STEADMAN PHILIPPON RESEARCH INSTITUTE

Orthopaedic Research Journal 2017-2018

STEADMAN PHILIPPON RESEARCH INSTITUTE

STEADMAN PHILIPPON RESEARCH INSTITUTE

2017-2018

ORTHOPAEDIC RESEARCH JOURNAL

Contents

Dear Friends,

I am pleased to share our second edition of the Steadman Philippon Research Institute (SPRI) *Orthopaedic Research Journal*. A commemoration of the ground-breaking science being produced in Vail, Colorado, this publication will take you through key research highlights of the past eighteen months.

Recognized globally for our innovative research, SPRI is celebrating thirty years of leading-edge science in 2018. Our Center for Outcomes-Based Orthopaedic Research, Center for Regenerative Sports Medicine, Department of Biomedical Engineering and Department of Imaging Research are dedicated to finding cures and enhancing lives, for people all over the world.

Excitingly, SPRI began 2017 by moving into state-of-the-art, brand-new facilities within Vail Health Hospital. Originally located in the basement of the hospital, our labs moved up—including a brand-new Center for Regenerative Sports Medicine Lab and Biomotion Lab on the first floor, and Surgical Skills and Robotics Lab on the fourth floor, right beside the clinical offices of The Steadman Clinic. This has facilitated unprecedented collaboration between SPRI scientists and clinic physicians, accelerating our bench-to-bedside approach to research. The beginning of 2017 ignited a spark for SPRI, and the past eighteen months have been tremendously productive and rewarding.

Thank you for your continued support of Steadman Philippon Research Institute. Our skilled scientists and physicians, excellent research partners and invested community make the incredible work being done at SPRI possible.

Please join us for the Fourth Annual Vail Scientific Summit, August 19–21, 2018.

Respectfully yours,

Johnny Huard, Ph.D.
Chief Scientific Officer

Johnny Huard, Ph.D.
Chief Scientific Officer

Mission

Building on our legacy of excellence in orthopaedic sports medicine, SPRI is unlocking the secrets of healing, finding cures and enhancing lives through global leadership in regenerative medicine, scientific research, innovation and education.

Our Primary Areas of Research and Education

Steadman Philippon Research Institute (SPRI) is one of the most innovative orthopaedic and sports medicine research organizations worldwide. With extensive publications and awards, SPRI is a leader in independent institutions. SPRI's scientists and researchers work in the following departments:

DEPARTMENT OF BIOMEDICAL ENGINEERING enhances patient care by focusing on injury mechanisms and prevention, develops and validates novel surgical treatments and rehabilitation techniques, and teaches advanced research protocols using state-of-the-art biomedical research techniques and technologies.

CENTER FOR OUTCOMES-BASED ORTHOPAEDIC RESEARCH conducts evidence- or outcomes-based research using actual clinical data that aids both physicians and patients in making better and more informed treatment decisions.

CENTER FOR REGENERATIVE SPORTS MEDICINE focuses on the basic science of regenerative medicine and the translation of this research into practical orthopaedic treatments.

IMAGING RESEARCH develops and evaluates noninvasive imaging techniques of the joints for the purpose of directing and monitoring clinical treatment and outcomes, and to enhance the clinical relevance of biomechanics research.

SURGICAL SKILLS LABORATORY implements new surgical technologies and trains surgeons—including SPRI's clinical fellows—in new techniques using high-tech equipment and tools.

EDUCATION AND FELLOWSHIP PROGRAM administers and coordinates the clinical fellowships and international scholars programs, hosts conferences and international academic meetings, produces and distributes publications and educational media, and organizes educational outreach programs in partnership with the local school district.

SPRI's research is widely published in professional journals and presented both in the United States and internationally to educate peers interested in advancing the field of orthopaedics. SPRI's elite fellowship programs attract top physicians from around the world to participate in its highly sought-after training programs. With a focus on bench-to-bedside research, SPRI scientists work closely with physicians at The Steadman Clinic to develop new treatments and techniques that can be translated to patient care.

Research Advisory Committee Meeting Chairman

Johnny Huard, Ph.D.

Johnny Huard, Ph.D.

Chief Scientific Officer

- Director, Center for Regenerative Sports Medicine
- Chairman, Research Advisory Committee, Steadman Philippon Research Institute
- Distinguished Professor, Department of Orthopaedic Surgery at the McGovern Medical School, University of Texas Health Science Center at Houston

Photo: John Kelly

Dr. Johnny Huard is a world-renowned scientist and serves as Chief Scientific Officer and Director of the Center for Regenerative Sports Medicine at Steadman Philippon Research Institute (SPRI) in Vail, Colorado. Dr. Huard also serves as the Distinguished Professor and Vice Chair for Research in the Department of Orthopaedic Surgery at the McGovern Medical School, University of Texas Health Science Center at Houston (UTHealth) since May 1, 2015. In addition, he is the Director of The Brown Foundation Institute of Molecular Medicine Center for Tissue Engineering and Aging Research at UTHealth in Houston, Texas. Prior to his position at SPRI and UTHealth, Dr. Huard held the Henry J. Mankin Professor and Vice Chair for Musculoskeletal Cellular Therapeutics and the Director of the Stem Cell Research Center in the Department of Orthopaedic Surgery at the University of Pittsburgh for 20 years. He also held appointments in Microbiology and Molecular Genetics, Bioengineering, Pathology and Physical Medicine and Rehabilitation, Pediatrics at the University of Pittsburgh Cancer Institute (UPCI) and the University of Pittsburgh. Dr. Huard was also the Deputy Director of Cellular Therapeutic Research at the McGowan Institute for Regenerative Medicine at the University of Pittsburgh.

In his current faculty position, Dr. Huard oversees over 25 individuals including medical, graduate and undergraduate students, post-doctoral researchers, basic science faculty and staff, clinical research fellows, and technical and administrative staff. He is the Chair of SPRI's Research Advisory Committee (RAC) and also chairs the Vail Scientific Summit annual meeting each August. This year, there are over 40 speakers from around the world participating in the annual summit, "Regenerative & Translational Medicine: A Focus on Human Clinical Applications."

Dr. Huard's research laboratory focuses on the identification, characterization, and clinical applications of muscle-derived stem cells for the treatment of conditions including Duchenne muscular dystrophy (DMD); critical sized long bone and cranial bone injuries; acutely injured articular cartilage and articular cartilage damaged by osteoarthritis; compartment syndrome that involves injury to the muscles, nerves, circulatory, lymphatic system vasculature, etc.; infarct injured hearts and cardiomyopathy due to DMD. Much of Dr. Huard's stem cell research has been used clinically (over 700 patients in Canada and the United States) for the treatment of urinary incontinence and myocardial infarction and is now part of a Phase III clinical trial. Having received 76 grants over the past 20 years and leading research on five federally funded grants, Dr. Huard has a proven history of extramural research and funding. Dr. Huard has authored over 360 manuscripts including peer-reviewed articles, review articles, invited papers, and book chapters for various high-profile scientific journals including *Nature Cell Biology, Nature Biotechnology, Journal of Cell Biology, Journal of Clinical Investigation, Cell Stem Cells,* and more. Dr. Huard and his research team have received over 80 awards including the Orthopaedic Society's prestigious Kappa Delta Awards (Young Investigator in 2004 and Ann Doner Vaughan Award in 2018) and was also the recipient of the University of Pittsburgh's Chancellor's Distinguished Research Award. He has had 800 abstracts accepted for presentation at national and international conferences. Dr. Huard currently serves on multiple editorial boards of scientific journals and reviews numerous scientific papers for a wider variety of scientific journals in his area of expertise. He serves on numerous study review groups at the National Institutes of Health and the Department of Defense.

Research Advisory Committee Meeting Co-Chairs:

Marc J. Philippon, M.D., Robert F. LaPrade, M.D., Ph.D., and Peter J. Millett, M.D., M.Sc.

Marc J. Philippon, M.D.

Sports Medicine, Hip Disorders, Hip Arthroscopy

- Orthopaedic Surgeon and Managing Partner, The Steadman Clinic
- Co-Chairman and Co-Director of Sports Medicine Fellowship, Steadman Philippon Research Institute
- Research Advisory Committee Member, Steadman Philippon Research Institute

Photo: John Kelly

Dr. Marc J. Philippon is the Managing Partner at The Steadman Clinic and is one of the world's leading orthopaedic surgeons. Dr. Philippon joined The Steadman Clinic in 2005 from the University of Pittsburgh Medical Center, where he served as Director of Sports Medicine/Hip Disorders Fellowship. He also was the Director of the University of Pittsburgh Medical Center's Golf Medicine Program. Previously, Dr. Philippon was Chief of Orthopaedic Surgery at Holy Cross Hospital in Fort Lauderdale, Florida.

Dr. Philippon is recognized by his peers in *U.S. News and World Report* as being among the top one percent in the nation in his specialty.

Dr. Philippon is internationally known for performing joint preservation techniques utilizing arthroscopic hip surgery to treat painful joint injury in high-level athletes who constantly use powerful hip rotation. He has treated nearly 1,000 professional and Olympic athletes successfully, many of them returning to high performance, winning Olympic Medals, setting new NFL, NHL and MLB records and winning PGA tournaments. Dr. Philippon is a consultant to the NHLPA and the Royal Spanish Tennis Federation and to many professional and Olympic organizations. In addition, Dr. Philippon serves as a member and trustee for both the U.S. Ski and Snowboard Team Foundation and the United States Olympic and Paralympic Foundations. A frequent invited speaker at national and international sports medicine and orthopaedic meetings, Dr. Philippon has also authored many peer-reviewed scientific articles. He has performed surgery in fifteen different countries and has designed many instruments to improve surgical techniques in hip surgery. In 2017, he was honored as the 21st Robert K. Kerlan MD Memorial Lecturer at the Keck School of Medicine at the University of Southern California.

Dr. Philippon initially came to the United States as a student-athlete, playing NCAA soccer and tennis on an athletic scholarship. He earned his medical degree with an academic scholarship from McMaster University Medical School in Hamilton, Ontario, Canada in 1990, and completed his orthopaedic surgery residence at the University of Miami, Jackson Memorial Hospital in 1995.

Board-certified by the American Board of Orthopaedic Surgery, Dr. Philippon is an active member of many medical organizations. He is also a Fellow with the American Academy of Orthopaedic Surgeons and is a Master Instructor with the Arthroscopy Association of North America. Dr. Philippon is an elected member of the Herodicus Society and is a founding member of the International Society of Hip Arthroscopy (ISHA). He will serve as president of ISHA in 2018–2019.

In 2012, Dr. Philippon received an Achievement Award from the American Academy of Orthopaedic Surgeons in recognition of outstanding contributions to the profession of orthopaedic surgery. In 2016, he received the 1st Annual Joseph McCarthy Award for Achievement in Advancing Knowledge and Scholarship in Hip Joint Preservation. His recognition continues as the leading researcher and surgeon in hip preservation with the "Vinci" Sports Health Award from The Vincera Foundation in 2018.

Dr. Philippon lives in Colorado with his wife and three children. He enjoys spending time with his family and participating in sports such as cycling, skiing, ice hockey, swimming, and golf.

Robert F. LaPrade, M.D., Ph.D.

Orthopaedic Complex Knee and Sports Medicine Surgeon

- Partner, The Steadman Clinic
- Chief Medical Officer and Co-Director of the Sports Medicine Fellowship Program, Steadman Philippon Research Institute
- Research Advisory Committee Member, Steadman Philippon Research Institute

Photo: John Kelly

Robert F. LaPrade, M.D., Ph.D., is a complex orthopaedic knee and sports medicine surgeon and partner at The Steadman Clinic in Vail, Colorado. He serves as Chief Medical Officer and Co-Director of the Sports Medicine Fellowship Program and the Director of the International Scholars Program at Steadman Philippon Research Institute. He is also the Sports Medicine Committee Chair for the International Society for Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine (ISAKOS) and is on the board of directors of the Vail Valley Surgery Center. Dr. LaPrade is on the Editorial Board of the American *Journal of Sports Medicine (AJSM)* and *Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA)*. Dr. LaPrade is known as one of the few specialists with extended expertise in the three main areas of medicine: clinical expertise, a lauded researcher and an outstanding educator.

Dr. LaPrade is recognized as one of the top knee surgeons in the world. Often referred to as a "doctor's doctor," he has specialized skills and expertise in diagnosing and treating complicated knee injuries and previously failed surgeries. He has treated athletes at all levels, including Olympic, professional (football, soccer, basketball, ice hockey, baseball, lacrosse, etc.), semi-professional and intercollegiate athletes and has returned many athletes back to full participation both after treating either their new injuries or previous failed knee surgeries. Dr. LaPrade has special expertise in treating posterolateral knee injuries, PCL tears, knee dislocations, revision ACL reconstructions, meniscal transplants, MCL injuries, knee osteotomies, fresh osteoarticular allografts, articular cartilage resurfacing procedures, complex patellofemoral instability and other difficult combined and revision injuries.

Selected as "One of the Best Doctors in America" and "One of the Most Compassionate Doctors," Dr. LaPrade is passionate about treating sports medicine injuries and is recognized for his outstanding and specialized surgical skills. Dr. LaPrade is known as a super-specialized clinician scientist who has utilized his vast and comprehensive research on sports medicine injuries to improve patient care and invent new ways to treat knee problems. Many of the surgeries that he has invented have been performed worldwide and are recognized as the gold standard for the treatment of many complex knee surgeries.

As one of the world's most celebrated complex knee surgeons and clinical scientists, Dr. LaPrade has published more than 350 peer-reviewed scientific manuscripts, has over 12,000 citations and 125 book chapters, and has given over 1,000 professional presentations, symposia, grand rounds and instructional course lectures. He has received many awards for his research, including the OREF Clinical Research Award, considered akin to a Nobel Prize in orthopaedics, and his research team has been awarded the AOSSM Excellence in Research Award three times since 2009, the Achilles Award from ISAKOS twice, and the Cabaud Memorial Award from AOSSM. Dr. LaPrade is the most published author in the top cited orthopaedic journal, the *American Journal of Sports Medicine (AJSM)*, with over 130 articles in *AJSM* alone. He is the sole author of the only comprehensive textbook on posterolateral knee injuries and has been the editor for several sports medicine textbooks. Dr. LaPrade is recognized as a pioneer in knee research, with many referrals from internationally and nationally recognized physicians because of his successful patient outcomes and his development of more effective surgical techniques for the reconstruction of complex knee injuries.

Recognized internationally as an outstanding teacher, Dr. LaPrade's Vail International Complex Knee Course is considered to be the top international complex knee course. He has hosted several hundred sports surgeons who have observed his practice in Vail to learn clinical exam and surgical techniques. Dr. LaPrade has served as the Course Chair of national and international sports medicine and biologics related courses and has been a true mentor by involving many former SPRI fellows as faculty for these courses. He has been awarded several teaching awards, including three annual teaching awards given by the fellows at The Steadman Clinic Sports Medicine Fellowship program.

Peter J. Millett, M.D., M.Sc.

Shoulder, Knee, Elbow Specialist and Sports Medicine

- Partner, The Steadman Clinic
- Board Member, Steadman Philippon Research Institute
- Research Advisory Committee Member, Steadman Philippon Research Institute
- Medical Director, Ski and Snowboard Club Vail

Peter J. Millett, M.D. M.Sc., is a partner at The Steadman Clinic who specializes in disorders of the shoulder, knee, elbow and sports-related injuries. Dr. Millett is a researcher and board member at Steadman Philippon Research Institute. Consistently selected as one of the "Best Doctors in America," Dr. Millett has been ranked in the top one percent of orthopaedic surgeons by *U.S. News and World Report.*

As a shoulder and sports medicine specialist, Dr. Millett has treated elite athletes from the NFL, NBA, MLB, NHL, PGA, Formula One, X-Games and the Olympics. Dr. Millett is a member of the American Orthopaedic Society for Sports Medicine, the American Shoulder and Elbow Surgeons, the Orthopaedic Research Society, the Arthroscopy Association of North America, the German Arthroscopy Association, the Sports Council and the Herodicus Society. Dr. Millett was recently honored by being an invited keynote speaker at the German Shoulder and Elbow Society, where he was also made an honorary member. Dr. Millett was also honored as the keynote speaker for the British Shoulder and Elbow Society.

Among other journals, Dr. Millett serves on the editorial board of the prestigious journals, *American Journal of Sports Medicine, Arthroscopy* and the *Journal of Shoulder and Elbow Surgery.* Dr. Millett has authored over 200 peer-reviewed scientific papers and three books on orthopaedic surgery and is renowned for his work on double-row rotator cuff repair, AC joint injuries, shoulder instability and the arthroscopic treatment of glenohumeral osteoarthritis. As an innovator, Dr. Millett also has a number of patents for his inventions. As an educator, Dr. Millett has been very involved in medical education training residents, medical students and fellows. During his career, he has trained over eighty fellows from the United States and abroad.

Dr. Millett attended the University of Scranton in Scranton, Pennsylvania and Dartmouth Medical School in Hanover, New Hampshire. While studying skeletal biology at the University of Cambridge in England, Dr. Millett earned a Master of Science (M.Sc.) degree. He completed his orthopaedic residency at Hospital for Special Surgery and Cornell University Medical Center in New York City. After a fellowship in shoulder, knee and sports medicine in Vail with Steadman Philippon Research Institute, Dr. Millett joined the faculty at Harvard Medical School, working with Professor Jon J.P. Warner. While at Harvard, Dr. Millett had a busy clinical practice and was active academically, teaching Harvard orthopaedic residents and medical students and serving as the Co-Director of the Harvard Shoulder Service and Shoulder Fellowship. While in Boston, he also started the Musculoskeletal Proteomics Research Group. In 2005, Dr. J. Richard Steadman of The Steadman Clinic and Steadman Philippon Research Institute recruited Dr. Millett to return to Vail to join the Clinic and Institute.

Research Advisory Committee

SPRI's Dr. Johnny Huard Awarded Prestigious Kappa Delta Award

A Tribute by Dan Drawbaugh, CEO of SPRI and The Steadman Clinic

Johnny Huard, Ph.D., Chief Scientific Officer and Director of the Center for Regenerative Sports Medicine at Steadman Philippon Research Institute, was honored to receive the prestigious 2018 ORS (Orthopaedic Research Society) Kappa Delta Ann Doner Vaughan Award on March 8, 2018.

Since Dr. Marc Philippon recruited Dr. Johnny Huard to Vail a few years ago, we've gotten to know Johnny as not just a world-class scientist, but as someone who is fueled by a personal mission to improve people's lives. His work is generating significant advancements in regenerative medicine. All of us at Steadman Philippon Research Institute are gratified to see Dr. Huard and his staff recognized for the groundbreaking research they have accomplished over the years and recently in our laboratories in Vail.

Seventy-two years ago at its golden anniversary, the Kappa Delta Sorority announced the establishment of the Kappa Delta Research Fellowship in Orthopaedics. The Kappa Delta Awards are the first awards created to honor achievements in the field of orthopaedic research, and they are exclusively presented to people who have performed high-impact research that has had a tremendous effect on the field of orthopaedics.

Dr. Huard is not a stranger to these prestigious awards. In 2004, he was awarded the Kappa Delta Young Investigator Award for his discoveries of muscle-derived stem cells (MDSCs). This discovery was revolutionary, and for many, could be considered a top achievement in a career.

But Dr. Huard did not peak as a young investigator.

Instead, Dr. Huard has continued to expand and grow in his focus, studying regenerative medicine with MDSCs,

isolating MDSCs, the biology of MDSCs, promoting angiogenesis for tissue repair, blocking angiogenesis for the repair of non-vascularized tissues, investigating stem cell depletion during aging, parabiotic pairing between normal and diseased mice, pregnancy as a form of parabiotic pairing, and of course, orthobiologics. And those are just some of the highlights of his career in research.

Dr. Huard's Kappa Delta Award is considered a lifetime achievement award for orthopaedic research. In twenty-five years, he's certainly achieved a lot.

Perhaps what is even more special about Dr. Huard's lifetime achievement award is that we all know there's so much more he's going to achieve in his lifetime.

Congratulations to Dr. Johnny Huard on a tremendous accomplishment.

The Steadman Clinic Surgeons and Physicians

Marc J. Philippon, M.D.
Managing Partner
Sports Medicine, Hip Disorders, Hip Arthroscopy

Randy W. Viola, B.A., M.D.
Hand, Wrist, Elbow and Orthopaedic Trauma Specialist

Donald S. Corenman, D.C., M.D.
Spine and Neck Specialist

David C. Karli, M.B.A., M.D.
Spine, Sports and Regenerative Medicine Specialist

Tom R. Hackett, M.D.
Knee, Shoulder and Elbow Surgeon

Peter J. Millett, M.D., M.Sc.
Shoulder, Knee and Elbow Surgery
Sports Medicine

Thomas O. Clanton, M.D.
Foot and Ankle Sports Medicine

Robert F. LaPrade, M.D., Ph.D.
Complex Knee and Sports Medicine Surgeon

Thos A. Evans, M.D.
Interventional Pain Management,
Musculoskeletal Regenerative Medicine

Matthew T. Provencher, M.D.
Shoulder, Knee and Sports Surgery

Raymond H. Kim, M.D.
Adult Joint Construction, Knee and Hip Arthroplasty

David A. Kuppersmith, M.D.
Internal Medicine

Joel M. Matta, M.D.
Hip Disorders: Preservation, Replacement
and Fractures

C. Thomas Haytmanek, Jr. M.D.
Foot, Ankle and Trauma Surgery

2017-2018 New Physicians and Collaborations

In 2017, the teams at SPRI and The Steadman Clinic welcomed four new physicians to the organization: Dr. Raymond H. Kim, an adult joint reconstruction and knee and hip arthroplasty specialist; Dr. David A. Kuppersmith, an internal medicine physician, Dr. Joel M. Matta, a hip disorder specialist focused on preservation, replacement and fracture repair; and Dr. C. Thomas Haytmanek, a foot, ankle and trauma surgeon.

With the arrival of **Dr. Kim** and **Dr. Matta**, The Steadman Clinic expanded its orthopaedic offerings to include arthroplasty—full joint replacement—which will also translate to new research projects within SPRI. Both Dr. Kim and Dr. Matta will mentor adult reconstruction clinical fellows in the 2018-2019 class year.

In his role as The Steadman Clinic's internal medicine physician, **Dr. Kuppersmith** works with a tremendous number of patients and collaborates across all clinical teams. His arrival to the organization has filled a previous absence in the clinic, as patients no longer have to seek an internist from outside of the clinic.

A former SPRI fellow, **Dr. Haytmanek** is the newest arrival to The Steadman Clinic. His arrival doubles the foot and ankle team, both in terms of clinical practice and research. Dr. Haytmanek's research projects include hindfoot fusion nails, total ankle arthroplasty and cartilage repair. He and Dr. Thomas O. Clanton will mentor two foot & ankle clinical fellows in the 2018-2019 class year.

In 2018, SPRI began a collaboration with a renowned professor from Colorado State University. Working on her sabbatical with CRSM since January 2018, **Nicole Ehrhart, VMD, MS, Diplomate ACVS** is a professor in orthopaedic oncology at the Flint Animal Cancer Center and holds the Ross M. Wilkins MD Limb Preservation Foundation University Chair in Musculoskeletal Biology and Oncology. Dr. Ehrhart is also the Director of the Laboratory of Comparative Musculoskeletal Oncology and Traumatology and has been actively involved in limb preservation research, regenerative medicine, tissue engineering and sarcoma research for 18 years. She holds joint faculty positions in the School of Biomedical Engineering, the Cell and Molecular Biology program, the Gates Regenerative Medicine Center at the University of Colorado and The University of Colorado Cancer Center. In addition to her research, she has held several leadership positions in the

Dr. Kim performing arthroplasty in the operating room

American College of Veterinary Surgeons (Scientific Program Chair, Residents Forum Chair, and Examination Committee), Veterinary Society for Surgical Oncology (President), Veterinary Orthopedic Society (President) and Chair of the 2014 World Veterinary Orthopaedic Congress Organizing Committee. She is the first woman to be granted a University-Level Endowed Chair position at Colorado State University. She is actively engaged in translational bone and muscle regeneration research benefiting both human and canine patients. Since joining CRSM, Dr. Ehrhart has played a key role in introducing an academic setup in the department. Dr. Erhart helped submit SPRI's first NIH R21 research proposal in collaboration with Colorado State University. She has successfully secured a philanthropic gift for CRSM and was instrumental in establishing CRSM's journal club. She has been a vital research partner for SPRI.

Joint Replacement: A New Frontier for The Steadman Clinic

Prior to Dr. Raymond Kim and Dr. Joel Matta joining The Steadman Clinic in 2017, The Steadman Clinic did not offer total joint replacement as one of its many orthopaedic procedures. The arrival of these doctors not only benefits the organization, but also directly benefits the clinic's patients—more patients can be helped with their specific needs. Dr. Matta is a hip disorder specialist, focusing his practice on preservation, replacement and fractures, and Dr. Kim is an adult joint reconstruction specialist, focusing his work on knee and hip arthroplasty.

HIP SURGERY RESEARCH AND THE CLINICAL PRACTICE OF JOEL MATTA, M.D.

The Matta team is focused on surgical treatment of adult hip problems, including hip preservation surgery, primary and revision Anterior Approach Total Hip Arthroplasty and treatment of sequelae of traumatic hip problems.

Several projects related to Anterior Approach Total Hip Arthroplasty (THA) and facilitating technology are underway at SPRI, which center upon improving understanding and accuracy of acetabular cup position (anteversion and inclination) in the pelvis. For decades surgeons have been relying on direct visualization during surgery and then make direct measurements off of plain XR. However, both of these methods are imprecise or inaccurate. The team is working on three projects to not only increase awareness of these historical problems, but to also show how effective modern computer navigation methods are.

Raymond H. Kim, MD

Joel M. Matta, MD

To do so, Dr. Matta and his team have reworked some mathematical formulas that calculate the true anatomic position of the acetabular component. These formulas are mathematical proofs that delineate the discrepancies between historical and the novel computer guidance technique. These proofs have enabled the team to create simple graphs that can be used easily to convert data from conventional methods to the correct anatomic data. The researchers have also created a national survey to assess how surgeons evaluate acetabular cup position and how well surgeons can evaluate cup position.

JointPoint™ is one of the computer navigation programs developed to assist in surgery for THA cup placement. The team is studying observer inter-reliability and intra-observer reliability of the software, hoping to show that software is an effective and reproducible technique that surgeons can rely on for acetabular cup placement.

The Matta team is also studying how to assess femoral offset. Recreating the biomechanics of the hip during a THA is fundamental for a patient to have an excellent result, and having the correct femoral offset is a large part of that goal. Traditionally, evaluating the femoral offset consistently without advanced imaging has been difficult. The team is defining landmarks on the greater trochanter of the femur, and these newly described "lines" on an XR of the hip allow surgeons to quickly evaluate offset intraoperatively using fluoroscopy.

This project is defining these landmarks and also studying their relationship to femoral version, which is related to femoral offset on XR evaluation.

The supine position on the radiolucent orthopedic table used with Anterior Approach THA makes use of software enhanced radiography efficient and repeatable. Dr. Matta's hope is to continue to make hip surgery more successful and to provide surgeons with tools that they can use to improve their individual results and precision.

The team is also beginning a clinical review of the consecutive series of Anterior Approach THA performed by Dr. Matta in over 4,000 hips over the past 22 years.

Of his many esteemed publications, Dr. Matta's article "Ten- and Twenty-Year Survivorship of the Hip Following Periacetabular Osteotomy for Acetabular Dysplasia," published in the *Journal of the American Academy of Orthopaedic Surgeons*, is extremely significant.

RAYMOND H. KIM, M.D., AND JOINT REPLACEMENT RESEARCH

Dr. Raymond H. Kim joined The Steadman Clinic to build The Steadman Clinic Joint Replacement Institute and to serve as the Medical Director for the Vail Health Total Joint Service Line. The Steadman Clinic Joint Replacement

Institute specializes in outpatient knee and hip replacements. Since starting the joint replacement program, Dr. Kim has performed over 1,000 joint replacements, half of these being performed as outpatient procedures. Much of the success of the outpatient joint replacement program is based upon Dr. Kim's research including these recent studies:

Risk factors for delayed inpatient functional recovery after total knee arthroplasty. Hoogeboom TJ, van Meeteren NL, Schank K, **Raymond H. Kim**, Miner T, Stevens-Lapsley JE. Biomed Res Int. 2015; 2015: 167643.

Does Tourniquet Use in Total Knee Arthroplasty Affect Recovery of Lower Extremity Strength and Function? A Randomized Trial. Dennis DA, Kittelson AJ, Yang CC, Miner TM, **Raymond H. Kim,** Stevens-Lapsley JE. Clinical Orthopaedics and Related Research 2016 Jan; 474(1): 69-77.

Tourniquet Application During Total Knee Arthroplasty Does Not Benefit Perioperative Blood Loss of Transfusion Requirement with the Routine Use or Tranexamic Acid. Watters TS, Levy DL, **Raymond H. Kim**, Miner TM, Dennis DA, Jennings JM. Reconstructive Review, 2016 Sept; 6(3): 43-47.

Determining False Positive Rates of Leukocyte Esterase Reagent Strip When Used as a Detection Tool for Joint Infection. McNabb DC, Dennis DA, **Raymond H. Kim**, Miner TM, Yang CC, Jennings JM. Journal of Arthroplasty 2017 Jan; 32(1): 220-222.

Tibial Tray Thickness Significantly Increases Medial Tibial Bone Resorption in Cobalt-Chromium Total Knee Arthroplasty Implants. Martin JR, Watts CD, Levy DL, Miner TM, Springer BD, **Raymond H. Kim.** Journal of Arthroplasty 2017 Jan; 32(1): 79-82.

Medial Tibial Stress Shielding: A Limitation of Cobalt Chromium Tibial Baseplates. Martin JR, Watts CD, Levy DL, **Raymond H. Kim**. Journal of Arthroplasty 2017 Feb; 32(2): 558-562.

Incidence of Modern Alumina Ceramic and Alumina Matrix Composite Femoral Head Failures in Nearly 6 Million Hip Implants. Lee GC, **Raymond H. Kim**. Journal of Arthroplasty 2017. Feb; 32(2): 546-551.

Patellar component design influences size selection and coverage. Yang CC, Dennis DA, Davenport PG, **Raymond H. Kim**, Miner TM, Johnson DR, Laz PJ. Knee. 2017 Mar; 24(2): 460-467.

Metal Artifact Reduction Sequence MRI Abnormalities in Asymptomatic Patients with a Ceramic-on-Polyethylene Total Hip Replacement. Jennings JM, Martin JR, **Raymond H. Kim**, Yang CC, Miner TM, Dennis DA. J Bone Joint Surg Am. 2017; Apr 5; 99(7): 593-598.

Use of a computerized arthroplasty registry to generate operative reports decreases transcription errors. Jennings JM, McNabb DC, Meservey AJ, Dennis DA, **Raymond H. Kim**, Miner TM. Int J Med Inform. 2017 May; 101:23-27.

Midterm Clinical and Radiographic Results of Mobile-Bearing Revision Total Knee Arthroplasty. **Raymond H. Kim**, Martin JM, Dennis DA, Yang CC, Jennings JM, Lee GC. J Arthroplasty. 2017 Jun; 32(6): 1930-1934.

Patellar tendon reconstruction using an extended gastrocnemius flap following cryogenic injury to the knee. **Raymond H. Kim**, Randolph AH, Tirre CJ, Morrey M, Jennings JM. Knee. 2017 Jun; 24(3): 686-691.

False-positive Cultures After Native Knee Aspiration: True or False. Jennings JM, Dennis DA, **Raymond H. Kim**, Miner TM, Yang CC, McNabb DC. Clin Orthop Relat Res. 2017 Jul; 475(7): 1840-1843.

Coronal alignment predicts the use of semi-constrained implants in contemporary total knee arthroplasty. Martin JR, Fehring KA, Watts CD, Levy DL, Springer BD, **Raymond H. Kim**. Knee. 2017 Aug; 24(4): 863-868.

Magnitude of Deformity Correction May Influence Recovery of Quadriceps Strength After Total Knee Arthroplasty. Loyd BJ, Jennings JM, Falvey JR, **Raymond H. Kim**, Dennis DA, Stevens-Lapsley JE. J Arthroplasty. 2017 Sep; 32(9): 2730-2737.

Early High-Intensity Versus Low-Intensity Rehabilitation After Total Knee Arthroplasty: A Randomized Controlled Trial. Bade MJ, Struessel T, Dayton M, Foran J, **Raymond H. Kim**, Miner T, Wolfe P, Kohrt WM, Dennis D, Stevens-Lapsley JE. Arthritis Care Res. 2017 Sep; 69(9): 1360-1368.

Influence of Hip Abductor Strength on Functional Outcomes Before and After Total Knee Arthroplasty: Post Hoc Analysis of a Randomized Controlled Trial. Loyd BJ, Jennings JM, Judd DL, **Raymond H. Kim**, Wolfe P, Dennis DA, Stevens-Lapsley JE. Phys Ther. 2017 Sep 1; 97(9): 896-903.

Implant Design and Effects on Patellofemoral Crepitus. McNabb DC, Dennis DA, Jennings JM, Daines B, Laz P, **Raymond H. Kim**. J Knee Surg. 2017 Nov; 30(9): 863-871.

Assessment of Knee Kinematics in Older Adults Using High-Speed Stereo Radiography. Kefala V, Cyr AJ, Harris MD, Hume DR, Davidson BS, **Raymond H. Kim**, Shelburne KB. Med Sci Sports Exerc. 2017 Nov; 49(11): 2260-2267.

Porous-Coated Metaphyseal Sleeves for Severe Femoral and Tibial Bone Loss in Revision TKA. Watters TS, Martin JR, Levy DL, Yang CC, **Raymond H. Kim**, Dennis DA. J Arthroplasty. 2017 Nov; 32(11): 3468-3473.

Direct Anterior Hip Replacement Does Not Pose Undue Radiation Exposure Risk to the Patient or Surgeon. McNabb DC, Jennings JM, Levy DL, Miner TM, Yang CC, **Raymond H. Kim**. J Bone Joint Surg Am. 2017 Dec 6; 99(23): 2020-2025.

Radiographic Changes in Nonoperative Contralateral Knee After Unilateral Total Knee Arthroplasty. Parisi TJ, Levy DL, Dennis DA, Harscher CA, **Raymond H. Kim**, Jennings JM. J Arthroplasty. 2018 Feb 15. [Epub ahead of print]

Center for Regenerative Sports Medicine

Johnny Huard, Ph.D.
Chief Scientific Officer
Director, Center for Regenerative Sports Medicine
Chairman, Research Advisory Committee

Sudheer Ravuri, Ph.D.
Deputy Director

Yong Li, M.D., Ph.D.
Deputy Director

Nicole Ehrhart, VMD, MS, Diplomate ACVS
Sabbatical Faculty

Hajime Utsunomiya M.D. Ph.D.
Regenerative Sports Medicine Scholar

Alex Scibetta
Research Technician I

Lizzie Morris
Research Technician I

Kaitie Whitney
Clinical-Translation Research Coordinator

Sabrina Gonzalez
Research Technician I

Matthew Potter
Research Technician I

Michael Mullen
Research Technician I

Anna Laura Nelson
Research Technician I

Jacob Billings
Research Assistant

Grace Merriman
Intern

Patrick Quinn
Intern

Mika Talwar
Intern

The focus of the Center for Regenerative Sports Medicine (CRSM) is to understand basic stem cell biology and translate that knowledge to the clinic to aid in the healing and regeneration of a variety of tissues. The team concentrates on gene therapy, tissue engineering and regenerative medicine applications based on the use of muscle-derived stem cells (MDSCs) and adipose-derived stem cells (ADSCs).

CRSM's internationally diverse group of investigators focus their attention on a variety of areas of specialization using MDSCs and ADSCs including Duchenne muscular dystrophy, critical sized long bone and cranial defects, acutely injured and osteoarthritic articular cartilage lesions, injured ligaments and meniscal tears, compartment syndrome in injured limbs involving damage to the muscles, nerves, circulatory, and lymphatic system vasculature and infarct injured and cardiomyopathic hearts.

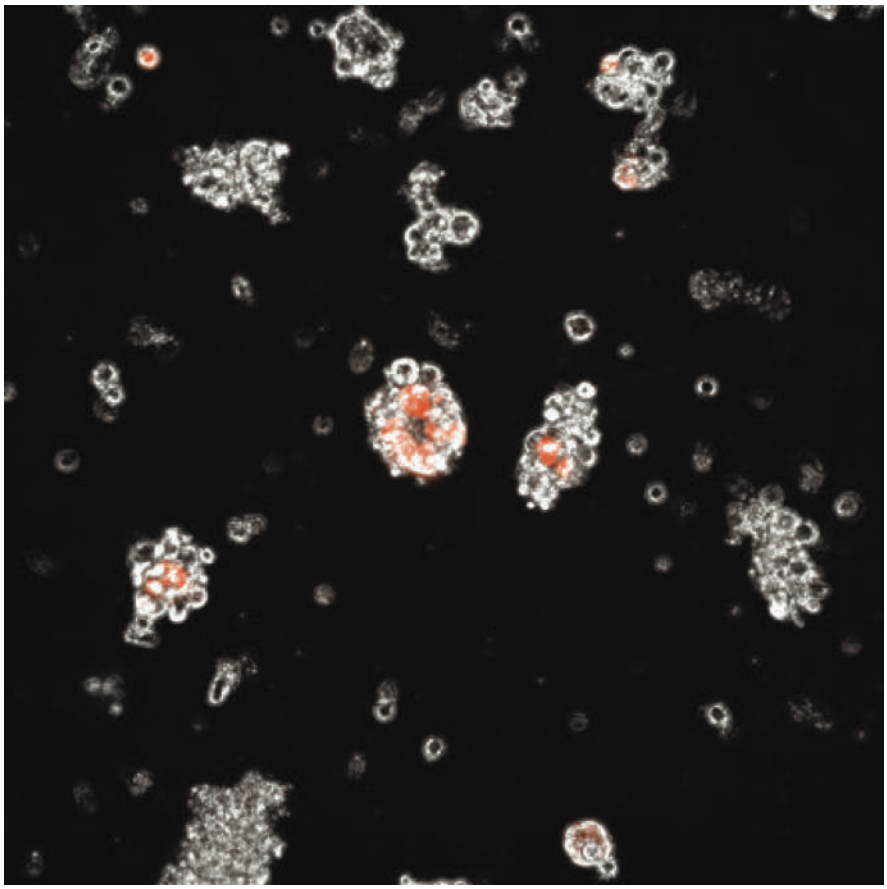
The team continues to investigate a variety of agents to prevent the formation of fibrosis and promote angiogenesis following muscle injuries and disease. In addition, the team's orthobiologics research—including platelet-rich plasma (PRP) and bone marrow concentrate (BMC)—is helping to refine these treatments for clinical applications.

Achievements

Dr. Huard and his research team have published more than 360 peer-reviewed papers and 82 book chapters and have produced 800 abstracts. In 2017 and the first half of 2018, the team produced over 35 research articles, and 75 posters and research presentations.

Dr. Huard has received 85 awards, 12 noted honors and covers, 13 finalists and nominees thus far. In 2017, he received 2287 citations and in the first half of 2018, Dr. Huard received 1178, totaling 33,892 overall in his publishing career. Dr. Huard's h-index is 98 with an i10 index of 319.

In March 2018, Dr. Huard was presented with the prestigious Kappa Delta Ann Doner Vaughan Award for 25 years of high-impact research and discoveries in the field of orthopaedics. This monumental achievement is akin to a lifetime achievement award and builds upon Dr. Huard's notable career as a researcher and scientist.

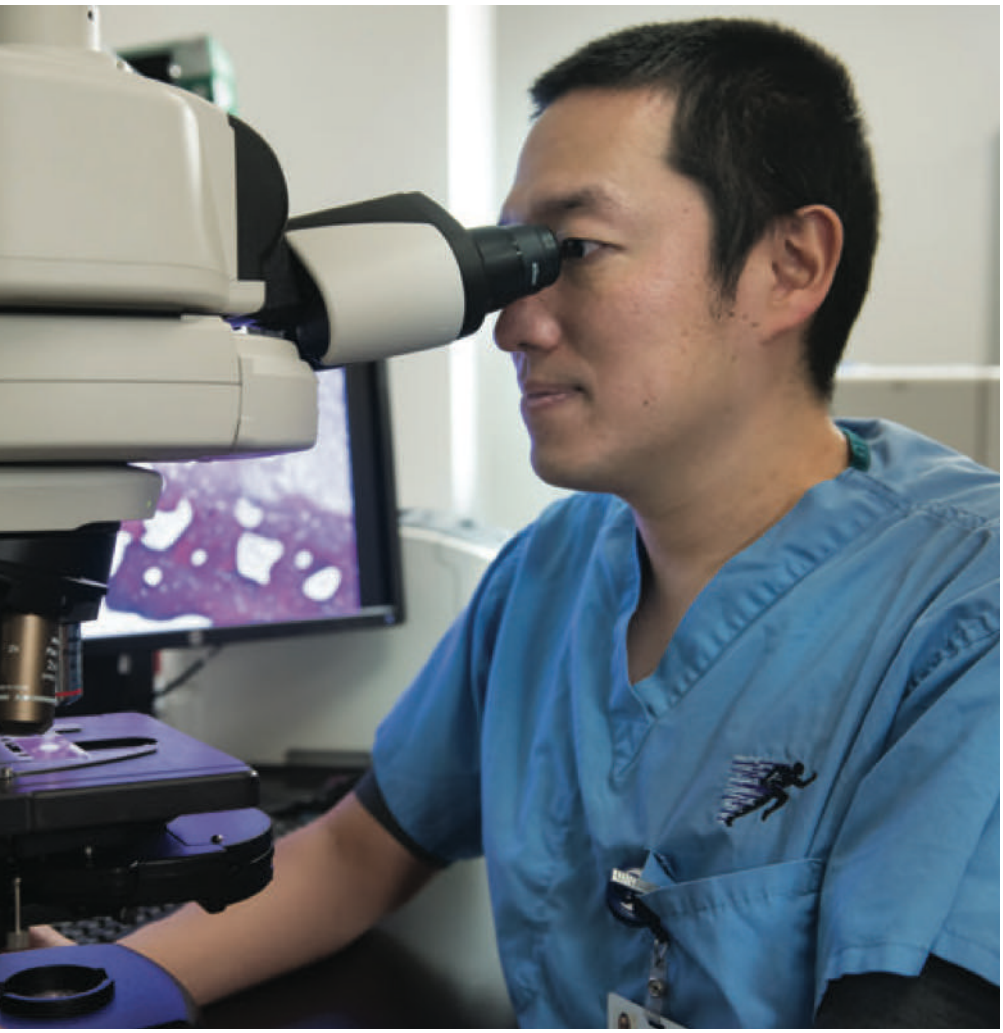


ONGOING PROJECTS

With an enduring focus on translational regenerative medicine, CRSM continues to investigate basic science studies that will have direct impact on orthopaedic care. The team's emphasis on exploring orthobiologics includes ongoing work on optimizing platelet-rich plasma (PRP), the efficacy of bone marrow concentrate (BMC) and delivering biologics and drug therapy via microspheres and much more. The team is involved in multidisciplinary projects that research future clinical translation of muscle-derived stem cells (MDSCs) and adipose-derived stem cells (ADSCs).

CRSM works with the other SPRI departments to build comprehensive research studies, including analyzing clinical outcomes with the Center for Outcomes-Based Orthopaedic Research (COOR) and conducting anatomical and biomechanical studies with the Department of Biomedical Engineering. This multifaceted approach will ultimately help physicians diagnose and treat orthopaedic injuries and diseases.

CRSM



This collaborative microsphere study was presented at the 2018 Orthopaedic Research Society meeting.

Advancing Cartilage Repair

Building on the legacy of Steadman Philippon Research Institute (SPRI) Co-Chair and Founder Dr. J. Richard Steadman's pioneering microfracture surgical technique, CRSM scientists are working with researchers at the University of Wisconsin and the University of California, San Francisco (UCSF) to investigate using biomimetic biomolecule—microsphere—technology to aid cartilage growth for articular surfaces.

As true pioneers in microsphere technology, the University of Wisconsin scientists produce the biomimetic microspheres and send them to SPRI for continued research. Once at CRSM, the team creates a model consisting of MDSCs and human umbilical vein cells. As the cells transform and multiply in a petri dish in the lab, the microspheres bond to them and regulate cellular changes.

Since the research project began, the scientists have found that the microspheres process can eliminate detrimental factors in the blood that impede healing. This important discovery suggests that using microsphere therapy with microfracture surgery will help cartilage heal and repair much faster than with surgery alone.

NEW PERSPECTIVE ENHANCES APPROACH TO CARE

The CRSM team continues to conduct this vital research on microsphere therapy, both looking ahead toward the potential applications in orthopaedic procedures and looking back at the legacy of techniques pioneered by The Steadman Clinic's physicians and validated through SPRI. The team's microsphere studies extend beyond cartilage research and include investigating a variety of agents, including losartan, suramin, relaxin and decorin to prevent the formation of fibrosis and promote tissue regeneration. With the goal of translating these therapies into patients, CRSM endeavors to conduct clinical trials and seek FDA approvals.

Enhancing Cartilage Regeneration

Knowing that the FDA-approved drugs Avastin and Losartan eliminate growth factors in the tissue repair process, Dr. Huard and his team have investigated the application to joints. In using Avastin and Losartan, the team discovered that the drugs blocked the factors that hampered cartilage growth, by blocking angiogenesis and fibrosis. These findings were validated in animal models with chondral defects.

After this promising research, the CRSM team is considering whether infusing Avastin and Losartan with microspheres could produce even better outcomes. For this ongoing research, a concentrate will be injected into the injured knees of several animal models. The technique of using Avastin and Losartan could promote healing because of the sustained drug release, but the team will explore if taking the drug alone or through the microsphere process boosts healing the most.

Optimizing Platelet-Rich Plasma (PRP)

Clinicians and scientists have used PRP for treatment and research for years, but the biologic therapy has not been without its drawbacks. With no storage solution to maintain PRP's biological activity, patients have had to be treated within 24 hours of draw.

The CRSM team has investigated whether freezing PRP effectively stores it for safe future use. The team drew samples from 25 healthy donors and prepared two different types of PRP—Leukocyte-rich PRP with elevated white blood cells for treating damaged soft tissues and Leukocyte-poor PRP with fewer white blood cells for treating joint injury. After drawing, the biological factors in the two PRP preparations were analyzed and the remaining samples were frozen and stored at -80 degrees Celsius. The frozen PRP samples were tested at different times to determine if freezing impacted the factors in the two preparations. The research team found that freezing had influenced biological factors within the two PRP preparations compared to fresh samples. The team will further investigate approaches to minimizing the detrimental impact of freezing on PRP preparations for optimal clinical uses.

While studying in vitro models, CRSM will also study the effect of freezing PRP for longer periods of time to determine its biological potential. Knowing that younger people have more regenerative cells, this research could encourage people to bank and freeze their PRP at a young age and use the healing therapies years later, when needed.

CRSM

Dr. Thos Evans extracting bone marrow from a patient

This study was featured at the International Combined Orthopaedic Research Society meeting in April and a paper was submitted for publication in a peer-reviewed journal in May.

Bone Marrow Concentrate (BMC) Combats Hip Osteoarthritis

With 1 in 4 adults over the age of 50 affected by osteoarthritis, CRSM researchers and physician investigators are exploring innovative musculoskeletal treatments to diminish hip pain and functional limitations caused by the debilitating joint disease. With Steadman Clinic physician Thos A. Evans, MD as primary investigator, CRSM is working on concentrating the regenerative factors of bone marrow to harness its biological potential.

Twenty-four patients suffering from hip osteoarthritis participated in a clinical study, undergoing a single BMC injection. The marrow was extracted from each patient's pelvic bone with a needle and syringe, and was processed via centrifuge to create the aspirate concentrate.

In collaboration with the Center for Outcomes-Based Orthopaedic Research (COOR), pain scores and hip function data following patient procedures occurred at one-month, three-month and six-month intervals. As early as three weeks after their injections, patients reported significant reduction of hip pain, which continued to improve through their six-month follow-ups.

Philanthropy and Grants

Since the beginning of 2017, CRSM has been awarded 12 major philanthropic gifts and 4 new grants, in addition to continued funding of 4 other grants. The new grants include:

National Institutes of Health, "Biomimetic Coacervate Delivery of Muscle Stem Cells to Improve Cardiac Repair"

Musculoskeletal Transplant Foundation (MTF), "Can We Improve Meniscal Healing in the Avascular Zone? Fibrin Clot Augmentation with Stem Cells and Anti-Fibrotic Drugs"

National Institutes of Health, "Muscle Stem Cells Reprogrammed Through Genome Engineering for Autonomously Regulated Anti-Fibrotic Therapy"

National Institutes of Health, "Effects of Circulating Factors and Progenitors on Wound Healing during Pregnancy"

Regenerative Medicine Research and Therapeutic Applications at SPRI

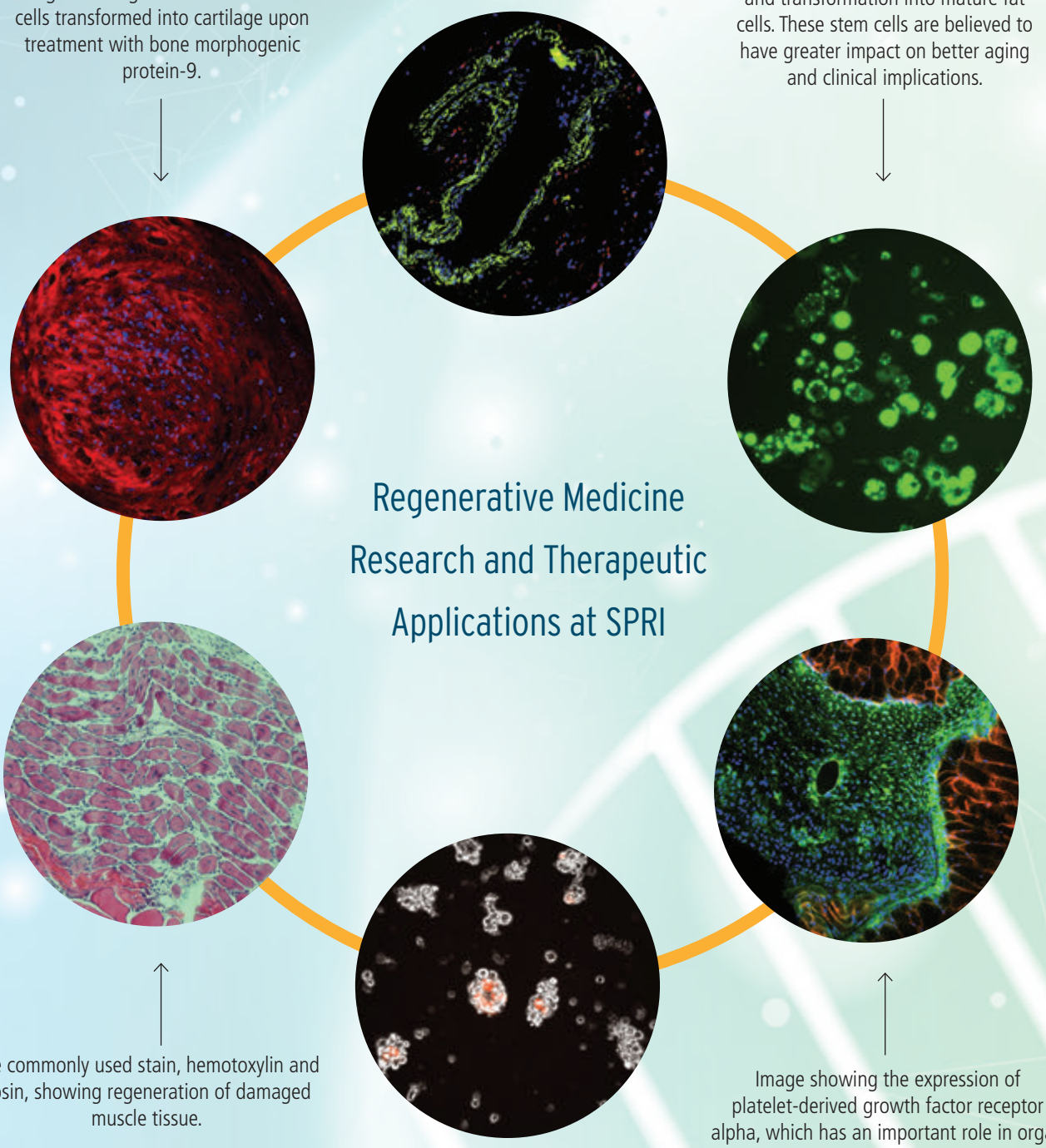


Image showing a large blood vessel in ulnar collateral ligament tissue stained for progenitor marker and smooth muscle.

Adipose/Fat derived stem cells (ADSCs) accumulating fat droplets and transformation into mature fat cells. These stem cells are believed to have greater impact on better aging and clinical implications.

Image showing the expression of platelet-derived growth factor receptor alpha, which has an important role in organ development and wound healing.

Transfection, a method used to transfer genetic material into cells and make the DNA/RNA function inside the cells. Picture showing the gene expression.

The commonly used stain, hemotoxylin and eosin, showing regeneration of damaged muscle tissue.

Image showing muscle-derived stem cells transformed into cartilage upon treatment with bone morphogenic protein-9.

CRSM

Sending Off Exemplary Employees

The research being performed at CRSM would not be possible without the commitment and diligent work of its researchers. Dr. Huard would like to commend his team for their dedication and highlight the work of three employees who left the center in 2018.

YONG LI, M.D., PH.D.

Dr. Li served as Deputy Director of CRSM for nine months, during which time he was a valuable asset to the team. While at SPRI, Dr. Li played a vital role in submitting SPRI's first NIH R21 research proposal in collaboration with Colorado State University. Dr. Li conducted the DOD-funded Compartment Syndrome project at CRSM for which he submitted a manuscript for publication.

Dr. Li completed both his medical training and doctorate in China. He worked as a professor for several years, both in China and at the University of Pittsburgh and University of Texas Medical School. He has more than 100 peer-reviewed publications and has a history of funding through federal grants.

Dr. Li brought extensive expertise in TGF-beta-related tissue injury and fibrosis and research focus in studying skeletal muscles in terms of molecular, cellular and pathological processes. He reported a new concept of injury-induced muscle-derived stem/progenitor cells that he successfully isolated and characterized.

In his nine months at SPRI, Dr. Li made a tremendous impact on the CRSM team and the research being conducted. He moved to Houston at the end of June 2018 to join his family and pursue future endeavors.

SABRINA GONZALEZ

A dedicated research technician, Sabrina focused her work on studying the effects of PRP and BMC to promote the healing of a variety of tissues including muscles, bone and articular cartilage. Knowing that in order to use PRP for regenerative applications, understanding the biological composition over time led Sabrina to investigate the effects of freezing PRP.

Sabrina also worked with characterizing and studying biomarkers in synovial fluid of patients with ACL tears and worked with a veterinarian at Colorado State University to identify and measure systemic markers and biological ailments that are influenced by volumetric muscle loss repair. These changes could be utilized as a non-invasive tool to monitor muscle healing.

After making an impact in the orthopaedic and regenerative medicine world, Sabrina has accepted a graduate assistant position for the Minnesota State University volleyball team where she will pursue a master's degree in exercise physiology while coaching NCAA volleyball.

MATTHEW POTTER

As a research technician, Matthew Potter investigated adipose-derived stem cells and their regenerative medicine applications, specifically in relation to aging. During his time at SPRI, Matthew refined his molecular biology laboratory techniques and helped to shape the direction of CRSM research projects with the support and guidance of the studies' principle investigators.

After his dedicated research to regenerative medicine at SPRI, Matthew has begun medical school at the Medical College of Georgia where he plans to incorporate a career in research alongside his clinical pursuits.

Matthew is the second investigator that departed CRSM to join a medical school, following Andi Liebowitz, one of the first research technicians to join CRSM in 2015. She is now attending medical school at Columbia University. The CRSM team is very proud to educate and produce the next generation of scientists and medical doctors.

ProofPoint Biologics

A unique bridge between clinical and research practices, ProofPoint Biologics was founded in 2017. With a focus on an evidence-based biologics approach, ProofPoint's work with CRSM includes collecting a research sample from each clinic patient receiving PRP and BMC treatment. The de-identified samples are beneficial to research efforts for several reasons. First, the collected samples allow scientists to develop a biobank to improve the understanding of PRP and BMC's biological composition and potential. In investigating these patient samples, scientists can also validate and optimize PRP and BMC, which ultimately helps to refine these biologic treatments for their best clinical applications.

An experienced CRSM researcher, Kaitie Whitney joined ProofPoint Biologics as a Research and Development Senior Researcher. In this role, Kaitie leads several research projects focused on studying the biological and clinical effects of autologous biologics including PRP and BMC. As these therapies show enormous promise for various musculoskeletal conditions, further research is warranted to fully harness their biological potential. Under CRSM, ProofPoint Biologics is on the forefront of research by conducting translational, evidence-based clinical research to develop, optimize and validate clinical applications of PRP and BMC therapies. Kaitie's research is made possible through the distinctive partnership between ProofPoint Biologics, The Steadman Clinic and SPRI's Center for Regenerative Sports Medicine. As Chief Scientific Officer of SPRI, Dr. Huard oversees ProofPoint Biologics and works closely with Kaitie Whitney and Kelly Adair (SPRI COO) to optimize the evidence-based biologics approach of ProofPoint Biologics.

Conferences

The third Annual Vail Scientific Summit took place in August 2017 in Vail, Colo. The continued focus of the summit is to not only share science, but to also spark collaborations with other scientists and clinicians from all over the world. More than 60 speakers joined the third iteration of the Vail Scientific Summit, making it a landmark event for SPRI.

Education and Public Outreach

CRSM's technical staff continued their engagement with the Education and Public Outreach (EPOC) programs by participating in laboratory tours and working on intensive research projects with local Eagle County high school students. As mentors, the staff taught the students how to design and execute their own research experiments.

Collaborative Efforts

CRSM has continued its musculoskeletal collaborations with the Mike Shannon Network—working with Northwestern University and the Mayo Clinic—and the Steven Read Network, through which the team is working with the University of California, San Francisco on next generation microfracture research. This year, the CRSM team also launched an industrial collaboration with Celltex on the biological and regenerative medicine application of adipose-derived stem cells.

Additional philanthropic funding from generous benefactors has allowed CRSM to study innovative therapies for cartilage repair, better aging through adipose-derived stem cells, gene editing and Duchenne muscular dystrophy, rotator cuff repair, characterizing stem cell populations, anti-aging drugs and stem-cell-based therapies for ACL repair.

Dr. Huard and his team continued their collaboration with UTHealth Orthopaedics, working on a variety of studies focused on improving the care of musculoskeletal conditions and boosting the body's natural healing powers.

Projections

Thanks to a philanthropic gift, CRSM will be receiving a new flow cytometry machine that will greatly enhance its basic science characterization studies. Bringing this machine in house will reduce time and expenses associated with outsourcing experiments.

Under Dr. Huard's leadership, CRSM submitted over 26 new grant proposals in 2017 and is focused on submitting more in 2018 and 2019, at the federal, foundation, private and public level.

In August, Dr. Huard and CRSM will host the fourth Annual Vail Scientific Summit under the title "Regenerative & Translational Medicine: A Focus on Human Clinical Applications." As in past years, the team anticipates abundant sharing of ideas and collaborations to arise from the conference.

Department of Biomedical Engineering

Scott Tashman, Ph.D.
Director

Travis Turnbull, Ph.D.
Deputy Director

Alex Brady, M.S.
Senior Robotics Engineer

Kimi Dahl, M.S.
Research Scientist

Hunter Storaci, M.S.
Research Engineer

Sarah Wilson
Research Engineer

Zach Aman
Research Assistant

Bryson Kemler, M.S.
Research Assistant

Joe Krob
Research Assistant

Hannah Finch
Research Assistant

Kristin Dunford
Research Assistant

Alex Kuczmarski
Research Assistant

Sam Rosenberg
Research Assistant

Claire Coprivizia
Summer Research Assistant

The Department of Biomedical Engineering (BME) is a multidisciplinary laboratory that applies quantitative, analytical and integrative methods to the field of orthopaedic medicine. With a focus on injury prevention and restoration techniques, BME is dedicated to integrating clinical care, research and education alongside the resources of renowned medical doctors to improve the treatment of musculoskeletal diseases and orthopaedic injuries. The team focuses on biomechanics, musculoskeletal mechanics, biomedical imaging and orthopaedic engineering.

With the launch of the new, state-of-the-art Biomotion Lab, the team is able to investigate human movement mechanics using 3D analysis of movement. The studies being performed in the lab focus on proactively preventing injury by evaluating movement efficiency, assessing dynamic joint function, evaluating surgical and physical therapy outcomes, managing rehabilitation progression, measuring the effectiveness of equipment, studying pathologies and their influence on sports performance and enhancing performance techniques for athletes.

The new Biomotion Lab is complemented by the innovative robotics laboratory that uses mechanical equipment to investigate and answer research questions through a testing medium that reproduces the natural movement of joints. The robotic arm is equipped with a universal force torque sensor that allows BME researchers to test cadaveric human joints, gaining insights into their kinematics. Evaluating joints in this way increases accuracy, repeatability and autonomy. The Robotics Lab also allows researchers to perform cutting studies to identify the effects of tendons and ligaments on joint movement. Additionally, the robot allows for enhanced reconstruction studies to evaluate surgical procedures.

In focusing on movement, BME prioritizes preventing injuries alongside discovering the best course for treatment. This exemplifies SPRI's focus on bench-to-bedside research, as the scientists are committed to helping patients improve their quality of life and return to physical activity.

Metrics of Success

The Department of Biomedical Engineering evaluates its success on four distinct performance objectives:

- Receiving awards that validate the team's research excellence, impact and overall contribution to orthopaedics and sports medicine
- Presenting studies at renowned conferences—both nationally and internationally—in front of diverse audiences around the world
- Submitting and receiving acceptance for publication in high-impact, peer-reviewed journals

Dr. Scott Tashman, Director, and Kimi Dahl, Research Scientist, work in the Biomotion Lab

- Involvement in the community via outreach programs to educate students and community members in the fields of orthopaedic sports medicine and science through hands-on learning and mentorship

Achievements

With its direct impact on injury prevention techniques and treatment for all individuals, BME's research is incredibly valuable for scientists, surgeons and physicians all over the world. In being a major contributor to the orthopaedic sports medicine community, BME prioritizes presenting at conferences, publishing in top-tier journals and engaging the community in its research efforts.

In 2017, the BME department was honored with three major awards, the most ever in the history of the department. For the past six years, BME has earned at least one major national or international award, which is a remarkable achievement.

25 Publications in 2017

13% increase
in publications since 2016

10 publications
in *The American Journal of Sports Medicine*, the top journal in orthopaedics based on 1- and 5-year Impact Factors

AWARD HIGHLIGHT: ACHILLES ORTHOPAEDIC SPORTS MEDICINE AWARD

The Achilles Orthopaedic Sports Medicine Research Award recognizes the researchers who have performed the most outstanding clinical or laboratory research in the field of sports medicine, including the care and prevention of injuries.

TARGETING FAI WITH BIOMOTION RESEARCH

With many young athletes plagued by severe hip injuries due to femoroacetabular impingement (FAI), BME scientists are utilizing its state-of-the-art Biomotion Lab to identify the factors that cause the symptoms of FAI and then develop the strategies not only to avoid the defect, but to also treat patients with FAI symptoms. Previous FAI studies focused primarily on studying bone shape, but the BME team hypothesizes that the combination of bone shape and motion lead to FAI symptoms.

The clinical study includes 120 adult recreational athletes participating in high-risk FAI sports like skiing. Many of the individuals in the study will already have the hip defect associated with FAI and/or hip pain. Through analyzing the athletes' anatomy with the advanced 3D imaging of the Biomotion Lab, BME researchers are assessing joint function and creating

Based on SPRI's findings, a screening tool will be developed to identify individuals who are prone to FAI-related hip injuries. The tool will not only be designed with injury prevention in mind, but it will also be a treatment tool for clinicians.

BME

Wearable sensors can be worn in the field, allowing BME to analyze human movement with real-life implications

animated 3D computer models of how each subject's hip joint moves during different activities. This data will help the BME team pinpoint the precise combinations of motion and anatomy that cause impingement and can lead to joint damage.

In collaboration with the Center for Outcomes-Based Orthopaedic Research (COOR), BME is tracking the participants in this study for three years by collecting data on the subjects' hip pain and function loss. The Imaging Research team is also involved in the study, reviewing MRI scans for changes in hip labrum and cartilage. These follow-ups will help identify the specific factors causing injury. Determining the intersection of anatomy and movement will help people alter their activities to prevent hip damage.

INVESTIGATING HIP MICROINSTABILITY

Hip microinstability is small abnormal movements within the hip that can cause damage to structures inside the hip. This damage can result in pain and lead to arthritis. As there is currently no evidence-based measure for accurate diagnosis, early detection of hip microinstability is difficult—it often goes undiagnosed until symptoms overwhelm the patient. Without a defined treatment of the disorder, hip microinstability is an extremely challenging defect for afflicted patients and physicians trying to treat.

Using the leading-edge Robotics Lab, BME researchers launched a first-of-its-kind microinstability study with a cadaver study of 16 healthy hip specimens. Researchers measured rotation and range of motion of the femur and pelvis of the specimens. The scientists then injured the soft tissue surrounding the joint in half of the hips and tore the labrum in the other hips. The robot tests were repeated on the injured hips. From here, data will be analyzed to determine if hip microinstability is caused by tissue damage around the hip joint.

The Imaging Research team is using MRI technology to create 3D models of the hip before and after injury. After all of the robotics testing is complete, scientists will use the specimens to validate the 3D models.

As the study continues, BME will work to establish the objective criteria for diagnosing microinstability as well as identifying risk actors. This will be developed into treatment and prevention protocols, which is vital for clinicians as hip microinstability often begins in young athletes.

The first-ever Summer Scholars, photographed with Dr. Steadman, Dr. Philippon, and EPOC mentors

Education and Public Outreach

BME researchers have a continuing presence within SPRI's Education and Public Outreach (EPOC) programs.

- For Eagle County fifth graders, BME leads interactive tours through its laboratories, including Biomotion and Robotics
- Researchers visit local middle schools and participate as judges in science fairs
- BME provides one-on-one mentorship to students chosen for the selective high school Science Club
- BME led the first-ever Summer Scholars program in June 2018, creating an intensive week-long STEM course for 20 top science students in Eagle County

Projections

With its new laboratory spaces, BME will be able to continue researching biomechanics, musculoskeletal mechanics, biomedical imaging and orthopaedic engineering in innovative new ways. The team will continue its vital studies involving hips, shoulders, knees and ankles. With a persistent focus on preventing injuries and developing best-in-class treatments, BME remains committed to a bench-to-bedside project focus.

BME collaborates across SPRI and The Steadman Clinic to create a comprehensive focus to its research studies. With its physician investigators and with the help of teams like Imaging Research and the Center for Outcomes-Based Orthopaedic Research (COOR), BME will identify the causes of musculoskeletal and orthopaedic conditions and strategize on the best ways to treat them.

As community outreach and education are central to BME's performance objectives, the team will remain committed to educating students and local community members about the advanced science being performed at SPRI.

Center for Outcomes-Based Orthopaedic Research

Grant J. Dornan
Director and Biostatistician

Karen K. Briggs, M.B.A., M.P.H.
Director of Hip Research

Marilee Horan, M.P.H.
Upper Extremity Coordinator

Lauren Matheny
Foot and Ankle Research Coordinator

Ashley Perrigaud
Data Collection Coordinator

Erik Fritz, M.D.
Research Assistant

Mitchell Kennedy
Research Assistant

Colin Murphy
Research Assistant

Nicole Anderson
Research Assistant

Evan Beiter
Research Assistant

New Staff 2018-2019

Sara Robinson, M.S.
Spine and Pain Management
Research Coordinator

Liam Peebles
Research Assistant

James Spratt
Research Assistant

Brandon Goldenberg
Research Assistant

For 26 years, the Center for Outcomes-Based Orthopaedic Research (COOR) has been tracking and studying patient outcomes. The dedicated research staff at COOR is now following nearly 38,000 surgeries. In addition, over 145,500 patient-centered outcomes surveys have been collected and are being tracked.

COOR Director Grant Dornan presenting at SPRI's Injury Prevention Symposium

Achievements

COOR enjoyed its most productive publishing year in 2017, which included 59 PubMed-indexed studies, featuring 26 on patient outcomes from The Steadman Clinic. Nineteen of COOR's publications were featured in COOR's top target journals, including *The American Journal of Sports Medicine,* which is the highest impact journal for orthopaedic sports medicine.

In 2018, COOR was awarded the prestigious AOSSM *The American Journal of Sports Medicine (AJSM)* Systemic Review Award, which is given to the best systemic review paper submitted to *AJSM* during a calendar year. Published in 2017, this paper was entitled "High Rates of Osteoarthritis Develop After Anterior Cruciate Ligament Surgery: An Analysis of 4108 Patients."

Published 10-year outcomes of Dr. Philippon's femoroacetabular impingement (FAI) was a landmark event for COOR. The overwhelmingly positive outcomes prompted an editorial from *The Journal of Bone and Joint Surgery*, which modified the editor's initial skepticism. This validated Dr. Philippon's groundbreaking work in hip arthroscopy and highlighted the importance of tracking patient outcomes.

A CLOSER LOOK AT ARTHROSCOPY OUTCOMES

SPRI Co-Chair and Managing Partner of The Steadman Clinic Dr. Marc J. Philippon is a true pioneer when it comes to hip arthroscopy. Maintaining the principle that in the correctly selected patient, joint preservation is the best solution rather than total replacement, Dr. Philippon and his team launched a 10-year study following 145 patients who underwent arthroscopic surgery to treat femoroacetabular impingement (FAI)—the defect in the hip joint caused by extra bone on the pelvis and thigh bone around the hip joint. FAI can cause the bones to rub, which triggers pain and injury. It can ultimately lead to the development of cartilage and labral injuries.

In the study, half of the patients had hip labral repair while the others had labral debridement. Both arthroscopic procedures are designed to lessen hip pain, improve function and reduce the patient's need for a total hip replacement. Prior to launching this study, data on long-term outcomes after hip arthroscopy was limited, making this research vital for the orthopaedic community.

For 10 years following the patients' arthroscopy, COOR followed the progress of the study's participants, collecting data regarding their symptoms, pain levels and range of motion. The findings indicated that both surgeries produced significant improvements in patient outcomes and satisfaction. Nearly all patients reported improved hip function and reduced pain. The study confirmed previous arthroscopy research that indicated some patients will still need full replacement—often those with advanced arthritis or patients of advanced age.

COOR

Dr. Peter Millett's shoulder modeling study will benefit other clinicians

The overwhelming conclusion of the study is that, in the properly selected patients with FAI, patients return to excellent function and are happy with the results, reporting a 10 out of 10 on patient satisfaction with their outcomes. In filling the gap in the previously limited hip arthroscopy outcomes research, this study will benefit patients all over the world.

A MILESTONE PUBLICATION

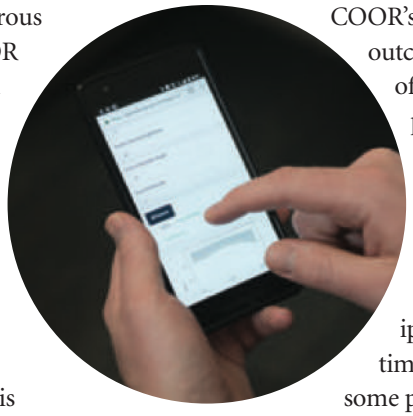
In 2017, Dr. Philippon participated on a study team that published a randomized control trial comparing hip arthroscopy to physical therapy. The study was published in June 2018 in *The Lancet*, the world's leading independent medical journal. *The Lancet* consistently ranks in the top three for high-impact medical journals, with an impact factor of 53.254. For this publication, Dr. Philippon served on the panel of an international clinical study, UK FASHIon Study Group. This study provided top-level evidence of the success of hip arthroscopy. In addition, COOR's Director of Hip Research, Karen Briggs, was honored when she was asked to provide independent commentary about the findings in the form of an editorial, also published in *The Lancet.*

PREDICTING LONG-TERM RECOVERY

After tracking patient outcomes following rotator cuff surgery, COOR has been able to create a model to predict probable outcomes in future patients undergoing surgery. The team used this model to design a predictive modeling app that will benefit physicians and patients. With Dr. Peter Millett as principal investigator of the shoulder modeling study, the team analyzed data from over 500 of Dr. Millett's patients who had rotator cuff repair between 2005 and 2014. The diverse group of patients had varied types of joint damage.

COOR gathered pre- and post-op data on 12 distinct variables including age, injury details and imaging results. For at least two years following treatment, participants were followed to keep track of their outcomes. The vast majority achieved superb outcomes and only a few required future surgical intervention.

Building off of the rigorous science compiled, COOR Director Grant Dornan and his team built the modeling app from the study. Now, clinicians enter key patient data into the app to get a preview of the patient's likely recovery based on the study's participants. This information will improve patient treatment selection and educate them with concrete, tangible data.



Clinicians all over the world can access the app, and over the next year, they will test the app in clinical settings and provide feedback for validating the models and fine-tuning the app as the patient database increases. The app is exemplary of SPRI's focus on creating a global impact with its research and innovations.

DECADES OF EVIDENCE ON ACL RECONSTRUCTION

Research from COOR has helped validate the work and legacy of Dr. J. Richard Steadman, SPRI Co-Chair and Founder of The Steadman Clinic. In the 1990s, the standard clinical opinion was that patients over age 40 were too old for ACL reconstruction. They were informed to modify their activity levels instead. Breaking the mold, Dr. Steadman believed that a person's age should not impact their consideration for ACL repair.

COOR's study on ACL outcomes isolated 77 of Dr. Steadman's patients age 40 and older who'd had ACL reconstruction between 1984 and 1993. The mean age of the study participants was 44 at the time of surgery, with some patients as old as 65. All patients in the study had high activity levels prior to surgery.

Of the 77 individuals in the study, more than 98 percent reported excellent results 10 years after surgery, and after 20 years, 84 percent said their ACLs were still doing well. The patients reported high function and activity levels after surgery and reported good function in their knees. Impressively, the median score on a 10-point patient satisfaction score, with 10 being the most satisfied, was 10. Despite the prevailing notion of physicians in the 1990s, only 19 of 77 patients needed an eventual total knee replacement.

These outcomes prove that people who have ACL reconstruction after age 40 can expect to return to their pre-injury activity levels and maintain good function in their knees for 20 years.

Twenty years of data on one procedure by one surgeon is rare in the outcomes research community, and COOR utilized the opportunity to create a validating outcomes study. The result of the team's findings is a unique snapshot into what a patient can expect 20 years after ACL reconstruction.

Dr. J. Richard Steadman in the operating room

Projections

COOR continues to track patient outcomes each day, enhancing the robust 26-year database. Completing vital outcomes studies not only endorses procedures being performed in The Steadman Clinic, but also helps validate evidence-based procedures for patients all over the world.

With great results from COOR's rotator cuff predictive modeling app, the team will look to use similar models in new categories, including shoulder instability. Predictive modeling is an increasingly valuable tool for physicians, in terms of diagnosis and treatment selection, and for patients, in regard to their education and care.

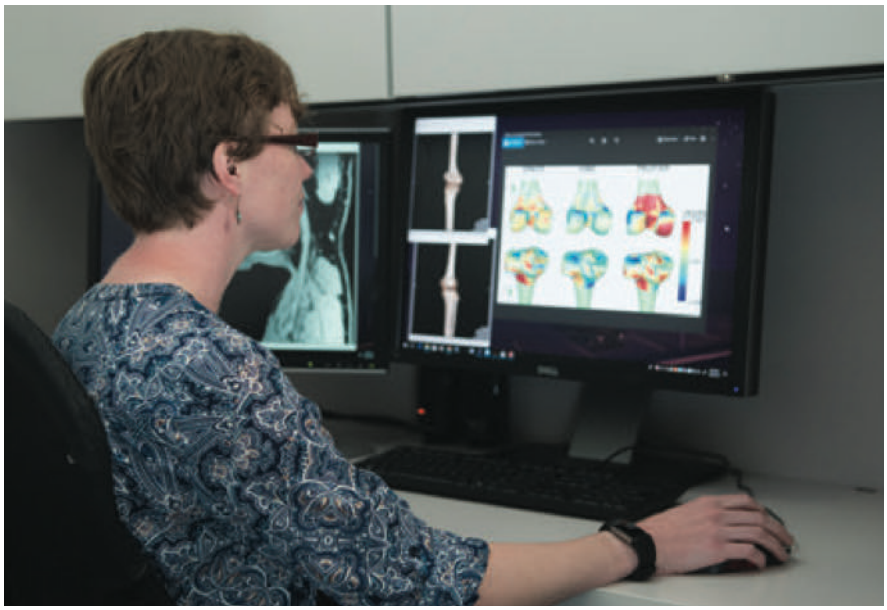
Department of Imaging Research

Charles Ho, M.D., Ph.D.
Director

Carly Lockard, M.S.
Senior Research Engineer

Karissa Gawronski
Research Assistant

The Department of Imaging Research at SPRI develops and evaluates noninvasive imaging techniques with an emphasis on joint health. Imaging Research complements and enhances the clinical relevance of research conducted by the other SPRI departments, including the Center for Regenerative Sports Medicine (CRSM), Biomedical Engineering (BME), and the Center for Outcomes-Based Orthopaedic Research (COOR).



With a state-of-the-art Skyra 3.0 T magentic resonance imaging (MRI) scanner, the Imaging Research team performs leading-edge research while applying imaging tools to improve patient outcomes. The improved and accurate 3T imaging allows the team to help provide precise diagnoses for injuries that affect the meniscus, labrum, cartilage, ligaments and tendons.

Imaging Research can assist physicians with diagnoses and plans for treatment. 3T imaging can also be used to monitor treatment and evaluate a patient's recovery. One of the primary goals of the Imaging Research team is to develop a comprehensive understanding of a patient's issues and how they can effectively be treated.

The Skyra 3T MRI provides higher resolution images at a greater speed than lower field scanners. The higher resolution allows for a more accurate evaluation of injuries and the faster speed allows for quicker patient examinations, reducing the chance for compromised images due to movement.

Imaging Research is a multifaceted department that enhances both the research being performed at SPRI and the diagnoses of patients at The Steadman Clinic.

IR

IR

RESEARCH INITIATIVES

With continued research on quantitative magnetic imaging research, the Imaging Research team continues to investigate the properties of tissues. By obtaining images of tissue before macroscopic tears occur, Imaging Research is able to assess whether there has been prior degradation or tissue injury. Recognizing the injury process at an earlier stage can make conditions more treatable, either by slowing the process or reversing it. Because long-term treatment can be difficult after a macroscopic tear has occurred, proactive imaging could provide an answer for physicians and patients.

EVALUATING ANKLE INJURIES

Traditionally, the severity of ankle injuries has been difficult to diagnose. The Imaging Research Team created an evidence-based measure for determining the damage of an injured ankle.

Knowing the key to developing an injury diagnosis tool was to understand the composition of a healthy ankle, the team investigated uninjured ankles, focusing on the peroneal tendon on the outside of the ankle. This tendon is a common source of ankle pain and disability.

The study involved 24 people with healthy ankles, ages 23 to 64. The team took MRI scans of each person's ankle in different positions and measured MRI-mapping values in each peroneal tendon. The values provided a clearer picture of what an uninjured tendon looked like, creating a baseline for comparing injured tendons. The research team anticipates studies that will show that the greater the difference between the injured tendon and baseline, the greater the damage.

This baseline study shows that quantitative MRIs provide a more accurate evaluation of injuries than conventional MRIs. The study also makes it easier for physicians to detect damage in an ankle earlier and can treat milder symptoms more effectively.

The team will continue to evaluate the baseline and begin mapping other ankle tendons. This quantitative mapping will provide an objective tool that could lead to new standard treatments for injured ankles.

MRI AS A CT-SCAN SUBSTITUTE

Computed tomography (CT) scans have been industry standard for diagnosing injured bones in a joint, because they provide clear, sharp images of bones. CT scans are less effective in showing soft tissues, which is where MRI scans are more commonly used. When patients have a joint injury, it's typical that they need both a CT and MRI scan to diagnose their injuries. The Imaging Research team at SPRI is investigating whether MRI scans can be used to assess both soft and hard tissues.

The team took CT and MRI scans of an uninjured cadaver knee and manually created 3D bone models on the computer. In collaboration with the University of Queensland and Commonwealth Scientific and Industrial Research Organisation in Australia, which created automatic computer models, the team evaluated both types of models. Although the models were produced with different methods, they were similar.

The team compared the MRI and CT bone models and saw that the models were very similar. An MRI can provide much more accurate models for diagnosis and treatment planning for joint injuries than was previously thought. This finding suggests that patients could forego CT scans, even with bone injuries.

This research is an example of the first real quantitative and qualitative data about MRI-based bone modeling.

Imaging Research presented results of this study in additional joints (hip, shoulder, ankle) at the 2018 Orthopaedic Research Society conference in New Orleans, LA in March.

Congratulations, Dr. Charles P. Ho

Charles P. Ho, M.D., Ph.D. has served as Director of the Imaging Research team at SPRI for many years. With extensive experience in musculoskeletal and sports medicine imaging and research, specifically in musculoskeletal MRI, Dr. Ho has provided tremendous leadership and expertise to both SPRI and The Steadman Clinic. His research at SPRI has led to better injury diagnosis and treatment plans, and has helped support the interdisciplinary research efforts of the Institute.

Dr. Ho has accepted a visiting professor position in Radiology-Diagnostics at the University of Colorado School of Medicine. Dr. Ho will be using his expertise as both an M.D. and Ph.D. in his role as professor while continuing to support SPRI as Director of Imaging Research.

2017-2018 Was Award Winning for SPRI

The groundbreaking research being conducted at SPRI is advancing orthopaedic care around the globe. The past eighteen months have produced many awards and honors for the Institute, including those highlighted here.

Center for Regenerative Sports Medicine (CRSM)

CRSM has been honored with numerous awards, including the prestigious Kappa Delta Award presented to CRSM Director Johnny Huard, Ph.D., in March 2018. The award celebrated his 25 years of high-impact research in orthopaedics.

Sports Medicine Fellow Sandeep Mannava, M.D. was honored as the winner of the 2018 AOSSM Fellow Research Award in Basic Science for his study, "Influence of Naproxen, Age and Body Mass Index on the Biological Composition of Leukocyte Rich Platelet-Rich Plasma: A Prospective, Therapeutic, Cohort Study."

The CRSM team has also featured:

- 2,105 new citations and 11 articles or book chapters published
- 37 abstracts accepted for Orthopaedic Research Society (ORS) meeting
- New Investigator Award Finalist for three studies, ORS
- 2017 Joe and Bettie Ward Award for Excellence in the Biology of Aging Studies
- 2017 Best PCR Award, Best Talk and Best Poster Award, Southwest Regional Symposium, ORS

Biomedical Engineering (BME)

The BME team has enjoyed award success in 2017 and 2018 including several major awards. The team earned three major awards in 2017, the most ever in a single year for BME. The team has now celebrated six consecutive years in which the team has been honored with one major national or international research award. Major awards include:

- 2017 International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS) Achilles Sports Medicine Research Award for outstanding clinical or laboratory research in the field of sports medicine
- 2017 American Orthopaedic Society for Sports Medicine (AOSSM) Cabaud Memorial Award for the best paper submitted concerning hard or soft tissue biology, in-vitro research, laboratory or "bench-type" research, or in-vivo animal research
- 2017 Best Scientific Exhibit, American Academy of Orthopaedic Surgeons (AAOS) for one of the best scientific exhibits at the AAOS annual meeting
- 2018 AOSSM William A. Grana Award for Best Original Research for the most outstanding original research paper that appeared in the *Orthopaedic Journal of Sports Medicine*
- 2018 AOSSM Cabaud Memorial Award for the second consecutive year

Center for Outcomes-Based Orthopaedic Research

COOR received several major honors in 2017 and 2018, validating the importance of outcomes-based research in the orthopaedic community.

Key highlights include:

- Top-cited paper Q1 2017, *Journal of Shoulder and Elbow Surgery*:
  Millett PJ, Warth RJ, Dornan GJ, Lee JT, Spiegl UJ. Clinical and structural outcomes after arthroscopic single-row versus double-row rotator cuff repair: a systematic review and meta-analysis of level I randomized clinical trials. J Shoulder Elbow Surg. Apr 2014;23(4):586-597.
- 2017 AOSSM Annual Meeting Poster Awards – Third Prize
- 2017 International Society of Hip Arthroscopy (ISHA) Basic Science Trainee Award Finalist
- 2017 ISHA Richard Vallar Award for Excellence in Clinical Research Finalist
- 2018 AOSSM *American Journal of Sports Medicine* Systemic Review Award for the best systemic review paper submitted to AJSM during a calendar year

Physicians Honored




SPRI's focus on bench-to-bedside research is exemplified with its physician investigators from The Steadman Clinic. From the faculty mentors of SPRI's elite clinical fellowship program to those conducting research, these physicians are helping to support SPRI's mission.

Dr. Peter J. Millett was presented with an Achievement Award from the American Academy of Orthopaedic Surgeons (AAOS) in 2017, which celebrates his contributions to education, research and advocacy in orthopaedics.

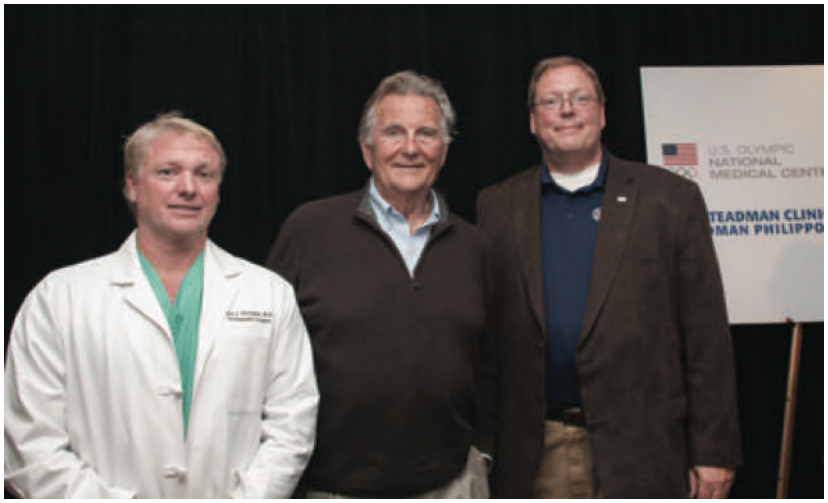
At the AAOSM annual meeting, **Dr. Robert F. LaPrade** was honored with the prestigious Cabaud Memorial Award on July 19, 2017. This award recognized his leadership in the field of orthopaedic research and his work into studying the effects of PRP on MCL healing.

In December 2017, **Dr. Matthew Provencher** was recognized with the renowned Col. Brian Allgood Memorial Leadership Award, given to the person who best exemplifies Col. Allgood's attributes of selfless leadership, commitment to excellence in military orthopaedics and loyalty to the ideals of duty, honor and country.

In May 2018, **Dr. Marc J. Philippon** was presented with the "Vinci" Sports Health Award for advancements and contributions to the field of hip preservation by The Vincera Foundation.

SPRI Partners in Forming First IOC Research Center in the United States

In 2014, the United States Olympic Committee (USOC) partnered with The Steadman Clinic and Steadman Philippon Research Institute. This partnership named The Steadman Clinic one of only two National Medical Providers for Team USA and provided invaluable resources to SPRI in the form of an extensive athlete database. This arrangement has helped SPRI fulfill its goals in creating the best evidence-based treatments and studying ways to prevent injuries before they happen.



Dr. Philippon, Dr. Steadman and Dr. Bill Moreau of the USOC at the partnership announcement in 2014

In October 2017, the International Olympic Committee (IOC) appointed the United States as a research center for the prevention of injury and protection of athlete health, joining just nine other appointed countries. The United States research center—the United States Coalition for the Prevention of Illness and Injury in Sport—is a joint research venture between SPRI, the USOC Sports Medicine Division and the University of Utah.

This historic coalition brings together highly experienced researchers from within each organization as an interdisciplinary team to foster collaborative research in support of the IOC's goals in the areas of injury prevention and athlete protection.

As a part of this coalition, SPRI is working with nine other research nations to help protect athlete health. If SPRI, as part of the US Coalition, discovers an injury prevention treatment, it will share that discovery with every nation. This is the global, Olympic spirit, and SPRI is proud to be a part of it.

In addition to this exciting partnership with the IOC, the organizations have extended their USOC partnership to 2028, which will go through the Los Angeles Summer Games. This was a unanimous vote by the Partners of The Steadman Clinic and a unanimous vote of Steadman Philippon Research Institute's Board of Directors.

Both relationships, with the IOC and USOC, position SPRI as a true global leader in research.

SPRI Promotes Global Collaboration

For 30 years, Steadman Philippon Research Institute (SPRI) has promoted collaborations with other research organizations and institutions to achieve its goal of advancing science, health care and injury prevention. SPRI hosts and co-hosts several events throughout the year in Vail, Colorado, making the small mountain community a true international hub of science and medicine.

Each year, Steadman Philippon Research Institute hosts two major academic symposiums—the Vail Scientific Summit and Injury Prevention Symposium. The Summit was in its third year in 2017, and the Symposium wrapped its second annual meeting in May 2018.

VAIL SCIENTIFIC SUMMIT

From August 23-26, 2017, SPRI hosted its Third Annual Vail Scientific Summit. The conference featured over 60 speakers, which included top physicians, scientists, surgeons and researchers. The forward-looking, collaborative event celebrated the benefits of a strong connection between science and medicine, which was exemplified by the discussions sparked by the conference panels.

The Third Annual Vail Scientific Summit included a special session dedicated to The Steadman Clinic's physicians, in which they outlined the clinical applications of regenerative medicine. This called to the translational nature of the orthopaedic research being discussed at the summit.

Much of the event was centered around encouraging new collaborations while building on existing ones. This created a full, cohesive summit that reinforced SPRI's position as an innovative leader in orthopaedic research and regenerative medicine.

Keynote speaker and Olympian Julia Mancuso with Dr. Philippon and Dr. Matta

The Fourth Annual Vail Scientific Summit, entitled "Regenerative & Translational Medicine: A Focus on Human Clinical Applications" is scheduled for August 19-21, 2018 at the Vail Marriott Mountain Resort.

INJURY PREVENTION SYMPOSIUM

SPRI and the USOC, its partner, hosted the Second Annual Injury Prevention Symposium May 3-5, 2018. Defined by a spirit of collaboration, the event addressed current research and clinical applications for sustaining athlete health throughout sports and exercise disciplines, across all ages.

The event featured an inspiring keynote address from Julia Mancuso, the most decorated female American alpine Olympic skier and one of only three Team USA athletes to medal in three consecutive winter Olympic Games. She spoke just two days after receiving a total hip replacement at The Steadman Clinic.

The symposium included panel discussions by a variety of professionals from different disciplines, providing unique insights into the topics of injury prevention and preserving athlete health. This allowed for a welcoming and insightful exchange of ideas from surgeons, scientists, physical therapists and other professionals, which highlights the Olympic spirit of working together and sharing ideas.

The Third Annual Injury Prevention Symposium will be held May 2-4, 2019.

Creating a Legacy of Education

Each year, SPRI educates more than 1,000 individuals from elementary school through career professionals. The multifaceted approach to education includes elite clinical fellowships and research appointments for international scholars, inspiring youth engagement programs, lecture series throughout the year and much more.

EDUCATION AND PUBLIC OUTREACH COMMITTEE (EPOC)

EPOC's program offerings include tours for local fifth grade students, featuring visits to SPRI's state-of-the-art laboratories including Biomotion, Regenerative Medicine, Robotics and Surgical Skills.

For students in middle school, SPRI researchers travel to schools for interactive sessions and participate in judging local science fair projects.

After being selected by their high school science teachers, 10 local juniors and seniors participate in a year-long Science Club, performing hands-on research. In 2018, the high school program expanded to include a Summer Scholars program, which provides an intensive Science, Technology, Engineering & Mathematics (STEM) course to 20 top science students from local schools.

Now, students of all ages in Eagle County can participate in tutoring and shadowing programs with SPRI scientists.

OPPORTUNITIES FOR COLLEGE STUDENTS

SPRI offers unique opportunities for undergraduate and graduate students. Each year, fifteen or more college, graduate or medical students work in research assistantships, which represent 35 percent of SPRI's workforce. While in these assistantships, students have the opportunity to co-author publications for high-impact journals and attend SPRI's nationally acclaimed academic conferences.

EDUCATING THE COMMUNITY

Citizens of Eagle County and SPRI benefactors have enrichment opportunities at SPRI. They enjoy tours of SPRI's leading-edge laboratories and can participate in research studies being performed in Vail. Members of the community and SPRI donors are also invited to attend SPRI's academic conferences.

PROFESSIONAL EDUCATION OFFERINGS

Through its meetings and academic symposia, SPRI reaches more than 400 professionals in the fields of orthopaedics, sports medicine, regenerative medicine and more each year. The conferences serve as professional development, continuing education and tremendous networking opportunities for all participants.

Sports Medicine, Orthopaedic Fellowships and International Scholarships

Part of SPRI's educational opportunities include elite clinical fellowships and research positions for surgeons from all over the world. Committed to training tomorrow's orthopaedic experts, SPRI's post-residency programs are considered some of the world's best. Physicians from as far away as Asia and South America come to Vail to learn from SPRI's renowned surgeons and researchers.

This year, SPRI selected seven surgeons to the world-renowned, ACGME-accredited Sports Medicine Fellowship. Two additional orthopaedic surgeons were selected for orthopaedic fellowships, including one Foot & Ankle Fellow and one Adult Reconstruction Fellow. Additionally, six scholars from around the world joined SPRI for appointments as International Scholars. Both groups spent twelve months working toward one goal—expanding their knowledge to help patients heal better and faster.

While in Vail, fellows and scholars have the unique opportunity to perform research in their respective areas of interest, including biomechanics, basic science, imaging and clinical research. The post-residents refine their orthopaedic skills and investigate the causes, prevention and cure of degenerative diseases, as well as the treatment and prevention of joint injuries. The fellows and scholars not only advance their own knowledge and expertise, but also improve patient care through their own research. The physicians also have the opportunity to refine their skills in SPRI's Surgical Skills Lab.

International Scholar Hajime Utsunomiya conducts research at SPRI.

SPRI currently maintains a network of more than 225 fellows in communities around the world who often serve in academic positions at leading universities and in private practices.

2017-2018 Sports Medicine Fellows

J.P. BEGLEY, M.D.

Dr. Begley graduated from Johns Hopkins School of Medicine. He completed an orthopaedic surgical residency at NYU Hospital for Joint Diseases. During that time, he served as team physician for the NYU and Long Island University's men's and women's basketball programs. Dr. Begley also provided medical care for the NYC Public High School Athletic League and the Alvin Ailey Dance Theater. His research interests include hip arthroscopy outcomes data, shoulder instability and athletic performance after surgery.

ANDREW BERNHARDSON, M.D., M.C., U.S.N.

Dr. Bernhardson graduated from the U.S. Naval Academy and attended medical school at the University of Minnesota. After graduation, he served as battalion and regimental surgeon with the U.S. Marine Corps in Afghanistan. Dr. Bernhardson completed his orthopaedic residency at the Naval Medical Center San Diego. He was also selected as the AOSSM representative to the AAOS Clinical Scientist Career Development Program in 2015.

PATRICK BUCKLEY, M.D.

Dr. Buckley received a bachelor's degree in biology from Villanova University where he graduated cum laude. He also graduated cum laude from Jefferson Medical College. While there, he was vice president of Alpha Omega Alpha. Dr. Buckley completed his orthopaedic surgery residency at Thomas Jefferson University Hospital. He was the team physician for the Philadelphia Phillies and Villanova University athletics. His research interests include sports following ACL reconstruction and treatment of the throwing athlete.

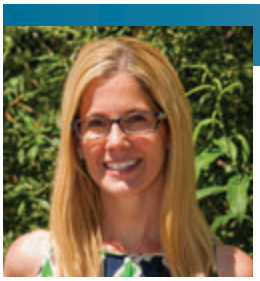
BLAKE DANEY, M.D.

Dr. Daney graduated cum laude from Miami University with a bachelor's degree in Zoology. He received his medical training at West Virginia University. There, he was inducted into Alpha Omega Alpha and Gold Humanism Honor Society. Dr. Daney completed his residency at Cleveland Clinic Akron General. His research interests include biomechanics, articular cartilage injuries and upper extremity nerve compression. He is a founding board member of Project CHASM, which provides medical care for the homeless.

2017-2018 Sports Medicine Fellows

BRENDAN HIGGINS, M.D., M.S.

Dr. Higgins graduated with a degree in Oceanography from the U.S. Naval Academy. Upon graduation, he was commissioned as an officer in the U.S. Marine Corps. He served as a platoon commander during Operation Iraqi Freedom. Dr. Higgins completed medical school at Georgetown University and his orthopaedic residency at Dartmouth Hitchcock Medical Center. He also earned a master's in Healthcare Leadership at Dartmouth. His research interests include total hip arthroplasty and cervical spine surgery.



CATHERINE LOGAN, M.D., M.B.A., M.S.

Dr. Logan attended Syracuse University, studying Health and Exercise Science. She earned a master's in Physical Therapy from the Medical College of Virginia. She practiced as a physical therapist at Johns Hopkins Hospital before enrolling at Tufts University School of Medicine where she earned a joint MD and MBA degree. At Tufts, Dr. Logan started a nonprofit that provides science education for underserved Boston youth. She received orthopaedic surgery training through the Harvard Combined Orthopaedic Residency Program where she served as editor-in-chief of the *Orthopaedic Journal.* Her research interests include discoid meniscus and return-to-play protocols.

CONNOR ZIEGLER, M.D.

Dr. Ziegler attended Gustavus Adolphus College where he was an Academic All-American swimmer, conference champion and NCAA finalist. He received the NCAA Post-Graduate Scholarship and was named to *ESPN The Magazine's* Academic All-America Men's At-Large Team. Dr. Ziegler attended medical school at the University of Minnesota. He completed residency at the University of Connecticut. His research interests include ACL and PCL reconstruction and total shoulder arthroplasty. He has published in numerous peer-reviewed journals.

2017-2018 FOOT & ANKLE FELLOW

JESS MULLENS, M.D.

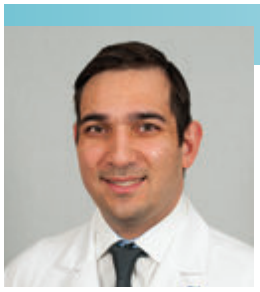
Dr. Mullens graduated from Berry College with a bachelor's in biology. He interned at the National Cancer Center in South Korea. Dr. Mullens earned his medical degree at the University of Alabama School of Medicine, where he was inducted into Alpha Omega Alpha. Dr. Mullens completed his residency at the University of South Alabama. He was elected Resident Scholar by the American Orthopaedic Foot and Ankle Society. His research interests include sports-related ankle injuries and gait analysis of the foot and ankle.

2017-2018 ADULT RECONSTRUCTION FELLOW

JAKUB TATKA, M.D.

Dr. Tatka received his bachelor's from Connecticut College where he studied music and technology. He attended Stony Brook School of Medicine where he was involved in medical missions in South America. He established an annual mission to Peru, which is now in its ninth year. During his residency, Dr. Tatka was chosen as Administrative Chief Resident. His research interests include Dupuytren's Disease and PCL reconstruction.

2017-2018 International Scholars



BURAK ALTINTAS, M.D.

Dr. Altintas earned his medical degree from Heidelberg University in Germany. He worked at Sporthopaedicum in Germany after completing his orthopaedic surgery residency. Dr. Altintas's research interests include shoulder instability and other traumatic and degenerative shoulder conditions. He has published several research papers on shoulder and elbow disorders in peer-reviewed orthopaedic journals.

IONNA BOLIA, M.D., M.S.

Dr. Bolia came to SPRI from the University of Athens School of Medicine, Department of Orthopaedic Surgery. She received her medical degree from Aristotle University of Thessaloniki School of Health Sciences in Greece. She also earned a master's degree in molecular and applied physiology. Dr. Bolia is focused on hip arthroscopy and is preparing for the U.S. Medical Licensing Examination and plans to apply for a medical residency in the United States.

LORENZO FAGOTTI, M.D.

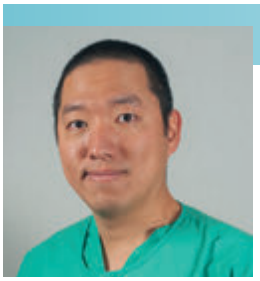
Dr. Fagotti completed his residency at the Santa Casa de São Paulo School of Medicine in Brazil. He was a fellow at the Hospital das Clinicas da Faculdade de Medicina da Universidade de São Paulo. He was involved in hip research studies at SPRI, focusing on hip arthroscopy, biomechanical and anatomical studies. Dr. Fagotti is applying for the Ph.D. program at the Santa Casa de São Paulo School of Medicine.

GILBERT MOATSHE, M.D.

Dr. Moatshe completed his residency at Oslo University Hospital in Norway and is working on a Ph.D. in collaboration with SPRI and the University of Oslo. In his second year at SPRI, Dr. Moatshe focused his research on arthroscopy and sports medicine, with an emphasis on treating knee injuries.

GILBERTO NAKAMA, M.D., M.S.

Dr. Nakama completed his master's degree at the Federal University of São Paulo in Brazil. He completed his medical residency and knee surgery specialization at the University of São Paulo as well. Dr. Nakama is focused on knee and translational regenerative medicine research.



HAJIME UTSUNOMIYA, M.D., PH.D.

In his second year at SPRI, Dr. Utsunomiya is specializing in stem cell research. His research focuses on using shoulder stem cells to treat rotator cuff tears. He is assisting Dr. Johnny Huard, SPRI's Chief Scientific Officer, with his regenerative medicine research and Dr. Marc Philippon, SPRI's Co-Chair.

Not only are SPRI's fellows and scholars advancing their own knowledge and expertise, but they are also improving patient care provided by orthopaedic physicians around the world, thanks to the groundbreaking research they are investigating at SPRI.

SPRI's vast network of fellows and scholars spans the globe, ensuring SPRI's global legacy of education.

Publications and Presentations

SPRI was prolific in its publications and presentations in 2017-2018. Many of the Institute's publications were published in high-impact, peer-reviewed medical journals, and presentations were given on a global stage.

Publications

Chandra SS, Engstrom C, Fripp J, Neubert A, Jin J, Walker D, Salvado O, Ho C, Crozier S. Local contrast-enhanced MR images via high dynamic range processing. Magn Reson Med. 2018 Sep;80(3):1206-1218. doi: 10.1002/mrm.27109. Epub 2018 Feb 4. PubMed PMID: 29399889.

LaPrade RF, Cinque ME, Dornan GJ, DePhillipo NN, Geeslin AG, Moatshe G, Chahla J. Double-Bundle Posterior Cruciate Ligament Reconstruction in 100 Patients at a Mean 3 Years' Follow-up: Outcomes Were Comparable to Anterior Cruciate Ligament Reconstructions. *Am J Sports Med.* 2018 Jul;46(8):1809-1818. doi:10.1177/0363546517750855. PubMed PMID: 29953296.

Moatshe G, Chahla J, Brady AW, Dornan GJ, Muckenhirn KJ, Kruckeberg BM, Cinque ME, Turnbull TL, Engebretsen L, LaPrade RF. The Influence of Graft Tensioning Sequence on Tibiofemoral Orientation During Bicruciate and Posterolateral Corner Knee Ligament Reconstruction: A Biomechanical Study. *Am J Sports Med.* 2018 Jul;46(8):1863-1869. doi: 10.1177/0363546517751917. PubMed PMID: 29953291.

Cinque ME, Dornan GJ, Chahla J, Moatshe G, LaPrade RF. High Rates of Osteoarthritis Develop After Anterior Cruciate Ligament Surgery: An Analysis of 4108 Patients. *Am J Sports Med.* 2018 Jul;46(8):2011-2019. doi: 10.1177/0363546517730072. Epub 2017 Oct 6. PubMed PMID: 28982255.

Cinque ME, Chahla J, Moatshe G, Faucett SC, Krych AJ, LaPrade RF. Meniscal root tears: a silent epidemic. *Br J Sports Med.* 2018 Jul;52(13):872-876. doi: 10.1136/bjsports-2017-098942. Epub 2018 Mar 24. PubMed PMID: 29574455.

Trindade CAC, Briggs KK, Fagotti L, Fukui K, Philippon MJ. Positive FABER distance test is associated with higher alpha angle in symptomatic patients. Knee Surg *Sports Traumatol Arthrosc.* 2018 Jun 29. doi: 10.1007/s00167-018-5031-2. [Epub ahead of print] PubMed PMID: 29959447.

Fagotti L, Tatka J, Salles MJC, Queiroz MC. Risk Factors and Treatment Options for Failure of a Two-Stage Exchange. Curr Rev *Musculoskelet Med.* 2018 Jun 22. doi: 10.1007/s12178-018-9504-1. [Epub ahead of print] Review. PubMed PMID: 29934884.

Pogorzelski J, Horan MP, Godin JA, Hussain ZB, Fritz EM, Millett PJ. Achilles tendon allograft-augmented latissimus dorsi tendon transfer for the treatment of massive irreparable posterosuperior rotator cuff tears. *Arch Orthop Trauma Surg.* 2018 Jun 6. doi: 10.1007/s00402-018-2943-8. [Epub ahead of print] PubMed PMID: 29876638.

Kane PW, DePhillipo NN, Cinque ME, Moatshe G, Chahla J, Carpenter E, Provencher MT, LaPrade RF. Increased Accuracy of Varus Stress Radiographs Versus Magnetic Resonance Imaging in Diagnosing Fibular Collateral Ligament Grade III Tears. *Arthroscopy.* 2018 Jun 5. pii: S0749-8063(18)30274-3. doi: 10.1016/j.arthro.2018.03.029. [Epub ahead of print] PubMed PMID: 29884567.

Briggs KK, Bolia IK. Hip arthroscopy: an evidence-based approach. Lancet. 2018 Jun 2;391(10136):2189-2190. doi: 10.1016/S0140-6736(18)31218-2. Epub 2018 Jun 1. PubMed PMID: 29893211.

LaPrade MD, Kallenbach SL, Aman ZS, Moatshe G, Storaci HW, Turnbull TL, Arendt EA, Chahla J, LaPrade RF. Biomechanical Evaluation of the Medial Stabilizers of the Patella. *Am J Sports Med.* 2018 Jun;46(7):1575-1582. doi: 10.1177/0363546518758654. Epub 2018 Mar 19. PubMed PMID: 29554436.

Moatshe G, Kruckeberg BM, Chahla J, Godin JA, Cinque ME, Provencher MT, LaPrade RF. Acromioclavicular and Coracoclavicular Ligament Reconstruction for Acromioclavicular Joint Instability: A Systematic Review of Clinical and Radiographic Outcomes. *Arthroscopy.* 2018 Jun;34(6):1979-1995.e8. doi: 10.1016/j.arthro.2018.01.016. Epub 2018 Mar 21. Review. PubMed PMID: 29573931.

Liechti DJ, Mitchell JJ, Menge TJ, Hackett TR. Immediate physical therapy without postoperative restrictions following open subpectoral biceps tenodesis: low failure rates and improved outcomes at a minimum 2-year follow-up. *J Shoulder Elbow Surg.* 2018 May 25. pii: S1058-2746(18)30167-8. doi:10.1016/j.jse.2018.02.061. [Epub ahead of print] PubMed PMID: 29804912.

Ferrari MB, Murphy CP, Gomes JLE. Meniscus Repair in Children and Adolescents: A Systematic Review of Treatment Approaches, Meniscal Healing, and Outcomes. *J Knee Surg.* 2018 May 23. doi: 10.1055/s-0038-1653943. [Epub ahead of print] PubMed PMID: 29791926.

Huard J. Stem cells, blood vessels, and angiogenesis as major determinants for musculoskeletal tissue repair. *J Orthop Res.* 2018 May 22. doi: 10.1002/jor.24058. [Epub ahead of print] Review. PubMed PMID: 29786150.

Provencher MT, Bradley JP, Chahla J, Sanchez A, Beaulieu-Jones BR, Arner JW, Kennedy NI, Sanchez G, Kennedy MI, Moatshe G, Cinque ME, LaPrade RF. A History of Anterior Cruciate Ligament Reconstruction at the National Football League Combine Results in Inferior Early National Football League Career Participation. *Arthroscopy.* 2018 May 19. pii: S0749-8063(18)30238-X. doi: 10.1016/j.arthro.2018.03.018. [Epub ahead of print] PubMed PMID: 29789252.

Ardern CL, Ekås GR, Grindem H, Moksnes H, Anderson A, Chotel F, Cohen M, Forssblad M, Ganley TJ, Feller JA, Karlsson J, Kocher MS, LaPrade RF, McNamee M, Mandelbaum B, Micheli L, Mohtadi NGH, Reider B, Roe JP, Seil R, Siebold R, Silvers-Granelli HJ, Soligard T, Witvrouw E, Engebretsen L. Prevention, diagnosis and management of paediatric ACL injuries. *Br J Sports Med.* 2018 May 17. pii: bjsports-2018-099493. doi: 10.1136/bjsports-2018-099493. [Epub ahead of print] PubMed PMID: 29773588.

Bolia IK, Briggs KK, Locks R, Chahla J, Utsunomiya H, Philippon MJ. Prevalence of High-Grade Cartilage Defects in Patients With Borderline Dysplasia With Femoroacetabular Impingement: A Comparative Cohort Study. *Arthroscopy.* 2018 May 2. pii: S0749-8063(18)30232-9. doi: 10.1016/j.arthro.2018.03.012. [Epub ahead of print] PubMed PMID: 29730219.

Pogorzelski J, Fritz EM, Horan MP, Katthagen JC, Provencher MT, Millett PJ. Failure following arthroscopic Bankart repair for traumatic anteroinferior instability of the shoulder: is a glenoid labral articular disruption (GLAD) lesion a risk factor for recurrent instability? *J Shoulder Elbow Surg.* 2018 May 2. pii: S1058-2746(18)30161-7. doi: 10.1016/j.jse.2018.02.055. [Epub ahead of print] PubMed PMID: 29730139.

Kane PW, Cinque ME, Moatshe G, Chahla J, DePhillipo NN, Provencher MT, LaPrade RF. Fibular Collateral Ligament: Varus Stress Radiographic Analysis Using 3 Different Clinical Techniques. *Orthop J Sports Med.* 2018 May 2;6(5):2325967118770170. doi: 10.1177/2325967118770170. eCollection 2018 May. PubMed PMID: 29770342; PubMed Central PMCID: PMC5946641.

Menge TJ, Chahla J, Mitchell JJ, Dean CS, LaPrade RF. Avulsion of the Anterior Lateral Meniscal Root Secondary to Tibial Eminence Fracture. *Am J Orthop* (Belle Mead NJ). 2018 May;47(5). doi: 10.12788/ajo.2018.0024. PubMed PMID: 29883509.

DePhillipo NN, Moatshe G, Brady A, Chahla J, Aman ZS, Dornan GJ, Nakama GY, Engebretsen L, LaPrade RF. Effect of Meniscocapsular and Meniscotibial Lesions in ACL-Deficient and ACL-Reconstructed Knees: A Biomechanical Study. *Am J Sports Med.* 2018 May 1:363546518774315. doi: 10.1177/0363546518774315. [Epub ahead of print] PubMed PMID: 29847148.

Frangiamore SJ, Mannava S, Briggs KK, McNamara S, Philippon MJ. Career Length and Performance Among Professional Baseball Players Returning to Play After Hip Arthroscopy. *Am J Sports Med.* 2018 May 1:363546518775420. doi:10.1177/0363546518775420. [Epub ahead of print] PubMed PMID: 29799269.

LaPrade CM, Bernhardson AS, Aman ZS, Moatshe G, Chahla J, Dornan GJ, LaPrade RF, Provencher MT. Changes in the Neurovascular Anatomy of the Shoulder After an Open Latarjet Procedure: Defining a Surgical Safe Zone. *Am J Sports Med.* 2018 May 1:363546518773309. doi: 10.1177/0363546518773309. [Epub ahead of print] PubMed PMID: 29792520.

Geeslin AG, Chahla J, Moatshe G, Muckenhirn KJ, Kruckeberg BM, Brady AW, Coggins A, Dornan GJ, Getgood AM, Godin JA, LaPrade RF. Anterolateral Knee Extra-articular Stabilizers: A Robotic Sectioning Study of the Anterolateral Ligament and Distal Iliotibial Band Kaplan Fibers. *Am J Sports Med.* 2018 May;46(6):1352-1361. doi: 10.1177/0363546518759053. Epub 2018 Mar 20. PubMed PMID: 29558208.

Frank RM, Ukwuani G, Chahla J, Batko B, Bush-Joseph CA, Nho SJ. High Rate of Return to Swimming After Hip Arthroscopy for Femoroacetabular Impingement. *Arthroscopy.* 2018 May;34(5):1471-1477. doi: 10.1016/j.arthro.2017.11.030. PubMed PMID: 29402586.

Vap AR, Mitchell JJ, Briggs KK, McNamara SC, Philippon MJ. Outcomes of Arthroscopic Management of Trochanteric Bursitis in Patients With Femoroacetabular Impingement: A Comparison of Two Matched Patient Groups. *Arthroscopy.* 2018 May;34(5):1455-1460. doi: 10.1016/j.arthro.2017.10.053. Epub 2018 Feb 1. PubMed PMID: 29395556.

Chahla J, Marchetti DC, Moatshe G, Ferrari MB, Sanchez G, Brady AW, Pogorzelski J, Lebus GF, Millett PJ, LaPrade RF, Provencher MT. Quantitative Assessment of the Coracoacromial and the Coracoclavicular Ligaments With 3-Dimensional Mapping of the Coracoid Process Anatomy: A Cadaveric Study of Surgically Relevant Structures. *Arthroscopy.* 2018 May;34(5):1403-1411. doi: 10.1016/j.arthro.2017.11.033. Epub 2018 Feb 1. PubMed PMID: 29395551.

Locks R, Bolia I, Utsunomiya H, Briggs K, Philippon MJ. Current concepts in revision hip arthroscopy. *Hip Int.* 2018 May 1:1120700018771927. doi: 10.1177/1120700018771927. [Epub ahead of print] PubMed PMID: 29768929.

Lockard CA, Wilson KJ, Ho CP, Shin RC, Katthagen JC, Millett PJ. Quantitative mapping of glenohumeral cartilage in asymptomatic subjects using 3 T magnetic resonance imaging. *Skeletal Radiol.* 2018 May;47(5):671-682. doi: 10.1007/s00256-017-2829-9. Epub 2017 Dec 1. PubMed PMID: 29196823.

Briggs KK, Soares E, Bhatia S, Philippon MJ. Postoperative alpha angle not associated with patient-centered midterm outcomes following hip arthroscopy for FAI. *Knee Surg Sports Traumatol Arthrosc.* 2018 Apr 11. doi: 10.1007/s00167-018-4933-3. [Epub ahead of print] PubMed PMID: 29644385.

Mather RC 3rd, Nho SJ, Federer A, Demiralp B, Nguyen J, Saavoss A, Salata MJ, Philippon MJ, Bedi A, Larson CM, Byrd JWT, Koenig L. Effects of Arthroscopy for Femoroacetabular Impingement Syndrome on Quality of Life and Economic Outcomes. *Am J Sports Med.* 2018 Apr;46(5):1205-1213. doi: 10.1177/0363546518757758. Epub 2018 Mar 13. PubMed PMID: 29533689.

Frank RM, Romeo AA, Richardson C, Sumner S, Verma NN, Cole BJ, Nicholson GP, Provencher MT. Outcomes of Latarjet Versus Distal Tibia Allograft for Anterior Shoulder Instability Repair: A Matched Cohort Analysis. *Am J Sports Med.* 2018 Apr;46(5):1030-1038. doi: 10.1177/0363546517744203. Epub 2018 Feb 1. PubMed PMID: 29389219.

Kraeutler MJ, Welton KL, Chahla J, LaPrade RF, McCarty EC. Current Concepts of the Anterolateral Ligament of the Knee: Anatomy, Biomechanics, and Reconstruction. *Am J Sports Med.* 2018 Apr;46(5):1235-1242. doi: 10.1177/0363546517701920. Epub 2017 Apr 20. PubMed PMID: 28426251.

Locks R, Bolia IK, Utsunomiya H, Briggs KK, Philippon MJ. Revision Hip Arthroscopy After Labral Reconstruction Using Iliotibial Band Autograft: Surgical Findings and Comparison of Outcomes With Labral Reconstructions Not Requiring Revision. *Arthroscopy.* 2018 Apr;34(4):1244-1250. doi: 10.1016/j.arthro.2017.10.054. Epub 2018 Feb 15. PubMed PMID: 29456067.

Murray IR, Robinson PG, West CC, Goudie EB, Yong LY, White TO, LaPrade RF. Reporting Standards in Clinical Studies Evaluating Bone Marrow Aspirate Concentrate: A Systematic Review. *Arthroscopy.* 2018 Apr;34(4):1366-1375. doi: 10.1016/j.arthro.2017.11.036. Epub 2018 Feb 13. Review. PubMed PMID: 29395555.

Ardern CL, Ekås GR, Grindem H, Moksnes H, Anderson AF, Chotel F, Cohen M, Forssblad M, Ganley TJ, Feller JA, Karlsson J, Kocher MS, LaPrade RF, McNamee M, Mandelbaum B, Micheli L, Mohtadi N, Reider B, Roe J, Seil R, Siebold R, Silvers-Granelli HJ, Soligard T, Witvrouw E, Engebretsen L. 2018 International Olympic Committee consensus statement on prevention, diagnosis and management of paediatric anterior cruciate ligament (ACL) injuries. *Br J Sports Med.* 2018 Apr;52(7):422-438. doi: 10.1136/bjsports-2018-099060. Epub 2018 Feb 24. PubMed PMID: 29478021; PubMed Central PMCID: PMC5867447.

Provencher MT, Chahla J, Sanchez G, Cinque ME, Kennedy NI, Whalen J, Price MD, Moatshe G, LaPrade RF. Body Mass Index Versus Body Fat Percentage in Prospective National Football League Athletes: Overestimation of Obesity Rate in Athletes at the National Football League Scouting Combine. *J Strength Cond Res.* 2018 Apr;32(4):1013-1019. doi: 10.1519/JSC.0000000000002449. PubMed PMID: 29351164.

DePhillipo NN, Kennedy MI, Aman ZS, Moatshe G, LaPrade RF. Osteoarticular Allograft Transplantation of the Trochlear Groove for Trochlear Dysplasia: A Case Report. *JBJS Case Connect.* 2018 Apr-Jun;8(2):e29. doi: 10.2106/JBJS.CC.17.00223. PubMed PMID: 29742532.

Ardern CL, Ekås G, Grindem H, Moksnes H, Anderson A, Chotel F, Cohen M, Forssblad M, Ganley TJ, Feller JA, Karlsson J, Kocher MS, LaPrade RF, McNamee M, Mandelbaum B, Micheli L, Mohtadi N, Reider B, Roe J, Seil R, Siebold R, Silvers-Granelli HJ, Soligard T, Witvrouw E, Engebretsen L. 2018 International Olympic Committee consensus statement on prevention, diagnosis and management of paediatric anterior cruciate ligament (ACL) injuries. Knee Surg Sports Traumatol *Arthrosc.* 2018 Apr;26(4):989-1010. doi: 10.1007/s00167-018-4865-y. Epub 2018 Feb 17. Review. PubMed PMID: 29455243; PubMed Central PMCID: PMC5876259.

Marchetti DC, Chahla J, Moatshe G, Slette EL, LaPrade RF. Quantitative radiographic assessment of the anatomic attachment sites of the anterior and posterior complexes of the proximal tibiofibular joint. *Knee Surg Sports Traumatol Arthrosc.* 2018 Apr;26(4):1104-1109. doi: 10.1007/s00167-017-4511-0. Epub 2017 Mar 21. PubMed PMID: 28326444.

Anavian J, Marchetti DC, Moatshe G, Slette EL, Chahla J, Brady AW, Civitarese DM, LaPrade RF. The forgotten joint: quantifying the anatomy of the proximal tibiofibular joint. *Knee Surg Sports Traumatol Arthrosc.* 2018 Apr;26(4):1096-1103. doi: 10.1007/s00167-017-4508-8. Epub 2017 Mar 20. PubMed PMID: 28321475.

Deng ZH, Li YS, Gao X, Lei GH, Huard J. Bone morphogenetic proteins for articular cartilage regeneration. *Osteoarthritis Cartilage.* 2018 Mar 24. pii: S1063-4584(18)31128-2. doi: 10.1016/j.joca.2018.03.007. [Epub ahead of print] Review. PubMed PMID: 29580979.

Piuzzi NS, Hussain ZB, Chahla J, Cinque ME, Moatshe G, Mantripragada VP, Muschler GF, LaPrade RF. Variability in the Preparation, Reporting, and Use of Bone Marrow Aspirate Concentrate in Musculoskeletal Disorders: A Systematic Review of the Clinical Orthopaedic Literature. *J Bone Joint Surg Am.* 2018 Mar 21;100(6):517-525. doi: 10.2106/JBJS.17.00451. PubMed PMID: 29557869.

Altintas B, Pitta R, Fritz EM, Higgins B, Millett PJ. Technique for Type IV SLAP Lesion Repair. *Arthrosc Tech.* 2018 Mar 12;7(4):e337-e342. doi: 10.1016/j.eats.2017.10.004. eCollection 2018 Apr. PubMed PMID: 29868401; PubMed Central PMCID: PMC5981853.

Robinson PG, Murray IR, West CC, Goudie EB, Yong LY, White TO, LaPrade RF. Reporting of Mesenchymal Stem Cell Preparation Protocols and Composition: A Systematic Review of the Clinical Orthopaedic Literature. *Am J Sports Med.* 2018 Mar 1:363546518758667. doi: 10.1177/0363546518758667. [Epub ahead of print] PubMed PMID: 29554460.

Faucett SC, Geisler BP, Chahla J, Krych AJ, Kurzweil PR, Garner AM, Liu S, LaPrade RF, Pietzsch JB. Meniscus Root Repair vs Meniscectomy or Nonoperative Management to Prevent Knee Osteoarthritis After Medial Meniscus Root Tears: Clinical and Economic Effectiveness. *Am J Sports Med.* 2018 Mar 1:363546518755754. doi: 10.1177/0363546518755754. [Epub ahead of print] PubMed PMID: 29517925.

Pogorzelski J, Muckenhirn KJ, Mitchell JJ, Katthagen JC, Schon JM, Dahl KD, Hirahara AM, Dines JS, Adams CR, Dooney T, Denard PJ, Turnbull TL, Millett PJ. Biomechanical Comparison of 3 Glenoid-Side Fixation Techniques for Superior Capsular Reconstruction. *Am J Sports Med.* 2018 Mar;46(4):801-808. doi: 10.1177/0363546517745626. Epub 2017 Dec 27. PubMed PMID: 29281797.

Geeslin AG, Moatshe G, Chahla J, Kruckeberg BM, Muckenhirn KJ, Dornan GJ, Coggins A, Brady AW, Getgood AM, Godin JA, LaPrade RF. Anterolateral Knee Extra-articular Stabilizers: A Robotic Study Comparing Anterolateral Ligament Reconstruction and Modified Lemaire Lateral Extra-articular Tenodesis. *Am J Sports Med.* 2018 Mar;46(3):607-616. doi: 10.1177/0363546517745268. Epub 2017 Dec 21. PubMed PMID: 29268024.

Frangiamore SJ, Moatshe G, Kruckeberg BM, Civitarese DM, Muckenhirn KJ, Chahla J, Brady AW, Cinque ME, Oleson ML, Provencher MT, Hackett TR, LaPrade RF. Qualitative and Quantitative Analyses of the Dynamic and Static Stabilizers of the Medial Elbow: An Anatomic Study. *Am J Sports Med.* 2018 Mar;46(3):687-694. doi: 10.1177/0363546517743749. Epub 2017 Dec 21. PubMed PMID: 29266961.

LaPrade RF, Goodrich LR, Phillips J, Dornan GJ, Turnbull TL, Hawes ML, Dahl KD, Coggins AN, Kisiday J, Frisbie D, Chahla J. Use of Platelet-Rich Plasma Immediately After an Injury Did Not Improve Ligament Healing, and Increasing Platelet Concentrations Was Detrimental in an In Vivo Animal Model. *Am J Sports Med.* 2018 Mar;46(3):702-712. doi: 10.1177/0363546517741135. Epub 2017 Dec 6. PubMed PMID: 29211969.

Mitchell JJ, Cinque ME, Dornan GJ, Matheny LM, Dean CS, Kruckeberg B, Moatshe G, Chahla J, LaPrade RF. Primary Versus Revision Anterior Cruciate Ligament Reconstruction: Patient Demographics, Radiographic Findings, and Associated Lesions. *Arthroscopy.* 2018 Mar;34(3):695-703. doi: 10.1016/j.arthro.2017.08.305. Epub 2017 Dec 8. PubMed PMID: 29225019.

Frank RM, Chalmers PN, Moric M, Leroux T, Provencher MT, Romeo AA. Incidence and Changing Trends of Shoulder Stabilization in the United States. *Arthroscopy.* 2018 Mar;34(3):784-792. doi: 10.1016/j.arthro.2017.08.289. Epub 2017 Dec 8. PubMed PMID: 29225018.

Moatshe G, Marchetti DC, Chahla J, Ferrari MB, Sanchez G, Lebus GF, Brady AW, Frank RM, LaPrade RF, Provencher MT. Qualitative and Quantitative Anatomy of the Proximal Humerus Muscle Attachments and the Axillary Nerve: A Cadaveric Study. *Arthroscopy.* 2018 Mar;34(3):795-803. doi: 10.1016/j.arthro.2017.08.301. Epub 2017 Dec 8. PubMed PMID: 29225017.

Logan CA, Beaulieu-Jones BR, Sanchez G, Chahla J, Kennedy NI, Cinque ME, LaPrade RF, Whalen JM, Vopat BG, Price MD, Provencher MT. Posterior Cruciate Ligament Injuries of the Knee at the National Football League Combine: An Imaging and Epidemiology Study. *Arthroscopy.* 2018 Mar;34(3):681-686. doi: 10.1016/j.arthro.2017.08.304. Epub 2017 Dec 8. PubMed PMID: 29225016.

Provencher MT, Chahla J, Cinque ME, Sanchez G, Kennedy NI, Haber DB, Tisosky AJ, Beaulieu-Jones BR, Price MD, Whalen JM, Moatshe G, LaPrade RF. Symptomatic Focal Knee Chondral Injuries in National Football League Combine Players Are Associated With Poorer Performance and Less Volume of Play. *Arthroscopy.* 2018 Mar;34(3):671-677. doi: 10.1016/j.arthro.2017.08.300. Epub 2017 Dec 8. PubMed PMID: 29225015.

Chahla J, Kennedy NI, Cinque ME, Sanchez G, Logan C, Vopat BG, Beaulieu-Jones B, Price M, Whalen J, LaPrade RF, Provencher MT. Posterolateral Corner Injuries of the Knee at the National Football League Combine: An Imaging and Outcomes Analysis. *Arthroscopy.* 2018 Mar;34(3):687-692. doi: 10.1016/j.arthro.2017.08.303. Epub 2017 Nov 13. PubMed PMID: 29146160.

Lattermann C, Kremser V, Altintas B. Use of Fresh Osteochondral Allografts in the Patellofemoral Joint. *J Knee Surg.* 2018 Mar;31(3):227-230. doi: 10.1055/s-0037-1607324. Epub 2017 Oct 16. PubMed PMID: 29036755.

Chahla J, James EW, Cinque ME, LaPrade RF. Midterm outcomes following anatomic-based popliteus tendon reconstructions. *Knee Surg Sports Traumatol Arthrosc.* 2018 Mar;26(3):812-818. doi: 10.1007/s00167-016-4382-9. Epub 2017 Jan 13. PubMed PMID: 28084495.

Cinque ME, Chahla J, Mitchell JJ, Moatshe G, Pogorzelski J, Murphy CP, Kennedy NI, Godin JA, LaPrade RF. Influence of Meniscal and Chondral Lesions on Patient-Reported Outcomes After Primary Anterior Cruciate Ligament Reconstruction at 2-Year Follow-up. *Orthop J Sports Med.* 2018 Feb 13;6(2):2325967117754189. doi: 10.1177/2325967117754189. eCollection 2018 Feb. PubMed PMID: 29468171; PubMed Central PMCID: PMC5813860.

Dippmann C, Kraemer O, Lund B, Krogsgaard M, Hölmich P, Lind M, Briggs K, Philippon M, Mygind-Klavsen B. Multicentre study on capsular closure versus non-capsular closure during hip arthroscopy in Danish patients with femoroacetabular impingement (FAI): protocol for a randomised controlled trial. *BMJ Open.* 2018 Feb 10;8(2):e019176. doi: 10.1136/bmjopen-2017-019176. PubMed PMID: 29440159; PubMed Central PMCID: PMC5829858.

Locks R, Utsunomiya H, Briggs KK, McNamara S, Chahla J, Philippon MJ. Return to Play After Hip Arthroscopic Surgery for Femoroacetabular Impingement in Professional Soccer Players. *Am J Sports Med.* 2018 Feb;46(2):273-279. doi: 10.1177/0363546517738741. Epub 2017 Nov 14. PubMed PMID: 29135269.

DePhillipo NN, Cinque ME, Godin JA, Moatshe G, Chahla J, LaPrade RF. Posterior Tibial Translation Measurements on Magnetic Resonance Imaging Improve Diagnostic Sensitivity for Chronic Posterior Cruciate Ligament Injuries and Graft Tears. *Am J Sports Med.* 2018 Feb;46(2):341-347. doi: 10.1177/0363546517734201. Epub 2017 Oct 13. PubMed PMID: 29028358.

Liechti DJ, Moatshe G, Backus JD, Marchetti DC, Clanton TO. A Percutaneous Knotless Technique for Acute Achilles Tendon Ruptures. *Arthrosc Tech.* 2018 Feb 1;7(2):e171-e178. doi: 10.1016/j.eats.2017.08.065. eCollection 2018 Feb. PubMed PMID: 29552483; PubMed Central PMCID: PMC5851437.

Pogorzelski J, Horan MP, Hussain ZB, Vap A, Fritz EM, Millett PJ. Subpectoral Biceps Tenodesis for Treatment of Isolated Type II SLAP Lesions in a Young and Active Population. *Arthroscopy.* 2018 Feb;34(2):371-376. doi: 10.1016/j.arthro.2017.07.021. Epub 2017 Sep 9. PubMed PMID: 28899638.

DePhillipo NN, Cinque ME, Kennedy NI, Chahla J, Moatshe G, LaPrade RF. Patellofemoral Chondral Defect in a Preadolescent Skier: A Case Report in Early Sport Specialization. *Int J Sports Phys Ther.* 2018 Feb;13(1):131-136. PubMed PMID: 29484250; PubMed Central PMCID: PMC5808009.

Schlegel TF, Abrams JS, Bushnell BD, Brock JL, Ho CP. Radiologic and clinical evaluation of a bioabsorbable collagen implant to treat partial-thickness tears: a prospective multicenter study. *J Shoulder Elbow Surg.* 2018 Feb;27(2):242-251. doi: 10.1016/j.jse.2017.08.023. Epub 2017 Nov 20. PubMed PMID: 29157898.

Mansurov N, Chen WCW, Awada H, Huard J, Wang Y, Saparov A. A controlled release system for simultaneous delivery of three human perivascular stem cell-derived factors for tissue repair and regeneration. *J Tissue Eng Regen Med.* 2018 Feb;12(2):e1164-e1172. doi: 10.1002/term.2451. Epub 2017 Jul 20. PubMed PMID: 28482145.

Chahla J, Cinque ME, Godin JA, Sanchez G, Lebus GF, Whalen JM, Price MD, Kennedy NI, Moatshe G, LaPrade RF, Provencher MT. Meniscectomy and Resultant Articular Cartilage Lesions of the Knee Among Prospective National Football League Players: An Imaging and Performance Analysis. *Am J Sports Med.* 2018 Jan;46(1):200-207. doi: 10.1177/0363546517737991. Epub 2017 Nov 7. PubMed PMID: 29112467.

Wright VJ, McCrum CL, Li H, Tranovich MJ, Huard J. Significant Chondrocyte Viability Is Present in Acetabular Chondral Flaps Associated With Femoroacetabular Impingement. *Am J Sports Med.* 2018 Jan;46(1):149-152. doi: 10.1177/0363546517732751. Epub 2017 Oct 12. PubMed PMID: 29024597.

Kruckeberg BM, Chahla J, Moatshe G, Cinque ME, Muckenhirn KJ, Godin JA, Ridley TJ, Brady AW, Arendt EA, LaPrade RF. Quantitative and Qualitative Analysis of the Medial Patellar Ligaments: An Anatomic and Radiographic Study. *Am J Sports Med.* 2018 Jan;46(1):153-162. doi: 10.1177/0363546517729818. Epub 2017 Oct 10. PubMed PMID: 29016187.

Pache S, Aman ZS, Kennedy M, Nakama GY, Moatshe G, Ziegler C, LaPrade RF. Posterior Cruciate Ligament: Current Concepts Review. *Arch Bone Jt Surg.* 2018 Jan;6(1):8-18. Review. PubMed PMID: 29430489; PubMed Central PMCID: PMC5799606.

Brady AW, Chahla J, Locks R, Mikula JD, Slette EL, LaPrade RF, Philippon MJ. Arthroscopic Reconstruction of the Ligamentum Teres: A Guide to Safe Tunnel Placement. *Arthroscopy.* 2018 Jan;34(1):144-151. doi: 10.1016/j.arthro.2017.08.308. Epub 2017 Dec 2. PubMed PMID: 29203379.

Vap AR, Mannava S, Katthagen JC, Horan MP, Fritz EM, Pogorzelski J, Millett PJ. Five-Year Outcomes After Arthroscopic Repair of Partial-Thickness Supraspinatus Tears. *Arthroscopy.* 2018 Jan;34(1):75-81. doi: 10.1016/j.arthro.2017.07.028. Epub 2017 Nov 2. PubMed PMID: 29100763.

Parada SA, Eichinger JK, Dumont GD, Parada CA, Greenhouse AR, Provencher MT, Higgins LD, Warner JJP. Accuracy and Reliability of a Simple Calculation for Measuring Glenoid Bone Loss on 3-Dimensional Computed Tomography Scans. *Arthroscopy.* 2018 Jan;34(1):84-92. doi: 10.1016/j.arthro.2017.07.032. Epub 2017 Oct 21. PubMed PMID: 29066267.

Bolia I, Utsunomiya H, Locks R, Briggs K, Philippon MJ. Twenty-Year Systematic Review of the Hip Pathology, Risk Factors, Treatment, and Clinical Outcomes in Artistic Athletes-Dancers, Figure Skaters, and Gymnasts. *Clin J Sport Med.* 2018 Jan;28(1):82-90. doi: 10.1097/JSM.0000000000000440. Review. PubMed PMID: 28742616.

Chahla J, Geeslin AG, Cinque ME, LaPrade RF. Biomechanical Proof for the Existence of the Anterolateral Ligament. *Clin Sports Med.* 2018 Jan;37(1):33-40. doi: 10.1016/j.csm.2017.07.003. Epub 2017 Sep 8. Review. PubMed PMID: 29173555.

Godin JA, Fagotti L, Briggs KK, Philippon MJ. Labral Augmentation with Native Tissue Preservation with a 7.5-Year Follow-up: A Case Report. *JBJS Case Connect.* 2018 Jan-Mar;8(1):e21. doi: 10.2106/JBJS.CC.17.00155. PubMed PMID: 29595538.

Katthagen JC, Bucci G, Moatshe G, Tahal DS, Millett PJ. Improved outcomes with arthroscopic repair of partial-thickness rotator cuff tears: a systematic review. *Knee Surg Sports Traumatol Arthrosc.* 2018 Jan;26(1):113-124. doi: 10.1007/s00167-017-4564-0. Epub 2017 May 19. Review. PubMed PMID: 28526996.

Mikula JD, Slette EL, Dahl KD, Montgomery SR, Dornan GJ, O'Brien L, Turnbull TL, Hackett TR. Intraarticular arthrofibrosis of the knee alters patellofemoral contact biomechanics. *J Exp Orthop.* 2017 Dec 19;4(1):40. doi: 10.1186/s40634-017-0110-8. PubMed PMID: 29260429; PubMed Central PMCID: PMC5736518.

Moatshe G, Morris ER, Cinque ME, Pascual-Garrido C, Chahla J, Engebretsen L, Laprade RF. Biological treatment of the knee with platelet-rich plasma or bone marrow aspirate concentrates. *Acta Orthop.* 2017 Dec;88(6):670-674. doi: 10.1080/17453674.2017.1368899. Epub 2017 Aug 23. Review. PubMed PMID: 28831830; PubMed Central PMCID: PMC5694813.

Hussain ZB, Chahla J, Mandelbaum BR, Gomoll AH, LaPrade RF. The Role of Meniscal Tears in Spontaneous Osteonecrosis of the Knee: A Systematic Review of Suspected Etiology and a Call to Revisit Nomenclature. *Am J Sports Med.* 2017 Dec 1:363546517743734. doi: 10.1177/0363546517743734. [Epub ahead of print] PubMed PMID: 29253348.

Whitney KE, Liebowitz A, Bolia IK, Chahla J, Ravuri S, Evans TA, Philippon MJ, Huard J. Current perspectives on biological approaches for osteoarthritis. *Ann N Y Acad Sci.* 2017 Dec;1410(1):26-43. doi: 10.1111/nyas.13554. Review. PubMed PMID: 29265418.

Millett PJ, Espinoza C, Horan MP, Ho CP, Warth RJ, Dornan GJ, Katthagen JC. Correction to: Predictors of outcomes after arthroscopic transosseous equivalent rotator cuff repair in 155 cases: a propensity score weighted analysis of knotted and knotless self-reinforcing repair techniques at a minimum of 2 years. *Arch Orthop Trauma Surg.* 2017 Dec;137(12):1761. doi: 10.1007/s00402-017-2819-3. PubMed PMID: 29063182.

Moatshe G, Godin JA, Chahla J, Cinque ME, Kennedy NI, Sanchez G, Beaulieu-Jones BR, LaPrade RF, Provencher MT. Clinical and Radiologic Outcomes After Scaphoid Fracture: Injury and Treatment Patterns in National Football League Combine Athletes Between 2009 and 2014. *Arthroscopy.* 2017 Dec;33(12):2154-2158. doi: 10.1016/j.arthro.2017.08.259. PubMed PMID: 29102567.

Cinque ME, Geeslin AG, Chahla J, Moatshe G, Pogorzelski J, DePhillipo NN, LaPrade RF. The Heel Height Test: A Novel Tool for the Detection of Combined Anterior Cruciate Ligament and Fibular Collateral Ligament Tears. *Arthroscopy.* 2017 Dec;33(12):2177-2181. doi: 10.1016/j.arthro.2017.06.028. Epub 2017 Aug 16. PubMed PMID: 28822632.

Fox JA, Sanchez A, Zajac TJ, Provencher MT. Understanding the Hill-Sachs Lesion in Its Role in Patients with Recurrent Anterior Shoulder Instability. *Curr Rev Musculoskelet Med.* 2017 Dec;10(4):469-479. doi: 10.1007/s12178-017-9437-0. Review. PubMed PMID: 29101634; PubMed Central PMCID: PMC5685959.

Moatshe G, Dornan GJ, Ludvigsen T, Løken S, LaPrade RF, Engebretsen L. High prevalence of knee osteoarthritis at a minimum 10-year follow-up after knee dislocation surgery. *Knee Surg Sports Traumatol Arthrosc.* 2017 Dec;25(12):3914-3922. doi: 10.1007/s00167-017-4443-8. Epub 2017 Mar 9. PubMed PMID: 28280907.

Dean CS, Chahla J, Matheny LM, Cram TR, Moulton SG, Dornan GJ, Mitchell JJ, LaPrade RF. Posteromedially placed plates with anterior staple reinforcement are not successful in decreasing tibial slope in opening-wedge proximal tibial osteotomy. *Knee Surg Sports Traumatol Arthrosc.* 2017 Dec;25(12):3687-3694. doi: 10.1007/s00167-016-4311-y. Epub 2016 Sep 9. PubMed PMID: 27613538.

Uchida S, Hatakeyama A, Kanezaki S, Utsunomiya H, Suzuki H, Mori T, Chang A, Matsuda DK, Sakai A. Endoscopic shelf acetabuloplasty can improve clinical outcomes and achieve return to sports-related activity in active patients with hip dysplasia. *Knee Surg Sports Traumatol Arthrosc.* 2017 Nov 28. doi: 10.1007/s00167-017-4787-0. [Epub ahead of print] PubMed PMID: 29185006.

Haber DB, Spang RC, Sanchez G, Sanchez A, Ferrari MB, Provencher MT. Revision Acromioclavicular-Coracoclavicular Reconstruction: Use of Precontoured Button and 2 Allografts. *Arthrosc Tech.* 2017 Nov 27;6(6):e2283-e2288. doi: 10.1016/j.eats.2017.08.039. eCollection 2017 Dec. PubMed PMID: 29349032; PubMed Central PMCID: PMC5766048.

Locks R, Chahla J, Bolia IK, Briggs KK, Philippon MJ. Outcomes following arthroscopic hip segmental labral reconstruction using autologous capsule tissue or indirect head of the rectus tendon. *J Hip Preserv Surg.* 2017 Nov 22;5(1):73-77. doi: 10.1093/jhps/hnx033. eCollection 2018 Jan. PubMed PMID: 29423254; PubMed Central PMCID: PMC5798156.

De Aguiar TO, Oliboni LS, Dezotti VM, Kennedy NI, Ferrari MB, Ellera Gomes JL. Simultaneous Radiographic Technique to Evaluate Ankle Instability. *Arthrosc Tech.* 2017 Nov 13;6(6):e2187-e2190. doi: 10.1016/j.eats.2017.08.028. eCollection 2017 Dec. PubMed PMID: 29349017; PubMed Central PMCID: PMC5766444.

Ellera Gomes JL, de Aguiar MR, Horta Barbosa LB, Kennedy NI, Ferrari MB. The External Rotation Radiographic Technique for Posterolateral Injury. *Arthrosc Tech.* 2017 Nov 13;6(6):e2183-e2186. doi: 10.1016/j.eats.2017.08.024. eCollection 2017 Dec. PubMed PMID: 29349016; PubMed Central PMCID: PMC5765720.

Golshani K, Cinque ME, O'Halloran P, Softness K, Keeling L, Macdonell JR. Upper extremity weightlifting injuries: Diagnosis and management. *J Orthop.* 2017 Nov 7;15(1):24-27. doi: 10.1016/j.jor.2017.11.005. eCollection 2018 Mar. Review. PubMed PMID: 29657436; PubMed Central PMCID: PMC5895929.

Rocha de Aguiar M, Horta Barbosa LB, Ferrari MB, Kennedy NI, Vieira de Castro J, Ellera Gomes JL. Simultaneous Bilateral Knee Valgus Stress Radiographic Technique. *Arthrosc Tech.* 2017 Nov 6;6(6):e2119-e2122. doi: 10.1016/j.eats.2017.08.032. eCollection 2017 Dec. PubMed PMID: 29349006; PubMed Central PMCID: PMC5766356.

Vinagre G, Kennedy NI, Chahla J, Cinque ME, Hussain ZB, Olesen ML, LaPrade RF. Hamstring Graft Preparation Techniques for Anterior Cruciate Ligament Reconstruction. *Arthrosc Tech.* 2017 Nov 6;6(6):e2079-e2084. doi: 10.1016/j.eats.2017.08.031. eCollection 2017 Dec. PubMed PMID: 29349000; PubMed Central PMCID: PMC5766355.

Chahla J, DePhillipo NN, Cinque ME, Kennedy NI, Lebus GF, Familiari F, Moatshe G, LaPrade RF. Open Repair of Quadriceps Tendon With Suture Anchors and Semitendinosus Tendon Allograft Augmentation. *Arthrosc Tech.* 2017 Nov 6;6(6):e2071-e2077. doi: 10.1016/j.eats.2017.08.005. eCollection 2017 Dec. PubMed PMID: 29348999; PubMed Central PMCID: PMC5766257.

Chahla J, Kennedy NI, Geeslin AG, Moatshe G, Cinque ME, DePhillipo NN, LaPrade RF. Meniscal Repair With Fibrin Clot Augmentation. *Arthrosc Tech.* 2017 Nov 6;6(6):e2065-e2069. doi: 10.1016/j.eats.2017.08.006. eCollection 2017 Dec. PubMed PMID: 29348998; PubMed Central PMCID: PMC5766256.

Moatshe G, Cinque ME, Godin JA, Vap AR, Chahla J, LaPrade RF. Comparable Outcomes After Bucket-Handle Meniscal Repair and Vertical Meniscal Repair Can Be Achieved at a Minimum 2 Years' Follow-up. *Am J Sports Med.* 2017 Nov;45(13):3104-3110. doi: 10.1177/0363546517719244. Epub 2017 Aug 14. PubMed PMID: 28806092.

Chahla J, Moatshe G, Cinque ME, Dornan GJ, Mitchell JJ, Ridley TJ, LaPrade RF. Single-Bundle and Double-Bundle Posterior Cruciate Ligament Reconstructions: A Systematic Review and Meta-analysis of 441 Patients at a Minimum 2 Years' Follow-up. *Arthroscopy.* 2017 Nov;33(11):2066-2080. doi: 10.1016/j.arthro.2017.06.049. Epub 2017 Aug 31. Review. PubMed PMID: 28866340.

Kocher MS, Logan CA, Kramer DE. Discoid Lateral Meniscus in Children: Diagnosis, Management, and Outcomes. *J Am Acad Orthop Surg.* 2017 Nov;25(11):736-743. doi: 10.5435/JAAOS-D-15-00491. Review. PubMed PMID: 29059110.

Geeslin AG, Geeslin MG, Chahla J, Mannava S, Frangiamore S, Philippon MJ. Comprehensive Clinical Evaluation of Femoroacetabular Impingement: Part 3, Magnetic Resonance Imaging. *Arthrosc Tech.* 2017 Oct 30;6(5):e2011-e2018. doi: 10.1016/j.eats.2017.06.062. eCollection 2017 Oct. PubMed PMID: 29399469; PubMed Central PMCID: PMC5794495.

Mannava S, Geeslin AG, Frangiamore SJ, Cinque ME, Geeslin MG, Chahla J, Philippon MJ. Comprehensive Clinical Evaluation of Femoroacetabular Impingement: Part 2, Plain Radiography. *Arthrosc Tech.* 2017 Oct 30;6(5):e2003-e2009. doi: 10.1016/j.eats.2017.06.011. eCollection 2017 Oct. PubMed PMID: 29399468; PubMed Central PMCID: PMC5794674.

Frangiamore S, Mannava S, Geeslin AG, Chahla J, Cinque ME, Philippon MJ. Comprehensive Clinical Evaluation of Femoroacetabular Impingement: Part 1, Physical Examination. *Arthrosc Tech.* 2017 Oct 30;6(5):e1993-e2001. doi: 10.1016/j.eats.2017.03.027. eCollection 2017 Oct. PubMed PMID: 29399467; PubMed Central PMCID: PMC5792748.

Murray IR, Gonzalez ZN, Baily J, Dobie R, Wallace RJ, Mackinnon AC, Smith JR, Greenhalgh SN, Thompson AI, Conroy KP, Griggs DW, Ruminski PG, Gray GA, Singh M, Campbell MA, Kendall TJ, Dai J, Li Y, Iredale JP, Simpson H, Huard J, Péault B, Henderson NC. αv integrins on mesenchymal cells regulate skeletal and cardiac muscle fibrosis. *Nat Commun.* 2017 Oct 24;8(1):1118. doi: 10.1038/s41467-017-01097-z. PubMed PMID: 29061963; PubMed Central PMCID: PMC5653645.

Godin JA, Hussain ZB, Sanchez A, Sanchez G, Ferrari MB, Cinque ME, Kennedy NI, Provencher MT. Multicompartmental Osteochondral Allografts of Knee and Concomitant High Tibial Osteotomy. *Arthrosc Tech.* 2017 Oct 23;6(5):e1959-e1965. doi: 10.1016/j.eats.2017.07.026. eCollection 2017 Oct. PubMed PMID: 29430397; PubMed Central PMCID: PMC5799047.

Ohnishi Y, Chang A, Utsunomiya H, Suzuki H, Nakamura E, Sakai A, Uchida S. Arthroscopic Technique to Reduce Suture Button Migration During Anterior Cruciate Ligament Reconstruction Procedure. *Arthrosc Tech.* 2017 Oct 23;6(5):e1927-e1931. doi: 10.1016/j.eats.2017.07.016. eCollection 2017 Oct. PubMed PMID: 29416980; PubMed Central PMCID: PMC5797844.

Gomes JLE, Leie MA, de Freitas Soares A, Ferrari MB, Sánchez G. Posterior Capsulotomy of the Knee: Treatment of Minimal Knee Extension Deficit. *Arthrosc Tech.* 2017 Oct 12;6(5):e1535-e1539. doi: 10.1016/j.eats.2017.06.033. eCollection 2017 Oct. PubMed PMID: 29354470; PubMed Central PMCID: PMC5709971.

Suzuki H, Chang A, Kumagae H, Shimizu Y, Sakai A, Uchida S. Arthroscopic Shoelace Side-to-Side Repair Technique Using Ultratape for the Treatment of Longitudinal Midsubstance Rotator Cuff Tears. *Arthrosc Tech.* 2017 Oct 9;6(5):e1845-e1850. doi: 10.1016/j.eats.2017.06.058. eCollection 2017 Oct. PubMed PMID: 29430390; PubMed Central PMCID: PMC5799492.

Sanchez G, Kennedy NI, Ferrari MB, Mannava S, Frangiamore SJ, Provencher MT. Arthroscopic Labral Repair in the Setting of Recurrent Posterior Shoulder Instability. *Arthrosc Tech.* 2017 Oct 9;6(5):e1789-e1794. doi: 10.1016/j.eats.2017.06.055. eCollection 2017 Oct. PubMed PMID: 29430388; PubMed Central PMCID: PMC5799491.

Buyukdogan K, Utsunomiya H, Bolia I, Fagotti L, Lebus GF, Briggs KK, Philippon MJ. Right Versus Left Hip Arthroscopy for Surgeons on the Learning Curve. *Arthrosc Tech.* 2017 Oct 9;6(5):e1837-e1844. doi: 10.1016/j.eats.2017.07.013. eCollection 2017 Oct. PubMed PMID: 29399466; PubMed Central PMCID: PMC5795093.

Sanchez G, Chahla J, Moatshe G, Ferrari MB, Kennedy NI, Provencher MT. Superior Capsular Reconstruction With Superimposition of Rotator Cuff Repair for Massive Rotator Cuff Tear. *Arthrosc Tech.* 2017 Oct 2;6(5):e1775-e1779. doi 10.1016/j.eats.2017.06.049. eCollection 2017 Oct. PubMed PMID: 29416966; PubMed Central PMCID: PMC5795266.

Cinque ME, Chahla J, Moatshe G, DePhillipo NN, Kennedy NI, Godin JA, LaPrade RF. Outcomes and Complication Rates After Primary Anterior Cruciate Ligament Reconstruction Are Similar in Younger and Older Patients. *Orthop J Sports Med.* 2017 Oct 2;5(10):2325967117729659. doi: 10.1177/2325967117729659. eCollection 2017 Oct. PubMed PMID: 29051896; PubMed Central PMCID: PMC5637972.

Paproki A, Engstrom C, Strudwick M, Wilson KJ, Surowiec RK, Ho C, Crozier S, Fripp J. Automated T2-mapping of the Menisci From Magnetic Resonance Images in Patients with Acute Knee Injury. *Acad Radiol.* 2017 Oct;24(10):1295-1304. doi: 10.1016/j.acra.2017.03.025. Epub 2017 May 24. PubMed PMID: 28551397.

Familiari F, Cinque ME, Chahla J, Godin JA, Olesen ML, Moatshe G, LaPrade RF. Clinical Outcomes and Failure Rates of Osteochondral Allograft Transplantation in the Knee: A Systematic Review. *Am J Sports Med.* 2017 Oct 1:363546517732531. doi: 10.1177/0363546517732531. [Epub ahead of print] PubMed PMID: 29039969.

Edgar CM, Singh H, Obopilwe E, Voss A, Divenere J, Tassavor M, Comer B, Sanchez G, Mazzocca AD, Provencher MT. Pectoralis Major Repair: A Biomechanical Analysis of Modern Repair Configurations Versus Traditional Repair Configuration. *Am J Sports Med.* 2017 Oct;45(12):2858-2863. doi: 10.1177/0363546517716175. Epub 2017 Jul 27. PubMed PMID: 28749741.

Millett PJ, Espinoza C, Horan MP, Ho CP, Warth RJ, Dornan GJ, Christoph Katthagen J. Predictors of outcomes after arthroscopic transosseous equivalent rotator cuff repair in 155 cases: a propensity score weighted analysis of knotted and knotless self-reinforcing repair techniques at a minimum of 2 years. *Arch Orthop Trauma Surg.* 2017 Oct;137(10):1399-1408. doi: 10.1007/s00402-017-2750-7. Epub 2017 Jul 26. Erratum in: Arch Orthop Trauma Surg. 2017 Dec;137(12):1761. PubMed PMID: 28748291.

Vap AR, Katthagen JC, Tahal DS, Horan MP, Fritz EM, Pogorzelski J, Millett PJ. Isolated Biceps Reflection Pulley Tears Treated With Subpectoral Biceps Tenodesis: Minimum 2-Year Outcomes. *Arthroscopy.* 2017 Oct;33(10):1788-1794. doi: 10.1016/j.arthro.2017.04.021. Epub 2017 Sep 6. PubMed PMID: 28888723.

Marchetti DC, Phelps BM, Dahl KD, Slette EL, Mikula JD, Dornan GJ, Bucci G, Turnbull TL, Singleton SB. A Contact Pressure Analysis Comparing an All-Inside and Inside-Out Surgical Repair Technique for Bucket-Handle Medial Meniscus Tears. *Arthroscopy.* 2017 Oct;33(10):1840-1848. doi: 10.1016/j.arthro.2017.04.013. Epub 2017 Jul 25. PubMed PMID: 28754246.

LaPrade RF, O'Brien L, Kennedy NI, Cinque ME, Chahla J. Return to National Basketball Association Competition Following Anterior Cruciate Ligament and Fibular Collateral Ligament Injuries: A Case Report. *JBJS Case Connect.* 2017 Oct-Dec;7(4):e81. doi: 10.2106/JBJS.CC.17.00085. PubMed PMID: 29286965.

Kennedy NI, Sanchez G, Mannava S, Ferrari MB, Frangiamore SJ, Provencher MT. Arthroscopic Rotator Cuff Repair With Mini-open Subpectoral Biceps Tenodesis. *Arthrosc Tech.* 2017 Sep 25;6(5):e1667-e1674. doi: 10.1016/j.eats.2017.06.036. eCollection 2017 Oct. PubMed PMID: 29416964; PubMed Central PMCID: PMC5795267.

Kennedy NI, Ferrari MB, Godin JA, Sanchez G, Provencher MT. Repair of an Isolated Coracoid Fracture With Suture Anchor Fixation. *Arthrosc Tech.* 2017 Sep 25;6(5):e1715-e1719. doi: 10.1016/j.eats.2017.06.042. eCollection 2017 Oct. PubMed PMID: 29399456; PubMed Central PMCID: PMC5793893.

Cinque ME, Kennedy NI, Moatshe G, Vinagre G, Chahla J, Hussain ZB, LaPrade RF. Osteochondral Allograft Transplants for Large Trochlear Defects. *Arthrosc Tech.* 2017 Sep 25;6(5):e1703-e1707. doi: 10.1016/j.eats.2017.06.027. eCollection 2017 Oct. PubMed PMID: 29399454; PubMed Central PMCID: PMC5793488.

Hussain ZB, Godin JA, Sanchez G, Kennedy NI, Cinque ME, Ferrari MB, Provencher MT. Reverse Total Shoulder Arthroplasty With Humeral Head Autograft Fixed Onto Glenoid for Treatment of Severe Glenoid Retroversion. *Arthrosc Tech.* 2017 Sep 25;6(5):e1691-e1695. doi: 10.1016/j.eats.2017.06.025. eCollection 2017 Oct. PubMed PMID: 29399452; PubMed Central PMCID: PMC5794907.

Axibal DP, Mitchell JJ, Mayo MH, Chahla J, Dean CS, Palmer CE, Campbell K, Vidal AF, Rhodes JT. Epidemiology of Anterior Tibial Spine Fractures in Young Patients: A Retrospective Cohort Study of 122 Cases. *J Pediatr Orthop.* 2017 Sep 22. doi: 10.1097/BPO.0000000000001080. [Epub ahead of print] PubMed PMID: 28945690.

Godin JA, Cinque ME, Pogorzelski J, Moatshe G, Chahla J, LaPrade RF. Multiligament Knee Injuries in Older Adolescents: A 2-Year Minimum Follow-up Study. *Orthop J Sports Med.* 2017 Sep 22;5(9):2325967117727717. doi: 10.1177/2325967117727717. eCollection 2017 Sep. PubMed PMID: 28975131; PubMed Central PMCID: PMC5613854.

Gomes JLE, Leie MA, Marczwski M, Sánchez G, Ferrari MB. Intra-articular Anterior Cruciate Ligament Reconstruction With Extra-articular Lateral Tenodesis of the Iliotibial Band. *Arthrosc Tech.* 2017 Sep 4;6(5):e1507-e1514. doi: 10.1016/j.eats.2017.05.032. eCollection 2017 Oct. PubMed PMID: 29354466; PubMed Central PMCID: PMC5709921.

Dean CS, Fernandes O, Cinque ME, Chahla J, LaPrade RF. Paraskiing Crash and Knee Dislocation With Multiligament Reconstruction and Iliotibial Band Repair. *Am J Orthop* (Belle Mead NJ). 2017 Sep/Oct;46(5):E301-E307. PubMed PMID: 29099891.

Godin JA, Chahla J, Moatshe G, Kruckeberg BM, Muckenhirn KJ, Vap AR, Geeslin AG, LaPrade RF. A Comprehensive Reanalysis of the Distal Iliotibial Band: Quantitative Anatomy, Radiographic Markers, and Biomechanical Properties. *Am J Sports Med.* 2017 Sep;45(11):2595-2603. doi: 10.1177/0363546517707961. Epub 2017 Jun 13. PubMed PMID: 28609131.

Bade MJ, Struessel T, Dayton M, Foran J, Kim RH, Miner T, Wolfe P, Kohrt WM, Dennis D, Stevens-Lapsley JE. Early High-Intensity Versus Low-Intensity Rehabilitation After Total Knee Arthroplasty: A Randomized Controlled Trial. *Arthritis Care Res* (Hoboken). 2017 Sep;69(9):1360-1368. doi: 10.1002/acr.23139. Epub 2017 Aug 13. PubMed PMID: 27813347; PubMed Central PMCID: PMC5415445.

Kruckeberg BM, Cinque ME, Moatshe G, Marchetti D, DePhillipo NN, Chahla J, LaPrade RF. Proximal Tibiofibular Joint Instability and Treatment Approaches: A Systematic Review of the Literature. *Arthroscopy.* 2017 Sep;33(9):1743-1751. doi: 10.1016/j.arthro.2017.03.027. Review. PubMed PMID: 28865578.

DePhillipo NN, Lebus GF, Cinque ME, Kennedy NI, Chahla J, LaPrade RF. Iatrogenic Trochlear Chondral Defects After Anterolateral Placement of Retrograde Femoral Nails. *Arthroscopy.* 2017 Sep;33(9):1727-1730. doi: 10.1016/j.arthro.2017.06.004. Epub 2017 Jul 25. PubMed PMID: 28754245.

Davies GJ, McCarty E, Provencher M, Manske RC. ACL Return to Sport Guidelines and Criteria. *Curr Rev Musculoskelet Med.* 2017 Sep;10(3):307-314. doi: 10.1007/s12178-017-9420-9. Review. PubMed PMID: 28702921; PubMed Central PMCID: PMC5577421.

Euler SA, Petri M, Venderley MB, Dornan GJ, Schmoelz W, Turnbull TL, Plecko M, Kralinger FS, Millett PJ. Biomechanical evaluation of straight antegrade nailing in proximal humeral fractures: the rationale of the "proximal anchoring point". *Int Orthop.* 2017 Sep;41(9):1715-1721. doi: 10.1007/s00264-017-3498-y. Epub 2017 May 11. PubMed PMID: 28497166.

Frank RM, Romeo AA, Provencher MT. Posterior Glenohumeral Instability: Evidence-based Treatment. *J Am Acad Orthop Surg.* 2017 Sep;25(9):610-623. doi: 10.5435/JAAOS-D-15-00631. Review. PubMed PMID: 28837454.

Corenman DS, Strauch EL, Dornan GJ, Otterstrom E, Zalepa King L. Navigation accuracy comparing non-covered frame and use of plastic sterile drapes to cover the reference frame in 3D acquisition. *J Spine Surg.* 2017 Sep;3(3):392-397. doi: 10.21037/jss.2017.08.14. PubMed PMID: 29057348; PubMed Central PMCID: PMC5637194.

LeBus GF, Chahla J, Sanchez G, Akamefula R, Moatshe G, Phocas A, Price MD, Whalen JM, LaPrade RF, Provencher MT. The Latarjet Procedure at the National Football League Scouting Combine: An Imaging and Performance Analysis. *Orthop J Sports Med.* 2017 Sep 1;5(9):2325967117726045. doi: 10.1177/2325967117726045. eCollection 2017 Sep. PubMed PMID: 28894758; PubMed Central PMCID: PMC5582664.

Kennedy NI, Godin JA, Ferrari MB, Sanchez G, Cinque ME, Hussain ZB, Provencher MT. Subpectoral Biceps Tenodesis: Interference Screw and Cortical Button Fixation. *Arthrosc Tech.* 2017 Aug 28;6(4):e1415-e1420. doi: 10.1016/j.eats.2017.05.028. eCollection 2017 Aug. PubMed PMID: 29354450; PubMed Central PMCID: PMC5622588.

Murray IR, Murray AD, Geeslin AG, Goudie EB, White TO, Petrigliano FA, LaPrade RF. Infographic: we need minimum reporting standards for biologics. *Br J Sports Med.* 2017 Aug 22. pii: bjsports-2017-098122. doi: 10.1136/bjsports-2017-098122. [Epub ahead of print] PubMed PMID: 28831016.

Godin JA, Sanchez G, Kennedy NI, Ferrari MB, Provencher MT. Open Repair of an Anterior Humeral Avulsion of the Glenohumeral Ligament. *Arthrosc Tech.* 2017 Aug 21;6(4):e1367-e1371. doi: 10.1016/j.eats.2017.05.019. eCollection 2017 Aug. PubMed PMID: 29354442; PubMed Central PMCID: PMC5622309.

Sanchez G, Kennedy NI, Ferrari MB, Chang A, Provencher MT. Sternoclavicular Joint Reconstruction in the Setting of Medial Comminuted Clavicle Fracture. *Arthrosc Tech.* 2017 Aug 21;6(4):e1355-e1359. doi: 10.1016/j.eats.2017.05.026. eCollection 2017 Aug. PubMed PMID: 29354440; PubMed Central PMCID: PMC5622535.

Sanchez G, Ferrari MB, Sanchez A, Kennedy NI, Provencher MT. Pectoralis Major Transfer for Treatment of Serratus Anterior Dysfunction in the Setting of Long Thoracic Nerve Palsy. *Arthrosc Tech.* 2017 Aug 21;6(4):e1347-e1353. doi: 10.1016/j.eats.2017.05.013. eCollection 2017 Aug. PubMed PMID: 29354439; PubMed Central PMCID: PMC5622283.

Ferrari MB, Sanchez G, Kennedy NI, Sanchez A, Schantz K, Provencher MT. Osteotomy of the Tibial Tubercle for Anteromedialization. *Arthrosc Tech.* 2017 Aug 21;6(4):e1341-e1346. doi: 10.1016/j.eats.2017.05.012. eCollection 2017 Aug. PubMed PMID: 29354438; PubMed Central PMCID: PMC5622281.

Vopat B, Beaulieu-Jones BR, Waryasz G, McHale KJ, Sanchez G, Logan CA, Whalen JM, DiGiovanni CW, Provencher MT. Epidemiology of Navicular Injury at the NFL Combine and Their Impact on an Athlete's Prospective NFL Career. *Orthop J Sports Med.* 2017 Aug 18;5(8):2325967117723285. doi: 10.1177/2325967117723285. eCollection 2017 Aug. PubMed PMID: 28840151; PubMed Central PMCID: PMC5565004.

Rodriguez-Fontan F, Payne KA, Chahla J, Mei-Dan O, Richards A, Uchida S, Pascual-Garrido C. Viability and Tissue Quality of Cartilage Flaps From Patients With Femoroacetabular Hip Impingement: A Matched-Control Comparison. *Orthop J Sports Med.* 2017 Aug 16;5(8):2325967117723608. doi: 10.1177/2325967117723608. eCollection 2017 Aug. PubMed PMID: 28868322; PubMed Central PMCID: PMC5562333.

Cinque ME, Godin JA, Moatshe G, Chahla J, Kruckeberg BM, Pogorzelski J, LaPrade RF. Do Tibial Plateau Fractures Worsen Outcomes of Knee Ligament Injuries? A Matched Cohort Analysis. *Orthop J Sports Med.* 2017 Aug 15;5(8):2325967117723895. doi: 10.1177/2325967117723895. eCollection 2017 Aug. PubMed PMID: 28840154; PubMed Central PMCID: PMC5560511.

DePhillipo NN, Cinque ME, Kennedy NI, Chahla J, Geeslin AG, Moatshe G, Engebretsen L, LaPrade RF. Inside-Out Repair of Meniscal Ramp Lesions. *Arthrosc Tech.* 2017 Aug 14;6(4):e1315-e1320. doi: 10.1016/j.eats.2017.05.011. eCollection 2017 Aug. PubMed PMID: 29354435; PubMed Central PMCID: PMC5622282.

da Silva RC, Pavei BS, Ferrari MB, Sanchez G, Horta Barbosa LB, Gomes JLE. Acromioclavicular Joint Dislocation: Repair Through Open Ligament Transfer and Nonabsorbable Suture Fixation. *Arthrosc Tech.* 2017 Aug 7;6(4):e1263-e1270. doi: 10.1016/j.eats.2017.05.004. eCollection 2017 Aug. PubMed PMID: 29354426; PubMed Central PMCID: PMC5622208.

Godin JA, Sanchez G, Cinque ME, Chahla J, Kennedy NI, Provencher MT. Osteochondral Allograft Transplantation for Treatment of Medial Femoral Condyle Defect. *Arthrosc Tech.* 2017 Aug 7;6(4):e1239-e1244. doi: 10.1016/j.eats.2017.04.010. eCollection 2017 Aug. PubMed PMID: 29354423; PubMed Central PMCID: PMC5621986.

Muckenhirn KJ, Kruckeberg BM, Cinque ME, Chahla J, DePhillipo NN, Godin JA, LaPrade RF. Arthroscopic Inside-Out Repair of a Meniscus Bucket-Handle Tear Augmented With Bone Marrow Aspirate Concentrate. *Arthrosc Tech.* 2017 Aug 7;6(4):e1221-e1227. doi: 10.1016/j.eats.2017.04.014. eCollection 2017 Aug. PubMed PMID: 29354421; PubMed Central PMCID: PMC5622027.

Cinque ME, Geeslin AG, Chahla J, Dornan GJ, LaPrade RF. Two-Tunnel Transtibial Repair of Radial Meniscus Tears Produces Comparable Results to Inside-Out Repair of Vertical Meniscus Tears. *Am J Sports Med.* 2017 Aug;45(10):2253-2259. doi: 10.1177/0363546517704425. Epub 2017 May 16. PubMed PMID: 28510478.

DePhillipo NN, Cinque ME, Chahla J, Geeslin AG, LaPrade RF. Anterolateral Ligament Reconstruction Techniques, Biomechanics, and Clinical Outcomes: A Systematic Review. *Arthroscopy.* 2017 Aug;33(8):1575-1583. doi: 10.1016/j.arthro.2017.03.009. Epub 2017 May 11. Review. PubMed PMID: 28502387.

Moatshe G, Cinque ME, Kruckeberg BM, Chahla J, LaPrade RF. Medial Patellar Instability: A Systematic Review of the Literature of Outcomes After Surgical Treatment. *Arthroscopy.* 2017 Aug;33(8):1587-1593. doi: 10.1016/j.arthro.2017.03.012. Epub 2017 May 10. Review. PubMed PMID: 28501222.

Neubert A, Wilson KJ, Engstrom C, Surowiec RK, Paproki A, Johnson N, Crozier S, Fripp J, Ho CP. Comparison of 3D bone models of the knee joint derived from CT and 3T MR imaging. *Eur J Radiol.* 2017 Aug;93:178-184. doi: 10.1016/j.ejrad.2017.05.042. Epub 2017 Jun 3. PubMed PMID: 28668413.

Mu X, Tang Y, Takayama K, Chen W, Lu A, Wang B, Weiss K, Huard J. RhoA/ROCK inhibition improves the beneficial effects of glucocorticoid treatment in dystrophic muscle: implications for stem cell depletion. *Hum Mol Genet.* 2017 Aug 1;26(15):2813-2824. doi: 10.1093/hmg/ddx117. PubMed PMID: 28549178; PubMed Central PMCID: PMC5886088.

Jensen G, Millett PJ, Tahal DS, Al Ibadi M, Lill H, Katthagen JC. Concomitant glenohumeral pathologies associated with acute and chronic grade III and grade V acromioclavicular joint injuries. *Int Orthop.* 2017 Aug;41(8):1633-1640. doi: 10.1007/s00264-017-3469-3. Epub 2017 Apr 28. PubMed PMID: 28455736.

Logan CA, Asnis PD, Provencher MT. The Role of Therapeutic Modalities in Surgical and Nonsurgical Management of Orthopaedic Injuries. *J Am Acad Orthop Surg.* 2017 Aug;25(8):556-568. doi: 10.5435/JAAOS-D-15-00348. Review. PubMed PMID: 28737616.

Piuzzi NS, Chahla J, Jiandong H, Chughtai M, LaPrade RF, Mont MA, Muschler GF, Pascual-Garrido C. Analysis of Cell Therapies Used in Clinical Trials for the Treatment of Osteonecrosis of the Femoral Head: A Systematic Review of the Literature. *J Arthroplasty.* 2017 Aug;32(8):2612-2618. doi: 10.1016/j.arth.2017.02.075. Epub 2017 Mar 15. Review. PubMed PMID: 28392136.

Mook WR, Civitarese D, Turnbull TL, Kennedy NI, O'Brien L, Schoeberl JB, LaPrade RF. Double-bundle posterior cruciate ligament reconstruction: a biomechanical analysis of simulated early motion and partial and full weightbearing on common reconstruction grafts. *Knee Surg Sports Traumatol Arthrosc.* 2017 Aug;25(8):2536-2544. doi: 10.1007/s00167-016-4056-7. Epub 2016 Mar 21. PubMed PMID: 27000394.

Fritz EM, Pogorzelski J, Hussain ZB, Godin JA, Millett PJ. Arthroscopic Repair of Humeral Avulsion of the Glenohumeral Ligament Lesion. *Arthrosc Tech.* 2017 Jul 31;6(4):e1195-e1200. doi: 10.1016/j.eats.2017.04.008. eCollection 2017 Aug. PubMed PMID: 29354417; PubMed Central PMCID: PMC5621980.

Hamamoto JT, Frank RM, Higgins JD, Provencher MT, Romeo AA, Verma NN. Shoulder Arthroscopy in the Lateral Decubitus Position. *Arthrosc Tech.* 2017 Jul 31;6(4): e1169-e1175. doi: 10.1016/j.eats. 2017.04.004. eCollection 2017 Aug. PubMed PMID: 29354413; PubMed Central PMCID: PMC5621971.

Chahla J, Moatshe G, Cinque ME, Godin J, Mannava S, LaPrade RF. Arthroscopic Anatomic Single-Bundle Anterior Cruciate Ligament Reconstruction Using Bone-Patellar Tendon-Bone Autograft: Pearls for an Accurate Reconstruction. *Arthrosc Tech.* 2017 Jul 31;6(4):e1159-e1167. doi: 10.1016/j.eats.2017.04.001. eCollection 2017 Aug. PubMed PMID: 29354412; PubMed Central PMCID: PMC5621867.

Higgins JD, Frank RM, Hamamoto JT, Provencher MT, Romeo AA, Verma NN. Shoulder Arthroscopy in the Beach Chair Position. *Arthrosc Tech.* 2017 Jul 31;6(4):e1153-e1158. doi: 10.1016/j.eats.2017.04.002. eCollection 2017 Aug. PubMed PMID: 29354411; PubMed Central PMCID: PMC5621929.

Cruz RS, Ferrari MB, Metsavaht L, LaPrade RF. Understanding posterior meniscal roots lesions: from basic science to treatment. *Rev Bras Ortop.* 2017 Jul 26;52(4):463-472. doi: 10.1016/j.rboe.2017.07.005. eCollection 2017 Jun-Jul. Review. PubMed PMID: 28884106; PubMed Central PMCID: PMC5582812.

Frangiamore SJ, Mannava S, Godin JA, Anavian J, Fritz EM, Millett PJ. Arthroscopic Pancapsular Shift With Labral Repair for Multidirectional Instability of the Shoulder. *Arthrosc Tech.* 2017 Jul 24;6(4):e1113-e1117. doi: 10.1016/j.eats.2017.03.032. eCollection 2017 Aug. PubMed PMID: 29354405; PubMed Central PMCID: PMC5621849.

Lebus GF, Fritz EM, Hussain ZB, Pogorzelski J, Millett PJ. Operative Treatment of Symptomatic Meso-Type Os Acromiale. *Arthrosc Tech.* 2017 Jul 24;6(4):e1093-e1099. doi: 10.1016/j.eats.2017.03.025. eCollection 2017 Aug. PubMed PMID: 28970997; PubMed Central PMCID: PMC5621774.

Millett PJ, Hussain ZB, Fritz EM, Warth RJ, Katthagen JC, Pogorzelski J. Rotator Cuff Tears at the Musculotendinous Junction: Classification and Surgical Options for Repair and Reconstruction. *Arthrosc Tech.* 2017 Jul 24;6(4):e1075-e1085. doi: 10.1016/j.eats.2017.03.023. eCollection 2017 Aug. PubMed PMID: 28970995; PubMed Central PMCID: PMC5621706.

Beaulieu-Jones BR, Rossy WH, Sanchez G, Whalen JM, Lavery KP, McHale KJ, Vopat BG, Van Allen JJ, Akamefula RA, Provencher MT. Epidemiology of Injuries Identified at the NFL Scouting Combine and Their Impact on Performance in the National Football League: Evaluation of 2203 Athletes From 2009 to 2015. *Orthop J Sports Med.* 2017 Jul 24;5(7):2325967117708744. doi: 10.1177/2325967117708744. eCollection 2017 Jul. PubMed PMID: 28812033; PubMed Central PMCID: PMC5529031.

Woodmass JM, LaPrade RF, Sgaglione NA, Nakamura N, Krych AJ. Meniscal Repair: Reconsidering Indications, Techniques, and Biologic Augmentation. *J Bone Joint Surg Am.* 2017 Jul 19;99(14):1222-1231. doi: 10.2106/JBJS.17.00297. PubMed PMID: 28719562.

Locks R, Utsunomiya H, Bolia I, Mannava S, Chahla J, Philippon MJ. Arthroscopic Focal Subspinal Decompression and Management of Pincer-Type Femoroacetabular Impingement. *Arthrosc Tech.* 2017 Jul 17;6(4):e1029-e1034. doi: 10.1016/j.eats.2017.03.016. eCollection 2017 Aug. PubMed PMID: 28970988; PubMed Central PMCID: PMC5621484.

Ferrari MB, Sanchez A, Sanchez G, Schantz K, Ellera Gomes JL, Provencher MT. Arthroscopic Bony Resection for Treatment of Symptomatic Bipartite Patella. *Arthrosc Tech.* 2017 Jul 10;6(4):e1003-e1007. doi: 10.1016/j.eats.2017.03.013. eCollection 2017 Aug. PubMed PMID: 28970984; PubMed Central PMCID: PMC5621425.

Mitchell JJ, Vap AR, Sanchez G, Liechti DJ, Chahla J, Moatshe G, Ferrari MB, Provencher MT. Concomitant Reverse Hill-Sachs Lesion and Posterior Humeral Avulsion of the Glenohumeral Ligament: Treatment With Fresh Talus Osteochondral Allograft and Arthroscopic Posterior Humeral Avulsion of the Glenohumeral Ligament and Labrum Repair. *Arthrosc Tech.* 2017 Jul 10;6(4):e987-e995. doi: 10.1016/j.eats.2017.03.012. eCollection 2017 Aug. PubMed PMID: 28970982; PubMed Central PMCID: PMC5621160.

LaPrade RF, Venderley MB, Dahl KD, Dornan GJ, Turnbull TL. Functional Brace in ACL Surgery: Force Quantification in an In Vivo Study. *Orthop J Sports Med.* 2017 Jul 6;5(7):2325967117714242. doi: 10.1177/2325967117714242. eCollection 2017 Jul. PubMed PMID: 28748195; PubMed Central PMCID: PMC5507383.

Pogorzelski J, Hussain ZB, Lebus GF, Fritz EM, Millett PJ. Anterior Capsular Reconstruction for Irreparable Subscapularis Tears. *Arthrosc Tech.* 2017 Jul 3;6(4):e951-e958. doi: 10.1016/j.eats.2017.03.008. eCollection 2017 Aug. PubMed PMID: 28970978; PubMed Central PMCID: PMC5621111.

Ferrari MB, Sanchez G, Chang A, Ferdousian S, Provencher MT. Medial Patellofemoral Ligament Reconstruction in a Revision Setting: Anchor and Interference Screw Fixation. *Arthrosc Tech.* 2017 Jul 3;6(4):e927-e932. doi: 10.1016/j.eats.2017.03.005. eCollection 2017 Aug. PubMed PMID: 28970976; PubMed Central PMCID: PMC5620562.

Ferrari MB, Sanchez G, Chang A, Sanchez A, Ellera Gomes JL, Provencher MT. Osteochondral Allograft Transplantation for Treatment of Focal Patellar Osteochondral Lesion. *Arthrosc Tech.* 2017 Jul 3;6(4):e907-e912. doi: 10.1016/j.eats.2017.02.025. eCollection 2017 Aug. PubMed PMID: 28970975; PubMed Central PMCID: PMC5620468.

Provencher MT, Mannava S, Tokish JM, Rogers JP. Traumatic Anterior Shoulder Instability: The US Military Experience. *Am J Orthop* (Belle Mead NJ). 2017 Jul/Aug;46(4):184-189. PubMed PMID: 28856345.

Menge TJ, Bhatia S, McNamara SC, Briggs KK, Philippon MJ. Femoroacetabular Impingement in Professional Football Players: Return to Play and Predictors of Career Length After Hip Arthroscopy. *Am J Sports Med.* 2017 Jul;45(8):1740-1744. doi: 10.1177/0363546517700118. Epub 2017 Apr 19. PubMed PMID: 28422531.

Mitchell JJ, Chahla J, Dean CS, Cinque M, Matheny LM, LaPrade RF. Outcomes After 1-Stage Versus 2-Stage Revision Anterior Cruciate Ligament Reconstruction. *Am J Sports Med.* 2017 Jul;45(8):1790-1798. doi: 10.1177/0363546517698684. Epub 2017 Apr 18. PubMed PMID: 28419808.

Philippon MJ, Trindade CAC, Goldsmith MT, Rasmussen MT, Saroki AJ, Løken S, LaPrade RF. Biomechanical Assessment of Hip Capsular Repair and Reconstruction Procedures Using a 6 Degrees of Freedom Robotic System. *Am J Sports Med.* 2017 Jul;45(8):1745-1754. doi: 10.1177/0363546517697956. Epub 2017 Apr 3. PubMed PMID: 28371596.

McHale KJ, Vopat BG, Beaulieu-Jones BR, Sanchez G, Whalen JM, McDonald LS, DiGiovanni CW, Theodore GH, Provencher MT. Epidemiology and Outcomes of Lisfranc Injuries Identified at the National Football League Scouting Combine. *Am J Sports Med.* 2017 Jul;45(8):1901-1908. doi: 10.1177/0363546517697297. Epub 2017 Mar 28. PubMed PMID: 28350487.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Outcomes of Inside-out Meniscal Repair in the Setting of Multiligament Reconstruction in the Knee. *Am J Sports Med.* 2017 Jul;45(9):2098-2104. doi: 10.1177/0363546517698944. Epub 2017 Mar 27. PubMed PMID: 28346834.

Marchetti DC, Moatshe G, Phelps BM, Dahl KD, Ferrari MB, Chahla J, Turnbull TL, LaPrade RF. The Proximal Tibiofibular Joint: A Biomechanical Analysis of the Anterior and Posterior Ligamentous Complexes. *Am J Sports Med.* 2017 Jul;45(8):1888-1892. doi: 10.1177/0363546517697288. Epub 2017 Mar 24. PubMed PMID: 28339288.

Katthagen JC, Vap AR, Tahal DS, Horan MP, Millett PJ. Arthroscopic Repair of Isolated Partial- and Full-Thickness Upper Third Subscapularis Tendon Tears: Minimum 2-Year Outcomes After Single-Anchor Repair and Biceps Tenodesis. *Arthroscopy.* 2017 Jul;33(7):1286-1293. doi: 10.1016/j.arthro.2017.01.027. Epub 2017 Mar 18. PubMed PMID: 28325692.

Kraeutler MJ, Chahla J, LaPrade RF, Pascual-Garrido C. Biologic Options for Articular Cartilage Wear (Platelet-Rich Plasma, Stem Cells, Bone Marrow Aspirate Concentrate). *Clin Sports Med.* 2017 Jul;36(3):457-468. doi: 10.1016/j.csm.2017.02.004. Epub 2017 Apr 1. Review. PubMed PMID: 28577706.

Takayama K, Kawakami Y, Lavasani M, Mu X, Cummins JH, Yurube T, Kuroda R, Kurosaka M, Fu FH, Robbins PD, Niedernhofer LJ, Huard J. mTOR signaling plays a critical role in the defects observed in muscle-derived stem/progenitor cells isolated from a murine model of accelerated aging. *J Orthop Res.* 2017 Jul;35(7):1375-1382. doi: 10.1002/jor.23409. Epub 2016 Sep 22. PubMed PMID: 27572850; PubMed Central PMCID: PMC5516198.

Kraeutler MJ, Anderson J, Chahla J, Mitchell JJ, Thompson-Etzel R, Mei-Dan O, Pascual-Garrido C. Return to running after arthroscopic hip surgery: literature review and proposal of a physical therapy protocol. *J Hip Preserv Surg.* 2017 Apr 11;4(2):121-130. doi: 10.1093/jhps/hnx012. eCollection 2017 Jul. Review. PubMed PMID: 28630733; PubMed Central PMCID: PMC5467407.

Presentations

Altintas, B, Pogorzelski J, Hussain ZA, Horan MP, Fritz EM, Godin JA, Millett PJ. Minimum Two-Year Outcomes Following Arthroscopic Rotator Cuff Repair in Patients Younger than Forty-Five Years. ePoster 37th AANA 36th Annual Meeting of the Arthroscopy Association of North America, Chicago, IL. April 26-28, 2018.

Altintas B, Horan MP, Dornan GJ, Pogorzelski J, Fritz EM, Hussain Z, Godin J, Millett PJ. Patient-reported outcomes following anatomic total shoulder arthroplasty for primary glenohumeral osteoarthritis: Mid-term results at a minimum of 5 years. Podium ESSKA, 2018 Glasgow Scotland, UK. May 9-12, 2018.

Altintas B, Pogorzelsk J, Fritz EM, Hussain ZB, Horan MP, Godin JA, Millett PJ. Return to Sports after arthroscopic Rotator Cuff Repair in Patients Younger than Forty-Five Years. British Elbow & Shoulder Society Annual Conference Glasgow Scotland, June 20, 2018.

Beaulieu-Jones B, Sanchez G, Arner JW, Frank RM, LaPrade RF, Provencher MT, Bradley JP. ACL Injury in collegiate Football Athletes: Impact on Draft Status and Professional Performance. ISAKOS. Shanghai. June 2017.

Begly JP, Utsunomiya H, Buckley B, Briggs KK, Philippon MJ. Femoroacetabular Impingement in Professional Basketball Players: Return to Play and Player Statistics. ESSKA Meeting. Glasgow, Scotland, May 2018.

Bernhardson, AS, Chang A, Zajac TJ, Sanchez G, Mulcahey M, Provencher MT. The Epidemiology of Ankle Pathology Identified at the NFL Combine, 2009 – 2016. 2018 Arthroscopy Association of North America Scientific Program. Chicago IL, April 2018.

Bolia I, Utsunomiya H, Locks R, Briggs K, Rodriguez M, Philippon MJ. Poster. 20-Year Systematic Review of the Hip Pathology, Risk Factors, Treatment and Clinical Outcomes in Ballet Dancers. International Association for Dan Medicine & Science. Houston, TX, Oct. 2017.

Bolia I, Briggs K, Locks R, Utsunomiya H, Philippon MJ. Poster. Association of hip strength with the Hip Sports Test: A functional test to measure athletes' ability to return to sport activity after hip arthroscopy. AOSSM Annual Meeting, Toronto, Canada, July 2017.

Bolia I, Fagotti L, McNamara S, Briggs K, Dornan G, Philippon MJ. Prevalence of deep vein thrombosis and pulmonary embolism following hip arthroscopy. A systematic review and meta-analysis. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Bolia I, Briggs K, Utsunomiya H, Locks R, Philippon MJ. Poster. Association of Hip Strength with the Hip Sports Test: A Functional Test to Measure Patient's Ability to Return to Sports Activity after Hip Arthroscopy. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Bolia I, Briggs K, Utsunomiya H, Fagotti L, Philippon MJ. Poster. Factors and Clinical Outcomes Associated with Fibrocystic Changes of the Femur Identified by MRI in the Hip. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Bolia IK, Briggs KK, Ho CP, Philippon MJ. Poster. Factors and clinical outcomes associated with fibrocystic changes of the femur as identified by MRI in the hip. AANA Annual Meeting, Chicago, IL, April 2018.

Briggs KK, Ho CP, McNamara S, Philippon MJ. Changes in the Hip in Youth Hockey Players over 5 seasons. Poster. IOC World Conference on Prevention of Injury and Illness in Sport. Monte Carlo, Monaco, March 2017.

Briggs KK, Ho CP, McNamara S, Philippon MJ. Prevalence of Acetabular Labral Tears in Asymptomatic Young Athletes. Poster. IOC World Conference on Prevention of Injury and Illness in Sport. Monte Carlo, Monaco, March 2017.

Briggs KK, Trindade CA, Maglione D, Philippon MJ. Sport Specific Prevalence of Chondral Injuries in the Hip. Poster. IOC World Conference on Prevention of Injury and Illness in Sport. Monte Carlo, Monaco, March 2017.

Callanan M, Provencher MT. The Influence of Cervical Spine Injuries on Performance Outcomes in Prospective NFL Athletes. AAOS March 2018.

Callanan M, Provencher MT. Comparative Techniques of Stenosis Measurement in NFL Combine Athletes with Prior Cervical Injuries. AAOS March 2018.

Chahla J, Mikula J, Schon J, Dean C, Dahl K, Menge T, Turnbull T, Soares A, LaPrade R, Philippon M. Hip capsular closure: A biomechanical analysis of failure torque. AOSSM Specialty Day. San Diego, CA, March 2017.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Double-Bundle PCL Reconstruction: A Prospective Study Of Two-Year Patient Reported Outcomes With Stress Radiographs.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF ISAKOS Biennial Meeting 2017. Shanghai, China, June 2017.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Two-tunnel Transtibial Repair of Radial Meniscus Tears Produces Comparable Results to Inside-Out Repair of Vertical Meniscus Tears.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Poster, ISAKOS Biennial Meeting 2017. Shanghai, China June 2017.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Outcomes Following Single-Stage Revision Anterior Cruciate Ligament Reconstruction versus Two-Stage Revision with Tunnel Bone Grafting. Poster, ISAKOS Biennial Meeting 2017. Shanghai, China, June 2017.

Chahla J, Moatshe G, Geeslin AG, Sanchez G, Cinque ME, Provencher MP, LaPrade RF. Radial Tears of the Meniscus: Diagnosis, Advanced Surgical Techniques and Patient Outcomes. Scientific Exhibit, AAOS Annual Meeting 2017, San Diego, CA, March 2017.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Inside-out Meniscal Repairs in the Setting of Multiligament Reconstruction in the Knee: Does Meniscal Repair affect Outcomes and Failure Rates? Poster, AAOS Annual Meeting 2017, San Diego, CA, March 2017.

Chahla J, Dean CS, Matheny LM, Mitchell JJ, Cinque ME, LaPrade RF. Inside-out Meniscal Repairs in the Setting of Multiligament Reconstruction in the Knee: Does Meniscal Repair affect Outcomes and Failure Rates? Poster, AOSSM Annual Meeting 2017, Toronto, Canada, July 2017.

Chang A, Lockard CA, Shin RC, Clanton TO, Ho CP. Regional Variations of Ankle and Hindfoot Cartilage T2 Mapping Normative Values in Asymptomatic Subjects at 3 T MRI. Radiological Society of North America (RSNA), Chicago, IL, Nov. 26-Dec. 1, 2017.

Chen W, Chen H, Yifei Wang, Mu X, Huard J. Osteogenic Differentiation of Human Adipose Derived Stem Cells is Enhanced by Stem Cell Factor (SCF) through the mTOR Pathway. ORS annual meeting. San Diego, CA March 19-22, 2017.

Cheng H, Lu A, Gao X, Huard J. The expression level of Cyclin-Dependent Kinase differs between young and old muscle-derived stem cells: Implications for Cell Cycle Regulation during aging. ORS annual meeting. San Diego, CA March 19-22, 2017.

Cheng H,, Gao X, Lu A, Huard J. BMP4 regulates Cell Cycle kinetics in Aging of Muscle-Derived Stem Cells mediated Osteogenesis and bone regeneration. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Cinque M, Geeslin AG, Chahla J, Dornan GJ; LaPrade, RF. Two-tunnel Transtibial Repair of Radial Meniscus Tears Produces Comparable Results to Inside-Out Repair of Vertical Meniscus Tears. Poster, AOSSM Annual Meeting 2017, Toronto, Canada, July 2017.

Cinque ME, Chahla J, Mitchell JJ, Moatshe G, Pogorzelski J, Godin J, LaPrade RF. Do Chondral and Meniscal Pathology Identified at Time of Surgery Predict Outcomes Following Primary Anterior Cruciate Ligament Reconstruction? ePoster, American Association of Arthroscopy (AANA) Meeting 2017, Denver, CO, May 2017.

Clanton, TO. Hand-On Surgical Skills Lab. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Ankle Arthroscopy Overview. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Treating Osteochondral Defects. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Lateral Ankle Instability. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Ankle Fractures and Scoping Ankle Fractures. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Achilles Tendon Disorders & Injuries. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Ankle Fusions: Open vs Arthroscopic. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Options in Stage II Flatfoot Deformity. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Options in Stage III Flatfoot Deformity and Charcot Foot. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Hallux Valgus, Limitus/Rigidus and Varus. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. CPR Plantar Plate Repair and Lesser Toe Deformities. Arthrex Surgical Skills Training: Advanced Ankle Instability Vail, CO, Jan. 21, 2017.

Clanton, TO. Arthrex Brostrom Repair- Internal Brace Augmentation. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. Lateral Ankle Reconstruction. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. Ankle Fractures and Syndesmosis Injuries. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. Midsubstance Tears: Percutaneous Knotless Repair. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. OCD: Arthroscopic BMS+Biocartilage-TalarOATS. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. Plantar Plate Tears: Dorsal Minimally Invasive CPR Approach. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. MCO and FDL Transfer/Spring Ligament. Arthrex Foot and Ankle Symposium. Vail, CO, Feb. 2-3, 2017.

Clanton, TO. Biomechanical comparison of various repair techniques for Achilles repair. Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Comparison of outcomes between Brostrom repairs and lateral ankle reconstruction with an allograft. Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Anatomy and biomechanics of the syndesmosis ligaments. Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Let me try to kill the panel. Case presentations. Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Moderator "Tendinopathies". Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Moderator "Deltoid tears. A mini debate". Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Moderator "Hindfoot 2- Spring Ligament". Baltimore Fellows Foot & Ankle Meeting. Vail, CO, Feb. 8-11, 2017.

Clanton, TO. Hand-On Surgical Skills Lab. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Deltoid Repair and Reconstruction. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. ATFL Repair and Reconstruction. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. AITFL Internal Brace. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Spring Ligament Repair and Reconstruction. Arthrex Surgical Skills Training: Foot and Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Achilles Midsubstance Speedbridge. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Syndesmotic Tightrope and Ankle Instability. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Plantar plate repair with CPR system. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. IB applications with Hallux Varus and Valgus. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Plantar Lapidus Technique and Applications. Arthrex Surgical Skills Training: Foot & Ankle Course. Vail, CO, Feb. 17, 2017.

Clanton, TO. Foot and Ankle Trauma in the Athlete: Getting Them Back in the Game. AOSSM 2017 Specialty Day. San Diego, CA, March 6, 2017.

Clanton, TO. Ankle Sprains and Lateral Ankle Instability – Is It Really a Benign Problem? Columbia University Grand Rounds. New York, New York, May 18, 2017.

Clanton, TO. What to Do for Bad Ankle Sprains – What Is the Science? Orthopaedic Spine Lecture Series. Vail, CO, May 23, 2017.

Clanton, TO. Why Do I Fix Achilles Tendon Ruptures with a Midsubstance Speed Bridge? The Annual American Orthopaedic Foot and Ankle Society Industry Satellite Symposium. Seattle, Washington, July 12, 2017.

Clanton, TO. The Effect of Hip and Knee Arthritis on the Ankle. Rocky Mountain Orthopaedic Resident Arthroplasty Course. Denver, CO, Aug. 20, 2017.

Clanton, TO. The History of Total Ankle Arthroplasty. Rocky Mountain Orthopaedic Resident Arthroplasty Course. Denver, CO, Aug. 20, 2017.

Clanton, TO. Open Approaches/Osteotomies to Access Talar and Tibial Lesions. Controversies in Foot and Ankle Arthroscopy and Sports Medicine: Solutions and Outcomes APEx Series (AANA). Rosemont, Illinois, Sep. 9, 2017.

Clanton, TO. The Syndesmosis Dilemma: Use of the Arthroscope and Fixation Choices. Controversies in Foot and Ankle Arthroscopy and Sports Medicine: Solutions and Outcomes APEx Series (AANA). Rosemont, Illinois, Sep. 9, 2017.

Clanton, TO. Biomechanics of Ankle Ligaments and Ligament Reconstruction. Controversies in Foot and Ankle Arthroscopy and Sports Medicine: Solutions and Outcomes APEx Series (AANA). Rosemont, Illinois, Sep. 9, 2017.

Clanton, TO. Lateral Ankle Instability. Foot & Ankle: New Technology Update. Pittsburgh, Pennsylvania, Nov. 16, 2017.

Clanton, TO. Orthobiologics. Foot & Ankle: New Technology Update. Pittsburgh, Pennsylvania, Nov. 16, 2017.

Clanton, TO. InternalBrace™ Ligament Augmentation Rationale. Arthrex Medical Education Level III Foot and Ankle Fellowship Forum. Naples, Florida, April 27, 2018.

Clanton, TO. InternalBrace™ Repair for ATFL Augmentation. Arthrex Medical Education Level III Foot and Ankle Fellowship Forum. Naples, Florida, April 27, 2018.

Clanton, TO. TightRope® Literature: Where Are We Now. Arthrex Medical Education Level III Foot and Ankle Fellowship Forum. Naples, Florida, April 27, 2018.

Clanton, TO. Case Presentations: Ankle Instability. Arthrex Medical Education Level III Foot and Ankle Fellowship Forum. Naples, Florida, April 27, 2018.

Clanton, TO. Graduation History of Ankle Arthroscopy in the Ankle Joint. Annual Rockwood Orthopaedic Endowed Lectureship and Resident. Houston, Texas, June 15, 2018.

Clanton, TO. History of Total Ankle Replacement. Annual Rockwood Orthopaedic Endowed Lectureship and Resident. Houston, Texas, June 15, 2018.

Clanton, TO. Life Lessons from My Orthopaedic Training and Career. Annual Rockwood Orthopaedic Endowed Lectureship and Resident. Houston, Texas, June 15, 2018.

Clanton, TO. Round Table Case Discussions of the Foot and Ankle. American Orthopaedic Society of Sports Medicine Annual Meeting (AOSSM). San Diego, CA, July 6, 2018.

Clanton, TO. Foot and Ankle Case Panel Discussion. American Orthopaedic Society of Sports Medicine Annual Meeting (AOSSM). San Diego, CA, July 6, 2018.

Clanton, TO. The Dreaded High Ankle Sprain: How to Diagnose and How to Manage. American Orthopaedic Society of Sports Medicine Annual Meeting (AOSSM). San Diego, CA, July 8, 2018.

Clanton TO, Matheny LM, Chang A, Johnson N. Predictors of Outcomes Following Microfracture with Extracellular Cartilage Matrix Augmentation vs. Microfracture Alone for Treatment of Ankle Articular Cartilage Lesions. Annual Meeting of the AAOS New Orleans, Louisiana, March 7, 2018.

Clanton TO, Matheny LM, Chang A, Johnson N. Total Ankle Arthroplasty vs Ankle Arthrodesis: A Comparative Study of Proportional Hazard Modeling, Survivorship and Functional Outcomes. Annual Meeting of the AAOS. New Orleans, Louisiana, March 7, 2018.

Clanton TO, Matheny LM, Chang A. Total Ankle Arthroplasty vs Ankle Arthrodesis: A Comparative Study of Patient Reported Outcomes. Specialty Day of the American Orthopaedic Foot & Ankle Society (AOFAS) at the American Academy of Orthopaedic Surgeons (AAOS).New Orleans, Louisiana, March 10, 2018.

Clanton TO, Matheny LM , Chang A. Predictors of Outcomes Following Microfracture with Extracellular Cartilage Matrix Augmentation vs. Microfracture Alone for Treatment of Ankle Articular Cartilage Lesions. 18th biennial meeting of the European Society of Sports Traumatology Knee Surgery and Arthroscopy (ESSKA) Congress biennial meeting. Glasgow, Scotland,May 11, 2018.

Clanton TO. Matheny LM. Reliability and Validity of Scores from the Foot and Ankle Ability Measure: A Rasch Analysis. 18th biennial meeting of the European Society of Sports Traumatology Knee Surgery and Arthroscopy (ESSKA) Congress biennial meeting. Glasgow, Scotland, May 9-12, 2018.

Clanton TO, Matheny LM. Reliability and Validity of Scores from the Foot and Ankle Ability Measure: A Rasch Analysis. Annual Meeting of American Orthopaedic Foot & Ankle Society (AOFAS). Boston, Massachusetts, July 11-14, 2018.

Deng Z, Gao X, Sun X, Amra S,Cui Y, Huard J. Gender Difference of Tibial Fracture in a normal and muscular dystrophic Mouse Model. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Fagotti L, Utsunomiya H, Briggs K, Bolia I, Philippon MJ. Anterior acetabular coverage and valgus hip in patients with center edge angle less than 30 associated with THA after hip arthroscopy. 9th ISHA Annual Meeting, Santiago, Chile, Oct., 2017.

Fagotti L, Utsunomiya H, Briggs K, Lebus G, Locks R, Philippon MJ. Poster. To What Extent Are We Cutting the Anterior Hip Capsule During Interportal Capsulotomy? – A Cadaveric Anatomical Study of Arthroscopic Hip Surgery. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Fagotti L, Bolia I, Briggs K, Utsunomiya H, Philippon MJ. Poster. Clinical Outcomes following Arthroscopic Hip Capsular Reconstruction using Iliotibial Band Allograft versus Dermal Allograft. ESSKA Meeting. Glasgow, Scotland, May 2018.

Fiala MJ, Gao S, Guo P, Huard J. Expression of Two Necessary Genes for Cell Reprogramming in Muscle Derived Stem Cells. ORS annual meeting. San Diego, CA March 19-22, 2017.

Frangiamore S, Mannava S, Briggs K, McNamara S, Philippon MJ. Poster: Femoroacetabular Impingement in Professional Baseball Players: Return to Play Following Hip Arthroscopy. AOSSM Annual Meeting, Toronto, Canada, July 2017.

Frank J, Chahla J, Mitchell J, Motatshe BG, Sanchez G, Philippon MJ. Hip Fluid Seal: Techniques for Reestablishment. Orthopaedic Video Theater. AAOS Annual Meeting. San Diego, CA, March 2017.

Frank RM, Kim JK, O'Donnell P, Golijanin P, Verma NN, Cole BJ, Nicholson GP, Romeo AA, Provencher MT. Outcomes Of Latarjet versus Distal Tibia Allograft for Anterior Shoulder Instability Repair: A Prospective Matched Cohort Analysis. 36th Annual AANA Meeting. Denver, CO, May 19, 2017.

Frank RM, Basques B, Leroux T, Griffin J, Thorsness R, Verma NN, Provencher MT, Romeo AA. Complications Following Anterior Shoulder Instability Treatment: Bankart Repair Versus Latarjet. 36th Annual AANA Meeting. Denver, CO, May 18, 2017.

Frank RM, Kim, J, O'Donnell P, Golijanin P, Verma NN, Cole BJ, Nicholson GP, Romeo AA, Provencher MT. Outcomes of Latarjet Versus Distal Tibia Allograft for Anterior Shoulder Instability Repair " A Prospective Matched Cohort Analysis. AAOS 2017 San Diego, CA March 2017.

Frank RM, Golijanin P, Vopat BG, Chauhan VN, Gross D, Romeo AA, Provencher MT. Impact of Sagittal Rotation on Axial Glenoid Width Measurement in the Setting of Glenoid Bone Loss. 11th Biennial ISAKOS Congress, Shanghai, China. June 4-8, 2017.

Frank RM, Basques B, Leroux T, Griffin J, Thorsness R, Verma NN, Provencher MT, Romeo AA. Complications following Anterior Shoulder Instability Treatment: Bankart Repair vs Latarjet. 11th Biennial ISAKOS Congress. Shanghai, China. June 4, 2017.

Frank RM, Kim JK, O'Donnell P, Obrien M, Newgren J, Verma NN, Nicholson GP, Cole BJ, Romeo AA, Provencher MT. Outcomes of Latarjet vs. Distal Tibia Allograft for Anterior Shoulder Instability Repair: A Prospective Matched Cohort Analysis. 11th Biennial ISAKOS Congress. Shanghai, China. June 8 2017.

Frank RM, Kim JK, O'Donnell P, Obrien M, Newgren J, Verma NN, Nicholson GP, Cole BJ, Romeo AA, Provencher MT. Outcomes of Latarjet vs. Distal Tibia Allograft for Anterior Shoulder Instability Repair: A Prospective Matched Cohort Analysis. 2017 AOSSM Annual Meeting. Toronto, Canada. July 20-23, 2017.

Frank RM, Richardson CJ, Sumner S, Verma NN, Cole BJ, Romeo AA, Provencher MT. 90-Day Complications Following the Distal Tibia Allograft Procedure. SECEC-ESSSE Congress. Berlin Sept 2017.

Frank RM, Kim J, O'Donnell PJ, O'Brien M, Newgren J, Verma NN, Nicholson GP, Cole BJ, Romeo AA, Provencher MT. Fellows Clinical Science Research Award: Outcomes of Latarjet vs. Distal Tibia Allograft for Anterior Shoulder Instability Repair: A Prospective Matched Cohort Analysis. The American Orthopaedic Society for Sports Medicine. Annual Meeting. Toronto Canada, July 2017.

Frank RM, Romeo AA, Richardson CJ, O'brien MC, Sumner SA, Verma NN, Cole BJ, Provencher MT. Outcomes of Latarjet vs. Distal Tibia Allograft for Anterior Shoulder Instability Repair: A Prospective Matched Cohort Analysis. ASES March 2018.

Frank RM, Cvetanovich GL, Lansdown D, Cotter EC, Richardson CJ, McCarty EC, Provencher MT, Romeo AA. Scientific Exhibit – Management of the Patient with Failed Shoulder Stabilization: A Treatment Algorithm. 2018 AAOS Annual Meeting. New Orleans LA, March 2018.

Frank RM, Richardson CJ, Sumner S, Verma NN, Cole BJ, Romeo AA, Provencher MT. 90-Day Complications Following the Distal Tibia Allograft Procedure. 2018 AOSSM Annual Meeting. New Orleans LA, March 9, 2018.

Gao S, Guo P, Huard J. 5-Azacytidine Induces Cardiac Markers in Murine Muscle-Derived Stem Cells. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Gao X, Lu A, Amra S, Guo P, Huard CA, Sun X, Huard J. Super-Healer Mice Exhibit Improved Cartilage Regeneration Due To Enhanced Psmad1/5 Signaling. ORS annual meeting. San Diego, CA March 19-22, 2017.

Gao X, Sun X, Amra S, Cheng H, Huard C, MoraBoellstorff DG, Wang B, Huard J. Bone Defect Healing Differs Between Skull and Long Bone In The Dystrophin/utrophin Double Knockout Mice. ORS annual meeting. San Diego, CA March 19-22, 2017.

Gao X, Sun X, Deng Z, Charles A Huard, Cheng H, Huard J. Effects of Multipregnancy on Bone Parameters and Tibia Fracture Healing. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Gao X, Cheng H, Amra S, Tang Y, Sun X, Awada H, Lu A, Deng Z, Huard C, Wang B, Wang Y, Huard J,. Use of Coacervate to Deliver BMP2 and sFlt1 Enhances Human Muscle-Derived Stem Cell-Mediated Cartilage Repair in an MIA-Induced Osteoarthritis Model. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Geeslin AG, Chahla J, Cinque ME, Civitarese DA, LaPrade RF. Double-Bundle PCL Reconstruction: A Prospective Study Of Two-Year Patient Reported Outcomes With Stress Radiographs. Poster, AOSSM Annual Meeting 2017, Toronto, Canada, July 2017.

Godin JA, Cinque ME, Pogorzelski J, Moatshe G, Chahla J, LaPrade RF. Multi-Ligament Knee Injuries in Adolescents: A 2-Year Minimum Follow-Up Study. Southern Orthopaedic Association Annual Meeting, Hilton Head Island, SC, June 28 – July 1, 2017.

Godin J, Millett PJ. Pogorzelski J, Horan MP, Fritz EM. Arthroscopic Superior Capsule Reconstruction (ASCR) vs. Latissimus Dorsi Transfer (LDT): a comparison of early clinical outcomes. AANA Annual Meeting, Denver, CO. May 18-20, 2017.

Godin JA, Pogorzelski J, Hussain ZB, Fritz EM, Horan MP, Frangiamore S, Mannava S, Millett PJ. Return to Recreational Activity and Two-Year Outcomes Following Reverse Total Shoulder Arthroplasty. AAOS New Orleans, LA. March 6 -10 2018.

Godin JA, Pogorzelski J, Horan MP, Fritz EM, Millett PJ. Mid-term results after shoulder stabilization using the "Bony Bankart Bridge" technique. 37th AANA 36th Annual Meeting of the Arthroscopy Association of North America, Chicago, IL. April 26-28, 2018.

Guo P, Gao S, Lu A, Huard J. Macrophages modulation by enhanced TIPE2 Gene expression attenuated muscle histopathology in mdx mice. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Ho, CP. The Role of Imaging in Screening and Preventing Overuse Injuries in Athletics; Can Imaging Identify the Injury Before They Become Symptomatic? SPRI Conference on the Prevention of Injury & Illness in Sport, Vail, CO. Jan. 28-29, 2017.

Ho, CP. Experiences/Update in Sports MRI of the Shoulder. 34th Annual Magnetic Resonance Imaging 2017: National Symposium. Educational Symposia. Las Vegas, Nevada. April 3 – 7, 2017.

Ho, CP. Experiences/Update in Sports MRI of the Knee. 34th Annual Magnetic Resonance Imaging 2017: National Symposium. Educational Symposia. Las Vegas, Nevada. April 3 – 7, 2017.

Ho, CP. Experiences/Update in MRI of Articular Cartilage and Imaging Biomarkers. 34th Annual Magnetic Resonance Imaging 2017: National Symposium. Educational Symposia. Las Vegas, Nevada. April 3 – 7, 2017.

Ho, CP. Experiences/Update in Sports Imaging of the Hip. 34th Annual Magnetic Resonance Imaging 2017: National Symposium. Educational Symposia. Las Vegas, Nevada. April 3 – 7, 2017.

Ho, CP. Quantitative MRI Evaluation of Tissue Health. Vail Scientific Summit. Vail, CO. Aug. 23 – 26, 2017.

Katthagen C, Moatshe G, Dornan GJ, Millett PJ. Influence of radiographic parameters on reduction of the critical shoulder angle with lateral acromioplasty – a mathematical model. Podium. German Shoulder and Elbow Society Stuttgart, Ludwigsburg, Germany. May 19, 2017
.

Katthagen C, Menge TJ, Horan MP, Tahal DS, Moatshe G, Millett PJ. Arthroscopic coracoplasty for subcoracoid impingement in 145 cases with a mean follow-up of 4 years. Podium. German Shoulder and Elbow Society Stuttgart, Ludwigsburg, Germany. May 20, 2017.

Katthagen JC, Horan MP, Moatshe G, Menge TJ, Tahal DS, Dornan GJ, Millett PJ. Impact of anatomical parameters on outcomes after arthroscopic coracoplasty for subcoracoid impingement syndrome. Poster 34th AGA Congress Munich, Germany Sep. 7-9, 2017.

Katthagen JC, Moatshe G, Horan MP, Dornan GJ, Millett PJ. Association of the coracoid anatomy and a full-thickness supraspinatus tear with the subcoracoid impingement syndrome – an MRI analysis. Poster 34th AGA Congress Munich, Germany Sep. 7-9, 2017.

Katthagen JC, Horan MP, Moatshe G, Menge TJ, Tahal DS, Dornan GJ, Millett PJ. Impact of anatomical parameters on outcomes after arthroscopic coracoplasty for subcoracoid impingement syndrome. ePoster. 27th SECEC-ESSSE 2017 Berlin, Germany, Sep. 13-16, 2017.

Katthagen JC, Moatshe G, Horan MP, Dornan GJ, Millett PJ. Association of the coracoid anatomy and a full-thickness supraspinatus tear with the subcoracoid impingement syndrome – an MRI analysis. ePoster 27th SECEC-ESSSE 2017 Berlin, Germany Sep. 13-16, 2017.

Katthagen JC, Moatshe G, Horan MP, Dornan GJ, Millett PJ. Association of the coracoid anatomy and a full-thickness supraspinatus tear with the subcoracoid impingement syndrome – an MRI analysis. ePoster German Congress for Orthopedics & Trauma Surgery (DKOU17) Berlin, Germany Oct. 24-27, 2017.

Katthagen JC, Menge T, Horan MP, Tahal DT, Moatshe G, Millett MP. Arthroscopic coracoplasty for subcoracoid impingement in 145 cases with a mean follow-up of 4 years. Podium German Congress for Orthopedics & Trauma Surgery (DKOU17) Berlin, Germany Oct. 26, 2017.

King JT, Whitney KE, Pillifant K, Chahla J, Utsunomiya H, Evans TA, Huard J. The Effect of Freezing on the Biomarker Concentration in Platelet-Rich Plasma Releasate: A Pilot Study. ORS annual meeting. San Diego, CA March 19-22, 2017.

LaPrade RF. The Posterior Cruciate Ligament. OSSUR. Jan. 12, 2017.

LaPrade RF. Meniscal Injuries. Hafjell Resident Course. Feb. 2, 2017.

LaPrade RF. Medial Collaeral Ligament. Hafjell Resident Course, Feb. 2, 2017.

LaPrade RF. ACL Reconstruction Revision, Hafjell Resident Course, Feb. 3, 2017.

LaPrade RF. MCL; Anatomic augmentation Technique. Hafjell Resident Course, Feb. 4, 2017.

LaPrade RF. Revision ACLR; Kvitfjell (Norwegian Arthroscopy Association), Feb. 4, 2017.

LaPrade RF. Meniscal Injuries, Kvitfjell (Norwegian Arthroscopy Association), Feb. 4, 2017.

LaPrade RF. MCL, Kvitfjell (Norwegian Arthroscopy Association), Feb. 4, 2017.

LaPrade RF. Anterior Cruciate Ligament Revision Reconstruction Technical Issues: A Case-Based Approach. AAOS Meeting March 16, 2017.

LaPrade RF. Multiple Ligament Knee Injuries – What Would You Do? AAOS Meeting March 17, 2017.

LaPrade RF. PCL Anatomy. 2017 Anatomic and Biomechanical Basis of Knee Ligament Reconstruction "Deconstruction to Reconstruction, April 27, 2017.

LaPrade RF. Double Bundle PCL Reconstruction. 2017 Anatomic and Biomechanical Basis of Knee Ligament Reconstruction "Deconstruction to Reconstruction," April 27, 2017.

LaPrade RF. Posterolateral Corner Reconstruction. 2017 Anatomic and Biomechanical Basis of Knee Ligament Reconstruction "Deconstruction to Reconstruction," April 27, 2017.

LaPrade RF. Meniscal Root Tears – What they are and why they should be repaired. 2017 Anatomic and Biomechanical Basis of Knee Ligament Reconstruction "Deconstruction to Reconstruction," April 28, 2017.

LaPrade RF. Meniscus Root Repair: Transosseous Two Tunnel Repair. 2017 Anatomic and Biomechanical Basis of Knee Ligament Reconstruction "Deconstruction to Reconstruction," April 28, 2017.

LaPrade RF. Double Bundle PCLR in MLI Knee. Mayo 2017 Knee Dislocation and Multi-Ligament Knee Reconstruction Course, May 12, 2017.

LaPrade RF. State of the Art in Ligament Reconstruction. Spring AANA, May 19, 2017.

LaPrade RF. PRP for treating Ligament Tears. ISAKOS, Shanghai China, June 3, 2017.

LaPrade RF. ISAKOS, Shanghai China, June 4, 2017.

LaPrade RF. Treatment of Acute Posterolateral Corner Injuries. ISAKOS, Shanghai China, June 5, 2017.

LaPrade RF. Treatment of MCL and Posteromedial Corner Injuires in ACL Reconstruction. ISAKOS, Shanghai China, June 3, 2017.

LaPrade RF. Meniscus Root Tears – Two Tunnel Technique. ISAKOS, Shanghai China, June 6, 2017.

LaPrade RF. Meniscal Root Tears – What are They and Why You Need to Fix Them. ISAKOS, Shanghai China, June 6, 2017.

LaPrade RF. PCL Double Bundle Reconstruction: Only Way to Go. ISAKOS, Shanghai China, June 8, 2017.

LaPrade RF. PRP for Ligament Tears. ISAKOS, Shanghai China, June 8, 2017.

LaPrade RF. PCL Double Bundle Reconstruction: Only Way to Go. VICKS, Vail, CO, June 10, 2017.

LaPrade RF. Biologics Treatments for Orthopedic Injuries: A Case Based Approach. AOSSM, Toronto ON, Canada. July 21, 2017.

LaPrade RF. Incidence and Detection of Meniscal Ramp Lesions on MRI. AOSSM, Toronto ON, Canada. July 21, 2017.

LaPrade RF. ESS in Hockey: What are the Risks? AOSSM, Toronto ON, Canada. July 21, 2017.

LaPrade RF. Case Based Approach to Complex/MLI Knee: PCL, PLC, MCL. AOSSM, Toronto ON, Canada. July 21, 2017.

LaPrade RF. Meniscal Considerations: Root vs Complete Repair. Smith and Nephew Event, Massachusetts, Aug. 27, 2017.

LaPrade RF. Posterolateral Norner Injuries: No Longer the Dark Side of the Knee. Brazil Sep. 28, 2017.

LaPrade RF. Double Bundle PCL Reconstructions: The New Gold Standard. Brazil, Sep. 28, 2017.

LaPrade RF. Radial Tears of the Menisci – New Techniques and Why We Need to Repair These. Brazil, Sep. 28, 2017.

LaPrade RF. Meniscal Root Tears: The Silent Epidemic. Brazil Sep. 29, 2017.

LaPrade RF. Radial Tears of the Menisci – New Techniques and Why We Need to Repair These. Sao Paulo, Brazil, Sep. 27, 2017.

LaPrade RF. Posterolateral Corner Injuries: No Longer the Dark Side of the Knee. Sao Paulo, Brazil, Sep. 27, 2017.

LaPrade RF. PCL Double Bundle Reconstruction: The New Gold Standard. Sao Paulo, Brazil, Sep. 27, 2017.

LaPrade RF. Deeper Dive into the Medial Side of the Knee: MPFL, MCL, and Medial Meniscal Root Tears. Fall AANA 2017, Nov. 3, 2017.

LaPrade RF. ACL Revisions: What You Need to Prepare For. Fall AANA 2017, Nov. 4, 2017.

LaPrade RF. Radial Meniscal Tears: We Can Reliably Repair Them. Fall AANA 2017, Nov.4, 2017.

LaPrade RF. The Posterolateral Corner of the Knee- No Longer the Dark Side. Polish Arthroscopy Society Congress, Nov.17, 2017.

LaPrade RF. State of Treating PCL Tears in 2017 – Double Bundle is the New Gold Standard. Polish Arthroscopy Society Congress, Nov.17, 2017.

LaPrade RF. The Principles behind Anatomic-Based Reconstruction. Polish Arthroscopy Society Congress, Nov.17, 2017.

LaPrade RF. My Approach to Complex Knees: Clinical Examination and Stress Radiography. Warwick, England, Nov. 20, 2017.

LaPrade RF. Lateral Reconstruction Technique. Warwick, England, Nov. 20, 2017.

LaPrade RF. PCL Reconstruction: Principles and Evidence for Double Bundle Reconstruction. Warwick, England, Nov. 20, 2017.

LaPrade RF. Root Repair Surgical Technique. Warwick, England, Nov. 20, 2017.

LaPrade RF. Como sistematizar mi Examen Fisico de Rodilla. Buenos Aires, Argentina, Dec. 3, 2017.

LaPrade RF. Que es lo que no vieron o hicieron mal en multiligamentarias que me derivan. Buenos Aires, Argentina, Dec. 3, 2017.

LaPrade RF. Slope Tibial: Es Importante? Buenos Aires, Argentina, Dec. 3, 2017.

LaPrade RF. Bone Marrow Aspirate Concentrate Harvesting and Processing Technique. Arthroscopy Techniques, Vol. 6, Issue 2, e441–e445 (Published online: April 10, 2017). AANA Chicago 2018.

LaPrade RF. Meniscal Root Tears: A Silent Epidemic. TRIA Orthopedic and Sports Medicine Conference. Feb. 9, 2018.

LaPrade RF. FCL/PLC: When to Repair, Augment or Reconstruct? AAOS Symposium, New Orleans. March 9, 2018.

LaPrade RF. The Lateral Side of the Knee – How to Recognize and Treat LCL/Posterolateral Corner Injuries. AOSSM Specialty Day, New Orleans. March 10, 2018.

LaPrade RF. Can we Agree on Biologics Outcomes Metrics for Clinical Trials? AAOS Biologics, Stanford. Feb. 17, 2018.

LaPrade RF. Anatomy of the Anterolateral Complex. Sports Knee Program. Watford, England. April 5, 2018.

LaPrade RF. DB PCL Reconstruction. Sports Knee Program. Watford, England. April 5, 2018.

LaPrade RF. The Lateral Meniscus Root: Why it is Important in ACL Surgery. Sports Knee Program. Watford, England. April 5, 2018.

LaPrade RF. Clinically Relevant PCL Anatomy. Sports Knee Program. Watford, England. April 5, 2018.

LaPrade RF. PLC Reconstruction. Sports Knee Program. Watford, England. April 5, 2018.

LaPrade RF. Meniscal Root Tears: The Missed Epidemic. 17th Brazilian Knee Surgery Congress. April 14, 2018.

LaPrade RF. Three Trends in Ligament and Meniscal Reconstruction. 17th Brazilian Knee Surgery Congress. April 14, 2018.

LaPrade RF. Repair of Radial Meniscal Tears: The New Two-Tunnel Technique. 17th Brazilian Knee Surgery Congress. April 14, 2018.

LaPrade RF. Treatment of Combined PCL and Posterolateral Knee Injuries: Case-Based. 17th Brazilian Knee Surgery Congress. April 14, 2018.

.

LaPrade RF. Multiple Ligament Injuries Involving the PCL – Workup and Treatment Schedule. 17th Brazilian Knee Surgery Congress. April 12, 2018.

.

LaPrade RF. Treatment of Combined PCL and MCL Injuries. 17th Brazilian Knee Surgery Congress. April 14, 2018.

LaPrade RF. Early Sports Specialization. 2 Annual Injury Prevention Symposium. May 3-5th, 2018.

LaPrade RF. Multiple Ligament Complex Knee Injuries in Olympic Ski Athletes. 2nd Annual Injury Prevention Symposium. May 3-5, 2018.

LaPrade R, Trindade C, Philippon M, Goldsmith M, Rasmussen M, Saroki A, Loken S. Biomechanical assessment of hip capsular repair and reconstruction procedures using a 6 degree-of-freedom robotic system. ISAKOS Biennial Meeting, Shanghai, China, June 2017.

Lebus B, Briggs K, Dornan G, McNamara S, Philippon MJ. Poster. Acetabular Labral Reconstruction Outcome Analysis and Development of a Predictive Model. ESSKA Meeting. Glasgow, Scotland, May 2018.

Liebowitz A, Morris ER, Scibetta AC, Mu X, Huard J. Liebowitz A, Morris ER, Scibetta AC, Mu X, Huard J. ORS annual meeting. San Diego, CA March 19-22, 2017.

Lockard C, Wilson K, Ho CP, Shin R, Katthagen C, Millett PJ. Quantitative mapping of glenohumeral cartilage in asymptomatic subjects using 3.0 T MRI. Poster. ORS, San Diego, CA. March 19-22, 2017.

Lockard CA, Wilson KJ, Ho CP, Shin RC, Katthagen JC, Millett PJ. Quantitative Mapping of Glenohumeral Cartilage in Asymptomatic Subjects Using 3.0 T Magnetic Resonance Imaging. Orthopaedic Research Society 2017 Annual Meeting, San Diego, USA, March 19-22, 2017.

Lockard CA, Chang A, Wilson KJ, Clanton TO, Ho CP. T2* Mapping and Subregion Analysis of the Posterior Tibialis Tendon in Asymptomatic Subjects Using 3.0 T MRI. Orthopaedic Research Society 2018 Annual Meeting, New Orleans, USA, March 10-13, 2018.

Locks R, Bolia I, Briggs K, Philippon MJ. Prevalence of Chondral Defects on the Femoral Head and Acetabulum in Patients with Borderline Dysplasia Compared to Non-dysplastic Patients who Underwent to Hip Arthroscopy for Femoroacetabular Impingement Treatment. AAOS Annual Meeting. San Diego, CA, March 2017.

Locks R, Briggs K, Bolia I, Chahla J, Philippon MJ. Poster. Labral widths are associated with increased risk of severe cartilage damage on the femoral head. AOSSM Annual Meeting, Toronto, Canada, July 2017.

Lu A, Pan H, Aditi U. Gurkar, Niedernhofer LJ, Robbins PD, Huard J. Knockout of DNA Repair Endonuclease ERCC1-XPF in Murine Differentiated Myocytes Does Not Affect Muscle Regeneration. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Lu A, Pan H, Huard C, Tseng C, Gao X, Guo P, Huard J. ORS annual meeting. Pregnancy Improves Myogenic Differentiation of Myogenic Progenitor Cells. San Diego, CA March 19-22, 2017.

Lu A, Pan H, Zhao J, McGowan S, Niedernhofer LJ, Robbins PD, Huard J. Genetic reduction of MyD88 improves the differentiation of muscle derived stem/progenitor cells in the Ercc1-/Δ mouse model of accelerated aging. ORS annual meeting. San Diego, CA March 19-22, 2017.

Mannava S, Horan MP, Frangiamore S, Fritz EM, Godin JA, Pogorzelski J, Millett PJ. Return to recreational sporting activities following total shoulder arthroplasty. Podium AOSSM Annual Meeting Toronto Canada July 23, 2017.

Martetschläger F, Reifenschneider Franziska, Fischer Nicole, Wijdicks C, Millett PJ, Imhoff A., Braun S. Biomechanical analysis of different cerclage techniques and additional "internal bracing" for stabilization of anterior sternoclavicular joint instability. Podium. 34th AGA Congress Munich, Germany Sep. 7-9, 2017.

Martetschläger F, Reifenschneider Franziska, Fischer Nicole, Wijdicks C, Millett P, Imhoff A., Braun S. Biomechanical analysis of different cerclage techniques and additional "internal bracing" for stabilization of anterior sternoclavicular joint instability. ePoster. 27th SECEC-ESSSE 2017 Berlin, Germany Sep. 13-16, 2017.

Matheny, LM, Clanton, TO, Gittner, K, Harding J. Reliability and Validity of Foot and Ankle Outcome Measures. Annual Meeting of the AAOS. New Orleans, LA, March 6, 2018.

Matheny LM, Moulton SG, Dean CS, LaPrade RF. Arthroscopic Repair of Posterior Meniscal Root Tears: Comparing Outcomes of Medial and Lateral Root Repairs. AOSSM, July 2017.

Matheny LM, Clanton TO, Kevin B. Gittner KB, Harding, J. Normative Values for Commonly Reported Outcome Measures in the Foot and Ankle. Specialty Day of the American Orthopaedic Foot & Ankle Society (AOFAS) at the American Academy of Orthopaedic Surgeons (AAOS). New Orleans, Louisiana, March 10, 2018.

Matre PR, Wu J, Lee JH, Sinha KM, Lu A, Mu X, Gao X, Darabi R, Huard J. CRISPR/Cas9-Mediated Gene Editing of Dystrophic Muscle Progenitor Cells as a Potential Cell Therapy for DMD. ORS annual meeting. San Diego, CA March 19-22, 2017.

Matre PR, Wu J, Mu X, Lu A, Darabi R, Huard J. Dystrophin restoration by CRISPR/Cas9- Mediated Gene Editing Improves Cellular Properties of Muscle Progenitor Cells. ORS annual meeting. San Diego, CA, March 10-13, 2018.

McHale K, Theodore G, Whalen J, Vopat B, Beaulieu-Jones B, Sanchez G, Provencher MT. The Epidemiology and Outcomes of Lisfranc Injuries Identified at the NFL Scouting Combine. AAOS 2017, San Diego, CA, March 2017.

McHale KJ, Vopat BG, Sanchez G, Rossy WH, Logan C, Provencher MT. The Epidemiology of LisFranc Injuries at the National Football League Combine and its Impact on an Athlete's National Football League Career. The American Orthopaedic Society for Sports Medicine. Annual Meeting. Toronto Canada, July 2017.

Menge T, Briggs K, McNamara S, Philippon MJ. Survivorship and Outcomes 10 Years Following Hip Arthroscopy for Femoroacetabular Impingement: Labral Debridement compared to Labral Repair. AAOS Annual Meeting. San Diego, CA March 2017.

Mitchell J, Chahla J, Matheny L, Dean CS, Cinque M, LaPrade RF. Outcomes Following Single-Stage Revision Anterior Cruciate Ligament Reconstruction versus Two-Stage Revision with Tunnel Bone Grafting. Poster, AOSSM Annual Meeting 2017, Toronto, Canada, July 2017.

Mitchell J, Chahla J, Matheny L, Dean CS, Cinque M, LaPrade RF. Outcomes Following Single-Stage Revision Anterior Cruciate Ligament Reconstruction versus Two-Stage Revision with Tunnel Bone Grafting. Podium, American Association of Arthroscopy (AANA) Meeting 2017, Denver, CO, May 2017.

Mitchell J, Vap A, Briggs K, McNamara S, Philippon MJ. Low Body Mass Index and Obesity Associated with Lower Outcomes Following Hip Arthroscopy for Femoroacetabular Impingement AANA Annual Meeting, Denver, CO, May 2017.

Montgomery SR, Katthagen C, Mikula JD, Marchetti DC, Tahal DS, Brady A, Turnbull T, Millett PJ et al. Anatomic and Biomechanical Comparison of the Classic and Congruent-Arc Techniques of the Latarjet Procedure. AOSSM Specialty Day at Academy of Orthopaedic Surgeons 2017. San Diego, CA. March 18, 2017.

Morris ER, Gao X, Sun X, Huard J. Super-Healer Mice Resist Tendinopathy Induced by Ovariectomy. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Morris ER, Liebowitz AB, Scibetta AC, Mu X, Huard J. Regulation of pro-inflammatory mediators and intracellular lipid accumulation in progeria muscle stem cells with mechanical stimulation. ORS annual meeting. San Diego, CA March 19-22, 2017.

Mu X, Chen W, Huard J. Super Healing ECM from Super Healer Mice Improves Muscle Stem Cell Function. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Mu X, Jia Qiu, Tseng C, Cheng H, Liu C, Morris ER, Liebowitz A, Scibetta AC, Huard J. The use of serum and exosomes from young animals to improve the histopathologies and muscle stem cells of progeria mice. ORS annual meeting. San Diego, CA March 19-22, 2017.

Mu X, Ravuri S, Chen W, Huard J. Super-Healer Mouse Adipose-Derived Stem Cells (ASCs) Show Improved Regenerative/Repair Mechanisms. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Mu X, Seong KS, Chen W, Lee B, Huard J. Role of Wnt1-expressing Cells in Regulating Stem Cell Function in Skeletal Muscle. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Mu X, Zhao J, Chen W, Robbins PD, Laura J, Niedernhofer, Huard J. Inhibition of IKK/NF-κB signaling Delays Cell Senescence and Rescues Defective Muscle Phenotypes in Progeria Mice. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Mullens J, Clanton TO, Daney B, Matheny LM. Is There a Significant Relationship Between Tibiotalar Joint Space and Ankle Function Following Ankle Surgery. Annual Meeting of American Orthopaedic Foot & Ankle Society (AOFAS). Boston, Massachusetts, July 11-14, 2018.

Pechero G, Pan H, Cui Y, Lu A, Huard J. Pregnancy shows benefit effects on dystrophic mice. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Philippon, MJ. Labral Augmentation / Reconstruction. Vail Hip Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Capsular Reconstruction. Vail Hip Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Revision: Over Resection of the Cam Lesion. Vail Hip Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Arthroscopic Hip Surgery. Live Hip Surgery Broadcast. Vail Hip Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Steadman Philippon Research Institute Injury Prevention Symposium. Chairman, Vail, CO, Jan. 2017.

Philippon, MJ. Preventing Injury of the Hip through Screening; the Musculoskeletal Examination. Steadman Philippon Research Institute Injury Prevention Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Can Hip Arthroscopy Help the Degenerative Hip. Steadman Philippon Research Institute Injury Prevention Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Length of Career Following Injuries in the NFL. Steadman Philippon Research Institute Injury Prevention Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Major League Hockey Injuries. Steadman Philippon Research Institute Injury Prevention Symposium. Vail, CO, Jan. 2017.

Philippon, MJ. Hip Preservation: State of the Art. Keynote. Orthopaedic Symposium, Holy Cross Hospital, Fort Lauderdale, FL, Feb. 2017.

Philippon, MJ. FAI – Anatomy and Pathophysiology and Pattern Damage CAM, Pincer and Ilioischial. The Athlete's Hip: New Trends, Evaluation, and Surgical Management, AOSSM Surgical Skills Course. Rosemont, IL, Feb. 2017.

Philippon, MJ. Femoral Sided Pathology and Treatment. The Athlete's Hip: New Trends, Evaluation, and Surgical Management, AOSSM Surgical Skills Course. Rosemont, IL, Feb. 2017.

Philippon, MJ. State-of-the-Art in Hip Arthroscopy. Keynote Hip Session. Holy Cross Orthopaedic Symposium. Fort Lauderdale, Fl, Feb. 2017.

Philippon, MJ. Labrum – Remove, Repair, Reconstruct. Hip Arthroscopy – Should I incorporate it in my Practice Symposium. AAOS Annual Meeting. San Diego, CA, March 2017.

Philippon, MJ. How Much Dysplasia is too Much? Top Controversies in Hip Arthroscopy Instructional Course Lecture. AAOS Annual Meeting. San Diego, CA, March 2017.

Philippon, MJ. Labrum: When to Reconstruct. Top Controversies in Hip Arthroscopy Instructional Course Lecture. AAOS Annual Meeting. San Diego, CA, March 2017.

Philippon, MJ. How Should Silent FAI be Treated? Top Controversies in Hip Arthroscopy Instructional Course Lecture. AAOS Annual Meeting. San Diego, CA, March 2017.

Philippon, MJ. Ask an Expert – Hip Arthroscopy & Joint Preservation. AAOS Annual Meeting. San Diego, CA March 2017.

Philippon, MJ. Distinguished Professor Lecture: What I learned in over a Decade. AANA Modern Trends In Hip Arthroscopy. Chicago, Il, April 2017.

Philippon, MJ. When to reconstruct the labrum. AANA Modern Trends in Hip Arthroscopy. Chicago, Il, April 2017.

Philippon, MJ. Labral Augmentation Reconstruction: Industry Spotlight Demonstration. AANA Modern Trends In Hip Arthroscopy. Chicago, Il, April 2017.

Philippon, MJ. Capsular Reconstruction. AANA Modern Trends In Hip Arthroscopy. Chicago, Il, April 2017.

Philippon, MJ. Clinical Case Panel #3: Hip. Panel member. AANA Annual Meeting, Denver, CO, May 2017.

Philippon, MJ. Advances in Hip Arthroscopy. AANA Annual Meeting, Denver, CO, May 2017.

Philippon, MJ. Hip Labral Repair; surgical demonstration. ISAKOS Biennial Meeting, Shanghai, China, June 2017.

Philippon, MJ. Hip Pain in the athlete: evidence-based tools for diagnosis: Evidence Based Algorithm for the Diagnosis and Treatment of the Hip Pain in the Athlete. ISAKOS Biennial Meeting, Shanghai, China, June 2017.

Philippon, MJ. Advances in Hip Arthroscopy Over the last 10 Years. Distinguished Visiting Professor for Senior Resident Graduation. University of CA at Davis, Sacramento CA, June 2017.

Philippon, MJ. Labral Reconstruction: Hip Video Session. AOSSM Annual Meeting, Toronto, Canada, July 2017.

Philippon, MJ. Debridement vs. Repair vs. Reconstruction of the Labrum. AOSSM Annual Meeting, Toronto, Canada, July 2017.

Philippon, MJ. Platelet Rich Plasma in the athlete with hip pathology. Vail Scientific Summit, Vail, CO Aug. 2017.

Philippon, MJ. Techniques and Pearls for a successful Labral Reconstruction. Lunchtime live cadaveric demo. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Philippon, MJ. Advances in Hip Arthroscopy over the Last 10 Years. Kerlan Lecture. USC Keck School of Medicine, Los Angeles, CA, Oct. 2017.

Philippon, MJ. Focus Demonstration: Technical Pearls for Labral Augmentation:
When and How to Do it. ANNA Fall Course, Palm Desert, CA, Nov. 2017.

Philippon, MJ. Innovation and Advances in Hip Arthroscopy over the Last 10 Years.
45th Annual Scientific Meeting Percivall Pott Club. West Smithfield, England, Nov. 2017.

Philippon, MJ. Course Chairman. Vail Hip Symposium. Vail, CO, Jan. 2018.

Philippon, MJ. Labral Augmentation vs. Labral Reconstruction. Vail Hip Symposium. Vail, CO, Jan. 2018

Philippon, MJ. Live hip arthroscopy broadcast. Vail Hip Symposium. Vail, CO, Jan. 2018.

Philippon, MJ. Evolution of Untreated FAI. A Case Study. Council on Sports Medicine 5th Annual Meeting. Palm Beach, FL, Jan. 2018.

Philippon, MJ. Advances in Hip Arthroscopy Over the Last 10 Years. 11th Annual Winter Hip and Knee Course. Vail, CO, Jan. 2018.

Philippon, MJ. Hip Arthroscopy in Professional Athletes. 11th Annual Winter Hip and Knee Course. Vail, CO, Jan. 2018.

Philippon, MJ. Pre-Arthritic Hip Restoration. Dale Daniel Memorial Keynote Speaker. 2018 SCPMG Dale Daniel, MD Orthopaedic Symposium. Los Angeles, CA, Feb. 2018.

Philippon, MJ. Top Controversies in Hip Arthroscopy. Instructional Course Lecture. Silent FAI: Is there a role for prophylactic surgery? AAOS Annual Meeting. New Orleans, LA, March 2018.

Philippon, MJ. Top Controversies in Hip Arthroscopy. Instructional Course Lecture. How much dysplasia is too much? AAOS Annual Meeting. New Orleans, LA, March 2018.

Philippon, MJ. Top Controversies in Hip Arthroscopy. Instructional Course Lecture. Labrum: When to reconstruct? AAOS Annual Meeting. New Orleans, LA, March 2018.

Philippon, MJ. Labral Reconstruction/Augmentation. AOSSM & ISAKOS Hip Arthroscopy Course. The Hip in the Athlete – An International Perspective. Rosemont, IL, April 2018.

Philippon, MJ. Return to Sport in Elite Athletes Following Hip Arthroscopy. AOSSM & ISAKOS Hip Arthroscopy Course. The Hip in the Athlete – An International Perspective. Rosemont, IL, April 2018.

Philippon, MJ. State of the Art in Hip Cartilage Repair. ICRS Annual Meeting. Macau, China, April 2018.

Philippon, MJ. Hip Arthroscopy: Advancement over the last 10 years. China Hip Arthroscopy Course, Shanghai, China, April 2018.

Philippon, MJ. Evolution of Treatment of Labral Injuries: Labral Repair, Augmentation and Reconstruction. China Hip Arthroscopy Course, Shanghai, China, April 2018.

Philippon, MJ. Outcomes Following Hip Arthroscopy in Athletes. China Hip Arthroscopy Course, Shanghai, China, April 2018.

Philippon, MJ. The Mini Debate: Primary Hip Labral Debridement Repair Versus Reconstruction: How Do I Decide? AANA Annual Meeting, Chicago, IL, April 2018.

Philippon, MJ. Clinical Case Panel Panelist. Extra Articular Hip Pathology. AANA Annual Meeting, Chicago, IL, April 2018.

Philippon MJ. Hip Screening to Identify the Hip "At-Risk". 2nd Annual Injury Prevention Symposium, Vail, CO, May 2018.

Philippon MJ. Return to Sport in Elite Athletes Following Hip Arthroscopy. 2nd Annual Injury Prevention Symposium, Vail, CO, May 2018.

Philippon MJ, Bolia IK, Rodriguez M, Philippon M, Briggs K. Screening of professional ballet company using ultra-sound and clinical examination: Diagnosing the hip-at-risk. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Philippon MJ, Bolia IK, Briggs KK. Clinical Outcomes Following Arthroscopic Labral Augmentation Compared to Matched Cohort of Labral Reconstruction. AANA Annual Meeting, Chicago, IL, April 2018.

Philippon MJ, Bolia IK, Briggs KK. Superior Clinical Outcomes with Capsular Closure versus Non-Closure in Patients Undergoing Arthroscopic Hip Labral Repair. AOSSM Specialty Day, New Orleans, LA, March 2018.

Philippon MJ, Utsunomiya H, Locks R, Briggs KK. Poster. My first 100 compared to my Last 100 Labral Reconstructions: The role of patient selection in increasing survivorship. ESSKA Meeting. Glasgow, Scotland, May 2018.

Pogorzelski J, Horan MP, Fritz EM, Katthagen CJ, Millett PJ. Predictors of Outcome Following Arthroscopic Bankart Repair for Traumatic Anteroinferior Instability of the Shoulder. ePoster. AANA Annual Meeting, Denver, CO. May 18-20, 2017.

Rodriguez M, Bolia I, Briggs K, Philippon M. Screening of professional ballet company using ultra-sound and clinical examination: Diagnosing the hip-at-risk. International Association for Dan Medicine & Science. Houston, TX, Oct. 2017.

Pogorzelski J, Horan MP, Hussain ZB, Fritz EM, Millett PJ. Subpectoral Biceps Tenodesis for Treatment of Isolated SLAP Type II Lesions in a Young Population. ePoster. German Shoulder and Elbow Society Stuttgart, Ludwigsburg, Germany. May 18-20, 2017.

Pogorzelski J, Horan MP, Fritz EM, Katthagen CJ, Millett PJ. Glenoid Labral Articular Disruption (GLAD) Lesions are Associated with a Higher Failure Rate Following Arthroscopic Bankart Repair for Traumatic Anteroinferior Instability of the Shoulder. ePoster. 11th Biennial ISAKOS 2017 Shanghai, China. June 4-8, 2017.

Pogorzelski J, Horan MP, Fritz EM, Katthagen CJ, Godin JA, Millett PJ. Superior Capsule Reconstruction (SCR) vs. Latissimus Dorsi Transfer (LDT): a comparison of early clinical outcomes. Poster AOSSM Annual Meeting Toronto Canada July 20-23, 2017.

Pogorzelski J, Godin JA, Horan MP, Katthagen JC, Hussain ZB, Fritz EM, Millett PJ. Minimum Five Year Outcomes and Clinical Survivorship Following Arthroscopic Double-Row Repair for Supraspinatus Tendon Tears. Podium 34th AGA Congress Munich, Germany Sep. 7-9, 2017.

Pogorzelski J, Fritz EM, Horan MP, Hussain ZB, Katthagen JC, Godin JA, Millett PJ. Minimum Five-Year Outcomes and Clinical Survivorship Following Arthroscopic Double-Row Repair for Full-thickness Supraspinatus Tears. British Orthopaedic Trainee's Association Educational Congress 2017 Manchester, England. Nov.15-17, 2017.

Pogorzelski J, Altintas B, Fritz EM, Hussain ZA, Horan MP, Godin JA, Millett PJ. Minimum 2-year Clinical Outcomes and Return to Sports after Arthroscopic Rotator Cuff Repair in Patients Younger than Forty-Five Years. ePoster ESSKA 2018 Glasgow Scotland, UK. May 9-12, 2018.

Provencher MT. Luxatio Erecta (Inferior Glenohumeral Joint Dislocation) http://www.orthobullets.com/sports/3132/luxatio-erecta-inferior-glenohumeral-joint-dislocation?, 2017.

Provencher MT. Multidirectional Shoulder Instability (MDI) http://www.orthobullets.com/sports/3052/multidirectional-shoulder-instability-mdi?, 2017.

Provencher MT. Posterior Instability and Posterior Dislocation. http://www.orthobullets.com/sports/3051/posterior-instability-and-posterior-dislocation?, 2017.

Provencher MT. ACL Injuries at the NFL Combine: Impact of Isolated versus Complex ACL Injury on Draft Status and Professional Performance. NFL Physicians Society Meeting. Indianapolis, IN. March 2017.

Provencher MT. Shoulder Instability: The Latarjet Stabilization: Indication, Technique and Results. Arthroscopy and Arthropalsty Update 2017. Washington DC. April 2017.

Provencher MT. Shoulder Instability: When to pull the trigger on the Latarjet? Arthroscopy and Arthroplasty Update 2017. Washington DC. April 2017.

Provencher MT. Open Shoulder Stabilization Revisited-How to Do This Well. AOSSM 2017 Annual Meeting. OLC, Rosemont IL, Oct 2017.

Provencher MT. Humanitarian Assistance and Disaster Relief - Leadership Lessons from the Navy to Improve Medical Care. Inaugural Alpha Omega Alpha Visiting Professorship Address. Dartmouth–Hitchcock Medical Center, Lebanon, NH. May 2018.

Provencher MT. Leadership Lessons from the military to the Ivy and Pro Sports Teams. Inaugural Alpha Omega Alpha Visiting Professorship Address. Dartmouth–Hitchcock Medical Center, Lebanon, NH. May 2018.

Provencher MT. Shoulder instability - a radiographic and clinical journey to improve outcomes. Dartmouth–Hitchcock Medical Center, Lebanon, NH. May 2018.

Provencher MT. Leadership Lessons from the Ivy and to Pro Sports Teams. Dr. Harold M. Frost Memorial Lecture. Henry Ford Hospital, Detroit, MI. June 2018.

Provencher MT. Shoulder Instability – A Radiographic and Clinical Journey to Improve Outcomes. Dr. Harold M. Frost Memorial Lecture. Henry Ford Hospital, Detroit, MI. June 2018.

Provencher MT. Panelist. Instability: Anterior Instability in the Young Athlete. Discussion with Audience Participation. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Simple Bankart Repair Works the Best. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Classification of Instability: Can We Agree on Anything? Discussion with Audience Participation. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Panelist. Posterior Instability; Multidirectional Instability; Hyperlaxity. Discussion with Audience Participation. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Panel Moderator - 2 hour 30 min - Essential Interdisciplinary Tips on Patient Evaluation. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Panelist. Case Presentation with Audience Polling. Mid Shaft Clavicle Fracture: Sling vs Figure 8 vs Pin vs Plate and Acromioclavicular Separation: Non Operative vs Operative. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Session Moderator. Case Presentation with Audience Polling. Grade 4 or 5 Acromioclavicular: Has to Be Fixed: What is Best Technique. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Session Moderator. Case Presentation with Audience Polling. Grade 4 or 5 Acromioclavicular: Has to Be Fixed: What is Best Technique. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Superior Laberal Anterior and Posterior (SLAP) Tears in Non Throwers: When to Fix and When to Tenodese. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Panelist. The Throwing Athlete Discussion and Audience Participation. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT. Pectoralis Major Injuries. 35th Annual San Diego Course, Hilton BayFront, San Diego, CA, June 2018.

Provencher MT, McAdams T. Video Analysis of ACL Injuries in the NFL. NFL Physicians Society Meeting. Indianapolis, IN March 2017.

Provencher MT, Romeo AA. Instability of the shoulder joint-board review from Ortho Bullets. Online webinar http://www.orthobullets.com, June 2017.

Provencher MT, Denard PJ, Ladermann A, Romeo AA, Dines JS. Version and Inclincation Obtained with 3D Planning in Total Shoulder Arthroplasty: Do Different Programs Produce the same Results? SECEC Annual Meeting. Berlin, Germany Sept 2017.

Provencher MT, Frank RM, Sanchez G, Golijanin P, Gross D, Solomon DJ, Dewing CB. A Prospective Analysis of Patients with Anterior Versus Posterior Shoulder Instability: A Matched Cohort Examination and Surgical Outcomes Analysis of 198 Patients. ISAKOS Meeting Shanghai, China June 2017.

Provencher MT, Price MD, Logan C, Vopat B, Sanchez G, Beaulieu-Jones B. The Epidemiology of Injuries Identified at the NFL Scouting Combine and their Impact on Performance in the NFL: 2203 Athletes, 2009-2015. ISAKOS. Shanghai. June 2017.

Provencher MT, McCormick F, Sanchez G, LeClere LE, Dewing CB, Solomon DJ. A Prospective Outcome Evaluation of Humeral Avulsions of the Glenohumeral Ligament (HAGL) Tears in an Active Population. The American Orthopaedic Society for Sports Medicine. Annual Meeting. Toronto Canada, July 2017.

Ravuri S, Mu X, Chen W, Huard J. Adipose-Derived Stem Cells (ASCs) Isolated from Premature Aging/Progeroid Mice Maintain Stemness and Rejuvenative Potential. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Schroepfer HJ, Martin BM, Millett PJ. Bilateral Shoulder Dislocations Following a Motocross Accident. Podium NATA 2017 in Houston, TX. June 26-29, 2017.

Schroepfer HJ, Martin BM, Millett PJ. Bilateral Shoulder Dislocations Following a Motocross Accident. Poster. Rocky Mountain Athletic Trainers Association. Westminster, CO. March 23-26, 2017.

Scibetta AC, Gao X, Lu A, Huard J. Bone Morphogenetic Protein-9 (BMP9) Is Superior to BMP2, 6 and 7 to Enhance The Chondrogenic Potential Of HMDSCs. ORS annual meeting. San Diego, CA March 19-22, 2017.

Scibetta AC, Gao X, Lu A, Huard J. Mechanisms of BMP Induction of Chondrogenic Differentiation of Human Muscle-Derived Stem Cells. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Scibetta AC, Lu A, Niedernhofer LJ, Robbins PD, Huard J. Reduction in NF-κB rescues the aging phenotype of muscle derived stem/progenitor cells. ORS annual meeting. San Diego, CA March 19-22, 2017.

Scibetta AC, Lu A, Tseng C, Niedernhofer LJ, Robbins PD, Huard J. Interaction of Human Fibroblasts and Myogenic Progenitor Cells. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Scibetta AC, Lu A, Vihang A. Narkar, Huard J. Estrogen receptor-related receptor γ-overexpressing C2C12 cells rescues the defect of old muscle progenitor cells through VEGFA. ORS annual meeting. San Diego, CA March 19-22, 2017.

Scibetta AC, Morris ER, Liebowitz AB, Lu A, Gao X,, Huard J. Human Muscle-Derived Stem Cells Exhibit Gender Differences in Osteogenesis and Chondrogenesis In Vitro. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Scibetta AC, Pan H, Guo P, Lu A, Huard J. Horse Muscle-Derived Stem Cell Characterization. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Shupe PG, Ryan J. Warth, Gao X, Sun X, Mu X, Amra S, Lowe WR, Harner CD, Huard J. Whole Blood Fibrin Clot Preserves the Viability and Bioactivity of Human Muscle-Derived Stem Cells. ORS annual meeting. San Diego, CA March 19-22, 2017.

Sinha KM, Lu A, Andrew R, Huard J. Hypoxia inducible factor 1a (Hif1a) promotes the muscle regeneration capacity of MRL/MpJ mouse. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Sinha KM, Lu A, Guo P, Tseng C, Gao X, Huard J. Super-Healer Mice Contain Rejuvenating Circulating Factors that Enhance Tissue Regeneration. ORS annual meeting. San Diego, CA March 19-22, 2017.

Sinha KM, Yarmand R, Andrew R, and Huard J. Therapeutic uses of muscle-derived stem cells in the treatment of prostate cancer bone metastasis. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Sun X, Gao X, Amra S, Deng Z, Mu X, Huard J. Super healer mice exhibit superior bone quality bone fracture healing via modulation osteoblastogenesis and osteoclastogenesis. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Sun X, Lu A, Amra S, Guo P, Huard C, Gao X, Huard J. Super-healer mice exhibit superior bone quality. ORS annual meeting. San Diego, CA March 19-22, 2017.

Steineman BD, Moulton SG, Donahue TL, Dean CS, LaPrade RF. Coronal and Sagittal Plane Investigation of the Tibial ACL and Anterolateral Meniscal Root Insertion Overlap Relationship. Summer Biomechanics, Bioengineering and Biotransport Conference.

Tseng C, Pan H, Gao Z, Mikhail G. Kolonin, Lu A, Huard J. The role of PDGFRβ expressing cells in skeletal muscle during aging. ORS annual meeting. San Diego, CA March 19-22, 2017.

Tseng C, Pan H, Guo P, Lu A, Huard J. Superior Regenerative Capacity of Skeletal Muscle in MRL/MpJ Mice correlate with a reduced Inflammatory Responses and increased potency of muscle progenitor cells. ORS annual meeting. San Diego, CA March 19-22, 2017.

Tsikouris BD, Bolia IK, Vlaserou P, Angelis K, Briggs KK, Philippon MJ. Poster. Screening of high level weightlifters to identify prevalence of hip injury and risk factors for labral pathology. ESSKA Meeting. Glasgow, Scotland, May 2018.

Utsunomiya H, Locks R, Chahla J, Dornan G, Briggs K, Philippon MJ. Preoperative Predictors of Severe Cartilage Damage on Femoral Head and Acetabulum During Hip Arthroscopic Surgery – An Analysis of 2,544 Cases. ISAKOS Biennial Meeting, Shanghai, China, June 2017.

Utsunomiya H, Chahla J, Locks R, Briggs KK, Ho CP, Philippon MJ. Does Prevalence of Small Size Acetabular Bone Marrow Edema or Cystic Lesion on Three Tesla MRI Correlate with Poor Clinical Outcomes after Hip Arthroscopy? An Analysis of Two-to-Six-Year Follow-Up. ISAKOS Biennial Meeting, Shanghai, China, June 2017.

Utsunomiya H, Locks R, Chahla J, Bolia I, Briggs K, Philippon MJ. Does the center edge angle affect hip arthroscopy outcomes? 2 to 6 years outcomes of patients older than 30 years old and with center edge angle less than 30 degrees. ePoster. ISAKOS Biennial Meeting, Shanghai, China, June 2017.

Utsunomiya H, Briggs K, Dornan G, Bolia I, Locks R, Philippon MJ. Poster. Association Between Patient-Specific Factors and Severe Cartilage Damage of the Hip: Development of a Prediction Model to Guide Early Intervention. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Utsunomiya H, Briggs K, Bolia I, Locks R, Fagotti L, Philippon, MJ. Poster. Cam Impact and Femoral Head Asphericity – A New Evaluation Method for Deformity of Proximal Femur. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Utsunomiya H, Fagotti L, Briggs K, Bolia I, Philippon MJ. General joint laxity in patients with low center edge angle results in lower patient-reported outcomes. Poster. 9th ISHA Annual Meeting, Santiago, Chile, Oct. 2017.

Utsunomiya H, Gao X, Cheng H, Nakama G, Amra S, Deng X, Mascarenhas R, Ravuri SK, Goldman JL, Alliston T, Rodkey WG, Lowe W, Philippon MJ, Huard J. Poster: Limited Blockage of Vascular Endothelial Growth Factor (VEGF) With Intra-Articular Bevacizumab (Avastin) Injection Improves Microfracture-Mediated Cartilage Repair. ORS Annual Meeting, New Orleans, LA, March 2018.

Utsunomiya H, Gao X, Nakama G, Amra S, Deng Z, Cheng H, Frazier S, Ravuri SK, Goldman JL, LaPrade RF, Lowe WR, Rodkey WG, Philippon MJ, Alliston T, Huard J. Blocking TGF-β1 with Oral Losartan Administration Improves Microfracture-Mediated Cartilage Repair. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Utsunomiya H, Briggs KK, Dornan G, Locks R, Bolia I, Philippon MJ. Prediction Model for Severe Cartilage Damage of the Hip Using Basic Data in Daily Clinic to Guide Early Intervention. ICRS Annual Meeting. Macau, China, April 2018.

Utsunomiya H, Gao X, Nakama G, Amra S, Deng Z, Cheng H, Frazier SE, Ravuri SK, Goldman JL, Lowe WR, Rodkey WG, Philippon MJ, Alliston T, Huard J. Blocking TGF-B1 With Oral Losartan Administration Improves Microfracture-Mediated Cartilage Repair. ICRS Annual Meeting. Macau, China, April 2018.

Utsunomiya H, Briggs KK, Dornan G, Locks R, Bolia I, Philippon MJ. Prediction Model for Severe Cartilage Damage of the Hip Using Basic Data in Daily Clinic to Guide Early Intervention. ESSKA Meeting. Glasgow, Scotland, May 2018.

Utsunomiya H, Briggs KK, Locks R, Philippon MJ. Acetabular Bone Marrow Edema or Cystic Lesion on 3 Tesla MRI- Correlation with Severe Cartilage Damage and Clinical Outcomes after Hip Arthroscopy for Older 30-Year-Old Patients. ESSKA Meeting. Glasgow, Scotland, May 2018.

Vap AR, Mannava S, Pogorzelski J, Katthagen C, Horan MP, Fritz EM, Millett PJ. Five-Year Outcome Following Arthroscopic Repair of Isolated Partial-Thickness Rotator Cuff Tears. Annual Meeting Southern Orthopaedic Association meeting Hilton Head Island, SC. June 29, 2017.

Vap AR, Katthagen C, Pogorzelski J, Tahal DS, Horan MP, Fritz EM, Millett PJ. Arthroscopic Repair of Isolated Partial- And Full-Thickness Upper Third Subscapularis Tendon Tears: Minimum 2-Year Outcomes After Single Anchor Repair and Biceps Tenodesis. 34th Annual Meeting Southern Orthopaedic Association meeting Hilton Head Island, SC. July 1, 2017.

Vap AR, Katthagen C, Pogorzelski J, Tahal DS, Horan MP, Fritz EM, Millett PJ. Open subpectoral biceps tenodesis for isolated biceps reflection pulley lesions: Minimum 2-year outcomes in a young patient population. 34th Annual Meeting Southern Orthopaedic Association meeting Hilton Head Island, SC. July 1, 2017.

Vap AR, Katthagen C, Pogorzelski J, Tahal DS, Horan MP, Fritz EM, Millett PJ. Godin J, Pogorzelski J, Horan MP, Fritz EM, Katthagen JC, Millett PJ. Arthroscopic Superior Capsule Reconstruction vs. Latissimus Dorsi Transfer: A Comparison of Early Clinical Outcomes. 34th Annual Meeting Southern Orthopaedic Association meeting Hilton HeadIsland, SC. July 1, 2017.

Vap AR, Katthagen C, Pogorzelski J, Tahal DS, Horan MP, Fritz EM, Millett PJ. Open subpectoral biceps tenodesis for isolated biceps reflection pulley lesions: Minimum 2-year outcomes in a young patient population. Poster AOSSM Annual Meeting Toronto Canada July 20-23, 2017.

Vap AR, Pogorzelski J, Katthagen J., Mannava S, Horan MP, Millett PJ. Five-year outcome following arthroscopic repair of isolated partial-thickness rotator cuff tears. Podium 34th AGA Congress Munich, Germany Sep. 7-9, 2017.

Vap AR, Katthagen C, Tahal DS, Horan MP, Millett PJ. Arthroscopic Repair of Isolated Partial- and Full-Thickness Upper Third Subscapularis Tendon Tears: Minimum 2-Year Outcomes After Single-Anchor Repair and Biceps Tenodesis. 48th Annual Meeting Eastern Orthopaedic association meeting. Miami Beach, FL. Oct. 19, 2017.

Vap AR, Mannava S, Pogorzelski J, Katthagen C, Horan MP, Fritz EM, Millett PJ. Five-Year Outcome Following Arthroscopic Repair of Isolated Partial-Thickness Rotator Cuff Tears. ePoster. ESSKA 2018 Glasgow Scotland, UK. May 9-12, 2018.

Vojnits K, Pan H, Sun H, Tong Q, Darabi R, Huard J, Yong Li. Functional Neuronal Differentiation of the Injury Induced Muscle-Derived Stem Cells. ORS annual meeting. San Diego, CA March 19-22, 2017.

Vopat B, Beaulieu-Jones B, Sanchez G, Logan C, Theodore GH, DiGiovanni C, Provencher MT, McHale KJ. The Epidemiology of LisFranc Injuries at the NFL combine and its Impact on an Athlete's NFL Career. ISAKOS Shanghai June 2017.

Vopat BG, Cai W, Torriani MP, Vopat ML, Murali H, Lewis GJ, Sanchez K, Price MD, Provencher MT. Evaluating Glenoid Bone Loss with MRI-Generated 3-Dimensional Reconstructions. 2018 Arthroscopy Association of North America Scientific Program. Chicago IL, April 2018.

Wetzig A, Liu C, Wood M, Mackinnon S, Mu X, Huard J. Muscle stem cells adopt a neurogenic lineage in D acellular nerve allografts. ORS annual meeting. San Diego, CA March 19-22, 2017.

Whitney KE, BS, King JT, BS, Mannava S, Dornan G, Katerina Klett, Mitchell Kennedy, Evans TA, LaPrade RF, Huard J. The Influence of Age and BMI on the Biological Composition of Platelet-Rich Plasma. ORS annual meeting. San Diego, CA, March 10-13, 2018.

Whitney KE, Briggs KK, Bolia IK, Philippon MJ, Evan TA. Poster Bone Marrow Concentrate Injection Therapy Improves Outcomes in Symptomatic Hip Osteoarthritis Patients. Osteoarthritis Research Society International, Liverpool, England, April 2018.

Steadman Philippon Research Institute

Guidelines for Research, Information Dissemination and Authorship

Preamble

This statement provides general guidelines for the conduct and presentation of research done under the umbrella of **Steadman Philippon Research Institute** *(SPRI or Institute) and which uses any SPRI resources whatsoever. These guidelines are intended to help strengthen the quality of research, both written and orally presented, that is produced by SPRI. This statement affects all SPRI employees, the Steadman Clinic (Clinic) attending physicians, Clinic Fellows, International Research Scholars, visiting surgeons, consultants, interns, students, and other visitors in perpetuity. It also provides guidance and assurances to all collaborators (e.g., universities, private laboratories, commercial entities, etc.) involved in research projects with SPRI.*

Guidelines for Conducting Research

1. Internal Research Proposals

Before beginning any research project which uses any Institute resources, the Principal Investigator (PI) who is an Institute employee or Clinic attending must submit a written proposal to his/her SPRI Department Director, or if the PI is not an Institute employee, then to the Department Director who will be providing the necessary support, for internal review and approval. If the proposal is from other than a SPRI employee or Clinic attending and does not require support from a specific department, then the proposal must be submitted to the Chief Scientific Officer (CSO) for review and approval. Research proposals (protocols) should follow a standard format (see Appendix) and must be signed by the SPRI Department Director and all participants who are listed on the written protocol or proposal. Furthermore, all research and grant proposals must be signed by the Department Director before the proposals can be submitted to the IRB or the outside granting/funding agency. After the Department Director has approved and signed the proposal, it must then be sent to the CSO for review before submission to the IRB or the outside granting/funding agency. A detailed study format for proposals requiring Institutional Review Board (IRB) approval, outside funding review, etc., is at the Appendix. If desired, a more formal proposal may be submitted, provided it contains all of the requested information and essential elements, including all elements of informed consent required by Federal regulations and the responsible IRB. The CSO and responsible SPRI Department Director will determine whether the submitted proposal is approved or if the proposal requires further refinement before the investigator is given approval to conduct the study. The CSO and Department Director may also seek additional review from other sources/individuals as a part of this decision making process.

2. The Role of the Principal Investigator (PI)

The Principal Investigator has overall responsibility for the conduct and completion of the study project. The PI may delegate any part of the study project to another individual, but the responsibility for its completion may not be delegated. It is also the responsibility of the PI to assure that the study stays within its deadlines and budget.

To be the PI of a SPRI in-house study, that person must be one of the following:

1. Director of one of the SPRI research departments;
2. An MD, including The Steadman Clinic permanent attendings;
3. A DVM; or,
4. A PhD.

Those specifically prohibited from being a PI include Clinic Fellows, International Research Scholars, interns, part-time employees, and visitors. In the case of collaborative studies which are performed at a university or other outside agency, it is anticipated that the PI or co-PI will be a faculty or staff member at that university or agency, especially if the study involves use of animals or human subjects.

The PI sets the hypothesis for the study and supervises the experimental design (power analysis, sample size determination, etc.) and conduct of the research. The PI is ultimately responsible for the reports and publications and must confirm their accuracy and authenticity. Specific criteria include:

1. The PI must be aware of all aspects of the science being done in the study.
2. The PI is present on site and supervises the laboratory in which the research is carried out, especially if the research is conducted at a university or other agency.
3. The PI has overall responsibility and is in charge of the project.
4. Once the PI is established (and it must be established prior to submission to the IRB or for funding or commencement of the project), he/she has full responsibility for all aspects of the study, including obtaining all regulatory approvals, both initial and any required periodic reviews.
5. Because the PI may not necessarily be the person who had the original idea for the project, there needs to be a clear understanding as to what role the person with the idea serves in the study. For example, the person who had the original idea may not meet the qualifications to be a PI, or the person with the idea may not desire to serve as the PI for other reasons.
6. The PI is not necessarily the first author of any subsequent publications. **NOTE:** *Publication of the results is a separate matter and is addressed below.*
7. The PI may re-assign projects, authority for certain functions, authorship requirements and rights, etc. The PI may not delegate or re-assign ultimate responsibility for the project.

Although NIH typically does not allow co-principal investigators, one (maximum) co-principal investigator may be necessary for some specific purpose. If there is a co-principal investigator, then it must be clearly and unambiguously specified in writing in both the protocol and the informed consent form (if applicable) which co-PI is responsible for which aspects of the study. Except as noted above, a co-principal investigator in a different institution is to be discouraged unless there is a clear and compelling reason.

If there is a clinical study directed from The Steadman Clinic or SPRI, a staff member permanently affiliated with the Clinic or SPRI and qualified to be a PI as noted above will be the PI of record rather than a Fellow or International Research Scholar. Fellows and Scholars typically are only present for a maximum of 12 months, and they may lack the necessary time for project completion. If a Fellow or Scholar designs a definitive project that can be done within the period of the fellowship, then the PI would still be responsible for oversight.

All individuals who have a major role in the research study and who are not the PI should be listed in all documents as co-investigators. A co-investigator is a person who contributed significantly to the study idea, has secondary responsibility for a part of the study, and will significantly contribute to the study throughout its conduct.

Those who have less than a major role may be listed as a research associate. A research associate is someone who brings additional expertise and responsibility to the study and does not fall under the direct supervision of one of the investigators. Anyone involved in the study who does not qualify as an investigator and who works under the direct supervision of an investigator does not need to be listed on the research protocol.

NOTE: It is emphasized here that authorship and author order on any subsequent publications are completely separate from the research protocol itself. Authorship is discussed below.

3. Study Approval

A proposed research project is eligible for approval after:

1. Its goals/objectives/premise are clearly stated and deemed relevant to the clinical/medical community as well as the Clinic and/or Institute;

2. The study's key activities are listed, with timelines attached to each activity;
3. The projected starting and ending times of the study are established;
4. Staff requirements/time allocation are determined and related to the tasks needed;
5. The budget is developed, including both expenses as well as projected support/income;
6. The degree of difficulty to complete the study is described accurately. A justification for additional/new equipment, computer software, etc., is required along with a statement of whether staff has the knowledge and skill required to complete the project feasibly;
7. The SPRI Department Director and CSO have given approval;
8. All necessary regulatory and oversight approvals (e.g., IRB, Animal Care Committee, etc.) have been obtained; and,
9. Any clinical study must have The Steadman Clinic Service Chief's review and approval signature. The review and approval does not mean that the Service Chief is necessarily a part of the study. Furthermore, this review and approval has nothing whatsoever to do with authorship of any publications that may result from the study. This requirement does not pertain to non-clinical (i.e., laboratory) studies. As of the date of this document, the Service Chiefs are Dr. Marc Philippon (Hip), Dr. Randy Viola (Hand), Dr. Don Corenman (Spine), Dr. David Karli (Regenerative Medicine), Dr. Tom Hackett (Knee, Shoulder, Elbow), Dr. Peter Millett (Shoulder, Knee, Elbow), Dr. Tom Clanton (Foot and Ankle), Dr. Robert LaPrade (Knee), Dr. Thos Evans (Regenerative Medicine), Dr. Matthew Provencher (Shoulder, Knee), Dr. Raymond Kim (Arthroplasty), Dr. David Kuppersmith (Internal Medicine), Dr. Joel Mata (Arthroplasty), and Dr. Thomas Haytmanek (Foot and Ankle).

At the time of approval, the project will be placed on a priority list of other research projects within both the originating Department and the Institute.

4. IRB Approval

Once the proposal has been approved internally as noted above, and if the study requires human subjects or use of human tissue, the investigators must submit the proposal for IRB approval. It is the responsibility of the PI to see that IRB approval is obtained, if appropriate, in a timely fashion. No study may begin without IRB approval if required. If a study requires IRB approval, then a Department Director or permanent staff member with M.D., D.V.M., or Ph.D. credentials must act as PI for purposes of medical intervention and judgment.

5. Obtaining Informed Consent from Participants of Approved Studies

Only individuals with the following degrees or who hold the designated position are permitted to obtain informed consent from a participant in an approved study:

- MD (including Clinic Fellows and International Research Scholars)
- DVM
- PhD
- RN
- PA
- Department Directors

Staff members, research interns and Athletic Trainers (ATC) who do not possess one of the above degrees are not permitted to obtain informed consent from a study participant.

6. Project Funding

If the project is approved but does not yet have funding, but requires external funding, the PI must immediately send a copy of the proposal to the CEO, CSO, and CFO, who will then work with the Development Department in identifying and approaching potential funding sources.

7. Conference Presentations and Abstracts

Once the study data are analyzed and a report is prepared, all researchers (excluding outside collaborators such as university researchers or private laboratory scientists) are encouraged to present their work to an internal group of their peers before any presentations are made at a scientific meeting. To schedule a presentation, please see the Institute CEO or CSO. This presentation will be reviewed in light of the intended audience and the desired impact. It is likely that the presentation will be

held at an open meeting for all Institute and Clinic staff. The spirit of this recommendation is to help insure preparedness and give ample time to incorporate edits and suggestions to improve the presentation.

In the case of a public relations related request (article or presentation) from an outside group, the Department Director in conjunction with the Institute CSO will determine when and if the request will be met.

Conference papers should be directed to the most appropriate audience and meeting. A scientific paper, once presented to a national or international meeting, should not be presented in exactly the same format to additional meetings of the same constituency as original research and data. Presenting a paper at a clearly local or regional meeting does not preclude presenting the same paper to a national or international meeting. Presenting the same paper to different audiences at multiple meetings may be acceptable if all authors agree. This guideline does not preclude presentation multiple times as a portion of an invited presentation.

Authorship guidelines for conference presentations should be identical to the guidelines for papers submitted for publication to peer-reviewed journals (see below). All authors must meet the same criteria of substantial contribution to the paper, justifying inclusion as an author for the conference paper for presentation as well as for the manuscript submitted for publication. Anyone who is not an author of a paper is precluded from presenting it at a national or international meeting unless there are unforeseen or extenuating circumstances in which no author of the paper is available. The act of presenting the paper does not justify changing authorship or order of authorship for the conference paper or for the manuscript submitted for publication.

8. Publications

To maintain the highest level of research quality, the responsible Institute Department Director and, if a clinical study, the Clinic Service Chief (even if the Department Director or Clinic Service Chief is not an author) and all authors and co-authors of the material must review and give written feedback of all written products representing SPRI before they are submitted for publication or presentation. Additionally, the PI is strongly encouraged to seek responses from appropriate members of the Research Advisory Committee (RAC) as well. This requirement covers all manuscripts, papers, and public relations pieces. The same is also encouraged for abstracts and presentations. Furthermore, the PI and corresponding author will review with all authors any comments received from journal editors, reviewers, and referees to help determine why an article is accepted or rejected. Revised articles should go through the same review process as for initial submission.

9. Ownership of Study Data (Rights and Responsibilities)

SPRI owns all study data generated in all Steadman Clinics and SPRI laboratories if any Institute resources were used in any manner whatsoever. The Institute owns all rights to all data, findings, and material, written or otherwise, which were created during any part of studies undertaken in the Institute's facilities. This policy applies in perpetuity. The Institute cannot claim ownership to data that have been generated in a collaborating laboratory under the directorship of a Principal Investigator who is not an Institute staff member. In other words, each collaborating PI would own the data that are generated by his/her respective laboratories. If the Institute contracts with any outside organization to perform a specific study for a fee, then all data generated under the contract are property of the Institute. To limit potential problems, it is necessary that these issues be clarified and agreed upon in writing before any collaborative study is to begin.

The Principal Investigator (or Director of the outside laboratory) is responsible for the validity of data and veracity of the report. While all those involved in the study have equal rights to access the data, no one (laboratory staff or collaborators) should be permitted to disseminate the data (in published or presentation format) without the express written approval of SPRI. This prior approval is particularly important when it comes to the correct interpretation of the findings. For example, in a presentation, one could present (or discuss) the data wrongly if one is not fully aware of the background and does not comprehend the meaning of the data fully. Hence, that is why such a responsibility for the Principal Investigator (or Director of the laboratory) exists.

In the case of contract research, a company which paid for the project may wish to have partial or complete ownership of the data generated by the Institute. As such, the said company must cover all costs for the research done (including appropriate overhead), and a mutually acceptable written agreement should be signed beforehand. However, an unrestricted gift to SPRI or sponsorship of SPRI from an industrial/commercial concern does not entitle the company to the ownership of any data generated using such funds. Data are also owned by SPRI when generated on site by Ph.D. candidates, International Research (Visiting) Scholars, and research Fellows/Interns who are sponsored by an individual or commercial concern.

If any investigator, attending surgeon, Fellow, or participating staff member should leave the Institute's or Clinic's employment at any time, that individual must leave all materials, including equipment and data, with the Institute, unless and only unless, written permission is granted in advance from the Principal Investigator (or Director of the laboratory) as well as the Institute CEO and CSO. With written permission, the individual may take a copy of the material for the purpose of completing his/her analysis, writings, etc. All materials, original data, equipment, etc., will remain the property of SPRI in perpetuity. Furthermore, that individual is still required to follow all guidelines set forth in this document regarding presentation and/or publication of said data. All publications and presentations as a result of the work supported in any part by or done in the Institute must acknowledge the Institute. These guidelines on ownership of data also apply to former Fellows who already have or may in the future wish to access data owned by SPRI. Penalty for not abiding by these SPRI guidelines will preclude former Fellows, employees, and others temporarily associated with SPRI from having access to data in the future. Acts of misconduct may be referred to the Research Advisory Committee for recommendations for further sanctions.

10. Research Conducted Outside of the Institute

In the case of research funded by the Institute and conducted by an outside university or organization, a liaison for each organization will execute a Scope of Services Agreement or an appropriate Memorandum of Understanding. The liaison for each organization shall be a current permanent employee. In the case of SPRI, the liaison shall be the CSO. The Institute will not pay overhead surcharges to any organization conducting research in its behalf or at its request.

In the case of an Institute employee involved in research which is not conducted under the Institute's auspices and for which the Institute may or may not receive credit, the individual must inform the CEO and CSO in writing prior to involvement. The Institute has a right to limit time spent on such projects, assuming such work is performed during normal working hours or if it might affect the employee's work-related performance. In certain circumstances, the Institute has a right to ask for and receive acknowledgment in the project.

11. Contesting Decisions Made During the Study Preparation

Should any individual involved in a study wish to dispute a decision he/she cannot resolve with the PI or the Department Director, that individual must submit a timely query **in writing** to the Institute CSO. At that time the CSO will consult with the Department Director and Principal Investigator to arrive at a decision in an expedited manner. The Institute CSO may consult the Institute CEO and/or a managing partner of the Clinic; however, the Institute CEO and CSO shall have sole authority to act as the judge for final resolution.

12. Guidelines on Authorship for Manuscripts and Abstracts [Refs. 1-7]

The Institute recognizes the issues raised in such publications as the *Guide to the Ethical Practice of Orthopaedic Surgery*, the *New England Journal of Medicine*'s policy on authorship, the authorship policy of *The Journal of Bone and Joint Surgery*, and the *International Committee of Medical Journal Editors* (ICMJE) on authorship and contributorship. It is the purpose of this section of the SPRI Guidelines for Research, Information Dissemination, and Authorship to discuss authorship in particular, but also to identify possible authorship abuse and how to resolve such problems and abuse. Table 1 defines types of authorship abuse.

Table 1. *Types and descriptions of authorship abuse* [Ref. 6]

Type of Authorship Abuse Description	Description
Coercion authorship	Use of intimidation tactics to gain authorship. Arguably a serious form of scientific misconduct.
Honorary, guest, or gift authorship	Authorship awarded out of respect or friendship, in an attempt to curry favor and/or to give a paper a greater sense of legitimacy.
Mutual support authorship	Agreement by two or more investigators to place their names on each other's papers to give the appearance of higher productivity.
Duplication authorship	Publication of the same work in multiple journals.
Ghost authorship	Papers written by individuals who are not included as authors or acknowledged.
Denial of authorship	Publication of work carried out by others without providing them credit for their work with authorship or formal acknowledgment. A form of plagiarism and therefore scientific misconduct.

Generally speaking, the naming of authors to articles from the Institute will abide by the following standards:

Definition of Authorship

An "author" is generally considered to be someone who has made substantive intellectual contributions to a published study. An author must take responsibility for at least one component of the work, should be able to identify who is responsible for each other component, and should ideally be confident in their co-authors' ability and integrity. Authorship credit should be based on 1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it for important intellectual content; and 3) critical revision and final approval of the version to be published. Authors should meet conditions 1, 2, and 3, above. All persons designated as authors should qualify for authorship as detailed above, and all individuals who qualify should be listed.

Individuals who have contributed to only one segment of the study or have contributed only cases or case material should be credited in a footnote, and such individuals should not be considered or listed as authors. Merely proposing a new idea or hypothesis, without active participation in the study, does not qualify that individual for authorship. Acquisition of funding, collection of data, or general supervision of the research group alone does not constitute authorship.

Table 2 summarizes authorship requirements.

Table 2. *ICMJE requirements for authorship and examples of contributions that do not qualify for authorship* [Ref. 6]

Requirements for authorship

"Authorship credit should be based on
1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; and
2) drafting the article or revising it critically for important intellectual content; and
3) final approval of the version to be published; and
4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
Authors should meet all conditions 1, 2, 3 and 4."

All authors should be able to take public responsibility for their contribution to the work.

Examples of contributions that do not qualify for authorship but that should be acknowledged in the paper

1) Providing funding, technical advice, reagents, samples, or patient data.
2) Providing students or technical personnel who perform studies.
3) Routine collection of data.
4) General supervision of the research group.

Responsibility of Authors

Individuals listed as authors must be thoroughly familiar with all aspects of the study and should be willing to take responsibility for the accuracy and content of the portion of the manuscript to which he/she contributed. That is, each listed author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

Table 3 summarizes the requirements and responsibilities of all categories of authors.

Table 3. *Requirements and responsibilities of all co-authors* [Ref. 6]

Author Category	Contribution and Responsibility to the Work and Publication
First author	Fulfills ICMJE authorship criteria. Performs bulk of the experimental work and manuscript preparation.
Senior author	Fulfills ICMJE authorship criteria. Typically the last person on an authorship list. Directs, oversees, and guarantees the authenticity of the work. Takes responsibility for the scientific accuracy, valid methodology, analysis, and conclusions of all work described in the paper. Able to explain all of the results described in the paper.
Corresponding author	Fulfills ICMJE authorship criteria. Typically assumed by the first or senior author. Must be a permanent employee of SPRI or a Steadman Clinic attending. Communicates with editors and readers. Provides specific information on the contributions of all coauthors to the paper. Ensures that all authors are aware of and approve the submission of the manuscript, its content, authorship, and order of authorship.
Middle/contributing author	Fulfills ICMJE authorship criteria. Contributions do not rise to those of first or senior author. Order of middle/contributing authors should reflect their relative contributions to the paper.

Order of Authors

Author order **must** be determined and agreed to prior to commencement of writing a manuscript. Prior to manuscript submission, the Department Director, participating Attending Surgeon(s), and participating Senior Staff are required to meet to determine and agree upon the final author order and contributorship per the above definition. This agreed upon final determination will ensure that all listed authors meet the above authorship definition and criteria prior to manuscript submission.

Authors will be listed in the order of importance to the execution of the three study segments listed above: Plan, do, write. The PI (or senior author) has the right to determine order of authors, but typically the first author should be that individual who has contributed the most overall effort followed in succession by the individual who contributed the second most, and so on. **Such author order is separate from and not to be confused with investigator order as it appears on the research protocol.** It is extremely important to realize that "gift authorship" or adding any author who has not participated as noted above is considered literary fraud and must not be allowed to occur. Original signatures of all authors are required on copyright releases, conflict of interest and disclosure forms, or on memoranda of agreement. The corresponding author for any manuscript coming from SPRI must always be a permanent employee of SPRI or The Steadman Clinic. That is, the corresponding author may **not** be a Fellow, an International Research Scholar, an intern, a visitor, or any other individual holding a temporary position within SPRI or the Clinic.

Authorship Dispute Resolution and Adjudication Subcommittee

Should any individual who is a co-author on a manuscript wish to dispute an authorship decision he/she cannot resolve with the first author or senior author, that individual must submit a timely query/complaint **in writing** to the SPRI RAC Chairman. At that time the SPRI RAC Chairman will consult with the Department Director and the first author and senior author to arrive at a resolution of the dispute. If a satisfactory resolution cannot be reached, the SPRI RAC Chairman will appoint three (3) extramural RAC members who are and must be free of any involvement or conflict of interest with the subject manuscript to serve on a RAC Authorship Dispute Resolution and Adjudication Subcommittee. The SPRI RAC Chairman will provide the written complaint to the subcommittee and describe what actions have been taken along with any other pertinent facts. The subcommittee will then function independently by reviewing the facts presented, having teleconferences with the parties involved if deemed appropriate, and taking any other actions necessary. The subcommittee will then attempt to mediate an agreement between the parties to reach a final resolution. If a resolution cannot be reached, the subcommittee will make a specific recommendation to the SPRI RAC Chairman. The SPRI RAC Chairman will then consult with the Institute CEO and/or a managing partner of the Clinic on the recommendations of the subcommittee; however, the Institute CEO and SPRI RAC Chairman shall have sole authority to determine the final resolution of the dispute. Table 4 further describes means to minimize and resolve authorship disputes. It also outlines additional actions that the Authorship Dispute Resolution and Adjudication Subcommittee may take if deemed necessary and appropriate.

Table 4. *Recommendations for minimizing and resolving authorship disputes*

1. All research institutions, journals, and scientific societies should have in place formal authorship policies. This present document is intended to serve as the formal authorship guidelines for Steadman Philippon Research Institute. The threshold for authorship on a scientific paper should be a direct and significant intellectual contribution to the study. [Refs. 1-8] All authors should have contributed to the writing of the manuscript. At a minimum, each author should have written at least the portion of the manuscript in which his/her contribution is discussed and should be able to take public responsibility for that contribution. [Refs. 1-7]
2. This present document sets forth how extramural members of the SPRI Research Advisory Committee (RAC) will serve as an Authorship Dispute Resolution and Adjudication Subcommittee of the RAC. The Authorship Dispute Resolution and Adjudication Subcommittee will be free from all real and perceived conflicts of interest. This subcommittee will be composed of three disinterested extramural RAC members appointed by the RAC Chairman. A different subcommittee may be constituted for each incidence that requires adjudication.

3. The Authorship Dispute Resolution and Adjudication Subcommittee will not be the final decision making body in authorship disputes. Rather, the role of this subcommittee is to provide a fresh set of eyes on the problem and to assist the individuals involved in the dispute to arrive at an ethical and professional solution.

4. The Authorship Dispute Resolution and Adjudication Subcommittee will have the authority to recommend that disciplinary action be pursued if clear evidence of abusive authorship practices is uncovered. "Coercion authorship" and "denial of authorship" (see Table 1) should be treated as scientific misconduct and be referred to appropriate institutional authorities for further investigation and disciplinary action.

5. All letters of submission accompanying manuscripts submitted by the corresponding author should include an authorship verification statement that is signed by each co-author and that describes his/her specific contributions.

6. The specific roles of all co-authors should be included in the published article, depending upon specific journal requirements. Deliberate falsification of the description of co-author contributions should be viewed as scientific misconduct.

7. Every effort should be made to avoid authorship problems from the outset. Authorships should be negotiated and defined in writing at the beginning of an investigation. Frequent communication between all co-authors should occur while study investigations are ongoing. Authorship should be discussed regularly and redefined in writing if necessary. These actions will obviate the need for the Authorship Dispute Resolution and Adjudication Subcommittee to become involved.

References

1. Avowal of Authorship, *Arthroscopy,* 1999.
2. Day, R.A.: How to List the Authors, In: *How to Write and Publish a Scientific Paper*, ISI Press, Philadelphia, 1979 pp 14-17.
3. Guidelines for Authors, *Am J Sports Med*, 2011.
4. Instructions to Authors, *J Bone Joint Surg*, 2011.
5. Who did what?: (Mis)perceptions about authors' contributions to scientific articles based on order of authorship, *J Bone Joint Surg,* 2003.
6. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals, *International Committee of Medical Journal Editors*, December 2014. http://www.icmje.org/. Accessed on line 04 June 2015.
7. Harvard Medical School Authorship Guidelines, 1999. http://hms.harvard.edu/about-hms/integrity-academic-medicine/hms-policy/faculty-policies-integrity-science/authorship-guidelines. Accessed online 04 June 2015.

SPRI Authorship Agreement for All Publications

Check one box:

☐ Start of study ☐ Start of manuscript preparation ☐ Interim (if necessary)

☐ Prior to manuscript submission ☐ Revision

Working Title of Paper: _____

PI of Study: _____

Proposed Author Order_____

Author Name	Comments	Signature
1.		
2.		
3.		
4.		
5.		
6.		
7.		

In keeping with the International Committee of Medical Journal Editors (ICMJE) on authorship and contributorship, I attest that I have contributed to the following.
(**INITIAL** all that apply in the numbered line that corresponds to your number above.):

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Study conception OR**

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Study design OR**

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Data collection OR**

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Data analysis and interpretation**

AND

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Drafting initial manuscript OR**

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Editing initial draft of the manuscript**

AND

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Approval of the final manuscript to be published**

AND

1._____|2._____|3._____|4._____|5._____|6._____|7._____**Finally, I agree with and will be accountable for the findings and conclusions presented in this paper.**

Corresponding Author _____ Signature _____

Department/Laboratory Director _____ Signature _____

Chief Scientific Officer Signature _____

Date _____

Steadman Philippon Research Institute Formal Proposal Format

This format should be followed for all formal proposals, submissions to Institutional Review Boards, and proposals for outside funding. If a reviewing body has a specific format that must be followed, then that format must take precedence. (Additional formatting information and requirements are available from the Vail Health IRB administrator.)

TITLE PAGE: Include title of the proposal, principal investigator, all co-investigators, name of institution(s), contact information for PI, and proposed initiation and completion dates.

ABSTRACT: Briefly state the problem, hypothesis, specific aims, methods, expected results, and significance.

INTRODUCTION AND BACKGROUND: State the problem clearly and in detail, including the significance of the problem. Provide a thorough review of the literature on this problem. Either attach the literature search or state when it was completed. Cite only pertinent references.

PREVIOUS WORK BY THE AUTHORS: Describe any work already completed. Cite published literature by the authors.

HYPOTHESIS: State clearly the hypothesis/null hypothesis of this study and what specific question is to be answered. Include the purpose and specific aims of this study

OBJECTIVES/STUDY QUESTION: Be specific.

CLINICAL RELEVANCE: Provide a clear statement of how results of this study will influence clinical practice.

MATERIALS AND METHODS: Give specific details of how the study will be carried out (i.e., the study design). Describe resources to be used. Explain and justify the sample size, including a power analysis. State how the data obtained will be analyzed, including statistical tests to be used. Describe the subjects or patients. For the inclusion criteria, describe clearly the patient/subject population to be included. For the exclusion criteria, be specific and include the following statement: "No exclusion criteria shall be based on race, ethnicity, gender, or HIV status, unless exceptions are stated and justified."

RISKS AND BENEFITS: State any anticipated risks to human subjects if applicable. State if there are any direct benefits for subjects enrolled in this study (there rarely are any). State a justification for use of animals if applicable. If radiation is involved, you must use the standard Vail Health IRB verbiage.

CONFIDENTIALITY: Explain how data and patient/subject privacy will be protected.

REFERENCES: List pertinent references cited above. Use a standard medical journal format.

BUDGET: Provide a detailed budget and justification for additional expenditures. Include human resources.

SIGNATURE PAGE: Include the signatures of the PI, all co-investigators, the Department Director who will be called upon to provide support to the study if not an investigator, and the Clinic Service Chief (noted above), if applicable for a clinical study.

STEADMAN PHILIPPON RESEARCH INSTITUTE

181 West Meadow Drive, Suite 1000
Vail, Colorado, 81657
970-479-9797, www.sprivail.org