. Costouros, MD  
Allison J. Rao  
Tyler R. Johnston  
Alex S. H. Harris, PhD  
R. Lane Smith, PhD

**Introduction:** Injection of local anesthetics into joints is commonly used for diagnostic and therapeutic purposes. It has been shown that these agents are toxic to articular cartilage and synovial tissue. However, the role of apoptosis in cell death is still unclear. The purpose of this study was to (1) quantify the degree of apoptotic cell death in chondrocytes and synovial cells exposed to local anesthetics and (2) determine whether apoptosis inhibition could reduce cell death.

**Methods:** Human chondrocytes and synovial cells were expanded in vitro and exposed to normal saline, 0.5% bupivacaine, 0.5% ropivacaine, 1% lidocaine, or 1:1000 epinephrine for 90 minutes. Apoptosis was then detected at 1, 3, 5, and 7 days following exposure using TUNEL and immunohistochemistry. Apoptosis was then inhibited using a broad-spectrum caspase inhibitor.

**Results:** were normalized to normal saline controls and analyzed by generalized regression models and pairwise confidence intervals.

**Results:** Analysis of cumulative chondrocyte apoptosis relative to control following anesthetic exposure demonstrated >60% cell death with 0.5% bupivacaine and 1:1000 epinephrine. In synovial cells, epinephrine was also very cytotoxic, however 1% lidocaine induced the most apoptosis. Caspase inhibition was most effective in blocking apoptotic cell death in both chondrocytes and synovial cells when co-administered with 0.5% ropivacaine.

**Discussion and Conclusion:** Local anesthetics induce chondrocyte and synovial cell apoptosis in a time dependent fashion, with peak apoptosis occurring 5 days following exposure. Both chondrocytes and synovial cells are most sensitive to caspase inhibition following exposure to 0.5% ropivacaine. Apoptosis inhibition may be an effective strategy in minimizing chondrocyte and synovial cell death following exposure to intra-articular anesthetics. Further investigation is clinically warranted.

**Notes:**

12:23 pm–12:31 pm

### **The Effect of Anti-Rotation Pins on Stability of the Bone Prosthetic Interface of a Novel Compressive Osseointegration Implant Used for Limb Salvage Surgery: A Biomechanical Study with Clinical Outcomes**

Raffi S. Avedian, MD  
Timothy Chen, BS  
David G. Mohler, MD

**Introduction:** Durable limb salvage for patients undergoing surgery for bone sarcomas remains a clinical problem with implant failure rates up to 60% at 10 years. A novel limb salvage endoprosthesis that uses compressive osseointegration to achieve bone implant stability may achieve longer survivorship rates compared to traditional implants; however failures due to rotational instability have been reported. The purpose of this study was to determine the biomechanical and clinical effects of anti-rotation pins used in this implant.

**Methods:** A biomechanical study that used four groups of eight matched cadaver femur specimens was conducted to test

various anti-rotation pin configurations including zero, one, two, three, and four pins. A servohydraulic device was used to apply torque at the bone prosthesis interface. We also conducted a retrospective clinical study to compare the clinical and radiographic outcome of 30 cases where implants without antirotation pins were used to 20 cases where implants with pins were used.

**Results:** Statistically significant differences in torque required to cause failure were noted in groups comparing zero pins to one pin and two compared with three pins. Regression analysis confirmed that increasing the number of anti-rotation pins increased the torque required to cause failure at the bone prosthesis interface of this implant across all groups. In the clinical study we observed 2 failures (6%) in the no pin group and zero failures in the group with pins. All patients in the pin group achieved osseointegration. No periprosthetic fractures were observed.

**Discussion and Conclusions:** Although with the numbers available we cannot draw any definitive conclusions it appears that the use of anti-rotation pins does not impede osseointegration but may in fact promote it by conferring implant stability. Based on the results of this study we modified our practice to use a minimum of 3 anti-rotation pins when implanting this device.

**Notes:**

12:31 pm–12:39 pm

### Biomechanical Comparison of the Lower Trapezius Transfer Versus Latissimus Dorsi Tendon Transfer for Irreparable Massive Posterosuperior Rotator Cuff Tears

Reza Omid, MD  
Nathanael D. Heckmann, BS  
Lawrence Wang, MPH  
Michelle H. McGarry, MS  
C. Thomas Vangsness, MD  
Thay Q. Lee, PhD

**Background:** Tendon transfers for massive irreparable rotator cuff tears are sometimes performed on younger patients to improve strength, specifically in external rotation. Currently,

the latissimus dorsi tendon transfer is most commonly used with some success but functional results and outcomes remain variable. Furthermore, the exact function of the latissimus transfer has come into question in the light of conflicting EMG data. The lower trapezius transfer has been used in patients with brachial plexopathy to improve external rotation but its use in the rotator cuff deficient shoulder has not been reported in the literature. Anatomically, the trapezius transfer is better situated to have a more direct line of pull to improve external rotation. Additionally, rehabilitation for the lower trapezius transfer may also be easier than that for the latissimus dorsi transfer. The purpose of this study was to compare the biomechanical effects of the trapezius transfer versus the latissimus dorsi transfer in a cadaveric model of a massive posterosuperior rotator cuff tear.

**Methods:** Eight cadaveric shoulders were tested at 0°, 30°, and 60° of abduction in the scapular plane with anatomically based muscle loading using a custom shoulder testing system that can simulate all of the involved muscle forces and permit measurement of glenohumeral joint kinematics and joint forces. Muscle loads based on cross sectional area of the muscle were applied to the deltoid, pectoralis major, long head of biceps, subscapularis, supraspinatus, infraspinatus, teres minor, and latissimus dorsi/teres major. Humeral rotational range of motion and the amount of humeral rotation due to muscle loading were measured. Glenohumeral kinematics and joint reaction forces were measured throughout the range of motion using a custom load cell. After testing the intact condition, the supraspinatus and infraspinatus were resected to simulate a massive posterosuperior rotator cuff tear. Testing conditions were repeated for the rotator cuff deficient shoulder. Next, the lower trapezius transfer was performed with three muscle-loading conditions (12N, 24N, 36N). Finally, the latissimus dorsi transfer was performed and tested with only one muscle loading condition (24N) similar to a previous study. A repeated-measures analysis of variance with a Tukey's HSD post-hoc analysis was used for statistical analysis of each parameter.

**Results:** The amount of internal rotation due to muscle loading increased with a massive cuff tear at 0°, 30°, 60° abduction (p-value < 0.05), and was restored with the latissimus 24N load at 0° abduction and the trapezius 12N load at all abduction angles; all other muscle loads over-corrected internal rotation. At maximum internal rotation, the humeral head apex shifted superiorly and laterally at 0° and 30° of abduction (p-value < 0.05) and shifted superiorly at 60° of abduction after the massive cuff tear (p-value < 0.05); this abnormal shift was reduced in the medial-lateral direction with trapezius transfer 36N load at 0° abduction (p-value < 0.05) and cor-

rected in the superior-inferior direction with trapezius transfer 36N load at 30° abduction (p-value < 0.05), but was not significantly corrected with the latissimus transfer at all abduction angles. At neutral humeral rotation, the 24N trapezius load restored the intact compressive force at 0°, 30°, and 60° abduction and the 36N trapezius load restored the intact compressive force at 60° abduction. However, the latissimus transfer failed to restore the intact compressive force at all rotational and abduction angles (p-value < 0.005). At neutral humeral rotation at 0° abduction, the rotator cuff tear caused an anteriorly directed force and was restored by the trapezius transfer 24N load (p-value < 0.05), whereas the latissimus transfer did not show any significant difference from the cuff tear condition.

**Conclusion:** Both the lower trapezius transfer and the latissimus dorsi transfer are beneficial in restoring rotational balance of the humerus due to muscle loading, and glenohumeral kinematics. The trapezius transfer was able to provide a better AP centering force than the latissimus transfer and restored contact forces to the intact condition. The increase in contact forces seen with the trapezius transfer, however, may be more problematic in patients with subtle osteoarthritis. Overall, we found that the lower trapezius transfer is biomechanically superior to the latissimus transfer in restoring native glenohumeral biomechanics. Clinical studies to evaluate the results of the trapezius transfer are warranted.

**Notes:**



## Western Orthopaedic Association

---

### Scientific Poster Exhibits

August 1-3, 2013

---

Poster presenters will have an opportunity to report their findings during the designated times indicated on the Scientific Program Schedule.

---

Scientific Posters will be on display during the Scientific Program in Grand Sierra Ballroom Pre-Function area on Thursday, Friday, and Saturday. Please plan to visit the Scientific Posters.

---

---

## *2013 WOA Poster Presenters*

---

	Poster(s)	Page(s)
Mark R. Adams, MD	1	99
Timothy B. Alton, MD	2	99
Harlan C. Amstutz, MD	3, 4	100
John G. Costouros, MD	5	101
Bobby Dezfuli, MD	6	101
Jonathan Eastman, MD	7	101
Reza Firoozabadi, MD, MA	8, 9, 10	102, 103
Michael Githens, MD	12	104
Ronald W. Hillock, MD	13	104
Matthew Jordan, MD	15	105
Kali Luker, MD	16	106

	Poster(s)	Page(s)
Mark McBride, MD	17	106
Mitchell McDowell, DO	18	107
Alexander Miric, MD	19	107
Faisal M. Mirza, MD, FRCSC, FAAOS, FAOSSM	22, 23	109, 110
Steven Nishiyama, DO, PhD	20	108
Wesley M. Nottage, MD	14	105
Raveesh D. Richard, MD	21	109
John S. Vorhies, MD	24	110
Tibor T. Warganich, MD	25	111
Hao-Hua Wu, BS	11	103

## Poster Abstracts

(An asterisk (\*) by an author's name indicates the presenter.)

### Poster 1

#### Adult Pedestrian Pelvic Injuries: Experience of a Major Urban Trauma Center 2000-2010

Mark R. Adams, MD  
Julie Agel, MA  
Milton L. Routt Jr., MD

**Introduction:** To assess the morbidity and mortality in adult patients who have sustained a pelvic fracture as the result of having been struck by an automobile and admitted to an urban Level 1 trauma center.

**Methods:** A descriptive study involving a retrospective database analysis of 358 consecutive adult injured patients with pelvic fractures between 2000 and 2010. All fractures were classified according to the OTA/AO classification system through the level of type. Variables that were assessed within each pelvic fracture type were: ISS, GCS, mortality, operative management and associated systemic and orthopedic injuries.

**Results:** The following table displays the percentage of the clinical indicators of severity reviewed by pelvic fracture type. For all clinical indicators C type fractures had the highest percentage of severity except for AIS Head  $\geq 4$ .

Fractures involving the lower extremity were more commonly noted than fractures of the upper extremity in this group of patients. In particular, fractures of the tibia/fibula (codes 41, 42, 43, and 44) predominated in each of the types.

**Discussion and Conclusion:** In the pedestrian struck patient, those with a 61C type pattern have a more severe clinical profile, with worse ISS, GCS, mortality rate, higher degrees of injury to the chest and abdomen, and are more likely to undergo surgical intervention. Patients who are admitted with complex pelvic injuries should be thoroughly evaluated for other system injuries. There should be a high level of suspicion for other orthopedic injuries as well as systemic concerns.

### Poster 2

#### Epidural Abscess of the Cervical Spine

Timothy B. Alton, MD  
Amit Patel, MD  
Carlo Bellabarba, MD  
Richard J. Bransford, MD  
Jens R. Chapman, MD

**Introduction:** Cervical spinal epidural abscess (CSEA) is a rare but increasingly frequent condition with potentially devastating complications. Ideal management remains controversial. This study evaluated patients with spontaneous bacterial CSEA assessing the impact of risk factors, location and extent of the abscess, pathogen and treatment (medical vs. surgical) on post-intervention motor scores (MS).

**Methods:** Retrospective review of patients with spontaneous CSEA at a single tertiary medical center, Jan/05- Dec/11. Patient demographics, presenting complaints, radiographic features, neurological status, intervention (medical vs. surgical), risk factors and follow-up were reviewed.

**Results:** 62 patients, age 22 to 82 years (mean 31), average 3.1 levels involved. 34 isolated cervical cases, 23 with thoracic, 2 with lumbar, and 3 with all spinal segments involved. Average follow-up 245 days. Risk factors: history of IV drug abuse (53.2%), hepatitis (30.6%), diabetes mellitus (21%). Interestingly, 16.1% without discernable risk factors. 69% of pathogens were staphylococci aureus (32.3% MRSA). 25 patients were treated medically with antibiotics alone (group 1) and 38 with surgery alone (group 2). 19 of 25 patients in group 1 (76%) failed medical management (decreasing MS or increasing pain) requiring delayed surgery (group 3). Overall, patients treated surgically improved 11.4 points while patients treated medically had a 12.9 point decrease. Within the cross-over group (group 3), MS dropped an average of 40.9 points (99.2 to 58.3) before surgery (average time 2.61 days), recovered 23.6 points after surgery but remained 17.7 points lower than initial MS.

**Conclusion:** The failure rate of medical management of CSEA is high (76%), results in poor MS outcomes, and is not

predicted by labs or risk factors. Early surgery improves MS and should be the mainstay of treatment. If medical management is undertaken, patients must be diligently monitored for any indication of neurologic decline and surgical decompression performed at the first sign of deterioration.

### Poster 3

## Does Femoral Neck to Cup Impingement Affect Metal Ion Levels in Hip Resurfacing?

Harlan C. Amstutz, MD  
Michel Le Duff, MA  
Alicia J. Johnson, BA  
Andrew Wassef, MD

**Introduction:** Impingement of the femoral neck with the acetabular component after metal-on-metal hip resurfacing arthroplasty (HRA) has been cited as a cause of edge-loading and accelerated wear of the bearing. No attempt has been made to correlate radiographic impingement signs (RIS) and blood metal ion levels. We 1) compared serum cobalt (CoS) and serum chromium (CrS) concentrations between patients with and without RIS in patients treated with unilateral HRA, 2) determined whether the size of RIS correlated with CoS and CrS, and 3) assessed the predictive value of RIS for high levels of CoS and CrS.

**Methods:** A retrospective radiographic review of 151 patients with CoS and CrS analyses yielded a study group of 21 patients with RIS and 130 without (controls). Radiographic measurements included the depth of the divot and the orientation of the acetabular component to compute the contact patch to rim (CPR) distance.

**Results:** Median CoS and CrS of the RIS group were greater than that of the controls in patients with a CPR distance less than 10mm. in predicting elevated ion levels (7 µg/L or greater), RIS had a sensitivity of 50% for CoS and 33% for CrS, and a specificity of 88% for both CoS and CrS. The depth of the divot did not correlate with CoS or CrS.

**Discussion and Conclusions:** RIS influences CoS and CrS only when the functional coverage of the head is insufficient because of poor socket positioning. RIS alone is not a good predictor of elevated metal ion levels.

### Poster 4

## Long-Term Clinical Results of Hip Resurfacing

Harlan Amstutz, MD  
Michel Le Duff, MA

**Introduction:** The first metal-on-metal hip resurfacing arthroplasty (MMHRA) designs of the modern era were implanted in the mid 1990's. However, there is a paucity of 10 year minimum data.

**Methods:** Four hundred and sixty three patients (533 hips) were treated with Conserve Plus MMHRA from November 1996 through May 2002. There were 343 men and 120 women. Mean age was 48.3 years. Etiologies included primary osteoarthritis (63%), DDH (11%), ON (11%), Trauma (5%), Childhood disorders (5%), Inflammatory disease (4%) and others (1%). Forty (8%) had undergone another surgery prior to MMHRA. Patients were included irrespective of gender, etiology, age, or the presence of femoral head defects.

**Results:** Mean follow-up was 12.4 years (10 to 15.5). Fifteen patients (18 hips) died of causes unrelated to the surgery and ten were lost to follow up. Mean UCLA hip scores at last follow-up were 9.4, 9.6, 9.3, and 7.3 for pain, walking, function, and activity, respectively. in hips reconstructed with a femoral component larger than 46 mm (n=280), the Kaplan-Meier survival estimates were 97.7% at 10 years and 95.0% at 13 years. The hips with large cysts and small components operated with the first generation surgical technique had a 10 year survivorship of 89.1%. in contrast, with the second generation technique these hips with risk factors had a 10 year survivorship of 93.8%. Five hips underwent revision surgery for metal wear debris issues, all related to malpositioned sockets. There were no cases of metal hypersensitivity.

**Discussion and Conclusion** Metal-on-metal hip resurfacing arthroplasty performed with this device that has large head coverage is a durable option for patients, including most etiologies, women, older patients, and patients with a high BMI. Long-term durability and absence of wear issues were achieved by optimal socket orientation.

## Poster 5

### Comparison of Postoperative Fatty Infiltration in Open Versus Arthroscopic Rotator Cuff Repair

John G. Costouros, MD  
Garet Comer, MD  
Christian Gerber, MD

**Introduction:** Fatty infiltration in chronic rotator cuff tears is a progressive process that is not reversible following surgical repair. This process directly impacts clinical outcomes and risk of structural failure following open and arthroscopic rotator cuff repair (RCR). The purpose of this study was to compare fatty infiltration and outcomes in patients with isolated, full-thickness tears of the supraspinatus treated with open versus arthroscopic RCR.

**Methods:** Thirty-seven consecutive patients with isolated, operatively treated full-thickness tears of the supraspinatus tendon were selected for the study. Patients underwent clinical examination and pre- and postoperative MRI with staging of fatty infiltration of the rotator cuff at a minimum of one year postoperatively. Group 1 (open RCR) consisted of 19 patients with a mean age of 57 and follow-up of 24 months. Group 2 (arthroscopic RCR) consisted of 18 patients with a mean age 54 years and follow-up of 18 months.

**Results:** Absolute and age-adjusted Constant scores improved significantly in both groups following surgery. There were no statistically significant differences between the two groups in clinical outcomes. In Group 1, mean fatty degeneration of the supraspinatus increased from  $0.7 \pm 0.6$  to  $1.3 \pm 0.7$ ; conversely, in Group 2 there was no progression. Mean fatty degeneration of the infraspinatus progressed significantly in both groups. In Group 1, mean values increased from  $0.6 \pm 0.4$  to  $1.2 \pm 0.6$  and in Group 2 from  $0.2 \pm 0.4$  to  $0.4 \pm 0.5$ . Patients in Group 1 were at significantly greater risk of progression of fatty degeneration of the infraspinatus compared to Group 2.

**Discussion and Conclusion:** Open RCR was associated with an increased risk of progression of fatty degeneration of the supraspinatus muscle. Both methods were associated with progression of fatty degeneration in the infraspinatus. Further studies which explore why open RCR methods may lead to greater progression of fatty infiltration are needed.

## Poster 6

### Effect of Human Versus Computerized Voice Recognition Transcription on Billing Level in an Orthopaedic Surgery Practice

Bobby Dezfuli, MD  
Margaret Chilvers, MD

**Introduction:** Computer based speech recognition transcription software (CBT) use has increased in prevalence in the last decade. However, its effects on level of billing in an orthopaedic practice have not been published.

**Methods:** During a one-year period, patients were seen by the author at one of two Orthopaedic Surgery Clinics at the University of Arizona. One clinic utilized human transcriptionists (HT) and another CBT.

**Results:** A total of 1,758 notes were generated, 900 completed by HT and 858 by CBT. Of all HT notes, 70 (8%) were billed as level 4, whereas only 27 (3%) notes generated by CBT billed as level 4 ( $P$  less than 0.01). When analyzing only new patient reports, 29 (9%) HT reports billed as level 4, whereas only 11 (3%) notes generated by CBT billed as level 4. CBT does not result in a higher level of billing.

**Discussion and Conclusion:** Caution must be used with implementation of this new technology on the basis of cost savings.

## Poster 7

### Correlating Preoperative Imaging with Intraoperative Fluoroscopy in Iliosacral Screw Placement

Jonathan Eastman, MD  
Milton L. Routt Jr., MD

**Introduction:** Percutaneous iliosacral screw fixation of unstable posterior pelvic ring injuries has become a common successful treatment method. There is a wide spectrum of variability specific to the posterior pelvic ring. The sagittal plane anatomical variation of the sacrum can be clearly appreciated on the sagittal reconstructions of a pelvic computed tomography (CT) scan. The aim of this study was to determine whether the anticipated inlet and outlet angles obtained from

preoperative CT scans correlate with the actual angles utilized with intraoperative fluoroscopy.

**Methods:** Through a retrospective review of a prospectively collected trauma database, 24 consecutive patients were identified with unstable pelvic ring injuries requiring operative fixation using percutaneous iliosacral screws. Utilizing the sagittal reconstruction images, preoperative anticipated inlet and outlet angle measurements were calculated. The corresponding fluoroscopic inlet and outlet angles utilized for each patient were obtained and then compared to the preoperative angles.

**Results:** The preoperative CT scans showed an average inlet view of 20.5 degrees (7-37) and an average outlet view of 42.8 degrees (30-59). The intraoperative fluoroscopic views showed an average inlet of 24.9 degrees (12-38) and an average outlet view of 42.4 degrees (29-52). The average difference from preoperative imaging to intraoperative views was 4.4 degrees (-21 – 5) for the inlet view and 0.45 degrees (-9 – 7) for the outlet view.

**Discussion and Conclusion:** There is a significant amount of anatomic variation of the posterior pelvic ring. The preoperative CT sagittal reconstruction images allow for appropriate preoperative planning for anticipated intraoperative fluoroscopic inlet and outlet views within 5 degrees. Obtaining quality intraoperative images can be difficult in certain patient populations and clinical situations. Having knowledge of the desired intraoperative views preoperatively can prepare a surgeon, aid in efficiently obtaining the correct views intraoperatively, and ultimately assist in the placement of safe iliosacral screws.

### Poster 8

## Prevention of Iliosacral Screw Intrusion Through the Lateral Iliac Cortex

Reza Firoozabadi, MD, MA  
Frederick P. Oldenburg, MD  
James C. Krieg, MD  
Milton L. Routt Jr., MD

**Introduction:** Iliosacral screws are commonly used to treat unstable pelvic ring injuries. Intrusion of the screw head and/or washer through the posterior lateral cortical wall of the ilium is possible during insertion. Screw and washer intrusion decreases the efficacy of the fixation construct. The purpose of this study was to describe and validate a technique that reliably prevents iliosacral screw/washer intrusion. The technique

utilizes an adjusted fluoroscopic view, tangential to the posterior ilium, used in combination with the tactile feedback of screw placement. Use of a second blunt tipped guide wire or other narrow diameter yet sturdy instrument allows the surgeon to both palpate any residual washer motion and visualize the washer movement and contact under fluoroscopy.

**Methods:** Retrospective review of prospectively gathered data of all patients who were treated with iliosacral screws placed at a Level I trauma center over an eight month period (November 1st, 2007 to June 30th, 2008), after Institutional Review Board permission was obtained.

**Results:** One hundred eighty one screws were placed in 115 patients during this time period. The positioning of all iliosacral screws was assessed using postoperative pelvic CT scans. For three screws (1.67%), the anterior cranial portion of the washer was noted to intrude into the outer iliac cortical surface, but in all three the majority of washer and the entire screw head remained lateral to the cortical surface. No washer was noted to completely intrude through the lateral cortex.

**Conclusion:** This technique reliably prevents intrusion of screw/washer during placement of iliosacral screws.

### Poster 9

## Inguinal Abnormalities in Male Patients with Acetabular Fractures Treated Using an Ilioinguinal Exposure

Reza Firoozabadi, MD, MA  
Paul R. Stafford  
Milton L. Routt Jr., MD

**Introduction:** Surgeons performing an ilioinguinal exposure for acetabular fracture surgery need to be aware of aberrant findings such as inguinal hernias and spermatic cord lesions which increase the complexity of the exposure and closure. The purpose of this study is to report these occurrences in a clinical series of adult males undergoing acetabular fracture fixation and a series of adult male cadavers. The secondary aim is to characterize these abnormalities to aid surgeons in detecting these abnormalities preoperatively and coordinating a surgical plan with a general surgeon.

**Methods:** *Clinical study*— Retrospective review of treated acetabular fractures through an ilioinguinal approach over a 3 year period. Incidence of inguinal canal and spermatic cord

abnormalities requiring general surgery consultation were identified. Corresponding CT scans were reviewed and radiographic characteristics of the spermatic cord abnormalities and/or hernias were noted. *Cadaveric study*— 18 male cadavers dissected bilaterally using an ilioinguinal exposure. The inguinal canal and the contents of the spermatic cord were identified and characterized.

**Results:** *Clinical Study*— 5.7% (5/87) of patients had spermatic cord lesion and/or inguinal hernia requiring general surgical intervention: 2 indirect inguinal hernias, 1 isolated cord lipoma without associated bowel herniation, and the 2 remaining patients had both direct inguinal hernias and cord lipomas. Preoperative pelvic CT scan review of all 5 patients identified abnormalities noted intraoperatively. Cord lipomas visualized as enlargements of the spermatic cord with homogeneous density. Hernias visualized as enlarged spermatic cords with heterogeneous density. *Cadaver Study*— 31% (11/36) of cadavers studied had spermatic cord and/or inguinal canal abnormalities: 1 cadaver-bilateral indirect inguinal hernias, 3 cadavers-bilateral spermatic cord lipomas, and 3 cadavers-unilateral spermatic cord lipomas. Average cord diameter in those with abnormalities was 24.9 mm (15-28) compared to 16 mm (11-22) in normal cords, which was statistically significant.

**Discussion and Conclusion:** The clinical and cadaveric findings emphasize the importance of understanding inguinal abnormalities and the value of detecting them preoperatively. The preoperative pelvic CT scans were highly sensitive in detecting inguinal abnormalities. When abnormalities are detected, the orthopedic surgeon must coordinate the operative plan with a general surgeon.

### Poster 10

#### Cell Saver Use in Acetabular Surgery — Does Approach Matter?

Reza Firoozabadi, MD, MA  
Alan K. Swenson  
Milton L. Routt Jr., MD

**Introduction:** Open reduction internal fixation of acetabular fractures can lead to large volumes of intraoperative blood loss. Intraoperative autologous transfusion (IAT) by means of Cell Saver (CS) technology is routinely utilized during surgery, but at a monetary cost. Primary aim of this study was to determine if IAT rates and volumes were significantly different between anterior versus posterior approaches, and to ascertain if blood loss was different between the two

approaches. This data could potentially aid surgeons to determine when CS should be used for acetabular fracture surgery.

**Methods:** 145 consecutive acetabular fractures treated either with an anterior or a posterior approach were included in this retrospective single-center cohort study. IAT was used in all cases. Assessment included: Demographic data, Injury Severity Score (ISS), fracture classification, blood loss, CS blood returned, blood products administered during procedure, length of procedure, postoperative blood products administered until discharge.

**Results:** 65 fractures treated via an anterior approach and 80 fractures through a posterior approach. Mean intraoperative blood loss: 786mL for the anterior approach versus 485mL for posterior approach. CS blood returned: in 23/65 anterior cases and 6/80 posterior approach cases. Mean CS return (all cases included): 141mL for anterior approach versus 28mL for posterior approach. The mean CS blood return for the 23 anterior cases in which blood was returned to the patient was 398mL, and 379mL for the 6 cases in which blood was returned utilizing the posterior approach. Subgroup analysis identified male gender and anterior approach as the only risk factor for elevated blood loss and CS blood return.

**Discussion and Conclusion:** Patients undergoing acetabular fracture surgery have significantly increased blood loss when an anterior approach is utilized compared to a posterior approach. Anterior approach cases utilize CS blood return at a statistically significant higher rate compared to posterior approach cases. Potential cost saving measures can be utilized by preferentially using IAT for acetabular fractures that require an anterior approach.

### Poster 11

#### Prevalence of Clinical Depression Among Patients Undergoing ACL Reconstruction and Correlation with Functional Scores

Grant H. Garcia, MD  
\*Hao-Hua Wu, BS  
Min Jung Park, MD, MMSc  
Fotios Tjoumakaris, MD  
Bradford Tucker, MD  
Brian Sennett, MD  
John D. Kelly IV, MD

**Introduction:** The anterior cruciate ligament (ACL) is a commonly injured ligament of the knee. There have been many

studies with regards to surgical fixation techniques and timing of the surgery, but there is a lack of literature on how patient mood affects surgical outcome. Our purpose was to assess mood and clinical symptoms of Major Depressive Disorder (MDD) and correlate the severity of depressive symptoms with functional scores of the knee in patients who have suffered an ACL injury.

**Methods:** In this IRB approved, multi-center prospective cohort study, 60 patients undergoing primary ACL reconstruction were given a validated clinical depression questionnaire (QIDS-SR16) and knee function questionnaires (Lysholm, IKDC) pre-operatively and during the post-operative period (6w, 12wk, 6mo, 1year). Functional outcome scores were used to correlate the depression severity to a patient's perception of knee function at that time point. A QIDS-SR16 score of 6 or greater served as a threshold for diagnosis of MDD.

**Results:** Among the 60 patients enrolled in the study, 30 scored 6 or greater on the QIDS-SR16. Those who recorded more symptoms of depression on the QIDS-SR16 had lower IKDC and Lysholm scores post-operatively. Patients with MDD scored an average of 9.9 points lower on their IKDC form and 12.58 points lower on the Lysholm scale when compared to patients without MDD.

**Discussion and Conclusion:** We found that 50% of our study cohort reported symptoms of MDD and that as depression symptoms improved, so did the perception of knee function as well. Patients with MDD performed on average worse than their non-MDD counterparts on the IKDC and Lysholm functional tests. Thus, in patients being evaluated for ACL repair, recognition of MDD should be an important part of the evaluation, which may lead to better patient outcome.

### Poster 12

## Open Reduction and Internal Fixation Versus Total Elbow Arthroplasty for the Treatment of Geriatric Distal Humerus Fractures: A Systematic Review

Michael Githens, MD  
Julius A. Bishop, MD

**Introduction:** There is a growing body of evidence suggesting that total elbow arthroplasty (TEA) is a suitable alternative to open reduction internal fixation (ORIF) for geriatric distal

humerus fractures and may provide faster rehabilitation and improved short-term function. The purpose of this systematic review was to compare TEA with ORIF in terms of functional outcomes and complications.

**Methods:** Literature search and article selection were independently performed by two authors. Studies meeting criteria for inclusion were observational cohort studies or randomized controlled trials evaluating functional and radiologic outcomes and complications in elderly patients treated for distal humerus fractures with either TEA or ORIF with locking plates. A quality assessment tool was used to evaluate individual study methodology. Standardized data extraction was performed and data was pooled for analysis.

**Results:** 26 studies with 548 patients met inclusion criteria (ORIF n=9, TEA n=13, ORIF vs. TEA n= 4). in 25 studies, quality was determined to be weak while one study was of moderate quality. Mean arc of motion was 101 degrees after both TEA and ORIF. Mean Mayo Elbow Performance Scores were 90.8 after TEA and 87.1 after ORIF. TEA resulted in 12.7% major and 24.1% minor complication rates whereas ORIF resulted in 12.9% major and 19.2% minor complication rates. The rate of deep infection was 3% after TEA compared to 1.2% after ORIF. Each group had an 11% reoperation rate.

**Discussion:** A systematic literature review revealed that TEA and ORIF for the treatment of geriatric distal humerus fractures produced similar functional outcome scores and range of motion. The quality of studies was generally weak. Major complication and reoperation rates were similar but minor complications and deep infections were more common after TEA. Ongoing research is indicated to better define the roles of ORIF vs. TEA in the management of these injuries.

### Poster 13

## Social Media and the Orthopedic Surgeon

Ronald W. Hillock, MD  
Trevor R. Call, MS

**Introduction:** The rapid expansion of the Internet and Social Media has transformed the way we communicate with both peers and patients. It is imperative that the interactions in which we engage be of a professional nature. The purpose of this study was to review the electronic footprint of Orthopedic Surgeons practicing in the Nevada market

and evaluate the content posted by or linked to each surgeon's name.

**Methods:** The Orthopedic Surgeon pool was defined by using databases available to the public by the American Board of Orthopedic Surgery and the Nevada State Board of Osteopathic Medicine. The study group included all physicians practicing in the state of Nevada who were defined as "Orthopedic Surgeons." Inappropriate or unprofessional content was defined by published standards. The Google search engine was then used to identify the information that had been posted on websites, Facebook, LinkedIn and YouTube.

**Results:** Of the 170 Orthopedic Surgeons identified in Nevada, 76% had websites, 45% had a Facebook account, and 25% had a LinkedIn account. 3% of Nevada Orthopedic Surgeons were associated with inappropriate material, text or images. All of the inappropriate content was posted to Facebook accounts that were personal in nature but publicly accessed.

**Discussion and Conclusion:** Websites, as well as both personal and professional social media platforms are used heavily by Orthopedic Surgeons to represent themselves to the community. Not all content posted on these platforms was professional. Inappropriate and unprofessional content posted publicly in any format is detrimental to the individual Orthopedic Surgeon and the profession's collective reputation in the community.

#### Poster 14

### Magnetic Resonance Arthrography Assessment of the Superior Labrum Using the BLC

Jason Jancosko, DO, MPT  
\*Wesley M. Nottage, MD  
Keith Burnett, MD  
Adrian Koziak, MSc

The purpose of the study was to describe the variation of the superior labrum with increasing age by assessing magnetic resonance (MR) arthrograms.

**Methods:** Inclusion criteria were applied to the MR arthrogram data to ensure only shoulders, devoid of any known condition which might affect the superior labrum. 236 MR arthrograms were blindly assessed for biceps-labral complex (BLC) type and sub-labral recess size by a musculoskeletal

radiologist. We have chosen the BLC system, which defines normal superior labral variants, and is established in the radiology literature.

**Results:** The MR arthrograms demonstrated that the majority of shoulders in the first three decades of life were BLC type 1 and showed a steady increase in BLC types 2 and 3 with increasing age. Assessments demonstrated significantly greater ( $p < 0.01$ ) mean BLC types in those over 40 compared with those less than 40 years of age. Significant differences ( $p < 0.05$ ) were noted when comparing the mean BLC assessments between different decades of age, with the majority of differences noted between younger and older decades. There appears to be a physiologic detachment with age, which becomes significant at 40 years of age, which are not to be taken as a pathologic condition.

**Conclusions:** The results of this study confirm the hypothesis that the superior labrum progressively detaches with increasing age. These findings can contribute to whether the superior labrum is considered abnormal when assessed radiographically, which can aid an observer in an effort to reduce the rates of unnecessary SLAP 2 repair.

#### Poster 15

### Body Mass Index in Relation to Total Hip Arthroplasty Complications

Matthew Jordan, MD  
John Reilly, MPH  
Daniel C. Jupiter, PhD  
Kindyle L. Brennan, PhD  
Kirby Hitt, MD  
Christopher Chaput, MD

**Introduction:** As the prevalence of obesity in America increases, the number of obese patients who undergo total hip arthroplasty (THA) is expected to increase as well. While it is commonly thought that obese patients have a higher rate of surgical complications following THA, studies on the association of body mass index (BMI) and THA report conflicting results. The purpose of this study was to determine whether there is a relationship between BMI and complication rates in patients undergoing THA.

**Methods:** A retrospective review of 1,504 patients treated at a single institution over 9 (2003-2011) years was performed. Data collected included patient age, gender, BMI

(WHO classification), occurrence of revision surgery, and types of various complications, both medical and surgical. Logistic regression modeling using covariates age, gender and WHO classified BMI, was applied to determine independent risk factors for complications (surgical, medical, or any).

**Results:** There were a total of 1,447 patients that met the study inclusion criteria, 830 (56.19%) women and 647 (43.81%) men. For medical complications, multivariate regression analysis demonstrated an association between occurrence of complication and underweight status, significant obesity (WHO Class III) and for each year of increased age, with odds ratios of 4.29 (95% CI 1.36-13.5), 2.32 (95% CI 1.05-5.17), and 1.04 (95% CI 1.02-1.06), respectively. The underweight class showed the strongest association with complications.

**Discussion and Conclusion:** Understanding patient characteristics that increase the risks of having a complication after THA is important in order to appropriately counsel patients, and possibly intervene pre-operatively to decrease modifiable risk factors related to increased or decreased BMI. It is also important to recognize the high complication rate in the underweight population, as many similar published studies in the past have neglected, leading to a falsely elevated complication rate in the “normal” BMI cohort.

## Poster 16

### Association of Proximal Femur Shape with Ipsilateral Lateral Compartment Knee Osteoarthritis

Kali Luker, MD  
Barton L. Wise, MD  
John K. Lynch, PhD  
Felix Liu, MA  
Neeta Parimi, MS  
Michael Nevitt, PhD, MPH  
Nancy E. Lane, MD

**Introduction:** Lateral compartment knee osteoarthritis (OA) is an understudied subtype of OA. Prior studies suggest that hip and pelvic anatomy are associated with lateral knee OA. We examined the association of proximal femoral shape with ipsilateral lateral compartment knee OA.

**Methods:** Proximal femoral shape and lateral knee osteoarthritis were examined in a cohort of 373 patients aged 45-

79 from the NIH-funded Osteoarthritis Initiative. We defined lateral knee OA as having Kellgren/Lawrence (K/L) grade 2 or greater with joint space narrowing (JSN) in the lateral compartment. Controls had K/L grade 0 or 1 and no JSN in lateral or medial knee joint compartments. Controls were frequency matched to cases by sex and 10-year age intervals. Proximal femoral shape was outlined on digitized supine radiographs. Fourteen unique and independent modes of shape were generated using Active Shape Modeling. These modes described 95.5% of the total variance in proximal femoral shape. Conditional logistic regression was used to examine the association of proximal femur shape with lateral compartment knee OA, adjusting for age, race, BMI and clinic site.

**Results:** Modes 1 and 8 were associated with lateral knee OA. An increase in one standard deviation (SD) of mode 1 and 8 decreased the odds of lateral knee OA [OR 0.78 and 0.65 respectively]. A positive value of mode 1 appears to result in a larger femoral head, longer femoral neck and greater neck-shaft angle. A positive value of mode 8 resulted in a larger femoral head with increased slope at the femoral head-neck junction and smaller trochanters. After adjusting for multiple comparisons, only mode 8 remained significantly associated with lateral knee OA.

**Conclusion:** Hip shape is associated with lateral compartment knee OA. Further work to understand why particular modes are associated with lateral compartment disease and how this should affect treatment algorithms is warranted.

## Poster 17

### Early Experience with Unlinked Patellofemoral and Unicompartmental Knee Arthroplasty

Mark McBride, MD  
Carola Romero, PA-C  
Joseph Jankiewicz, MD

**Introduction:** The success of UKA in patients with medial or lateral tibiofemoral OA of the knee has been well documented. For those patients who do not meet the criteria for UKA due to excessive patellofemoral disease, the procedure of choice has been total knee arthroplasty. There is an increasing population of patients who are keen to avoid total knee arthroplasty but have arthroplasty level disease in 2 compartments. Bicompartamental knee arthroplasty is able to achieve the goals of addressing the 2 compartments with

significant arthritic involvement while preserving the opposite tibiofemoral compartment and cruciate ligaments.

**Materials and Methods:** From 5/7/2010 to 4/6/2012 there were 14 patients (17 knees) who met the indications for bicompartamental knee arthroplasty and were also interested in avoiding total knee arthroplasty. There were 7 males, 7 females. 6 patients underwent surgery at a hospital as an inpatient and 11 were done as outpatient procedures at a freestanding ambulatory surgery center. The Stryker PKR was used for UKA, and ArthroSurface was used for PFA.

**Results:** There were no complications in either group. By 4 weeks postoperatively, 16/17 patients were ambulating well without walking aids. Tourniquet time average was 71 minutes. Those patients having the procedure done as an outpatient stayed an average of 100 minutes postoperatively while those having the procedure done in the hospital stayed an average of 3.2 days postoperatively. One patient underwent conversion to TKR for stiffness and one had arthroscopy for LMT and chondroplasty.

**Conclusion:** Unlinked bicompartamental knee arthroplasty is an intriguing alternative to TKR in younger more active patients with 2 compartment arthroplasty level arthritis of the knee. The early good results of this cohort suggest that this approach is worth continued use but with carefully selected patients and close follow up to track survivorship of implants and monitor for disease progression.

### Poster 18

## A Comparison of Various Contemporary Methods to Prevent a Wet Cast

Mitchell McDowell, DO  
Amit Patel, MD  
Carlo Bellabarba, MD  
Richard J. Bransford, MD  
Jens R. Chapman, MD

**Background:** Avoiding contact with water is a customary recommendation made for patients treated with a non-waterproof cast. A saturated wet cast has been associated with mechanical weakness, infection, and skin irritation leading to repeat medical visits. There are many traditional methods and commercially available products designed to prevent a wet cast,

however there is a paucity of literature regarding the optimal strategy. This study was designed to compare effectiveness, cost, and ease of use of some commonly used methods to prevent a wet cast.

**Methods:** Using a synthetic leg model, a short leg cast was applied and six different methods were tested: Group A (household self-sealing plastic wrap), Group B (plastic bag with rubber band), Group C (plastic bag with duct tape), Group D (double plastic bag with duct tape), Group E (reusable store-bought cast protector) and Group F (professional cast cover). Casts were submerged in water for two minutes and weighed. Each group underwent 10 individual trials. Effectiveness was measured by calculating amount of water absorption using cast weights before and after submersion in water. This was then compared to a control group. Cost analysis and ease of application were also evaluated.

**Results:** The percentage of water absorption prevention ranged from 62% to 100% with Group B being the least effective and Groups D, E, and F being the most effective. The range of costs for six weeks of cast care was between \$8.24 (Group B) and \$38.00 (Group F). There was considerable variation in simplicity of use. Groups C, D and E were found to be simple to use with increasing difficulty in Groups A, B and F.

**Discussion:** Our findings conclude that the six methods tested are effective in preventing the majority of water saturation. Although abstaining from contact with water is the most prudent approach, if a cast cover is to be used, we found that double plastic bags with duct tape (100% prevention, \$13) or the reusable store-bought cast protector (100% prevention, \$13) are the preferred contemporary methods to prevent a wet cast.

### Poster 19

## The Effect of Chronic Renal Disease on Primary Total Knee Arthroplasty: An Evaluation of Perioperative Morbidity and Implant Longevity

Alexander Miric, MD  
Maria C. S. Inacio, MS  
Robert S. Namba, MD

**Introduction:** The prevalence of chronic kidney disease (CKD) is rising worldwide. Patients with CKD are more likely

to have associated medical problems and are at greater risk for postoperative morbidity and mortality. The purpose of this study was to evaluate patient characteristics and risk of revision, surgical site infection, thromboembolic events, mortality and readmission of patients with CKD undergoing total knee arthroplasty (TKA).

**Methods:** A retrospective analysis of prospectively collected data by a Total Joint Replacement Registry was conducted. All primary TKA performed from 1/1/2005 to 12/31/2010 were included. Patient characteristics, co-morbidities and general health status were evaluated. Cox proportional hazard regressions and logistic regressions were used to evaluate the associations of CKD with outcomes while adjusting for confounders.

**Results:** 41,852 primary TKA cases were included. 2,686 (6.4%) TKA procedures were among CKD patients, with the majority of these in CKD stage 3 (1861, 69.3%). The cohort was on average 67 years old and the majority were female (62.3%). The median follow-up was 2.1 years. CKD patients were older, had poorer general health and had a higher prevalence of co-morbidities. After adjustment for age, gender, race, general health, and diabetes, CKD patients were at 1.5 (95% confidence interval (CI) 1.2-1.8) increased risk of readmission within 90 days and 1.7 (95% CI 1.4-2.1) increased risk of mortality at any point after the procedure. The risks for overall revision, aseptic revision, septic revision, surgical site infection (superficial, deep, all), deep vein thrombosis, pulmonary embolism, 30-day mortality, and 90-day mortality were not statistically significantly different between patients with CKD and those without.

**Conclusion and Discussion:** Our results suggest that CKD patients undergoing TKA do not experience significantly increased morbidity. However, an increase in risk of 90-day readmission and any time mortality was observed in the CKD group, underscoring that CKD patients are a fundamentally different population with a greater likelihood of serious associated diagnoses.

## Poster 20

### An In Vitro Characterization of Splash Displacement in Different Lavage Systems and Effectiveness of Lavage Shield

Steven Nishiyama, DO, PhD  
Narbeh Ghazarian, DO  
Anna M. Freemyer, BS  
Eric J. Rebich, BS  
Ronald W. Hillock, MD

**Introduction:** This study was designed to characterize splash patterns and contamination generated by irrigation techniques commonly utilized in the treatment of surgical wounds.

**Methods:** 4 irrigation scenarios: gravity flow (GF), asepto bulb syringe (ABS), high pressure pulsatile lavage without splash shield (HPPL), and high pressure pulsatile lavage with splash shielding (HPPL-S) were conducted on a sawbone knee model anchored to a standard operating table in an operating room (OR) of a community hospital. 3 Liters of normal saline supplemented with Fluorescein dye were utilized as fluid simulator in all trials. The OR was divided into 4 quadrants, Head Right (HR), Head Left (HL), Foot Right (FR), Foot Left (FL) and surveyed with a UV light source to characterize the radius and presence of florescent fluid/droplets. Furthermore, fluid washed through the model and recovered after each iteration was measured.

**Results:** GF trial resulted in the least amount of fluid lost at 47 ml. with exception of the GF trial, most trials had frank pooling in the HR quadrant at the feet where the surgeon stood. The HPPL trials contaminated the entire room with droplets too numerous to count. The HPPL-S trials reduced the number of droplets in quadrants, outside of the HR quadrants, to a range of 0-12 droplets. Additionally, the HPPL-S trial reduced the droplet distance to levels comparable to or below the gravity flow and asepto bulb syringe droplet distance.

**Discussion and Conclusion:** This study illustrates droplet splash patterns seen with high pressure and low-pressure irrigation systems. with utilization of a splashguard during high-pressure irrigation, we drastically reduced splash displacement and increased volume recovered. Decreased splash displacement theoretically reduces OR contamination and the risk of nosocomial infection. Although the value of splash shield use during operative wound irrigation is unclear, we hypothesize the benefits will substantially outweigh the nominal cost.

## Poster 21

## Open Reduction Internal Fixation and Acute Total Hip Arthroplasty for Complex Acetabular Fractures

Raveesh D. Richard, MD  
Justin G. Brothers  
Kaan Irgit, MD  
Brian Deegan  
James C. Widmaier  
Daniel S. Horwitz, MD

**Introduction:** In an effort to preserve the native hip joint, acetabular fractures are generally treated with anatomic open reduction and internal fixation (ORIF). However, in the setting of marginal impaction and femoral head injury, fixation alone may not be sufficient. The purpose of this study was to evaluate the intermediate clinical and radiographic follow up of acetabular fractures treated with combined ORIF and acute THA.

**Methods:** The records of 23 patients who presented to a level I trauma center between 2004 and 2010 with complex acetabular fractures and underwent combined ORIF with primary THA were reviewed. Patient demographics, treatment variables, Letournel classifications, clinical and radiographic outcomes were recorded. All procedures were performed by an orthopaedic trauma fellowship trained surgeon who performs elective THA in his practice. Findings of marginal impaction and femoral head injury were documented. Complications, reoperations, and radiographic outcomes were recorded.

**Results:** Three patients died and 1 was lost during follow-up. Remaining patients were followed at an average of 52 months  $\pm$  6.4 (range, 22-105). The average age was 67 years  $\pm$  2.6 (range, 50-89). There were 7 (30.4%) both column injuries, 7 (30.4%) isolated posterior wall (PW), 6 (26.1%) transverse and PW, 2 (8.7%) posterior column with associated wall fractures and 1 (4.4%) T-type. Intraoperatively, 16 (70%) patients were found to have marginal impaction while significant femoral head injury was found in 19 (82%) patients. There were 3 (13%) infections, 1 (4.3%) drop foot, 5 (21.7%) heterotopic ossifications, and 2 (8.6%) repeat dislocations. Three patients (13%) required reoperation. Twenty-two patients (95.7%) developed radiographic and clinical union.

**Discussion and Conclusion:** Combined ORIF and THA is an acceptable treatment an option for selected patients with severe acetabular fractures, with a low rate of revision and

high rate of fracture union. However, infection rates were higher than elective THA patients

## Poster 22

## Patient-Reported Outcome Instruments and the Minimum Important Difference in Total Hip Arthroplasty

Heather A. Stone, MPH  
\*Faisal M. Mirza, MD, FRCSC, FAAOS, FAOSSM  
Anna Ghambaryan, MD, PhD  
Kevin L. Troyer, PhD  
Art Sedrakyan, MD, PhD  
Nilsa I. Loyo-Berrios, PhD  
Manuel Bayona, MD, PhD  
Danica Marinac-Dabic, MD, PhD

**Introduction:** Current evidence suggests that total hip arthroplasty (THA) clinical investigations should include patient-reported outcome (PRO) data. However, the selection of a qualified PRO instrument remains a significant challenge. An instrument should demonstrate sufficient psychometric properties for a given population of interest with a well-defined minimum important difference (MID). Currently, there is a gap in knowledge regarding which instruments are optimal for THA clinical investigations and which of these instruments have identified MID values. Therefore, a systematic literature review was performed to evaluate the psychometric evidence published on PRO instruments used in THA clinical trials.

**Methods:** A systematic literature search was conducted using the OVID Medline database in order to identify qualified PRO instruments used in THA. Inclusion criteria were: English language, THA population, and psychometric evaluation of a non-generic (i.e., region- or disease-specific) instrument. The psychometric inclusion criterion was any assessment of validity, reliability, responsiveness, or MID. Publication date was not restricted.

**Results:** We identified 37 articles that assessed the psychometric properties of 11 non-generic PRO instruments specific to the THA population. The 3 most frequently evaluated instruments were: the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC, 12 articles), the Oxford Hip Score (OHS, 11 articles), and the Hip Osteoarthritis Outcome Score (HOOS, 5 articles). Additionally, MID values were only reported for 2 instruments: the WOMAC (1 article) and the OHS (3 articles).

**Discussion and Conclusion:** In the THA population, the WOMAC and the OHS were the most frequently evaluated instruments and were the only instruments with proposed MID values. These preliminary findings help to differentiate PRO instrument quality and to establish standardized outcome metrics to guide future clinical investigations and clinical decision making pathways.

**Poster 23**

**Patient-Reported Outcome Instruments and the Minimum Important Difference in Total Knee Arthroplasty**

Kevin Troyer, PhD

\*Faisal M. Mirza, MD, FRCSC, FAAOS, FAOSSM

Heather A. Stone, MPH

Anna Ghambaryan, MD, PhD

Art Sedrakyan, MD, PhD

Nilsa I. Loyo-Berrios, PhD

Manuel Bayona, MD, PhD

Danica Marinac-Dabic, MD, PhD

**Introduction:** Current evidence suggests that total knee arthroplasty (TKA) clinical investigations should include patient-reported outcome (PRO) data. However, the selection of a qualified PRO instrument remains a significant challenge. An instrument should demonstrate sufficient psychometric properties for a given population of interest with a well-defined minimum important difference (MID). Currently, there is a gap in knowledge regarding which instruments are optimal for TKA clinical investigations and which of these instruments have identified MID values. Therefore, a systematic literature review was performed to evaluate the psychometric evidence published on PRO instruments used in TKA clinical trials.

**Methods:** A systematic literature search was conducted using the OVID Medline database in order to identify qualified PRO instruments used in TKA. Inclusion criteria were: English language, TKA population, and psychometric evaluation of a non-generic (i.e., region- or disease-specific) instrument. The psychometric inclusion criterion was any assessment of validity, reliability, responsiveness, or MID. Publication date was not restricted.

**Results:** We identified 54 articles that assessed the psychometric properties of 16 non-generic PRO instruments specific to the TKA population. The 3 most frequently evaluated instruments were: the Western Ontario and McMaster Univer-

sities Osteoarthritis Index (WOMAC, 26 articles), the Oxford Knee Score (OKS, 20 articles), and the Knee Osteoarthritis Outcome Score (KOOS, 4 articles). Additionally, MID values were reported for 4 of the 16 identified instruments.

**Discussion and Conclusion:** In the TKA population, the WOMAC and the OKS were the most frequently evaluated instruments. Additionally, only a small proportion of the identified instruments had proposed MID values. These preliminary findings help to differentiate PRO instrument quality and to establish standardized outcome metrics to guide future clinical investigations and clinical decision making pathways.

**Poster 24**

**Complications in the Management of Bisphosphonate Related Femoral Fractures**

John S. Vorhies, MD

Jeffrey E. Krygier, MD

**Introduction:** Atypical femur fractures are a recently identified complication of long term bisphosphonate use. The radiographic changes and subsequent fractures can occur anywhere along the diaphysis. Management is often intramedullary fixation. This report describes complications and technical difficulties encountered in 12 patients who underwent fixation of atypical femur fractures.

**Methods:** A retrospective surgical database review was performed for fixation of femur fractures. Radiographs were reviewed to identify the cortical thickening pathognomonic with chronic bisphosphonate therapy. Patient charts and radiographs were reviewed.

**Results:** Seventeen operatively treated fractures were identified as being attributed to bisphosphonate use. Sixteen procedures included intramedullary stabilization. The most common technical complications were residual varus of subtrochanteric fractures (5 of 10 fractures) and anterior distal placement of the nail (6 of 14 antegrade nails with adequate imaging). No patient required a revision operation. One required conversion to a retrograde nail and plating for a distal anterior cortical breach. A second required intra-operative removal of the nail and exchange to a shorter implant with a smaller radius of curvature.

**Discussion and Conclusion:** The prevention of bisphosphonate-related femur fractures remains unrealized. In the interim, management poses unique challenges. Anterior nail placement

may be related to patient femoral anatomy, nail insertion sight, and proximal fractures providing less “forgiveness” as the nail traverses an intact distal diaphysis. In the subtrochanteric fractures, muscle forces on the proximal fracture pattern lend the proximal fragment to be flexed, abducted, and externally rotated. Even with open reductions, these fractures often had residual deformity. This study would support a low threshold to open proximal fractures as obtaining and maintaining reduction is difficult. Also, emphasis on nail starting point and selection of an implant with a small radius of curvature may help avoid anterior cortical contact.

motion. Combined cheilectomy and Moberg osteotomy is typically reserved for young and active patients with advanced disease. Cheilectomy alone is a quicker procedure with less potential complications. We found that patients in the cheilectomy plus Moberg osteotomy had a longer subjective 100% recovery. Time to regular shoes remained the same in each group and overall mean satisfaction score was similar. Interestingly, more patients in the cheilectomy only group reported their post-op pain to be higher than expected suggesting that the Moberg osteotomy may provide more pain relief.

### Poster 25

## A Functional Outcome Analysis of Hallux Rigidus Patients Undergoing Cheilectomy vs. Cheilectomy Plus Moberg Osteotomy

Tibor T. Warganich, MD  
Thomas G. Harris, MD  
Mitchell Weksler, MS II

**Introduction:** Hallux rigidus is marked by pain and decreased range of motion at the first MTP joint. We evaluated 63 patients with hallux rigidus undergoing surgery with cheilectomy vs. cheilectomy plus Moberg osteotomy to better understand the post surgical outcomes between the two groups in a practical, patient centered point-of-view.

**Methods:** This is a retrospective study based on patient satisfaction scores, functional outcomes, and radiographic imaging. This study includes 63 patients with hallux rigidus treated with cheilectomy vs. cheilectomy plus Moberg osteotomy via prospective analysis and questionnaire in a 5-year period.

**Results:** Time to 100% recovery was shorter in the cheilectomy alone group. Time to regular shoes and overall satisfaction was nearly identical in both groups. Both treatment groups had similar percentages of patients reporting less post-operative pain than expected. However, a higher percentage of patients in the cheilectomy only group reported more pain than expected compared to the combined procedure group (56.25% vs. 40.0%, respectively). More patients in the cheilectomy plus Moberg group had a grade III hallux rigidus, and more patients receiving a cheilectomy alone had a grade I hallux rigidus.

**Discussion and Conclusion:** Many treatment options are available for hallux rigidus. Cheilectomy is often used for milder disease and provides good pain relief and range of

---

## Individual Orthopaedic Instruction/ Multimedia Education

---

### Schedule:

Thursday, August 1, 2013 3:15 pm-4:15 pm

Friday, August 2, 2013 3:00 pm-4:00 pm

Saturday, August 3, 2013 1:45 pm-2:45 pm

The following AAOS DVDs are available for individual viewing at the above times.

1. **Anatomy of the Knee** (25 minutes)  
Stephen L. Brown, MD; Patrick M. Connor, MD; Donald F. D'Alessandro, MD;  
James E. Fleischli, MD
2. **Pectoralis Major Transfer for Irreparable Rotator Cuff Tears** (11 minutes)  
Sumant G. Krishnan, MD and Kenneth C. Lin, MD
3. **Surgical Dislocation and Debridement for Femoro-Acetabular Impingement** (22 minutes)  
Christopher L. Peters, MD and Jill A. Erickson, PhD
4. **Hip Resurfacing: Direct Anterior Approach** (12 minutes)  
William J. Hozack, MD; Michael M. Nogler, MD; Stefan Kreuzer, MD; and Martin Krismer, MD
5. **Imageless Navigation in Hip Resurfacing Arthroplasty** (15 minutes)  
Michael L. Swank, MD and Amy L. Hallock, MEd
6. **Basics of Computer Navigation in Total Knee Arthroplasty** (11 minutes)  
James B. Stiehl, MD
7. **Lateral Approach for Valgus Total Knee Arthroplasty** (12 minutes)  
James B. Stiehl, MD
8. **Molded Articulating Cement Spacers for Treatment of Infected Total Knee Arthroplasty**  
(12 minutes)  
Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA
9. **Arthroscopic Suprascapular Nerve Release** (23 minutes)  
Laurent Lafosse, MD
10. **Open Repair of Acute and Chronic Distal Biceps Ruptures** (25 minutes)  
James Michael Bennett, MD; Thomas Lynn Mehlhoff, MD; and James Burlin Bennett, MD
11. **Arthroscopic Acetabular Labral Repair: Surgical Technique** (9 minutes)  
Marc J. Philippon, MD; Mike J. Huang, MD; Karen K. Briggs, MPH, MBA; and David A. Koppersmith, BS

12. **Anterior Cruciate Ligament Reconstruction Using Achilles Allograft and Interference Screws** (10 minutes)  
Colin G. Looney, MD and William I. Sterett, MD
13. **Osteochondral Lesion of the Talus (OLT): Technique of Osteochondral Autologous Graft Transfer** (11 minutes)  
Sameh A. Labib, MD and Brett A. Sweitzer, MD
14. **Revision ACL Reconstruction Using the Anatomic Double Bundle Concept** (14 minutes)  
Freddie H. Fu, MD; Nicholas J. Honkamp, MD; Wei Shen, MD, PhD; Anil S. Ranawat, MD; and Fotios Tjounikaris, MD
15. **The Krukenberg Procedure for Children** (25 minutes)  
Hugh Godfrey Watts, MD; John F. Lawrence, MD; and Joanna Patton, ROT
16. **Single Incision Direct Anterior Approach to Total Hip Arthroplasty** (13 minutes)  
William J. Hozack, MD; Michael M. Nogler, MD; Javad Parvizi, MD, FRCS; Eckart Mayr, MD; and Krismer Martin, MD
17. **Medial Patellofemoral Ligament Reconstruction** (13 minutes)  
Ryan E. Dobbs, MD; Patrick E. Greis, MD; and Robert T. Burks, MD
18. **Hip Arthroscopy: Operative Set-Up and Anatomically Guided Portal Placement** (8 minutes)  
Allston Julius Stubbs, MD; Karen K. Briggs, MPH, MBA; and Marc J. Philippon, MD
19. **Anatomy of the Shoulder** (24 minutes)  
Donald F. D'Alessandro, MD
20. **Anterolateral Approach in Minimally Invasive Total Hip Arthroplasty** (18 minutes)  
Leonard Remia, MD
21. **Patient Specific Knee Design: An Evolution in Computer-Assisted Surgery** (22 minutes)  
Adolph V. Lombardi Jr., MD, FACS; Keith R. Berend, MD; and Joanne B. Adams, BFA
22. **Hemiarthroplasty for a Comminuted Fracture of the Proximal Humerus** (20 minutes)  
Jon J.P. Warner, MD; Darren J. Friedman, MD; Zachary R. Zimmer, BA; and Laurence D. Higgins, MD
23. **Rotator Interval Repair of the Shoulder: Biomechanics and Technique** (7 minutes)  
LCDR Matthew T. Provencher, MD, MC, USN and Daniel J. Solomon, MD
24. **Excision of Calcaneonavicular Tarsal Coalition** ( 7 minutes)  
Maurice Albright, MD; Brian Grottkau, MD; and Gleeson Rebello, MD
25. **Extensile Surgical Approach for the Resection of Large Tumors of the Axilla and Brachial Plexus** (9 minutes)  
James C. Wittig, MD; Alex R. Vap, BA; Camilo E. Villalobos, MD; Brett L. Hayden, BA; Andrew M. Silverman, BA; and Martin M. Malawer, MD
26. **The Anterior Supine Intermuscular Approach in Primary Total Hip Arthroplasty** (18 minutes)  
Keith R. Berend, MD; Adolph V. Lombardi Jr., MD; and Joanne B. Adams, BFA, CMI

27. **Robotic Arm-Assisted Unicompartmental Knee Arthroplasty: An Introductory Guide** (15 minutes)  
Christopher John Dy, MD; Kristofer Jones, MD; Samuel Arthur Taylor, MD; Anil Ranawat, MD; and Andrew D. Pearle, MD
28. **Vertical Humeral Osteotomy for the Revision of Humeral Components in Shoulder Arthroplasty** (21 minutes)  
Geoffrey Van Thiel, MD; Gregory P. Nicholson, MD; James Patrick Halloran, MD; Dana Piasecki, MD; Matthew T. Provencher, MD; and Anthony A. Romeo, MD
29. **Techniques for Safe Portal Placement in the Shoulder: The Ring of Fire** (13 minutes)  
Keith D. Nord, MD; Bradford A. Wall, MD; Prithviraj Chavan, MD; and William H. Garrett, BS
30. **Reconstruction of the Medial Collateral Ligament of the Elbow** (12 minutes)  
James Michael Bennett, MD; Thomas Lynn Melhoff, MD; and Rodney K. Baker
31. **Reconstruction of Abductor Mechanism-Gluteus Maximus Flap Transfer** (15 minutes)  
Leo Whiteside, MD and Marcel Roy, PhD
32. **Kinematic Alignment with Modified Conventional Instruments Instead of Patient-Specific Guides** (26 minutes)  
Stephen Howell, MD
33. **Arthroscopic Management of Femoroacetabular Impingement** (12 minutes)  
J. W. Thomas Byrd, MD
34. **Arthroscopic Suprascapular Nerve Decompression: Etiology, Diagnosis, and Surgical Technique** (21 minutes)  
Sanjeev Bhatia, MD; Adam B. Yanke, MD; Neil S. Ghodadra, MD; Seth Sherman, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD
35. **Combined Cartilage Restoration and Distal Realignment for Patellar and Trochlear Chondral Lesions** (12 minutes)  
Peter Chalmers, MD; Adam B. Yanke, MD; Seth Sherman, MD; Vasili Karas, BS; and Brian Cole, MD, MBA
36. **Simple Arthroscopic Anterior Capsulo-Labral Reconstruction of the Shoulder** (17 minutes)  
Stephen J. Snyder, MD and Jeffrey D. Jackson, MD
37. **Proximal Humerus Resection for Parosteal Osteosarcoma** (16 minutes)  
Yvette Ho, MD; Camilo E. Villalobos, MD; and James C. Wittig, MD
38. **Biceps Tenodesis: Open Subpectoral and Arthroscopic Technique** (19 minutes)  
Adam B. Yanke, MD; Peter N. Chalmers, MD; Anthony A. Romeo, MD; and Nikhil N. Verma, MD
39. **Total Shoulder Arthroplasty: Steps to Get It Right** (15 minutes)  
Richard J. Hawkins, MD
40. **ACL Anatomic Single Bundle Reconstruction Technical Note and Results** (20 minutes)  
Michael W. Moser, MD; Gonzalo Samitier Solis, MD; Terese L. Chmielewski, PT, PhD; and Trevor Lentz, PT

41. **Surgical Repair of Proximal Hamstring Avulsion in the Athlete** (15 minutes)  
Tal S. David, MD and Gabriel L. Petruccelli, MD
42. **Removal of a Broken Intramedullary Nail and Exchange Nailing for Tibial Nonunion**  
(10 minutes)  
Kenneth A. Egol, MD; Abiola Atanda, MD; Mathew Hamula, BA, BS; and Jason P. Hochfelder, MD
43. **Radical Resection of the Glenoid and Scapular Neck for Sarcoma and Reconstruction**  
(11 minutes)  
Brendon J. Comer, BA; Brett Hayden, BA; Camilo E. Villalobos, MD; and James C. Wittig, MD

## *Multimedia Financial Disclosure*

Western Orthopaedic Association has identified the option to disclose as follows.

The following participants have disclosed whether they or a member of their immediate family:

1. Receive royalties for any pharmaceutical, biomaterial, or orthopaedic product or device;
2. Within the past twelve months, served on a speakers' bureau or have been paid an honorarium to present by any pharmaceutical, biomaterial, or orthopaedic product or device company;
- 3a. Paid Employee for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;
- 3b. Paid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;
- 3c. Unpaid Consultant for any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier;
4. Own stock or stock options in any pharmaceutical, biomaterial, or orthopaedic device and equipment company, or supplier (excluding mutual funds);
5. Receive research or institutional support as a principal investigator from any pharmaceutical, biomaterial, orthopaedic device and equipment company, or supplier;
6. Receive any other financial/material support from any pharmaceutical, biomaterial, or orthopaedic device and equipment company or supplier;
7. Receive any royalties, financial/material support from any medical and/or orthopaedic publishers;
8. Serves on the editorial or governing board of any medical and/or orthopaedic publication;
9. Serves on any Board of Directors, as an owner or officer, on a relevant committee of any health care organization (e.g., hospital, surgery center, medical).
- n. No Conflicts to Disclose.

The Academy 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

Joanne B. Adams, BFA (n.)
Maurice Albright, MD (n.)
Abiola Atanda, MD (n.)
Rodney K. Baker (n.)
James Burlin Bennett, MD (2. <i>Ascension Orthopedics</i> ; 3b. <i>Ascension Orthopedics</i> ; 5. <i>Ascension Orthopedics</i> )
James Michael Bennett, MD (9. <i>AAOS</i> )
Keith R. Berend, MD (1. <i>Biomet</i> ; 3b. <i>Biomet, Salient Surgical</i> ; 5. <i>Biomet, Salient Surgical</i> ; 8. <i>Clinical Orthopaedics and Related Research, Journal of Arthroplasty, Journal of Bone and Joint Surgery – American, Orthopedics</i> ; 9. <i>American Association of Hip and Knee Surgeons</i> )
Sanjeev Bhatia, MD (n.)
Karen K. Briggs, MPH, MBA (5. <i>Ossur, Smith &amp; Nephew, Arthrex, Inc., Siemens</i> )
Stephen L. Brown, MD (n.)

Robert T. Burks, MD (1. <i>Arthrex, Inc.</i> ; 2. <i>Arthrex, Inc.</i> ; 3b. <i>Arthrex, Inc.</i> ; 9. <i>Arthroscopy Association of North America</i> )
J. W. Thomas Byrd, MD (3b. <i>Smith &amp; Nephew, A2 Surgical</i> ; 4. <i>A2 Surgical</i> ; 5. <i>Smith &amp; Nephew</i> ; 7. <i>Springer</i> ; 9. <i>Arthroscopy Association of North America, American Orthopaedic Society for Sports Medicine, International Society of Arthroscopy, Knee Surgery, Orthopaedic Sports Medicine</i> )
Peter Chalmers, MD (n.)
Prithviraj Chavan, MD (5. <i>Arthrex, Inc., Smith &amp; Nephew, DePuy, Synthes</i> )
Terese L. Chmielecki, PT, PhD (n.)
Brian Cole, MD, MBA (1. <i>Arthrex, Inc., DJ Orthopaedics, Lippincott, Elsevier</i> ; 2. <i>Genzyme</i> ; 3b. <i>Zimmer, Arthrex, Inc., Carticept, Biomimetic, Allosource, DePuy</i> ; 5. <i>Regentis, Arthrex, Smith &amp; Nephew, DJ Ortho</i> ; 7. <i>Lippincott, Elsevier, WB Saunders</i> ; 8. <i>JBJS, AJSM, Cartilage, JSES, AJO, Elsevier</i> )
Brendon J. Comer, BA (n.)
Patrick M. Connor, MD (1. <i>Biomet</i> ; 3b. <i>Zimmer</i> ; 9. <i>NFLPS, OrthoCarolina Research Institute</i> )

Donald F. D'Alessandro, MD (3b. <i>Biomet Sports Medicine</i> )
Tal S. David, MD (2. <i>Arthrex, Inc., Cayenne Medical, Inc.</i> ; 3c. <i>Cayenne Medical, Inc., Arthrex, Inc.</i> ; 4. <i>Cayenne Medical, Inc.</i> ; 5. <i>KFx Medical, Inc.</i> ; 7. <i>SLACK Inc.</i> ; 8. <i>Orthopedics, SLACK Inc.</i> ; 9. <i>American Orthopaedic Society for Sports Medicine, Arthroscopy Association of North America, Arthritis Foundation</i> )
Ryan E. Dobbs, MD (4. <i>Orthopaedic Implant Company</i> )
Christopher John Dy, MD (n.)
Kenneth A. Egol, MD (1. <i>Exactech, Inc.</i> ; 3b. <i>Exactech, Inc.</i> ; 5. <i>Synthes, OREF, OTA, OMEGA</i> ; 7. <i>SLACK Inc., Wolters Kluwer Health - Lippincott Williams &amp; Wilkins</i> ; 8. <i>Journal of Orthopaedic Trauma</i> )
Jill A. Erickson, PA-C (n.)
James E. Fleischli, MD (5. <i>Biomet</i> )
Darren J. Friedman, MD (2. <i>Allen Medical, Arthrex, Inc.</i> ; 3b. <i>Allen Medical</i> )
Freddie H. Fu, MD (1. <i>Arthrocare</i> ; 3a. <i>Stryker</i> ; 4. <i>Stryker</i> ; 7. <i>SLACK Incorporated</i> ; 8. <i>Saunders/Mosby-Elsevier</i> ; 9. <i>AAOS, American Orthopaedic Society for Sports Medicine, International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine, Orthopaedic Research and Education Foundation</i> )
William H. Garrett, BS (n.)
Neil S. Ghodadra, MD (n.)
Patrick Greis, MD (4. <i>Merck</i> )
Brian Grottkau, MD (9. <i>AAOS</i> )
Amy L. Hallock, MD (n.)
James Patrick Halloran, MD (n.)
Mathew Hamula, BA, BS (n.)
Richard J. Hawkins, MD (1. <i>Ossur</i> ; 3b. <i>DJ Orthopaedics</i> ; 7. <i>Wolters Kluwer Health - Lippincott Williams &amp; Wilkins</i> ; 9. <i>American Shoulder and Elbow Surgeons</i> )
Brett L. Hayden, BA (n.)
Laurence D. Higgins, MD (6. <i>Arthrex, Inc., Smith &amp; Nephew, Breg, DePuy</i> ; 9. <i>American Shoulder and Elbow Surgeons, Arthroscopy Association of North America</i> )
Yvette Ho, MD (6. <i>imedicalapps.com</i> )
Nicholas J. Honkamp, MD (n.)
Jason P. Hochfelder, MD (n.)
Stephen Howell, MD (1. <i>Biomet</i> ; 2. <i>Biomet, Stryker</i> ; 3b. <i>Biomet, Stryker</i> ; 5. <i>Stryker</i> ; 7. <i>Saunders/Mosby-Elsevier</i> ; 8. <i>Knee, American Journal of Sports Medicine</i> ; 9. <i>International Society of Arthroscopy, Knee Surgery, Orthopaedic Sports Medicine</i> )
William J. Hozack, MD (1. <i>Stryker</i> ; 3b. <i>Stryker</i> ; 5. <i>Stryker</i> ; 8. <i>Journal of Arthroplasty</i> ; 9. <i>Hip Society</i> )
Michael Huang, MD (6. <i>Genzyme, Smith &amp; Nephew</i> )
Jeffrey D. Jackson, MD (3a. <i>Arthrex, Inc.</i> )
Kristofer Jones, MD (n.)
Vasili Karas, BS (n.)

Stefan Kreuzer, MD (1. <i>Smith &amp; Nephew, Synvasive</i> ; 2. <i>Corin USA, Stryker, Salient Surgical, MAKO</i> ; 3b. <i>Corin USA, Stryker, Salient Surgical, MAKO</i> ; 5. <i>MAKO, Synvasive, Corin USA</i> )
Sumant G. Krishnan, MD (1. <i>Innovation Sports</i> ; 3b. <i>Mitek, Tornier</i> ; 4. <i>Johnson &amp; Johnson, Pfizer, Merck</i> ; 6. <i>Mitek, Tornier</i> )
Martin Krismer, MD (6. <i>Stryker Orthopaedics</i> )
David A. Koppersmith, BS (n.)
Sameh A. Labib, MD (2. <i>Arthrex, Inc.</i> ; 4. <i>ConformIS, Inc., Zimmer</i> ; 9. <i>AAOS, American Orthopaedic Foot and Ankle Society</i> )
Laurent Lafosse, MD (1. <i>TAG</i> ; 2. <i>TAG</i> ; 3b. <i>TAG</i> ; 3c. <i>TAG</i> ; 5. <i>TAG</i> )
John F. Lawrence, MD (n.)
Trevor Lentz, PT (n.)
Kenneth C. Lin, MD (n.)
Adolph V. Lombardi Jr, MD, FACS (6. <i>Biomet, Medtronic, GlaxoSmithKline, Merck, Tornier, Allergan, New Albany Surgical Hospital, Pivotal Research Solutions, Inc.</i> )
Colin G. Looney, MD (n.)
Martin M. Malawer, MD (n.)
Krismer Martin, MD (n.)
Eckart Mayr, MD (2. <i>Stryker</i> ; 3b. <i>Stryker</i> ; 5. <i>Stryker</i> )
Thomas L. Mehlhoff, MD (n.)
Michael W. Moser, MD (5. <i>OREF, OMEGA, Omeros</i> ; 9. <i>AAOS, American Orthopaedic Society for Sports Medicine</i> )
Gregory P. Nicholson, MD (1. <i>Innomed, Zimmer</i> ; 3b. <i>Zimmer, Tornier</i> ; 4. <i>Zimmer</i> ; 5. <i>EBI, Tornier, Zimmer</i> ; 7. <i>SLACK Incorporated</i> )
Michael M. Nogler, MD (2. <i>Stryker</i> ; 3b. <i>Stryker</i> ; 5. <i>Stryker Heraeus</i> ; 7. <i>Springer</i> )
Keith D. Nord, MD (1. <i>Arthrex, Inc.</i> ; 2. <i>Smith &amp; Nephew, Cayenne</i> ; 3b. <i>Smith &amp; Nephew, Cayenne</i> ; 4. <i>Bledsoe</i> ; 5. <i>DePuy, Synthes, Smith &amp; Nephew, Zimmer, Arthrex, Inc.</i> )
Dana Piasecki, MD (n.)
Javad Parvizi, MD, FRCS (3b. <i>Biomet, Covidien, National Institutes of Health (NIAMS &amp; NICHD), Salient Surgical, Smith &amp; Nephew, Stryker, TissueGene, Zimmer</i> ; 5. <i>3M, Musculoskeletal Transplant Foundation, National Institutes of Health (NIAMS &amp; NICHD), Stryker, Zimmer</i> ; 7. <i>Saunders/Mosby-Elsevier, SLACK Incorporated, Wolters Kluwer Health - Lippincott Williams &amp; Wilkins</i> ; 8. <i>American Journal of Orthopedics, Current Opinion in Orthopaedics, International Orthopaedics, Journal of Bone and Joint Surgery - American, Journal of Bone and Joint Surgery - British, Journal of the American Academy of Orthopaedic Surgeons, Orthopedics Today, SLACK Incorporated</i> ; 9. <i>American Association of Hip and Knee Surgeons, American Board of Orthopaedic Surgery, Inc., British Orthopaedic Association, CD Diagnostics, EOA, Hip Society, OREF, Orthopaedic Research Society, SmartTech, United Healthcare</i> )
Joanna Patton, ROT (n.)
Andrew D. Pearle, MD (n.)
Christopher L. Peters, MD (1. <i>Biomet</i> ; 2. <i>Biomet</i> ; 3b. <i>Biomet</i> ; 8. <i>Journal of Arthroplasty</i> ; 9. <i>AAOS</i> )

Gabriel L. Petruccioli, MD (5. <i>KFx Medical, Inc.</i> )
Marc J. Philippon, MD (1. <i>Smith &amp; Nephew, Bledsoe, Donjoy, ArthroSurface</i> ; 3b. <i>Smith &amp; Nephew</i> ; 4. <i>ArthroSurface, Hipco, MIS</i> ; 5. <i>Ossur, Arthrex, Siemens, Smith &amp; Nephew</i> ; 6. <i>Smith &amp; Nephew</i> ; 7. <i>SLACK Incorporated, Elsevier</i> ; 9. <i>International Society for Hip Arthroscopy, AOSSM, Steadman Philippon Research Institute</i> )
Matthew T. Provencher, MD (8. <i>Arthroscopy, BMC Musculoskeletal Disorders, Knee, Orthopedics, SLACK Incorporated, Vindico Orthopaedic Hyperguide</i> ; 9. <i>AAOS, American Orthopaedic Society for Sports Medicine, American Shoulder and Elbow Surgeons, Arthroscopy Association of North America, International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine, San Diego Shoulder Institute, Society of Military Orthopaedic Surgeons</i> )
Anil Ranawat, MD (4. <i>MAKO, ConforMIS</i> )
Gleeson Rebello, MD (n.)
Leonard Remia, MD (3b. <i>Encore Medical</i> ; 6. <i>Encore Medical</i> )
Anthony A. Romeo, MD (1. <i>Arthrex, Inc.</i> ; 2. <i>Arthrex, Inc., DJ Orthopaedics, Joint Restoration Foundation</i> ; 3b. <i>Arthrex, Inc.</i> ; 5. <i>Arthrex, Inc., DJ Orthopaedics</i> ; 6. <i>Arthrex, Inc., DJ Orthopaedics</i> ; 7. <i>Saunders/Mosby-Elsevier</i> ; 8. <i>Arthroscopy, Journal of Shoulder and Elbow Surgery, SLACK, Inc., Wolters Kluwer Health - Lippincott Williams &amp; Wilkins</i> ; 9. <i>American Orthopaedic Society for Sports Medicine, American Shoulder and Elbow Surgeons, Arthroscopy Association of North America</i> )
Marcel Roy, PhD (3c. <i>Signal Medical Corp.</i> )
Wei Shen, MD, PhD (n.)
Seth Sherman, MD (n.)
Andrew M. Silverman, BA (n.)
Stephen J. Snyder, MD (1. <i>Arthrex, Inc., DJ Orthopaedics, Linvatec, Sawbones/Pacific Research Laboratories, Wright Medical Technology, Inc.</i> ; 3a. <i>Redyns Medical</i> ; 3b. <i>Synthes</i> ; 4. <i>Redyns Medical, Johnson &amp; Johnson, Wright Medical</i> ; 7. <i>Wolters Kluwer Health - Lippincott Williams &amp; Wilkins</i> )
Gonzalo Samitier Solis, MD (8. <i>International Society of Arthroscopy, Knee Surgery, Orthopaedic Sports Medicine</i> ; 9. <i>International Society of Arthroscopy, Knee Surgery, Orthopaedic Sports Medicine</i> )
Daniel J. Solomon, MD (2. <i>Arthrex, Inc., Pacific Medical</i> ; 8. <i>Arthroscopy, American Orthopaedic Sports Medicine Society Sports Medicine Update</i> ; 9. <i>AAOS, American Orthopaedic Society for Sports Medicine, Society of Military Orthopaedic Surgeons</i> )

William I. Sterett, MD (1. <i>Biomet</i> ; 3b. <i>Arthrex, Inc.</i> ; 5. <i>Arthrex, Inc., Smith &amp; Nephew, Ossur, Siemens</i> )
James B. Stiehl, MD (1. <i>Zimmer, Innomed</i> ; 2. <i>Blue Orthopaedics Computer Company, Zimmer</i> ; 3b. <i>Blue Orthopaedics Computer Company, Zimmer</i> ; 3c. <i>Exactech, Inc.</i> ; 4. <i>Blue Orthopaedics Computer Company, Traumis, Inc. Technology Company</i> ; 8. <i>Knee, Journal of Arthroplasty</i> )
Allston J. Stubbs, MD (3b. <i>Smith &amp; Nephew</i> ; 4. <i>Johnson &amp; Johnson, Inc.</i> ; 5. <i>Bauerfeind, AG</i> ; 8. <i>VuMedi.com, Journal of Arthroscopy</i> ; 9. <i>International Society for Hip Arthroscopy, American Orthopaedic Society for Sports Medicine, Arthroscopy Association of North America</i> )
Michael L. Swank, MD (3b. <i>Brainlab, DePuy</i> ; 6. <i>Brainlab, DePuy</i> )
Brett A. Sweitzer, MD (n.)
Samuel Arthur Taylor, MD (n.)
Fotios P. Tjoumakaris, MD (2. <i>Ferring Pharmaceutical</i> )
Geoffrey S. Van Thiel, MD (n.)
Alex R. Vap, BA (n.)
Nikhil N. Verma, MD (1. <i>Smith &amp; Nephew</i> ; 3b. <i>Smith &amp; Nephew</i> ; 4. <i>Omeros</i> ; 5. <i>Arthrex, Inc., Smith &amp; Nephew, Athletico, ConMed Linvatec, Miomed, Mitek</i> ; 7. <i>Vindico Medical-Orthopedics Hyperguide, Arthroscopy</i> ; 8. <i>Journal of Knee Surgery, Arthroscopy, SLACK, Inc.</i> ; 9. <i>American Orthopaedic Society for Sports Medicine, Arthroscopy Association Learning Center Committee</i> )
Camilo E. Villalobos, MD (n.)
Bradford A. Wall, MD (n.)
Jon J. P. Warner, MD (1. <i>Zimmer, Tornier</i> ; 6. <i>Arthrocare, DJ Orthopaedics, Arthrex, Inc., Mitek, Breg, Smith &amp; Nephew</i> )
Hugh Godfrey Watts, MD (n.)
Leo Whiteside, MD (1. <i>Smith &amp; Nephew, Stryker</i> ; 2. <i>Smith &amp; Nephew</i> ; 3b. <i>Signal Medical Corp.</i> ; 3c. <i>Smith &amp; Nephew</i> ; 4. <i>Signal Medical Corp.</i> ; 8. <i>Journal of Arthroplasty, Clinical Orthopaedics and Related Research, Journal of Orthopaedics and Traumatology</i> )
James C. Wittig, MD (n.)
Adam B. Yanke, MD (n.)
Zachary R. Zimmer, BA (n.)



## Western Orthopaedic Association

77<sup>th</sup> Annual Meeting

August 1-3, 2013

The Resort at Squaw Creek  
Lake Tahoe, California

### 2013 CME Credit Record

#### Multimedia Education

**Instructions:** To ensure correct CME credit is awarded, please complete this form, indicating the DVDs you watched. Return this form to the WOA Registration Desk or complete the Credit Record online at [www.woa-assn.org](http://www.woa-assn.org). You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

**Please Print:**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Email Address: \_\_\_\_\_

*Thank you for your cooperation.*

## 2013 CME Credit Record Multimedia Education

Please place an **×** in the box by each DVD viewed and write any comments you may have in the space provided.  
You will be awarded hour per hour credit for time of participation.

- |  |  |  |  |
|--|--|--|--|
| <input type="checkbox"/> DVD 1 (25 min)  | <input type="checkbox"/> DVD 12 (10 min) | <input type="checkbox"/> DVD 23 (7 min)  | <input type="checkbox"/> DVD 34 (21 min) |
| <input type="checkbox"/> DVD 2 (11 min)  | <input type="checkbox"/> DVD 13 (11 min) | <input type="checkbox"/> DVD 24 (7 min)  | <input type="checkbox"/> DVD 35 (12 min) |
| <input type="checkbox"/> DVD 3 (22 min)  | <input type="checkbox"/> DVD 14 (14 min) | <input type="checkbox"/> DVD 25 (9 min)  | <input type="checkbox"/> DVD 36 (17 min) |
| <input type="checkbox"/> DVD 4 (12 min)  | <input type="checkbox"/> DVD 15 (25 min) | <input type="checkbox"/> DVD 26 (18 min) | <input type="checkbox"/> DVD 37 (16 min) |
| <input type="checkbox"/> DVD 5 (15 min)  | <input type="checkbox"/> DVD 16 (13 min) | <input type="checkbox"/> DVD 27 (15 min) | <input type="checkbox"/> DVD 38 (19 min) |
| <input type="checkbox"/> DVD 6 (11 min)  | <input type="checkbox"/> DVD 17 (13 min) | <input type="checkbox"/> DVD 28 (21 min) | <input type="checkbox"/> DVD 39 (15 min) |
| <input type="checkbox"/> DVD 7 (12 min)  | <input type="checkbox"/> DVD 18 (8 min)  | <input type="checkbox"/> DVD 29 (13 min) | <input type="checkbox"/> DVD 40 (20 min) |
| <input type="checkbox"/> DVD 8 (12 min)  | <input type="checkbox"/> DVD 19 (24 min) | <input type="checkbox"/> DVD 30 (12 min) | <input type="checkbox"/> DVD 41 (15 min) |
| <input type="checkbox"/> DVD 9 (23 min)  | <input type="checkbox"/> DVD 20 (18 min) | <input type="checkbox"/> DVD 31 (15 min) | <input type="checkbox"/> DVD 42 (10 min) |
| <input type="checkbox"/> DVD 10 (25 min) | <input type="checkbox"/> DVD 21 (22 min) | <input type="checkbox"/> DVD 32 (26 min) | <input type="checkbox"/> DVD 43 (11 min) |
| <input type="checkbox"/> DVD 11 (9 min)  | <input type="checkbox"/> DVD 22 (20 min) | <input type="checkbox"/> DVD 33 (12 min) |  |

Please indicate the DVD(s) you found to be most meaningful and any comments. Begin with the DVD number.

---

---

---

---

Please indicate any feedback that you may have concerning other DVDs. Begin with the DVD number.

---

---

---

---

Please indicate any comments or suggestions that you have regarding the Multimedia Presentations.

---

---

---

---



**Western Orthopaedic Association**

**77<sup>th</sup> Annual Meeting**

August 1-3, 2013

The Resort at Squaw Creek  
Lake Tahoe, California

**2013 CME Credit Record**

**Scientific Program**

**Instructions:** To ensure correct CME credit is awarded, please complete this form, indicating the Sessions you attended. Return this form to the WOA Registration Desk or complete the Credit Record online at [www.woa-assn.org](http://www.woa-assn.org). You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

**Please Print:**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Email Address: \_\_\_\_\_

*Thank you for your cooperation.*

## 2013 CME Credit Record Scientific Program

Please rate by circling the appropriate number:  
**5 = Excellent 4 = Good 3 = Satisfactory 2 = Fair 1 = Poor**

Thursday, August 1, 2013

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
<i>General Session I</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Symposium I</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Concurrent Session II</i> or <i>Concurrent Session III</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Symposium II</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>General Session IV</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Concurrent Session V</i> or <i>Concurrent Session VI</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>SAE Review — Sports Knee</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1

Friday, August 2, 2013

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
<i>General Session VII</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Symposium III</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Concurrent Session VIII</i> or <i>Concurrent Session IX</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>General Session X</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Symposium IV</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Concurrent Session XI</i> or <i>Concurrent Session XII</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>SAE Review — Trauma &amp; Total Hip</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1

Saturday, August 3, 2013

Sessions	Check if Attended	Presented objective balanced, & scientifically rigorous content	Achieved stated objectives	Satisfied my educational and/or professional needs
<i>General Session XIII</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Symposium V</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>General Session XIV</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>General Session XV</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>Symposium VI</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>General Session XVI</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
<i>SAE Review — Pediatrics</i>	<input type="checkbox"/>	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1

Comments:

---



---



## Western Orthopaedic Association

77<sup>th</sup> Annual Meeting

August 1-3, 2013

The Resort at Squaw Creek

Lake Tahoe, California

### 2013 CME Credit Record

#### Poster Presentations

**Instructions:** To ensure correct CME credit is awarded, please complete this form, indicating the posters viewed. Return this form to the WOA Registration Desk or complete the Credit Record online at [www.woa-assn.org](http://www.woa-assn.org). You may also mail this form to Western Orthopaedic Association, 110 West Road, Suite 227, Towson, MD 21204. CME certificates will be awarded to all participants. Unless you have provided a legible email address, please allow up to 30 days to receive your CME certificate.

**Please Print:**

*Name:* \_\_\_\_\_

*Address:* \_\_\_\_\_

*City:* \_\_\_\_\_ *State:* \_\_\_\_\_ *Zip:* \_\_\_\_\_

*Phone:* \_\_\_\_\_ *Fax:* \_\_\_\_\_

*Email Address:* \_\_\_\_\_

## 2012 CME Credit Record Poster Presentations

Please place an X in the box by each posters viewed and write any comments you may have in the space provided. Each poster viewed will account for 15 minutes of CME credit. There is a maximum of 4.5 CME credits available during the course of the meeting for viewing posters (or a total of 18 posters).

- |                            |                             |                             |                             |
|----------------------------|-----------------------------|-----------------------------|-----------------------------|
| <input type="checkbox"/> 1 | <input type="checkbox"/> 8  | <input type="checkbox"/> 14 | <input type="checkbox"/> 20 |
| <input type="checkbox"/> 2 | <input type="checkbox"/> 9  | <input type="checkbox"/> 15 | <input type="checkbox"/> 21 |
| <input type="checkbox"/> 3 | <input type="checkbox"/> 10 | <input type="checkbox"/> 16 | <input type="checkbox"/> 22 |
| <input type="checkbox"/> 4 | <input type="checkbox"/> 11 | <input type="checkbox"/> 17 | <input type="checkbox"/> 23 |
| <input type="checkbox"/> 5 | <input type="checkbox"/> 12 | <input type="checkbox"/> 18 | <input type="checkbox"/> 24 |
| <input type="checkbox"/> 6 | <input type="checkbox"/> 13 | <input type="checkbox"/> 19 | <input type="checkbox"/> 25 |
| <input type="checkbox"/> 7 |                             |                             |                             |

**Please indicate the poster(s) you found to be most meaningful and any comments. Begin with the poster number.**

---

---

---

---

**Please indicate any feedback that you may have concerning other posters. Begin with the poster number.**

---

---

---

---

**Please indicate any comments or suggestions that you have regarding the Poster Presentations.**

---

---

---

## 2013 Overall Scientific Evaluation

Your feedback is critical to program planning and future course development. Please take a few minutes to complete and return this evaluation form to the registration desk prior to departure.

Why did you choose to attend this Meeting?	High Importance	Some Importance	Little Importance	No Importance
Course Topic(s) . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning Method(s) . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Program Faculty . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of Program . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Timeliness . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Obtaining CME Credit . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poster Presentations . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How did we do overall?	Excellent	Good	Fair	Poor
Course Educational Objectives . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Practical Application to Practice . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Faculty Selection . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Opportunity to Interact with Faculty . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Course Syllabus . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Opportunity to Ask Questions . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lighting, Seating and General Environment . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Course Length . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Registration Fee . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Refreshment Breaks, Food and Beverages . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lodging Accommodations . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost of Lodging Accommodations . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall Course Rating . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How did we do on Poster Presentations?	Excellent	Good	Fair	Poor
Poster Educational Objectives . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Practical Application to Practice . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Opportunity to Interact with Poster Presenter/Co-Author . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poster Syllabus Material . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Opportunity to Ask Questions . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poster Location . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How did we do on Multimedia?	Excellent	Good	Fair	Poor
Multimedia Educational Objectives . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Practical Application to Practice . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DVD Selection . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multimedia Location . . . . .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CME INFO

# CME FORMS

The program content was:      **Just Right**                       **Too Advanced**                       **Too Basic**

How much of the content was new to you?      **Almost All**                       **About 75%**                       **About 50%**   
   **About 25%**                       **Almost None**

Would you recommend this meeting to colleagues?                      **Yes**                       **No**

Did you perceive industry (commercial) bias in this meeting?                      **Yes**                       **No**

*If yes, describe:* \_\_\_\_\_

What I liked best about this meeting: \_\_\_\_\_

How I would improve this meeting: \_\_\_\_\_

Overall, did we deliver what you came to learn?                      **Yes**                       **No**

What did you learn from attending this meeting? List an example of something you learned that can be applied to your practice: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

---

**2014 Needs Assessment Survey**

---

**Please list any medical topics that you would like included in future programs planned by WOA.**

---

---

---

---

---

---

---

---

---

---

**Please list any Office Management Topics that you would like included in the program.**

**Management of:**

---

---

---

---

---

---

---

---

---

---

