



2019 ANNUAL REPORT

*Internationally distinguished for patient care with
compassion and advanced clinical research*

Cincinnati SportsMedicine Research & Education Foundation
Cincinnati SportsMedicine & Orthopaedic Center — Mercy Health
Noyes Knee Institute

Welcome to our Foundation



I would like to provide a most enthusiastic and warm welcome to the 2019 annual report and the sponsorship organizations that contributed to one of our most successful and productive years. The Cincinnati SportsMedicine Research and Education Foundation is the parent organization to all our education and research programs with a commitment to excellence in all aspects of patient care, clinically applied research, and the education and teaching of surgeons, physical therapists, and allied health professionals in the USA and world-wide.

The Noyes Knee Institute was founded to advance these goals in the clinical treatment and long term clinical outcome registry studies for many specific knee ligament and other disorders. The physicians associated with the Foundation thrive through research and clinical practice to develop state-of-the art surgical techniques and treatment options that represent the most advanced procedures available world-wide. Our research personnel and scientists have conducted over 120 clinical research studies involving thousands of patients, published over 375 articles in peer-reviewed medical journals and orthopaedic textbooks, and trained 158 sports medicine and arthroscopic surgeons in our fellowship program.

A Foundation program, Sportsmetrics™, has received national and international recognition. Sportsmetrics™ is a scientifically proven, non-profit neuromuscular training program designed to prevent ACL injuries in female athletes and to provide the basis for the safe return to athletics in both male and female athletes after knee injury and surgery. Our Sportsmetrics™ staff teaches and certifies allied health professionals on training athletes and implementing the Sportsmetrics™ program in their communities. Sportsmetrics™ is the largest injury prevention program in the world and is described in detail later in this annual report.

In its 34th year, our annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, featured in this report, has trained thousands of physicians, physical therapists, and athletic trainers world-wide.

We appreciate the many expert faculty that support the excellence of our programs.

The Foundation was founded in 1985 by Frank R. Noyes, MD, President and Medical Director of the Cincinnati SportsMedicine and Orthopaedic Center.

The Foundation was established with the goal of bringing together surgeons, therapists, trainers, researchers and bioengineering professionals in a team approach to develop successful and innovative treatment programs to improve the lives of patients. The clinical and bioengineering research studies have received nearly every national and international award possible. These include the highest award from the American Academy of Orthopaedic Surgeons (Kappa Delta Award), the Orthopaedic Research and Education Foundation's Clinical Research Award, and the American Orthopaedic Society for Sports Medicine Clinical and Research Awards. The Foundation's studies were recently honored and ranked in bibliographic publications in the Journal of Bone and Joint Surgery and the Arthroscopy Journal as the "most-cited studies" in the world. This is unmatched by any other treatment or research facility world-wide.

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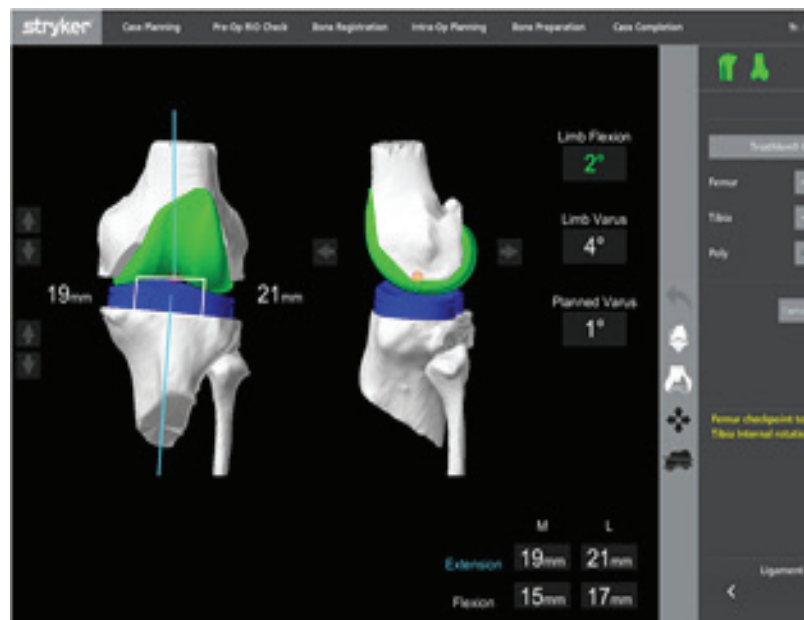
Our Mission

To improve the lives of patients everywhere by offering advanced and state-of-the-art treatments for Orthopaedic and Sports Medicine disorders based on excellence and success in documented clinical outcome studies and application of basic and clinical research.

2019

Accomplishments

Research and education advances are represented by the collaboration of physicians, scientists and research staff at Mercy Health – Cincinnati SportsMedicine and Orthopaedic Center, Cincinnati SportsMedicine Research and Education Foundation, Noyes Knee Institute, and the University of Cincinnati Department of Biomedical Engineering.



- Development and inauguration of the Cincinnati Shoulder and Elbow Fellowship. The first fellow, Dr. Brandon Kohrs, was welcomed in August 2019.
- Development, writing and editing of chapters for a new textbook titled “Return to Sports After ACL Reconstruction and Other Knee Operations: Limiting the Risk of Re-Injury and Maximizing Athletic Performance. This textbook includes 30 chapters, 18 of which are written by Cincinnati SportsMedicine physicians, therapist and research staff. The remaining 12 chapters are written by guest contributors who are experts in the field of orthopaedics and sports medicine. The textbook will be published by Springer-Verlag.
- Local, national, and international presentations by Drs. Frank Noyes, Thomas Lindenfeld, Samer Hasan, Marc Galloway, Matthew Busam, Sanjeev Bhatia and Michael Palmer.
- Hosted the 3rd annual Frank R. Noyes, MD and JoAnne Noyes Eminent Scholar Program at the University of Cincinnati, Department of Orthopaedic Surgery. The Eminent visiting scholar award was given to Edward M. Wojtys, MD. Dr. Wojtys is the William S. Smith Collegiate Professor of Orthopaedic Surgery in orthopaedic surgery and sports medicine at the University of Michigan in Ann Arbor, Michigan.



Education

- Over 75 invited presentations given at international, national, regional and local meetings.
- 5 abstracts submitted for presentation at international and national meetings.
- 60 teaching conferences attended by fellows, physical therapists, athletic trainers, physical therapy students and athletic training students.
- 12 journal clubs attended by staff physicians and fellows.
- Research and presentations on e-cigarettes and vaping and the impact on sports medicine, cardiac, pulmonary, and the brain.



Fellowship

- Nationally acclaimed sports medicine, knee, and shoulder fellowship program.
- Under the direction of Dr. Samer S. Hasan, the Inauguration of the Cincinnati Shoulder and Elbow Fellowship.
- ACGME/RRC accreditation; recognized by the American Orthopaedic Society for Sports Medicine and the Arthroscopy Association of North America.
- 158 fellow graduates (1979-2019) practicing across the United States and Canada.
- Expansion of fellowship faculty to include Drs. Michael Palmer (reconstruction and hip arthroscopy), and Sambhu Choudhury (joint reconstruction and biologics).



Sportsmetrics™

- Greater than 272 athletes trained in 2019. Introduced Sportsmetrics™ training into 5 new high schools and continued formal training in 5 high schools in the Cincinnati area.
- Certification: 133 individuals certified from 31 states, as well as Switzerland.
- Courses held in Cincinnati, OH; Hilton Head Island, SC; Kansas City, MO.
- Development of a new Sportsmetrics™ program catered to the beginner athlete and students to facilitate an anti-vaping program in schools.

Director Statements

The Foundation and patient care initiatives in 2019 continued on a very active and expanding pathway with major accomplishments in every Division, which are highlighted in the annual report. I am exceedingly proud of all the professional highlights in this annual report. The enthusiasm and continued excellence of our physician, rehabilitation, administrative, and research staff are a personal delight and wonderful experience as we work together so closely month-after-month in a truly wonderful teaching environment.



Frank R. Noyes, MD

Medical Director

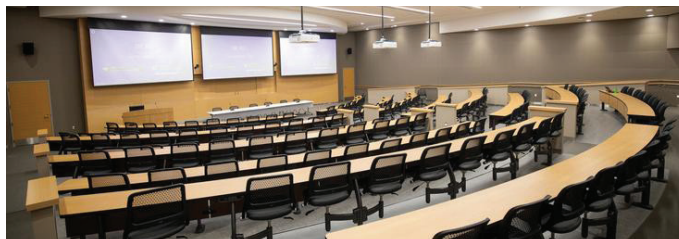
The ongoing and new 2019 clinical studies, surgical approaches, and research advances are presented in this report. Select publications are described in greater detail. New research initiatives in the shoulder, knee, hip, injury prevention and performance occurred in 2019. I hope you will enjoy this summary of the many accomplishments of the Foundation and accompanying organizations represented in this report.

2019 represented the sixth year of integration of Cincinnati SportsMedicine and Orthopaedic Center and Mercy Health, one of the largest healthcare systems in the United States. We are pleased that Mercy Health and the Jewish Hospital have endorsed and supported our clinical research and educational programs through a joint operating agreement. 2019 saw the development and inauguration of the Cincinnati Shoulder and Elbow fellowship under the co-direction of Dr. Samer Hasan. In addition to his role with the Shoulder and Elbow fellowship, Dr. Hasan has been appointed the Chief of Surgery and Chief of Orthopaedics at The Jewish Hospital. He is also one of four regional medical directors for the Orthopaedics Service Line for Mercy Health – Cincinnati and was named as one of three orthopaedic surgeons to the Bon Secours – Mercy Health system wide Clinical Integration Team.

Our continued growth now numbers a total of over 100 dedicated personnel in our Center and Foundation. We offer sports medicine and specialty clinics at six Centers throughout the Cincinnati and Northern Kentucky region. Last year alone, our physicians saw more than 3,000 new patients. Our physical therapy and rehabilitation staff managed more than 37,000 patient visits. Our patients are offered the advantage to enroll in advanced treatment programs in all disciplines. We continue to operate and function at our research Centers within the Foundation and for 2020 will be increasing our collaboration with the University of Cincinnati Department of Biomedical Engineering. This relationship has spanned an amazing 40 plus years of collaboration between scientists and clinicians. Department of Biomedical Engineering highlights are shared later in this report.

Our sports medicine and arthroscopy fellowship continues to attract an excellent group of orthopedists. The achievements of our fellows in 2018-2019 and 2019-2020 are provided. Our fellows work closely with our full-time staff and have major commitments to clinical and robotic research studies. The list of publications shows their involvement in national peer reviewed publications and presentations.

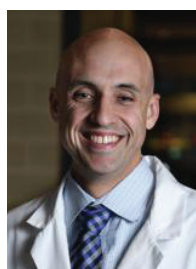
We are pleased to announce the completion of the new graduate medical education building and auditorium at The Jewish Hospital. This newly constructed facility will be home for many of our educational endeavors. This 17,200-square foot facility features the latest in state-of-the-art educational and teaching tools.



Professional Staff



Frank R. Noyes, MD
President, Noyes Knee Institute; Medical Director Cincinnati SportsMedicine Research and Education Foundation; President and CEO, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health; Sports Medicine Fellowship Director, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health



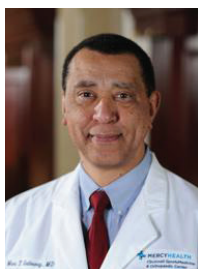
Matthew L. Busam, MD
Orthopaedic Surgeon, Fellowship Faculty, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health; Clinical and Research Faculty, Cincinnati SportsMedicine Research and Education Foundation, Chief Medical Officer, FC Cincinnati



Thomas N. Lindenfeld, MD
Sports Medicine Fellowship Faculty, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health; Clinical and Research Faculty, Cincinnati SportsMedicine Research and Education Foundation



Michael P. Palmer, MD
Orthopaedic Surgeon, The Christ Hospital; Adjunct Clinical Faculty, Cincinnati SportsMedicine Research and Education Foundation



Marc T. Galloway, MD
Sports Medicine Fellowship Faculty, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health; Clinical and Research Faculty, Cincinnati SportsMedicine Research and Education Foundation; Team Physician, Cincinnati Bengals



Sambhu N. Choudhury, MD
Orthopaedic Surgeon, Mercy Health. Adjunct Research Faculty, Cincinnati SportsMedicine Research and Education Foundation



Samer S. Hasan, MD, PhD, FAAOS
Co-Director, Shoulder and Elbow Center, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health; Co-Director Cincinnati Shoulder and Elbow Fellowship; Sports Medicine Fellowship Faculty, Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health; Clinical and Research Faculty, Cincinnati SportsMedicine Research and Education Foundation; Chief of Orthopaedics, The Jewish Hospital



Edward A. Marcheschi, MD
Physician, Mercy Health Orthopaedics, Sports Medicine and Spine; Chair, Biologic Orthopaedic Committee, Mercy Health, Adjunct Research Faculty, Cincinnati SportsMedicine Research and Education Foundation

Professional Staff

2018-2019 Fellows



Andrew Crapser, MD



Oscar Noel, DO



David Parker, MD



Andrew Smith, DO

2019-2020 Fellows



Mahmoud Almasri, MD



Nathan Krebs, DO



Trevor Stefanski, MD



Marion Swall, MD

Foundation Staff



Edward Grood, PhD
Emeritus Professor,
University of Cincinnati
Department of Biomedical
Engineering



Sue Barber-Westin, BS
Director, Clinical
Research,
Noyes Knee Institute



Cassie Fleckenstein, MS
Manager,
Clinical Research



Jennifer Riccobene, BA
Research Coordinator



Debbie Hartwig
Administrative Assistant



Tommy Campbell, BA
Director of Marketing,
Noyes Knee Institute
& Sportsmetrics™



Stephanie Smith, MS
Manager,
Sportsmetrics™ Program



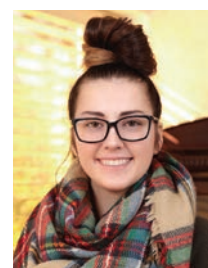
Teresa Wood
Fellowship Coordinator/
Administrative Assistant



Lauren Huser, MEng
Research Associate

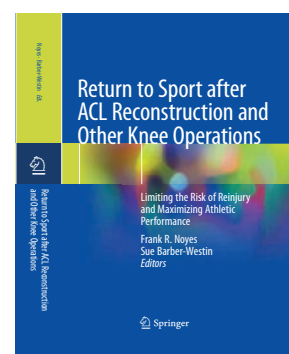
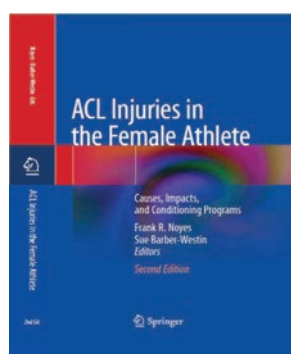
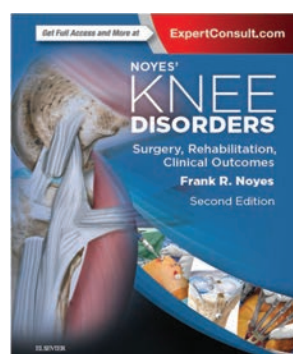
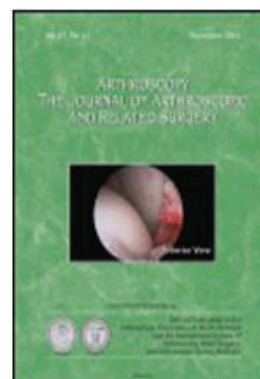


Carolyn Meder, ATC
Sportsmetrics™
Athletic Trainer



Lindsey Sipes, ATC
Research Coordinator

2019 Journal Publications and Textbook Chapters



Noyes' Knee Disorders: Surgery, Rehabilitation, Clinical Outcomes – This textbook is an unparalleled resource on the diagnosis, management, and outcomes analysis for the full range of complex knee disorders.

ACL Injuries in the Female Athlete – Nearly a million anterior cruciate ligament (ACL) injuries occur each year worldwide, causing long-term problems in the knee joint. This textbook examines the short- and long-term impacts of ACL injuries based on hundreds of published studies.

Return to Sport after ACL Reconstruction and Other Knee Operations – This textbook provides a wealth of information and will enable orthopaedic surgeons, medical practitioners, physical therapists, and athletic trainers to ensure athletes who suffer anterior cruciate ligament (ACL) injuries, or who require major knee operations, have the best possible chance of safely resuming sporting activities without subsequent problems.

Knee Division: Clinical Outcome Studies & Applied Clinical Research

- *Knee Disorders Prospective Registry*
- *Tibial and Femoral Osteotomy Realignment Studies*
- *Cartilage and Meniscus Restoration Center*
- *Robotic Patellofemoral and Tibiofemoral Joint Replacement Center*



This division is responsible for every phase of our patient-related studies under the direction of Dr. Frank Noyes. The Knee Registry is over 25 years old and numerous clinical studies have been published on all types of complex knee disorders. The publications have a 90% to 100% follow-up, which is a major credit to our research staff that follow our patients throughout the United States. Patients travel from all over the world to receive specialized care for serious knee disorders and our clinical and research team continues to provide the highest standard of care available with compassion and individualized treatment programs. The breadth of clinical outcomes studies are featured in the 2nd edition of the Noyes Knee Disorders book published in 2016.

Personnel: Sue Barber-Westin, Cassie Fleckenstein, Jennifer Riccobene, Lindsey Sipes

Publications

1. Barber-Westin SD, Noyes FR. Blood flow-restricted training for lower extremity muscle weakness due to knee pathology. A systematic review. *Sports Health*. 11: 69-83, 2019.
2. Noyes FR, Huser LE, Ashman B, Palmer M. Anterior cruciate ligament graft conditioning required to prevent an abnormal Lachman and pivot shift after ACL reconstruction. A robotic study of 3 ACL graft constructs. *Am J Sports Med*. 47:1376-1384, 2019.
3. Noyes FR, Crapser DC. Knee pain post total lateral meniscectomy. In Tapasvi S, Shekhar A (eds): *Knee Arthroscopy: A Case Repository*. Jaypee Brothers Medical Publishers, New Delhi, 2019.
4. Crapser DC, Noyes FR. Anterior cruciate re-tear with dilated tunnels. In Tapasvi S, Shekhar A (eds). *Knee Arthroscopy: A Case Repository*. Jaypee Brothers Medical Publishers, New Delhi, 2019.
5. Siegel MG. The dangers and concerns of intra-articular tranexamic acid. *Arthroscopy*. 35(11): 2973-2974, 2019.
6. Siegel MG. Editorial Commentary. Variations of national health-systems: time from injury to surgery can affect anterior cruciate ligament-medial collateral ligament treatment outcomes. *Arthroscopy*. 36(1): 212-213, 2020.
7. Barber-Westin SD, Noyes FR. One in five athletes sustain reinjuries upon return to high-risk sports after ACL reconstruction. A systematic review in 1,545 athletes less than 20 years of age. *Sports Health*, In Press.

Textbook chapters

Our textbook, [Return to Sport After ACL Reconstruction and Other Knee Operations: Limiting the Risk of Reinjury and Maximizing Athletic Performance](#), was published by Springer in 2019. Nearly a million anterior cruciate ligament (ACL) injuries occur each year worldwide, most of which are sustained by young athletes. The ability to return patients back to sports safely and without subsequent problems is paramount. Return to play has become the subject of increased scrutiny as a result of high reinjury rates that have been reported, as well as disappointing percentages of athletes who returned to sports even though normal or very good knee function was restored.

This unique textbook focuses on return to play after ACL and other knee operations and discusses:

- Common barriers to return to play, including physical, psychological, psychosocial, and neurocognitive problems.
- Return to play decision-based models and the roles of the orthopaedic surgeon and team physician.
- The complete spectrum of optimal treatment for ACL injuries, including preoperative, intraoperative, and postoperative rehabilitation.
- Advanced training concepts such as neuromuscular retraining, work load intensity, external focus, and visual-motor training concepts.
- Objective testing for knee function, neurocognitive function, and cardiovascular fitness.
- Identification and management of psychological issues including fear and depression in the athlete.
- Return to play considerations after meniscus surgery, patellofemoral realignment, articular cartilage procedures, and knee arthroplasty.

Chapters:

1. Noyes FR, Barber-Westin SD: Advantages and Potential Consequences of Return to Sport: Patient Satisfaction, Reinjury Rates, Knee Osteoarthritis.
2. Barber-Westin SD, Noyes FR: Common Physical and Psychological Barriers to Return to Sport.
3. Barber-Westin SD, Noyes FR: Return to Sport After ACL Reconstruction: Where's the Scientific Evidence?
4. Heckmann TP, Noyes FR, Barber-Westin SD: Preoperative Rehabilitation: Basic Issues.
5. Noyes FR, Barber-Westin SD: Intraoperative Considerations Crucial for a Successful Outcome.
6. Noyes FR, Barber-Westin SD: Early Postoperative Rehabilitation to Avoid Complications and Prepare for Return to Sport Training.
7. Barber-Westin SD, Noyes FR: Sportsmetrics™ Neuromuscular Training: Basic and Advanced.
8. Noyes FR, Barber-Westin SD: Return to Sport for Soccer and Basketball.
9. Barber-Westin SD, Noyes FR: Return to Sport for Tennis.
10. Noyes FR, Barber-Westin SD: The Physician's Comprehensive Examination.



11. Barber-Westin SD, Noyes FR: Neuromuscular Function, Agility, and Aerobic Testing.
12. Noyes FR, Barber-Westin SD: Muscle Strength and Balance Tests.
13. Barber-Westin SD, Noyes FR: Validated Questionnaires to Measure Return to Sport and Psychological Factors.
14. Barber-Westin SD, Noyes FR: Return to Sport After ACL Revision Reconstruction.
15. Noyes FR, Barber-Westin SD: Return to Sport After Meniscus Operations: Meniscectomy, Repair, and Transplantation.
16. Noyes FR, Barber-Westin SD: Return to Sport After Patellofemoral Realignment.
17. Noyes FR, Barber-Westin SD: Return to Sport After Partial and Total Knee Arthroplasty.
18. Noyes FR, Barber-Westin SD: Current Understandings and Directions for Future Research.

Manuscripts and Book Chapters Under Review/In Press

1. Barber-Westin SD, Noyes FR: Which anterior cruciate ligament prevention programs are effective in decreasing injury rates and improving neuromuscular indices in female athletes? A systematic review. Under review, *Sports Health*.

Current Major Studies

1. Long-term Clinical Outcomes Following Meniscus Transplantation: The purpose of this study is to evaluate the long-term outcomes following meniscus transplantation. The study objectives measured include decrease in pain, increase in function, and improvement of quality of life.
2. High Tibial Osteotomy with TOMA Fix Locking Plate: This study is being conducted to evaluate and report the long-term clinical outcomes of a high tibial osteotomy procedure with the use of the TOMA fix locking plate. Patients are evaluated at 1, 2, 5, 7, and 10 years post-operatively.
3. MPFL Reconstruction with Proximal Patellar Realignment: This prospective study is being conducted to evaluate the clinical outcomes following medial patellofemoral ligament (MPFL) reconstruction in patients with chronic patellar subluxation. Patients will be evaluated pre-operatively and again at 1, 2, 5, 7, and 10 years post-operatively.
4. ACL Revision with Tibial and/or Femoral Tunnel Bone Grafting: The purpose of this prospective study is to evaluate and report the clinical outcomes for patient who have undergone an ACL revision procedure with staged tibial and/or femoral tunnel bone grafting. Decrease in pain, increase in function, stability, and return to activity will be evaluated.
5. Short- and Long-Term Clinical Outcomes Following MAKO Patellofemoral and Tibiofemoral Joint Replacements: The primary purpose of this investigation is to report the short-and long-term clinical outcomes of patellofemoral arthroplasty (PFA) implanted using the MAKOplasty knee resurfacing system. The secondary purpose of this investigation is to compare the short-term outcomes, complication rates, and survival rates of PFA to historical controls who underwent an osteochondral procedure.
6. Cartilage Restoration of the Knee Joint: The purpose of this research study is to determine the long-term clinical outcomes of patients who receive a cartilage restoration procedure. Procedures being followed for this study include osteochondral autograft transfer, autologous chondrocyte implantation or meniscus transplant. The study objectives are to determine to what extent these operations reduce pain, increase function, and improve the quality of life in patients who have full-thickness cartilage defects and to precisely measure these improvements.
7. Distal Femoral Osteotomy for Valgus Malalignment in Young Patients: Clinical outcomes of pain, swelling, stability, function, and return to activity will be evaluated and reported in patients who undergo a distal femoral osteotomy. Patients will have a comprehensive knee exam and will complete patient reported outcome measures pre-operatively and again at designated time points after surgery.
8. Return to Recreational Activities and Work Following Total Knee Replacement: Introduction of Advanced Conditioning and Performance Programs to Achieve Higher Success Rates: Many patients strive to return to recreational activities and work following total knee replacement. There are three main purposes to this study. 1) Examine the factors that allow total knee replacement patients to return to recreational sports and/or work activities, and to achieve recommended physical activity levels as defined by the American Heart Association and the American College of Sports Medicine. 2) Examine the factors that limit the ability of patients to resume sports, work, and physical fitness training including comorbidities, general health, complications, and other factors. 3) Use advanced sports medicine rehabilitation principles that involve staged progressive protocols to safely prepare patients for sports, work, and physical fitness training. Objective measurements of muscle strength, endurance, balance, and neuromuscular control will be used to determine when patients may be cleared to participate in these activities.
9. Blood Flow Restriction Training for Severe Muscle Atrophy: Under the direction of Dr. Noyes, our research team is evaluating strength gains following utilization of blood flow restriction (BFR) training for muscle atrophy. Patients with severe muscle atrophy are enrolled into this prospective study and follow a very specific training program. The BFR training program consists of 9 visits over a 3 to 4-week period. Strength is measured prior to training and at the conclusion of the 9 visits. Further details about this study are provided later in this report.
10. Clinical Outcomes, Patient Satisfaction, and Increased Activity Parameters in Knee Osteoarthritis Patients After Platelet Rich Plasma and Stem Cell Treatment in Two Different Patient Activity Groups: This prospective study aims to determine the efficacy and clinical outcomes of a platelet rich plasma (PRP) injection or an intra-articular injection of stem cells plus bone grafting in different patient groups with knee osteoarthritis.

Shoulder Division: Clinical Outcome Studies & Applied Clinical Research

Under the direction and leadership of Dr. Samer Hasan and with contributions by Drs. Thomas Lindendorf, Marc Galloway, and Matthew Busam our Center is a destination for patients seeking quality non-operative and operative treatment for their shoulder and elbow injuries. Our physicians are involved in cutting edge research and technological advances. Our physicians are also reviewers and editors for various print and online publications. In 2019, Dr. Hasan co-edited the following online textbook published by the American Academy of Orthopaedic Surgeons.

Surgical Insights: Reverse Shoulder Arthroplasty (online course). Parsons B.O., Hasan S.S. (eds.). American Academy of Orthopaedic Surgeons. Rosemont, Illinois, 2019.

2019 was a very busy and productive year for the Shoulder Center. Complete details are included below.

Personnel: Cassie Fleckenstein, Jennifer Riccobene, Lindsey Sipes

Publications

1. Schumaier, A., Abboud, J., Grawe, B., Horneff, J.G., Getz, G., Williams, G., Ramsey, M., Namdari, S., Romeo, A., Nicholson, G., Keener, J., Friedman, R., Yian, E., Muh, S., Delaney, R., Otto, R., Levine, W., Tokish, J.T., Kazanjian, J., Dines, J., Green, A., Paxton S., Flanagan, B., Hasan, S., Kaar, S., Miniaci, A., Cuomo, F., "Evaluating Glenohumeral Osteoarthritis: The Relative Impact of Patient Age, Activity Level, Symptoms, and Kellgren-Lawrence Grade on Decision-making", *Arch Bone Joint Surg*, 2019;7(2):151-160.
2. Hasan, S.S., "Timing is Everything – Commentary on an article by Brian Forsythe, MD, et al.: "The Timing of Injections Prior to Arthroscopic Rotator Cuff Repair Impacts Risk of Surgical Site Infection"". *J Bone Joint Surg – Am.*, 2019;101(8):e33.
3. Hasan, S.S., Levy, J.C., Leitzke, Z.R., Kumar, A.G., Krupp, R.J., Harter, D.G., "Reverse Shoulder Prosthesis with a Lateralized Glenosphere: Early Results of a Prospective Multi-Center Study Stratified by Diagnosis", *J Shoulder Elbow Arthroplasty*, 2019;3:1-9.
4. Hasan, S.S., Rolf, R.H., Simpson, A., Eten, K., Elsass, T.R. "Single Shot versus Continuous Interscalene Block for Postoperative Pain Control following Primary Shoulder Arthroplasty: A prospective randomized clinical trial", *JAAOS – Global Res Rev.*, 2019;3(6):p e014.
5. Garrigues G.E., Zmistowski, B., Cooper A.M., Green, A., ICM Shoulder Group, "Proceedings from the 2018 International Consensus Meeting on Orthopedic Infections: evaluation of periprosthetic shoulder infection", *J Shoulder Elbow Surg.*, 2019;28:S32-S66.
6. Garrigues G.E., Zmistowski, B., Cooper A.M., Green, A., ICM Shoulder Group, "Proceedings from the 2018 International Consensus Meeting on Orthopedic Infections: management of periprosthetic shoulder infection", *J Shoulder Elbow Surg.*, 2019;28:S67-S99.

Book Chapters

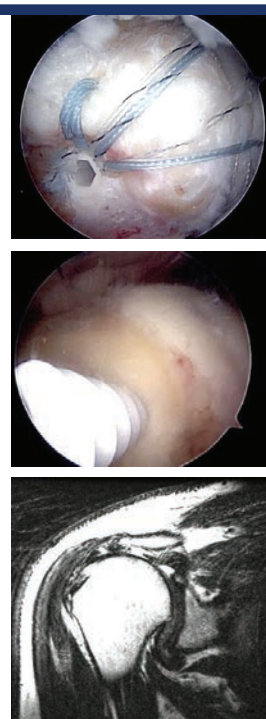
1. Hasan, S.S., "Reverse Shoulder Arthroscopy for Cuff Tear Arthropathy", In: "Surgical Insights: Reverse Shoulder Arthroplasty [online course]", B.O. Parsons and S.S. Hasan, eds. American Academy of Orthopaedic Surgeons, Rosemont, Illinois, 2019.

Manuscripts/Textbook chapters under review, in press

1. Kohrs, B. and Hasan, S.S., "Indications", In: *Reverse Shoulder Arthroplasty: A Comprehensive Case-Based Approach*, SLACK Inc., submitted.
2. Hasan, S.S., Schwindel L.E., Fleckenstein, C.M., "Prosthetic Shoulder Arthroplasty in Patients 40 Years Old or Less: Early Outcomes Stratified by Diagnosis and Surgery", in preparation.
3. American Shoulder and Elbow Society (ASES) Periprosthetic Joint Infection (PJI) Multicenter Workgroup. "Variability of culture specimen processing for suspected Shoulder periprosthetic joint infections during revision arthroplasty", *J Shoulder Elbow Surg.*, 2019, submitted.
4. Parker D., Smith A., Fleckenstein C.M., Hasan S.S., Role of Arthroscopy following Prosthetic Shoulder Arthroplasty. *JBJS Rev.*, submitted, 2020.
5. Palmer, M., Fleckenstein, C.M., Levy, M.S., Hasan, S.S., "The Distribution of Shoulder Replacements among Surgeons and Hospitals is Changing over Time", *JAAOS – Global Res. Rev.*, 2019, under review.
6. Hasan, S.S., Fleckenstein, C.M., Hajar, M., Ajayi, A., Early Outcomes and Tendon Integrity Following Arthroscopic Repair of Retracted Large and Massive Rotator Cuff Tears Augmented with a Bio-Inductive Collagen Implant. In preparation.

Abstracts

1. Hasan, S.S., Fleckenstein, C.M., Prosthetic Shoulder Arthroplasty in Patients 40 Years Old or Less. International Congress of Shoulder and Elbow Surgery, Buenos Aires, Argentina, September 20, 2019.



Current Studies

1. Longitudinal Study of the Results of Shoulder Replacement Surgery in Patients 40 Years Old or Less: The purpose of this study is to prospectively track and evaluate the short- and long-term outcomes of shoulder replacement surgery in patients age 40 years and younger. Dr. Hasan is currently tracking 40 patients for this study and has reported the outcomes at conferences in Paris, France (2017), Las Vegas (2018), and Buenos Aires, Argentina (2019).
2. Shoulder Arthroscopy Following Shoulder Replacement Surgery: Dr. Hasan is authoring this review article with 2018-2019 sports medicine fellows Drs. Andrew Smith and David Parker. The article summarizes the current indications, techniques, and results of shoulder arthroscopy following shoulder replacement surgery.
3. Clinical and MRI Outcomes of Patients Undergoing Repair of Large and Massive Rotator Cuff Tears with Collagen Patch Augmentation: A Retrospective Cohort Study: The purpose of this study is to evaluate the clinical outcomes of collagen patch augmentation for large and massive rotator cuff tears. Dr. Hasan is currently collecting MRI data, active range of motion, complications, healing rates, and patient reported outcome measures. Results for patients who received the collagen patch augmentation will be compared to a cohort of historical patients who underwent repair of similar tears but without the use of a patch.
4. OrthoSpace Multi-Center Study on the InSpace Balloon Arthroplasty: This multi-center, randomized controlled clinical trial will evaluate the InSpace balloon arthroplasty device. Mercy Health - Cincinnati SportsMedicine and Orthopaedic Center is one of 18 sites in the United States conducting this investigational device exemption study as a requirement for FDA approval. The balloon arthroplasty is a biodegradable saline filled balloon that is inserted arthroscopically into the subacromial space in order to improve comfort and function in patients with an irreparable rotator cuff tear but who still have preserved active range of motion.
5. OrthoFix Multi-Center Study on the Efficacy of Pulsed Electromagnetic Field (PEMF) Therapy as an Adjunctive Treatment to Surgical Repair of Full Thickness Rotator Cuff Tears: This is a randomized controlled clinical trial aimed at evaluating the effects of PEMF technology on promoting tendon to bone healing after arthroscopic rotator cuff repair.
6. American Shoulder and Elbow Surgeons (ASES) Multi-Center Young OA Study: The purpose of this prospective, multi-center study is to determine the predictors of successful outcome following arthroscopic management of glenohumeral arthritis in younger patients.
7. American Shoulder and Elbow Surgeons (ASES) Multi-Center Massive Rotator Cuff Study: The purpose of this data repository is to create a source of higher quality clinical evidence that may inform future clinical decision-making and studies regarding the eight most common treatment methods for massive rotator cuff tears.
8. Glenohumeral Shoulder Rotation and Arch of Motion in Overhead Athletes: This study is being conducted to evaluate the isolated glenohumeral rotations in overhead athletes and to correlate internal rotation deficits with number of years overhead sports participation.



Dr. Samer Hasan reconnecting with former CSMOC Sports Medicine Fellows Drs. Will Kesto and Todd Frush at the Arthrex Annual Orthopaedic Technology and Innovation Forum in Naples, Florida.



Dr. Hasan with former fellows Drs. Will Kesto and Jason Ramsey at the DJO Shoulder Summit in Chicago, Illinois.



Dr. Hasan instructs young orthopaedic surgeons at the 6th Annual DJO Residents and Fellows Course.

Hip Division: Clinical Outcome Studies & Applied Clinical Research



The prospective clinical outcomes hip division is responsible for every phase of all patient-related studies under the direction of Dr. Michael Palmer and adjunct faculty, Dr. Sanjeev Bhatia. The Hip Arthroscopy and Joint Preservation Center aims to provide patients from the Midwest region and beyond with a cutting edge, multidisciplinary approach involving injuries of the hip. Using the latest in newly developed arthroscopic and open surgical techniques, newly developed cartilage technologies, and non-surgical rehabilitation protocols and injections, the Center aims to provide young, active individuals with the best evidence-based non-arthroplasty treatment options for relieving hip pain, delaying the progression of end stage arthritis, and returning individuals to sports and function. Additionally, the Center is actively engaged in research and education efforts to advance the understanding of hip and joint preservation, sports medicine, and orthopaedic wellness.

Personnel: Cassie Fleckenstein, Jennifer Riccobene, Lindsey Sipes

Current Studies

1. In Office Ultrasound Guided Intra-articular Hip Injection vs. Hospital and Operating Room Based Fluoroscopic Guided Intra-articular Hip Injection: A Cost Minimization Analysis.
2. Can Effective Outcomes with Hip Arthroscopy be Achieved in Obese Individuals?: A Matched Cohort Analysis

Publications

1. 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.* 2019; 27(10): 3105-3109.
2. Ellman MB, Scheidt M, Skendzel JG, Bhatia S. Successful hip arthroscopy using postless distraction in a professional basketball player: a case report. *JBJS Case Connect.* 2019; 9(4): e0080.
3. Ellman MB, Hulse J, Chahla J, Bhatia S. Kite measurement technique for enhanced accuracy and technical proficiency of graft preparation in segmental labral reconstruction of the hip. *Arthrosc Tech.* 2019; 8(9): e1043-e1049.



Biomechanics and Robotics Division

Under the direction of Frank R. Noyes, MD and Edward S. Grood, PhD (Professor Emeritus, University of Cincinnati Department of Biomedical Engineering) the Biomechanics and Robotics Division conducts in-vitro studies on cadaveric knees using a highly sophisticated, custom-designed robotic system based on the Grood-Suntay coordinate system. The robotic system applies precise motions and loads determining three dimensional motions and tibiofemoral compartment displacements. The purpose of these investigations is to better understand knee ligament function, surgical reconstructions to restore knee stability after injury, and replacement.

Our Foundation, in conjunction with the Biomechanics and Robotics Division and the University of Cincinnati Department of Orthopaedic Surgery and Department of Biomedical Engineering, hosted the 3rd Annual Frank R. and JoAnne Noyes Eminent Scholarship Lecture program in August 2019 at the University of Cincinnati. Endowed Eminent Visiting Scholar, Edward Wojtys, MD was honored. Dr. Wojtys is the William S. Smith Collegiate Professor of Orthopaedic Surgery at the University of Michigan and completed his Sports Medicine Fellowship at Cincinnati SportsMedicine and Orthopaedic Center in 1985. Dr. Wojtys presented on the following topics.

- Mechanism of ACL Injury
- ACL Grafts – Current and Future

Additional presentations were provided by:

- Frank R. Noyes, MD:
 - ACL Surgery Advances 2019: Success of ACL Surgery and Role of Extra-Articular ITB Tenodesis
 - Clinical Outcome Studies and Return to Sports Objective Criteria
- Marc T. Galloway, MD:
 - The Orthopaedic Team Physician
- Stephanie L. Smith, MS:
 - Demonstration of the Sportsmetrics™ Program
- Barton Branam, MD:
 - In-Season Management of Shoulder Instability
- Jason Shearn, PhD:
 - UC Bioengineering Advances 2019-2020

Two Different Knee Rotational Instabilities Occur With Anterior Cruciate Ligament and Anterolateral Ligament Injuries: A Robotic Study on Anterior Cruciate Ligament and Extra-articular Reconstructions in Restoring Rotational Stability

Frank R. Noyes, M.D., Lauren E. Huser, M.Eng., John West, M.D., Darin Jurgensmeier, M.D., James Walsh, D.O., and Martin S. Levy, Ph.D.

Personnel: Edward S. Grood, PhD, Lauren Huser, MEng, Clinical Fellows

Studies Completed and Published

1. Noyes FR, Huser LE, Ashman B, Palmer M. Anterior cruciate ligament graft conditioning required to prevent an abnormal Lachman and pivot shift after ACL reconstruction: A robotic study of 3 ACL graft constructs. *Am J Sports Med* 2019;47(6):1376-1384.

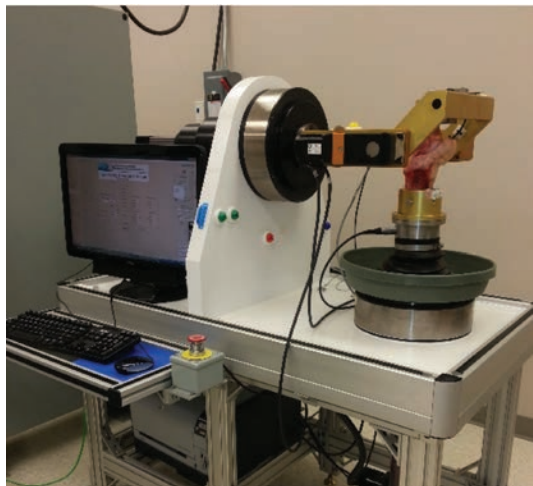
Current Studies

1. Correlative function of a BPTB ACL reconstruction in restoring normal anterior tibial translation and normal lateral tibiofemoral compartment translations in a pivot shift test.
2. Development of the predictability of the relationship between the Lachman and pivot shift tests in the ACL-deficient knee using historical data.

Upcoming Studies

1. Biomechanics of posterior cruciate ligament (PCL) deficiency and reconstruction.
2. Three-dimensional function of the ACL characterized by 3-D maps.
3. Kinematic alterations and treatment problems with abnormal knee hyperextension in ACL and other ligament knee injuries.
4. Effect of changing tibial slope on knee hyperextension: important measurement techniques for surgical correction of abnormal tibial slope.

Biomechanics and Robotics Division



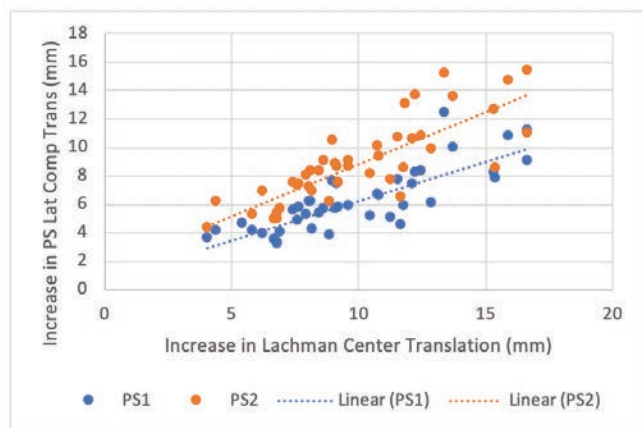
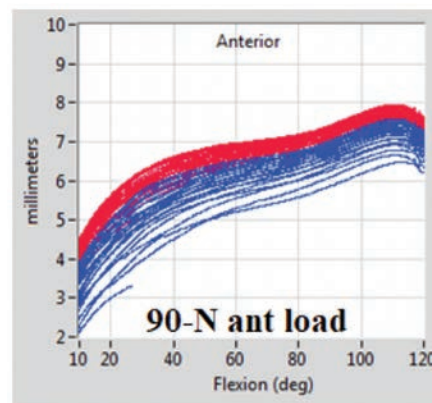
Our research is performed on a custom 6 degree-of-freedom robotic simulator that was developed and built by Edward S. Grood, PhD. Measurements of translations, rotations, and loads on all 3 axes are displayed and recorded in real-time.

This year has seen the culmination of 2 years of research on ACL graft conditioning. This important research was published this year in the American Journal of Sports Medicine and benefited from the work of fellows Brad Ashman (2017) and Michael Palmer (2018).

The goal of this study was to determine a practical conditioning protocol for two of the most common ACL graft constructs: semitendinosus-gracilis and bone-patellar tendon-bone. One of the major findings of this study is that graft-board tensioning prior to graft implantation is not effective in minimizing post-operative graft

elongation, as significant increases in anterior translation occur after implantation and subsequent cycling. In addition, this manuscript recommends to surgeons a simple conditioning protocol after implantation but prior to graft fixation that involves cycling the knee with an applied anterior force. Our research showed that this cyclic loading of the knee produced a properly conditioned graft that restored rotational knee stability at time-zero with minimal elongation.

Currently we are preparing a manuscript that uses data from 40+ knee specimens tested on the robot after ACL deficiency. This set of knee specimens represents one of the largest compilations of robotic biomechanical data to date. The use of a large historical data set allows us to characterize the biomechanical attributes of ACL deficiency with greater power than if we were to use a smaller sample size. For the current manuscript, we are using the large data set to explore the biomechanical relationship between the Lachman and pivot-



shift tests. These two tests are commonly used to diagnose ACL deficiency, but the pivot-shift test is performed differently surgeon-to-surgeon and is more subjective than the Lachman test. Because of this, it is important to determine at what degree of abnormal anterior translation in the Lachman test corresponds to a positive pivot-shift and, therefore, an ACL deficiency. In addition, the ACL graft tension at surgery is set using the Lachman test (millimeters of anterior tibial translation). The question being investigated is the correlation of the Lachman to a negative Pivot Shift subluxation after surgery. This research is currently being compiled into a manuscript and will be submitted for review this year.

Manuscripts:

1. Noyes FR, Huser LE, Ashman B, Palmer M. Anterior cruciate ligament graft conditioning required to prevent an abnormal Lachman and pivot shift after ACL reconstruction: A robotic study of 3 ACL graft constructs. Am J Sports Med 2019;47(6):1376-1384.

Biologics Division: Clinical Outcomes Studies and Applied Clinical Research

The biologics division was established in 2019 as part of a service line initiative of Mercy Health. Under the direction of Drs. Frank Noyes, Edward Marcheschi, and Sambhu Choudhury, this division is responsible for every phase of our biologic related studies. Biologics is a current hot topic in the field of orthopaedics for knee osteoarthritis. There is a tremendous amount of information available on the internet, but there is a lack of well designed, prospective clinical outcome studies for knee osteoarthritis. An extensive analysis and systematic review were completed by this division for knee osteoarthritis. This review provided very strong clinical basis and reaffirmed the need for good clinical information in the treatment algorithm. for knee osteoarthritis.

Personnel: Cassie Fleckenstein, Jennifer Riccobene, Lindsey Sipes

Current Major Studies

1. Bone Marrow Aspirate Concentrate (BMAC): Principal Investigator: Dr. Sambhu Choudhury
 - a. Independent analysis of 44 patients. Patient reported outcomes were collected at 3, 6, and 12 months post-operative.
 - b. This robust clinical evaluation will be completed in February 2020
2. Prospective, Randomized Control Trial: Principal Investigators: Dr. Frank Noyes, Dr. Edward Marcheschi
 - a. Prospective RCT of specific platelet rich plasma (PRP) intra-articular injections. Two types of PRP systems will be evaluated. Comparisons will be made to hyaluronic acid.
 - b. Active patients, age 40-65 will be enrolled into this study.
 - c. Data will be collected at 3, 6, and 12 months post injection. The data collected will be very detailed and will include subjective, objective, functional assessments as well as patient reported outcomes.
 - d. The goal of this study is to make recommendations to Bon Secours – Mercy Health regarding the efficacy of specific PRP products.



It is now known that PRP and BMAC injections do have a role in decreasing symptoms of knee arthritis. However, no study has ever shown that these injections will regenerate articular cartilage. Recent publications have shown that direct to consumer marketing of “stem cells” contains unethical information and claims of cartilage regeneration, which does not occur.

Neuromuscular Studies, Sportsmetrics™ Training Division

Sportsmetrics™ is the first and largest ACL injury prevention program scientifically proven to decrease serious knee ligament injuries in female athletes. The main goal of the Sportsmetrics™ Training Division is to develop and implement neuromuscular training programs that are effective in both preventing non-contact ACL injuries and improving athletic performance indicators. In addition to our formal Sportsmetrics™ program, we also offer the following training programs. Sportsmetrics™ Warm-Up for Injury Prevention and Performance (WIPP), Sportsmetrics™ Return to Play, Sportsmetrics™ Agility and Speed, Sportsmetrics™ Sports Injury Testing, Sportsmetrics™ Female Health Education, and Sportsmetrics™ Introduction to Athletics. A detailed description of each program is provided in this section.

We are also proud to announce the development of an anti-vaping initiative in high school athletes. Vaping is an epidemic that is impacting our young and vulnerable students and athletes.

Personnel: Stephanie Smith, Thomas Campbell, Sue Barber-Westin, Carolyn Meder



Current Studies

1. Effect of Sportsmetrics™ Training After ACL Reconstruction in Preventing Re-Injuries Upon Return to Sport.
2. Effect of Sportsmetrics™ Training in Local Female High School Athletes in Preventing Noncontact ACL Injuries.
3. Effect of an Advanced Sportsmetrics™ Training Program in Local Female High School Athletes in Preventing Noncontact ACL Injuries and Improving Sports Performance.

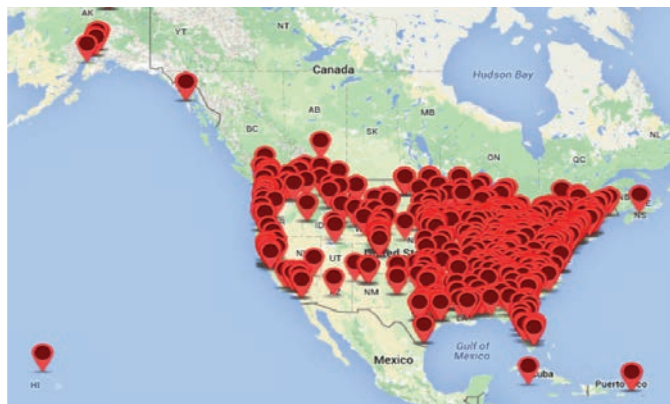
Number of Athletes Trained

- Over 4,300 athletes trained in the Cincinnati area since 2001 with overall significant improvements in neuromuscular indices, strength and conditioning levels.
- 272 athletes in 2019

Sportsmetrics™ Certification Program

Our Sportsmetrics™ certification program allows physical therapists, athletic trainers, and other healthcare professionals the opportunity to be part of the largest injury prevention program in the country. Our certified instructors use the scientifically-proven Sportsmetrics™ program as part of their rehabilitation program or in a group training scenario with high school and college athletes. Since 2002, we have certified over 2,300 individuals from 1,365 sites. We have certified trainers in all 50 states and 13 countries.

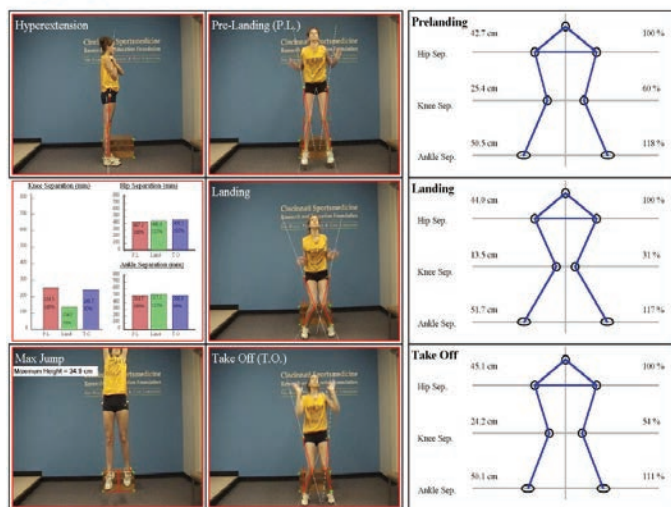
In 2019, 133 individuals from 31 states as well as Switzerland were certified to offer the Sportsmetrics™ program in their communities. Certifications were held in Cincinnati, OH; Kansas City, MO and Hilton Head Island, SC.





International Sites

Austria, Australia, Brazil, Canada, Finland, Hungary, Iceland, United Kingdom, Japan, Qatar, The Netherlands, Singapore, Switzerland



On-Site Host Sites since 2002 and number certified

1. Premier Bone & Joint Centers (16): Laramie, WY
2. SERC Physical Therapy (44): Kansas City, MO
3. Dayton Children's Hospital (18): Dayton, OH
4. University of Louisiana - Lafayette (10): Lafayette, LA
5. Emeryville Sports Physical Therapy (10): Emeryville, CA
6. Therapeutic Associates (46): Portland, OR
7. Carolinas Rehabilitation (34): Charlotte, NC
8. Community Rehab (17): Fremont, NE
9. McLeod Sports Medicine (25): Florence, SC
10. Ivy Rehab (23): Hoboken, NJ
11. Victory Sports Medicine (20): Skaneateles, NY
12. North Dakota State University (12): Fargo, ND
13. Apex Physical Therapy (10): San Mateo, CA
14. Georgia Sports Medicine (21): Atlanta, GA
15. The Jackson Clinics (30): Reston, VA
16. Hurley SportsCare (13): Flint, MI
17. SportsCare Memorial Medical Center (32): Springfield, IL
18. Physiotherapy Associates (18): Denver, CO
19. Physiotherapy Associates (15): Dover, DE
20. Northern Michigan Sports Medicine Center (16): Indian River, MI
21. Kitsap Physical Therapy & Sports Clinics (14): Silverdale, WA
22. St. Alphonsus Sports Medicine (20): Boise, ID

Neuromuscular Studies, Sportsmetrics™ Training Division

Sportsmetrics™ Programs

Formal Sportsmetrics™

- The original scientifically proven ACL injury prevention program backed by over 20 years of research. Formal Sportsmetrics focuses on teaching proper jump/land mechanics and decreasing lower limb strength deficits. It has 4 components, including a dynamic warm-up, jumps, strength and flexibility, that are performed 3 days a week for 6 weeks.

Sportsmetrics™ Warm Up for Injury Prevention & Performance (WIPP)

- A specially designed warm-up, incorporating the proven components of Sportsmetrics™ for 10-20 minutes of nonstop muscle and joint preparation, plyometrics, strength and flexibility. WIPP also includes agility drills that can facilitate a quick transition into practice and game day activities.

Sportsmetrics™ Return to Play

- For the athlete who has already suffered an injury or had knee surgery, to ensure they are ready for return to their sport. This program includes the fundamentals of the formal Sportsmetrics program in addition to specific objective testing of knee stability, coordination, muscle strength, agility and endurance.

Sportsmetrics™ Agility & Speed

- Offers athletes the same benefits of the original injury prevention program with added benefits of a complex conditioning regimen that can be catered to their sport. The program can be implemented with basketball, soccer, volleyball, tennis and lacrosse for optimal sports performance.

Sportsmetrics™ Sports Injury Testing

- Measures several important factors relating to an athlete's strength, coordination and body alignment. This compilation of tests compares the athlete's performance to a large research database of over 800 female athletes. The database is used to understand factors which may predispose an athlete to injury. Testing includes:
 - Video analysis of jump-land mechanics
 - Functional hop tests
 - Video analysis of a single leg squat
 - Vertical jump assessment
 - Core strength assessment
 - Speed, agility & endurance tests
 - Biodex isokinetic strength assessment (when available)

Sportsmetrics™ Female Health Education

- An educational health initiative with a focus on health issues and considerations specifically relating to female athletes. Topics covered include nutrition, strength training, ACL injuries, bone health, hormones, female athlete triad and more.

Sportsmetrics™ Introduction to Athletics

- An introduction to basic movement patterns and exercise safety considerations. This program was developed for the beginner athlete, individuals looking to initiate a more active lifestyle and as a part of our vaping diversion program.

Local, National, and International Meeting Presentations

Frank R. Noyes, MD



1. Blood Flow Restriction Therapy: A New Tool to Treatment Muscle Atrophy Post Surgery. 9th Pune Knee Rehabilitation Course, Pune, India, April 25, 2019
2. Use of Objective Criteria in the Clinic for Safe Return to Sports After Surgery. 9th Pune Knee Rehabilitation Course, Pune, India, April 25, 2019
3. Implementation of Neuromuscular Programs to Reduce ACL Injuries and Prevent Re-Occurrence of ACL Tears After Surgery. 9th Pune Knee Rehabilitation Course, Pune, India, April 25, 2019
4. Instructional Course Lecture: How to Repair the Meniscus. Why Should You Save the Meniscus? 9th Pune Knee Course, Pune, India, April 26-27, 2019
5. Case: Radial Lateral Meniscus Tear. 9th Pune Knee Course, Pune, India, April 26-27, 2019
6. Meniscus Allograft Transplantation. 9th Pune Knee Course, Pune, India, April 26-27, 2019
7. The High-Grade Pivot Shift: What is it and What Causes it? 9th Pune Knee Course, Pune, India, April 26-27, 2019
8. Anatomic ACLR with BPTB is Enough. 9th Pune Knee Course, Pune, India, April 26-27, 2019
9. Keynote Address: Lower Limb Alignment: Diagnosis, Treatment and Osteotomy in ACL and Cartilage Deficient Knees. 9th Pune Knee Course, Pune, India, April 26-27, 2019
10. Sagittal Plane Correction: Managing the Slope. 9th Pune Knee Course, Pune, India, April 26-27, 2019
11. Blood Flow-Restriction Therapy: An Important Rehabilitation Advance for Chronic Knee Muscle Atrophy and After Knee Surgery. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
12. Meniscus Repair and Transplantation: What's New in 2019. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
13. Treatment of Meniscus Tears: Rapid Fire Case Presentations. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
14. Treatment Options for Patellofemoral Disorders. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
15. Comprehensive Knee Exam: Clinical Rationale and Diagnosis. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
16. Treatment of the ACL-Deficient Knee: Presentation of Cases to Expert Panel. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
17. Scientific Basis and Development of the Sportsmetrics Neuromuscular Training Program. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
18. Prevention and Treatment of Knee Arthrofibrosis: A Major Complication of Knee Injury and Surgery. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
19. Use of Nonoperative and Operative Programs to Treat Knee Arthrofibrosis: Case Presentations. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
20. Surgical Treatment of PCL and Posterolateral Ligament Injuries. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
21. High Tibial Osteotomy: Techniques and Surgical Results. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
22. Partial Joint Replacement: Unicompartmental and Patellofemoral. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
23. Blood Flow Restriction Therapy Before and After Knee Surgery: An Important Addition to Your Treatment Plan. Annual Meeting of the Herodicus Society, Boston, MA, July 6, 2019
24. Complexities of ACL Injury. Return to Play Criteria for ACL, Shoulder, and Concussion Injuries. Sports Health Symposium, Boston, MA, July 11, 2019
25. Extra-articular Reconstruction in ACL-Deficient Knees: Back to the Future? AOSSM Annual Meeting ICL, Boston, MA, July 12, 2019
26. Selection of ACL Graft and Surgical Techniques to Prevent Problems. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
27. Meniscus Repair Cases: Presentation of Cases That Show Treatment Approaches. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
28. Treatment of Patellofemoral Instability and Techniques for MPFL Reconstruction. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
29. The Importance of Diagnosing Abnormal Tibial Slope to Prevent ACL Surgery Failure. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019

Local, National, and International Meeting Presentations

30. Treatment of Posterolateral Injuries and Surgical Techniques. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
31. Sportsmetrics: Neuromuscular Training to Prevent ACL Injuries. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
32. The Anterolateral Knee Ligament: Is a Surgical Reconstruction Necessary? Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
33. The Importance of Blood Flow Restriction Lower Extremity Exercises for Knee Disorders. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
34. Why is the Return to Sports Associated with High Reinjury Rates After Knee Surgery? Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
35. Treatment of PCL Injuries and Surgical Techniques. Advanced Course of Knee Surgery and Sports Physiotherapy, Sao Paulo, Brazil, Sept. 26, 2019
3. Lab Instructor, Arthrex Fellow Course, Naples, Florida, May 17, 2019
4. Complications of SLAP and Biceps Surgeries. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
5. Arthroscopic Treatments for the Massive and Irreparable Rotator Cuff Tear. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
6. Treatment of Shoulder Arthritis: From Arthroscopy to Arthroplasty. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
7. Posterior and Multidirectional Instability: 2019 Update. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
8. Distal Biceps Tendon Injuries: 2019 Update. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
9. Treatment of the Overhead Athlete: Cased Based Symposium. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
10. Treatment of Massive Rotator Cuff Tears: Case Based Symposium. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
11. The Stiff Shoulder: Operative and Non-Operative Treatment Options. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
12. Preoperative Planning. 6th Annual Revision Course in Shoulder Arthroplasty Tampa, FL, June 7-8, 2019
13. Moderator: Name that Stem. 6th Annual Revision Course in Shoulder Arthroplasty Tampa, FL, June 7-8, 2019
14. Co-moderator: Future of Shoulder Arthroplasty. 6th Annual Revision Course in Shoulder Arthroplasty Tampa, FL, June 7-8, 2019
15. Using Altivate Reverse as a Platform Stem – Advantages of an Inlay Component. San Diego Shoulder Course, San Diego, CA, June 19-22, 2019
16. Complications in Shoulder Arthroplasty. International Musculoskeletal Society (I.M.S.), Beirut, Lebanon, July 1-3, 2019
17. Treatment of Shoulder PJI 2019. International Musculoskeletal Society (I.M.S.), Beirut, Lebanon, July 1-3, 2019
18. Re-centering the Humeral Head: SCR or Balloon Spacer. International Musculoskeletal Society (I.M.S.), Beirut, Lebanon, July 1-3, 2019
19. Evaluation of Bone Loss in Anterior Shoulder Instability: from Inverted Pear to Glenoid Track. International Musculoskeletal Society (I.M.S.), Beirut, Lebanon, July 1-3, 2019
20. Treatment of Partial Thickness Rotator Cuff Tears: 2019 Update. International Musculoskeletal Society (I.M.S.), Beirut, Lebanon, July 1-3, 2019

Thomas N. Lindenfeld, MD

1. Shoulder Anatomy Review – What You Need to Know. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
2. Treatment of Partial and Massive Rotator Cuff Tears: Case Based Symposium. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
3. Comprehensive Examination of the Shoulder. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
4. Elbow Anatomy and Basic Arthroscopy. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019



Samer S. Hasan, MD, PhD

1. Invited Faculty, 8th Annual Fellows Course in Shoulder Arthroplasty, Dr. A Green, Course Director. Tampa, Florida, April 11-13, 2019
2. Role of Soft Tissue Augmentation to Reconstruct the Subscapularis. 2019 Mayo Course on Shoulder Tendon Transfers and Complex Rotator Cuff Repair, Rochester, Minnesota, April 25-27, 2019



Local, National, and International Meeting Presentations

21. Case Presentation: Posterior Shoulder Instability. International Musculoskeletal Society (I.M.S.), Beirut, Lebanon, July 1-3, 2019
22. Know Your History: What Has and Has Not Worked in Shoulder Surgery. DJO Shoulder Summit II, Chicago, IL August 24-25, 2019
23. Debate: Reverse or Anatomic TSA for 60-year-old Male with Osteoarthritis, Medialized Glenoid, and Intact Cuff; Anatomic All the Way! DJO Shoulder Summit II, Chicago, IL, August 24-25, 2019
24. Moderator, Free Papers Session 25 – Shoulder Instability, International Congress of Shoulder and Elbow Surgery, Buenos Aires, Argentina, September 20, 2019
25. Moderator, Shoulder Panel, DJO Workshop, ICSES 2019, Buenos Aires, Argentina, September 17-20, 2019
26. Invited Faculty, Northern California Shoulder and Elbow Course, Sacramento, CA, October 5, 2019
27. 2019 Update on Arthroscopic Treatment of Anterior Shoulder Instability. Mt. Carmel Orthopaedic Residency (Arthrex Sponsored), Columbus, OH, October 10, 2019
28. 2019 Update on Treatment of Posterior Shoulder Instability. Mt. Carmel Orthopaedic Residency (Arthrex Sponsored), Columbus Ohio, October 10, 2019
29. 2019 Update on Superior Capsule Reconstruction. Mt. Carmel Orthopaedic Residency (Arthrex Sponsored), Columbus Ohio, October 10, 2019
30. ICL#101: Arthroscopy to Arthroplasty for the Very Young Patient with Glenohumeral Arthritis, ASES 2019 Annual Meeting, New York, NY, October 17, 2019

Michael P. Palmer, MD

1. In Office Ultrasound Guided Intra-Articular Hip Injection vs. Hospital and Operating Room Based Fluoroscopic Guided Intra-Articular Hip Injection: A Cost Minimization Analysis. American Academy of Orthopaedic Surgeons Annual Meeting, Las Vegas, NV March 2019
2. Common Hip Problems and Injuries: Diagnosis and Treatment. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
3. Treatment of the ACL Deficient Knee: Presentation of Cases to the Expert Panel. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019



Fellows

Andrew C. Crapser, MD

1. Blood Flow-Restriction Therapy (BFR): An Advancement in Rehabilitation for Chronic and Post-Op Muscle Atrophy. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
2. E-Cigarettes: The New Epidemic Among Children. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019

Oscar F. Noel, DO

1. Advances in Total Knee Arthroplasty. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019

David B. Parker, MD

1. The Key to the Knee: Medial and Anterior Anatomy. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019

Andrew C. Smith, DO

1. The Key to the Knee: Lateral and Posterolateral Anatomy. 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019
2. What is the Scientific Basis for Knee Ligament Healing and Maturation to Restore Biomechanical Properties and a Return to Sports? 34th Annual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference, Hilton Head Island, SC, May 26-29, 2019

Advances on the Knee, Shoulder, Hip and Sports Medicine Conference

This three and one-half day course provides presentations on the latest controversies and clinical, surgical, and rehabilitation recommendations for knee, shoulder, hip, and sports medicine problems. Cincinnati SportsMedicine has long recognized the collaborative efforts of orthopaedists, physical therapists, athletic trainers and many other health professionals to successfully diagnose and treat musculoskeletal problems.



In 1986, in conjunction with the American Academy of Orthopaedic Surgeons, Cincinnati SportsMedicine Research & Education Foundation co-sponsored a continuing medical education program for orthopaedic medical specialists with the emphasis on the diagnosis and treatment of knee, shoulder, and sports medicine problems. Sponsored by Cincinnati SportsMedicine, this program has evolved into one of the premier continuing education programs in the country, with an internationally recognized guest faculty.

The Annual Advances on the Knee, Shoulder, Hip and Sports Medicine Conference is one of the few comprehensive continuing education courses that includes clinical, surgical, and rehabilitation techniques for knee, shoulder, elbow, hip, and sports medicine pathology. Our internationally recognized,

multi-disciplinary faculty share their experiences, research, and clinical outcomes to stimulate medical professionals to rethink their approach to many musculoskeletal challenges.





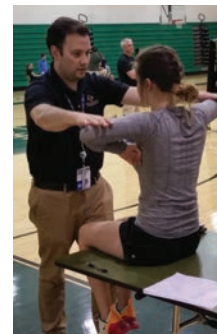
The 2019 meeting was our 34th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine Conference. We welcomed over 200 orthopaedic surgeons, physician assistants, physical therapists, physical therapy assistants, and athletic trainers to this conference. In addition to over 200 course participants, we welcomed 12 exhibitors. Course participants enjoyed listening to over 32 hours of presentations, breakouts, and panel discussions on the treatment of disorders of the knee, shoulder, elbow, hip, and sports medicine.

2019 Course Faculty:

Frank R. Noyes, MD
 Sanjeev Bhatia, MD
 Samer S. Hasan, MD, PhD
 Thomas N. Lindenfeld, MD
 Anthony A. Romeo, MD
 Edward M. Wojtys, MD
 Jay C. Albright, MD
 Jeffrey R. Dugas, MD
 Michael P. Palmer, MD
 Andrew C. Crapser, MD
 Oscar F. Noel, DO
 David B. Parker, MD
 Andrew C. Smith, DO
 Timothy P. Heckmann, PT, ATC
 George J. Davies, DPT, PT
 Julie Jasontek, PT, MHS
 Russell M. Paine, PT
 Kevin E. Wilk, DPT, PT
 Stephanie L. Smith, MS



Sports Medicine Fellowship Program



The fellowship program at Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health is nationally acclaimed as one of the finest post-residency, sports medicine specialty training experiences. Fellows who train at our Center receive extensive experience in surgery, clinic, academics, and research. The training is accomplished through busy surgical and clinical practices, bio skills laboratories, rehabilitation exposure, on-the-field team coverage, formal weekly teaching conferences, monthly journal clubs, and research projects. The highly structured program includes didactic lectures on sports medicine, indications and complications, rehabilitation, anatomy, and biomechanics. All of the physicians at Cincinnati SportsMedicine & Orthopaedic Center are very dedicated to the educational program and the fellows every year express their gratitude for the surgical and clinical experience. The rehabilitation and athletic trainer faculty, as well, are dedicated to the program and provide a unique educational experience.

Personnel: Frank R. Noyes, MD – Fellowship Director, Thomas N. Lindendorf, MD, Marc T. Galloway, MD, PhD, Matthew L. Busam, MD, Michael P. Palmer, MD, Cassie Fleckenstein, Teresa Wood

Studies Completed

1. Results of Prosthetic Shoulder Arthroplasty in Patients Under Age 40
2. Distribution of Shoulder Replacement Among Surgeons and Hospitals
3. Shoulder Arthroscopy Following Shoulder Replacement Surgery: Systematic Review
4. Anterior Cruciate Ligament Graft Conditioning Required to Prevent an Abnormal Lachman and Pivot Shift after ACL Reconstruction: A Robotic Study of 3 ACL Graft Constructs

Manuscripts Under Review/In Press

1. Palmer M, Fleckenstein C, Hasan S. The Distribution of Shoulder Replacements is Changing
2. Taylor ML, Palmer MP, Noyes FR. The Missed Lateral Meniscus Tear: Arthroscopic Repair of Tears at the Popliteal Hiatus
3. Hasan SS, Smith AC, Parker DB. Shoulder Arthroscopy Following Shoulder Replacement Surgery

Current Studies

1. Blood Flow Restriction Training for Severe Muscle Atrophy Following Knee Injury and Surgery
2. Clinical and MRI Outcomes of Patients Undergoing Repair of Large and Massive Rotator Cuff Tears with Collagen Patch Augmentation: A Retrospective Cohort Study
3. Reverse Shoulder Arthroplasty in Patients 90 Years Old or Greater
4. Handedness in Orthopaedic Surgery
5. Knee Hyperextension Measurements
6. Women's Sports Medicine Initiative
7. Instructional Video – Anterior Closing Wedge Osteotomy to Correct Abnormal Tibial Slope Prior to ACL Reconstruction
8. Quadriceps Strength After ACLR with Quadriceps Tendon Autograft: Systematic Review



The fellowship program continues to be enriched with Dr. Marc Galloway as the Cincinnati Bengals team physician and with Dr. Matthew Busam as the Chief Medical Officer for FC Cincinnati. Accompanied by the athletic coverage at local high schools, our fellowship provides for a robust sports medicine experience.

University of Cincinnati Department of Biomedical Engineering

Collaboration with the University of Cincinnati Department of Biomedical Engineering continued into its 43rd year. This department was co-founded in 1975 by Drs. Frank R. Noyes and Edward S. Grood as one of the first bioengineering departments in the United States. The collaborative efforts of engineers and orthopaedic surgeons has resulted in the highest honors and awards in orthopaedic research. Awards received by the scientists and orthopaedic surgeons in the Department of Biomedical Engineering include the Orthopaedic Research and Education Foundation (OREF) Clinical Research Award for Outstanding Orthopaedic Clinical Research, and three Kappa Delta Awards from the American Academy of Orthopaedic Surgeons (AAOS). Prestigious awards have also been received from the American Orthopaedic Society for Sports Medicine (AOSSM) and the Orthopaedic Research Society (ORS).



*Jason Shearn, PhD
Interim Chair, Department
of Biomedical Engineering*

In 2016, the Dean of the College of Engineering announced the formation of a Department of Biomedical Engineering with a new Director and added financial resources for additional programs and faculty. Under the direction of interim chair, Jason Shearn, PhD, this department has grown to include 8 primary faculty members, 4 joint faculty members, and 27 secondary faculty members. In addition, there are 342 undergraduate students, 31 graduate students and 20 PhD students in the various programs offered by the Department of Biomedical Engineering. We would like to

congratulate Dr. Shearn, former PhD student who worked under the tutelage of Drs. Grood and Noyes, on the success of the department and his continued accomplishments in education.

We are pleased to continue our collaboration with the Department of Biomedical Engineering, allowing our Foundation's faculty to enter into new, highly innovative, and ground breaking research. These programs have a translational application to the treatment of orthopaedic and sports medicine disorders.

Blood Flow Restriction Training

The Effect of Blood Flow Restriction Training (BFRT) in Post-Operative and Chronic Knee Disorders is a major prospective clinical study underway at Cincinnati SportsMedicine and Orthopaedic Center – Mercy Health. Muscle weakness or atrophy is a common condition found in patients with long-standing knee pain or after major knee surgery. As such, strength training is an imperative component in the rehabilitation of musculoskeletal injuries. In many patients, high-load training using heavy weight is used to assist in regaining strength; however, some individuals cannot tolerate the weight required. In these patients, the use of a blood pressure cuff applied to restrict blood flow to the leg is used along with exercises done with a comfortable amount of weight.

In 2018, we published a systematic review that found that BFRT was a safe and effective method to regain strength based on data from 9 studies involving 165 patients. We believed this was an important adjunct to use in the appropriately indicated patient and began our study. We currently have 3 groups of patients enrolled:

- ACL reconstructed knees that begin training either 4 or 12 weeks postoperatively
- Patients with chronic muscle atrophy who have been referred to our clinic for treatment and who cannot tolerate high-load, heavy weight training
- Patients who have had major knee surgery performed elsewhere in which severe muscle atrophy impairs their postoperative recovery and in whom traditional rehabilitation measures have failed


Early results of BFRT in these patient groups have been very encouraging. We have found that the program is well tolerated and safe. Approximately 50-75% have had very good improvements in muscle strength and felt the training was highly beneficial. This study will continue to enroll patients in 2020 to further refine protocols, cuff pressure, exercises, and program duration.

Purpose

Blood Flow-Restricted Training for Lower Extremity Muscle Weakness due to Knee Pathology: A Systematic Review
Bardhan-Kumar, Maiti, B, et al. Sports Health 2018


Determine if BFRT is effective:

1. Improving quadriceps & hamstring strength & cross-sectional area for chronic knee-related lower extremity muscle atrophy
2. Preventing lower extremity muscle atrophy after surgery



Methods

- Systematic review PubMed 1987-2017 (534 articles)
- Controlled trial (RTC or non-randomized)
- BFRT used to Rx chronic muscle atrophy or to prevent atrophy after knee surgery
- Report measured effect quadriceps and/or hamstrings muscle strength or CSA



Methods:
9 / 534 Studies Met Criteria


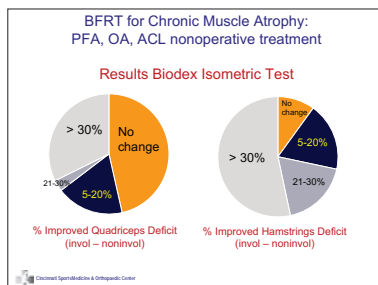
Level 1 RTC (n=8), level 2 (n=1)

Surgery: ACL recon (n=3), routine scope (n=1)

Chronic atrophy: Knee OA (n=4), PF pain (n=1)

BFRT: 168 subjects (93 F, 72 M), mean age 42

Controls: 170 subjects (100 F, 70 M), mean age 40


Results
Quadriceps Strength

BFRT within-group significant improvements

Study	Rx	Test Measure	Wks Trained	% Strength Increase	P value
Tennant '17	Knee scope	Isok 60°/s	9 - 12 S	75%	.002
Giles '17	PF pain	Isom-dyn	8 - 24 S	27%	<.001
Byrk '16	Knee OA	Isom-dyn	6 - 18 S	17%	.001
Ferraz '18	Knee OA	Leg press 1RM	12 - 24 S	26%	<.001
Segal '15	Knee OA	Leg press 1 RM	4 - 12 S	3%	.003

BFRT vs Control: greater quad strength improvements

- Ohta '03, Tennant '17, Segal (women) '15, Ferraz '18



Results
MRI CSA s/p ACL Reconstruction

Study	Muscle	% Decrease	14 vs 3 days p.o.	P value
Takarada '00	Quadriceps	9.4%	20.7%	<.05
	Hamstrings	9.2%	11.3%	NS
Iverson '16	Quadriceps	13.8%	13.1%	NS

Study	Muscle	% Ratio Inv/Non	16 wks p.o.	P value Btw Grps
Ohta '03	Quadriceps	101%	92%	<.05
	Hamstrings	105%	102%	NS

Possible quadriceps beneficial effect, Decreasing p.o. atrophy

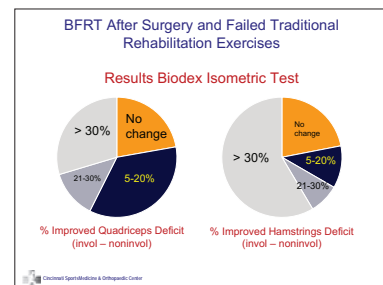
Systematic Review Recommendations

6/8 studies: BFRT effective

- ACL reconstruction, knee scope, knee OA and PF pain

No serious complications

- 2% BFRT subjects dropped out discomfort with cuff pressure
- 4/16 (25%) controls in 1 study dropped out discomfort with high-resistance training

Clinical Results of Primary Total Knee Replacement

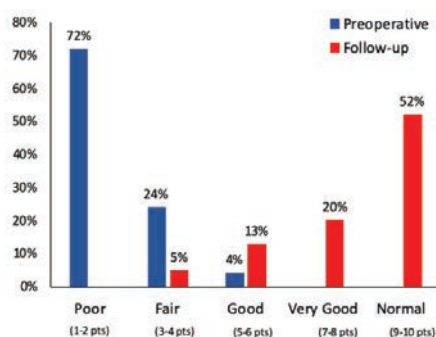
Methods

This study encompasses 54 patients who underwent TKR from 2013-2015 and were followed a mean of 4.8 years postoperatively (range, 3.4 to 5.6 years). The patients were 65 years of age or younger and were usually involved in recreational activities they wished to continue. All received a primary TKR using the Smith-Nephew Journey II and underwent a postoperative rehabilitation program designed by the Noyes Knee Institute with the goals to return strength and function to the lower extremity. Post operatively the patients were seen by the surgeon frequently and at least weeks 1, 3, and 6 to supervise return in knee motion and muscle function. Follow up at 6 months and one year, and as required thereafter. Patients were given special instruction and guidance for their return to work-out and recreational activities' patients registered into the prospective Institute Knee Registry and completed the Cincinnati Sportsmedicine and Orthopedic Center Knee Replacement Clinical Outcomes Registry, which includes the following:

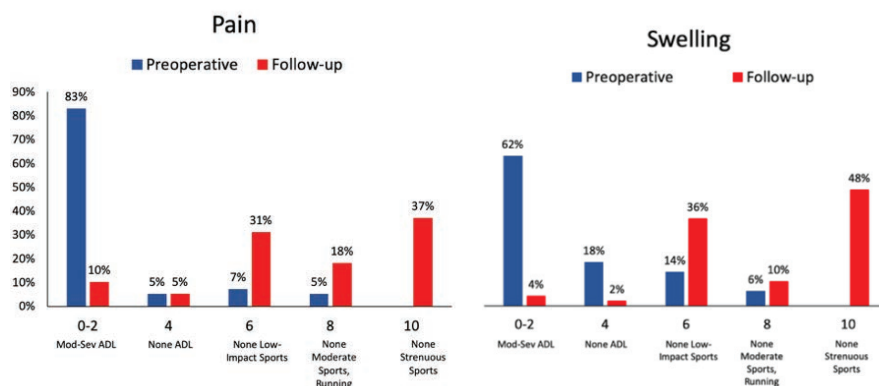
- KOOS, Jr. Knee Survey
- VR-12 Health Survey
- The validated Cincinnati Knee Rating System assessment of the overall condition of the knee and problems with daily activities
- Questions on general fitness level and sports/recreational activities
- Occupational Rating scale
- Questions on patient satisfaction and expectations

Results

Patient Perception of the Overall Knee Condition



Pain and Swelling: Cincinnati Knee Rating System

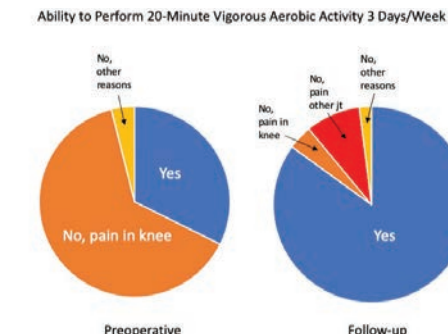


General Fitness Level

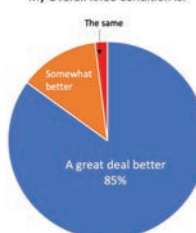
Are You Able to Take a Brisk 20-Minute Walk 5 Days a Week?



Are You Able to Perform 20 Minutes of Vigorous Aerobic Activity 3 Days a Week?



Compared to Before Surgery, My Overall Knee Condition is:



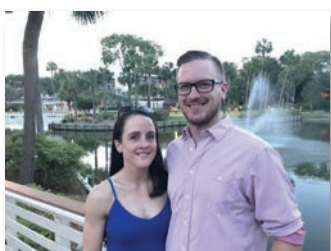
Event Photos

*American Academy
of Orthopaedic
Surgeons Annual
Meeting*



Event Photos

*34th Annual
Advances on the
Knee, Shoulder, Hip
and Sports Medicine
Conference*





Cincinnati SportsMedicine Research
& Education Foundation

Noyes Knee Institute



The Jewish Hospital —
Mercy Health



Mercy Health — Fairfield Hospital



Mercy Health — West Hospital

*A world class center of excellence that
makes a difference in patient lives*

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