

# 2021 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



The Cincinnati Sports Medicine Research and Education Foundation is the parent organization for our education and research programs. In collaboration with Graduate Medical Education at Jewish Hospital, and Bon Secours Mercy Health, this 2021 Annual Report showcases the major advances of all Divisions within our organization that have collectively provided a most successful and productive year. Over four decades, our staff have established and educated a world class team of orthopedic surgeons, physical therapists, athletic trainers, performance enhancement specialists and allied health professionals. These specialists are dedicated to our sports medicine and orthopedic patients in the entire spectrum of non-operative and operative treatment of patient musculoskeletal disorders, injuries, and arthritis to restore patients to an active healthy lifestyle and return to their occupations.

Our mission is to provide expert compassionate care to our patients in knowing of the expertise of our surgeons, rehabilitation, and clinical staff. We have published the most advanced research on clinical outcomes for musculoskeletal injuries and disorders. As a Foundation we have established educational programs and trained thousands of specialists world-wide. We wish to thank the surgical, clinical, rehabilitation, administrative staff, and allied medical personnel who have contributed to our Mission and made these advances possible.

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 orthopedic textbooks. We have trained 167 sports medicine and arthroscopic surgeons in our fellowship program who

have active orthopedic and sports medicine practices throughout the United States.

The Noyes Knee Institute was founded to advance the goals of long-term clinical outcome registry studies for knee ligament and other disorders. Now there are similar registry programs for shoulder and hip disorders, orthobiologics and sports medicine that are featured in this 2021 report.

The physicians associated with the Foundation strive, through research and clinical practice, to develop state-of-the art treatment options that represent the most advanced procedures available world-wide.

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 injury and surgery.

Our Sportsmetrics™ staff teaches and certifies allied health professionals locally, nationally and internationally in order to implement these programs in their communities. Sportsmetrics™ is the largest sports injury prevention program at 1,480 sites world -wide and is described in detail in this report.

2021 presented many challenges as we navigated COVID-19. We were pleased to provide a Virtual Advances on the Knee, Shoulder, Hip, and Sports Medicine Conference over Memorial Day with over 3200 participants throughout the USA and internationally. Our annual conference, now in its 35th year and featured in this report, has trained physicians, physical therapists, and athletic trainers world-wide. For 2022, we will be LIVE in Hilton Head for our 36th year! Thanks everyone for a wonderful 2021 year!

*We appreciate the 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 Orthopedic Center. The Foundation was established with the goal of bringing together surgeons, therapists, athletic 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 Orthopedic Surgeons (Three Kappa Delta Awards), the Orthopedic Research and Education Foundation's Clinical Research Award, and the American Orthopedic 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

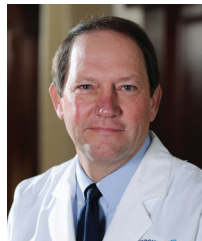
*To improve the lives of patients everywhere by offering advanced and state-of-the-art treatments for Orthopaedic and Sports Medicine disorders based on excellence and success in documented clinical outcome studies and application of basic and clinical research.*



# 2021 Accomplishments

- **The end of an era. After 37 years of dedicated patient care, Dr. Thomas Lindenfeld has headed into retirement.**

Dr. Lindenfeld joined Cincinnati SportsMedicine and Orthopaedic Center in 1984. During the course of his career, Dr. Lindenfeld treated patients with a variety of disorders of the knee, shoulder, and hip. Dr. Lindenfeld developed a special interest in upper extremity problems with the shoulder and elbow and wrote original articles on elbow arthroscopy and developed new techniques for stabilization after shoulder dislocation. Through his interest in the shoulder, he has found that many problems may be handled through physical therapy and not surgery.



In addition to maintaining a busy clinical and surgical practice, Dr. Lindenfeld was active in orthopaedic related societies. He was a member of the American Academy of Orthopaedic Surgeons (AAOS), American Orthopaedic Society for Sports Medicine (AOSSM), American Orthopaedic Association (AOA), and the Herodius Society. He also served as a member of the American Academy of Orthopaedic Surgeon's Education Committee and Clinical Committee on Sports Medicine and was a member of the American Board of Orthopaedic Surgery's Recertification Examination committee.

Over the course of his career, Dr. Lindenfeld cared for many athletes including Olympic gymnasts at Cincinnati Gymnastics Academy and Queen City Gymnastics. When Dr. Lindenfeld was not taking care of gymnasts, he could be found on the sidelines at our local high schools. Over his career, Dr. Lindenfeld was the team physician for Badin High School, Northwest High School, and McAuley High School.

Dr. Lindenfeld played an integral role in the Cincinnati SportsMedicine and Orthopaedic Center sports medicine Fellowship Program and was often an invited guest speaker at schools and community groups to address injury prevention topics, orthopaedic treatment advances and sports medicine.

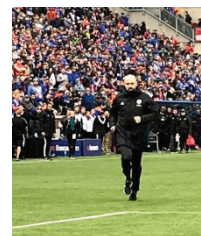
We thank Dr. Lindenfeld for his 37 years of leadership, teaching, loyalty, outstanding patient care, service, dedication and exemplifying a world class reputation. Best wishes to Dr. Lindenfeld as he heads onto new adventures.

- **Recruitment and hiring of Dr. Andrew Kalthoff**

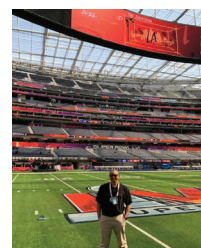
- **Dr. Kalthoff**, a 2021 graduate of our sports medicine fellowship, joined us in September 2021. Dr. Kalthoff specializes in orthopedic surgery with interests in knee, shoulder, and total joints. He is located at our Eastgate and Sardinia offices. He will be covering several local high schools including Batavia, Western Brown, Eastern Brown, Williamsburg, West Clermont, and Clermont Northeastern.



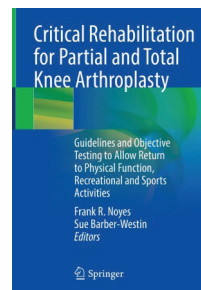
- **Dr. Busam** completed his 3rd year as Chief Medical Director for FC Cincinnati of MLS. The new stadium, TQL Stadium also debuted in Cincinnati.



- **Dr. Galloway and the Cincinnati Bengals** went to Superbowl LVI in Los Angeles. Dr. Galloway has been a leader in sports medicine both locally and nationally.



- Publication of **Dr. Noyes'** textbook "Critical Rehabilitation for Partial and Total Knee Arthroplasty: Guidelines and Objective Testing to Allow Return to Physical Function, Recreational and Sports Activities".







## Education

- Physicians gave over 44 virtual and in-person presentations to the international, national, regional, and local orthopaedic communities.
- 59 virtual teaching conferences attended by fellows, physical therapists, athletic trainers, and physical therapy students.
- 11 virtual journal clubs attended by staff physicians and fellows.
- Quarterly morbidity and mortality conferences attended by staff physicians and fellows.
- Continued expansion into virtual learning due to Covid-19 pandemic.



## Fellowship

- Nationally acclaimed sports medicine, knee, and shoulder fellowship program.
- Under the direction of Dr. Hasan, the Cincinnati Shoulder and Elbow Fellowship graduated its 2nd fellow and welcomed a new fellow for 2021-2022 academic year.
- ACGME/RRC accreditation; recognized by the American Orthopaedic Society for Sports Medicine and the Arthroscopy Association of North America.
- 167 fellow graduates (1979-2021) practicing across the United States and Canada.
- Expansion of faculty to include Dr. Andrew Kalthoff.



## Sportsmetrics™

- Greater than 150 athletes trained in 2021. Many of these sessions were conducted virtually.
- Certification: 103 individuals were certified. This was completed by integrating a virtual learning platform that allowed for the continuation of a hands-on learning environment.

# Director Statements

The clinical and research initiatives for patient care advances continued in 2021, on a very active and expanded pathway with major accomplishments in every Division highlighted in this annual report. The enthusiasm and excellence of our physicians, administrative, and research staff are a personal delight and I thoroughly enjoy working together month-after-month in this productive research and teaching environment.

We are now in our eighth year of integration of the Cincinnati Sports Medicine and Orthopedic Center and our Research and Education Foundation with Bon Secours Mercy Health, one of the largest healthcare systems in the United States. We are pleased to be integrated with the Graduate Medical Education Program at the Jewish Hospital for our clinical research and educational programs through a joint operating agreement. In 2021 the Cincinnati Shoulder and Elbow Fellowship under the co-direction of Dr. Samer Hasan continued to be highly successful with multiple applications for training. In addition, Dr. Hasan continued as the Regional Medical Director and Chair of the Orthopedic and Sports Medicine Service Line, Mercy Health Cincinnati. The Shoulder Division continued to have a highly successful year with new and continued clinical studies that are showcased in this report.

After nearly 30 years, we said good-bye to our home office on Montgomery Road. Our clinic, physical therapy, research and education, and Sportsmetrics™ offices have relocated to a brand new and expansive Orthopedic and Research Institute. The Institute occupies 20,000 square feet in a beautifully appointed outpatient building on the Jewish Hospital Kenwood Campus. The physician side now includes 10 physicians and 6 physician assistants seeing knee, shoulder, hip, hand, foot/ankle, and back injuries. The physical therapy department is over 7,500 square feet and currently has 6 full time physical therapists, 2 physical therapy assistants and 1 athletic trainer on staff. The physical therapy department now also includes a human performance concentration with equipment such as an Alter-G anti-gravity treadmill, force plate, Bod Pod for body fat/muscle analysis, and Vo2 max machine. All this equipment is brand new and will be used to get our athletic population back to their peak performance.

In September 2021, we welcomed our former CSMOC fellow, Andrew Kalthoff DO, to our sports medicine fellowship faculty. Dr. Kalthoff specializes in orthopedic surgery with interests in knee, shoulder, and total joints. He is located on the east side of Cincinnati. In addition to seeing patients in the Eastgate and Sardina areas, he will be covering several local high schools including Batavia, Western Brown,

Eastern Brown, Williamsburg, West Clermont, and Clermont Northeastern.

I wish to provide a special recognition to our orthopaedic surgeons and athletic trainers that provide a robust sports medicine program for multiple high schools, colleges, and professional teams. Dr. Chillelli was appointed the team physician for Miami University in Oxford, Ohio. In addition, I would also like to acknowledge Dr. Marc Galloway on his 14 years as Head Team Physician for the Cincinnati Bengals and as Director of the Mercy Health Sports Medicine Committee and Dr. Matthew Busam for his work as Chief Medical Officer for FC Cincinnati with MLS. Working as the head team physician at the collegiate and professional levels represents an extraordinary commitment.

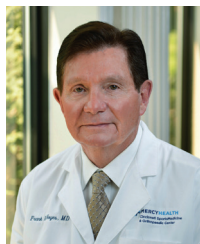
Our Center continues to offer sports medicine and specialty clinics at five Centers throughout the greater Cincinnati and Northern Kentucky region. Our patients are offered the opportunity to enroll in advanced treatment programs in all disciplines.

Our sports medicine fellowship is in its 43rd year. We continue to provide a nationally recognized program to train orthopedic surgeons on advanced and specialized treatment programs and surgery. Our faculty and staff provide the highest professionalism and dedication to this mission. Our fellows are an integral part of our clinical and research programs working closely with our full-time staff and have major commitments to clinical and robotic research studies. We are also pleased to collaborate with medical and hospital organizations and universities across the United States in other educational programs.

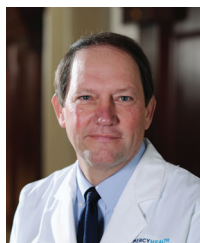


**Frank R. Noyes, MD**  
*Medical Director*

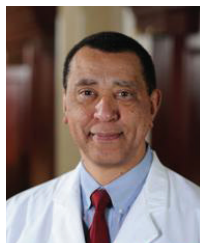
# Professional Staff


**Frank R. Noyes, MD**

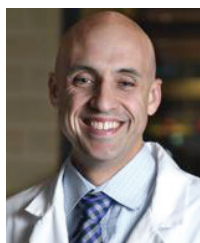
President, Noyes Knee Institute; Medical Director Cincinnati SportsMedicine Research and Education Foundation; President and CEO, Cincinnati SportsMedicine and Orthopaedic Center — Mercy Health; Sports Medicine Fellowship Director, Cincinnati SportsMedicine and Orthopaedic Center — Mercy Health


**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


**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


**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


**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


**Andrew Kalthoff, MD**

Orthopedic Surgeon, Cincinnati SportsMedicine, and Orthopedic Center — Mercy Health; Sports Medicine Fellowship Faculty, Cincinnati SportsMedicine, and Orthopedic Center — Mercy Health


**Michael P. Palmer, MD**

Orthopaedic Surgeon, The Christ Hospital; Adjunct Clinical Faculty, Cincinnati SportsMedicine Research and Education Foundation


**Sambhu N. Choudhury, MD**

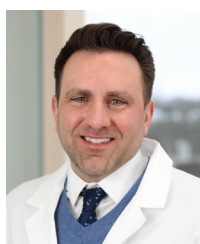
Orthopaedic Surgeon, Mercy Health, Adjunct Research Faculty, Cincinnati SportsMedicine Research and Education Foundation


**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


**Mahmoud Almasri, MD**

Orthopaedic Surgeon, Cincinnati SportsMedicine and Orthopaedic Center-Mercy Health; Sports Medicine Fellowship Faculty, Cincinnati SportsMedicine and Orthopaedic Center — Mercy Health; Director, Cincinnati Hip Preservation Center


**Brian Chilelli, MD**

Orthopaedic Surgeon, Cincinnati SportsMedicine and Orthopaedic Center — Mercy Health; Sports Medicine Fellowship Faculty, Cincinnati SportsMedicine and Orthopaedic Center-Mercy Health; Director, Knee Restoration and Orthobiologics division; Head Team Physician, Miami University Athletics


**Ankit Bansal, MD**

Orthopaedic Surgeon, Mercy Health Physicians; Sports Medicine Fellowship Adjunct Faculty, Cincinnati SportsMedicine and Orthopaedic Center — Mercy Health



# Professional Staff

## 2020-2021 Fellows



Dane Bolton, DO



Zubair Chaudry, MD



Dan Johnson, DO



Andrew Kalthoff, DO

## 2021-2022 Fellows



Imad Abushahin, MD



Nedal Alkhatib, MD



Naji Madi, 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



Stephanie Smith, MS  
Manager,  
Sportsmetrics™ Program



Teresa Wood  
Fellowship Coordinator/  
Administrative Assistant



Lauren Huser, MEng  
Consultant,  
Bioengineering



Carolyn Meder ATC  
Sportsmetrics™  
Athletic Trainer



Lindsey Sipes ATC  
Research Coordinator

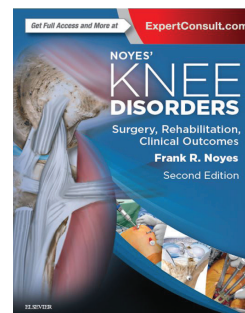
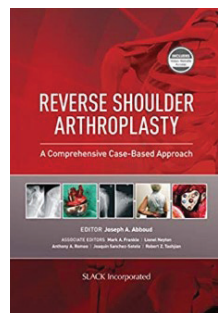
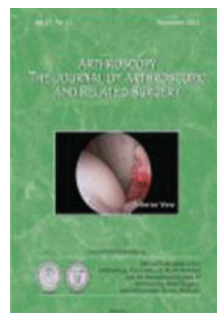


Aimee J. Cannon MS,  
ATC Clinical Research  
Coordinator

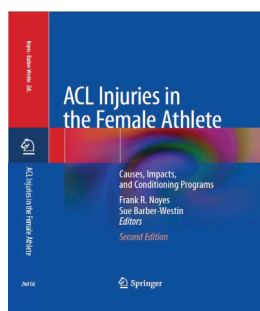


Olivia Clark, BA  
Biomechanical Research  
Associate

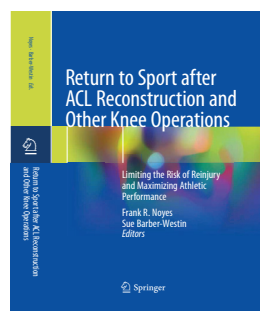
# 2021 Journal Publications and Textbook Chapters



**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.



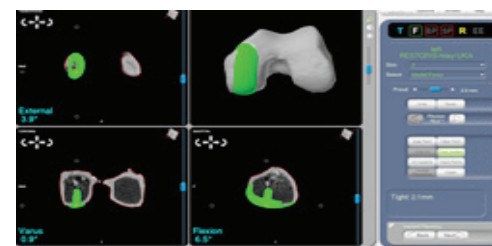
**Return to Sport after ACL Reconstruction and Other Knee Operations** – This textbook provides a wealth of information and will enable orthopaedic surgeons, medical practitioners, physical therapists, and athletic trainers to ensure athletes who suffer anterior cruciate ligament (ACL) injuries, or who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

A table of bibliometric studies that are representative of our research achievements is shown. Bibliometric science represents a statistical analysis using quantitative methods to establish the scholarly impact of publications and scientific advances on a medical field. The citation of studies published in subsequent publications, in this instance, orthopedics and sports medicine in national and international journals, represents one measure of the scholarly impact of the initial work and publications. The primary authors of these publications are cited, and all authors acknowledge that the honor is spread among the entire research and administrative team that enabled the scholarly research.

Author	Journal	Publication Title	Year	Highlights
Frank R. Noyes, MD	Journal of Bone and Joint Surgery	The Hundred Most-Cited Publications in Orthopedic Knee Research	2011	49 Journals: World-Wide Publications, 1945-2014
Frank R. Noyes, MD	Arthroscopy	The 25 Most-Cited Articles in Arthroscopic Orthopedic Surgery	2012	61 Journals: World-Wide Publications, 1980-2009
Frank R. Noyes, MD	Orthopedics	Fifty Most-Cited Articles in Anterior Cruciate Ligament Research	2015	11 Journals, English; World-Wide Publications, 1980-2013
Frank R. Noyes, MD	Arthroscopy	The Top 100 Most-Cited Articles on Arthroscopy: Most Popular Topic is Rotator Cuff Rather than Cartilage in the Last 5 Years	2021	1950 – March 31, 2020
Samer S. Hasan, MD, PhD	Journal of Surgical Orthopedic Advances	Trends and Characteristics of Highly Cited Articles in Shoulder Arthroplasty	2019	1972-2011
Samer S. Hasan, MD, PhD	International Journal of Orthopedics	The 50 Most Cited Articles in Shoulder Arthroplasty	2016	72 Journals; English; 1900-2016

# Knee Division: Clinical Outcome Studies & Applied Clinical Research

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



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 is featured in the 2nd edition of the Noyes Knee Disorders book published in 2016 that continues as a world-wide textbook in the United States, Asia, India and Europe.

Personnel: Sue Barber-Westin, Cassie Fleckenstein, Jennifer Riccobene and Aimee Cannon

## Publications

1. Walker M, Maini L, Kay J, Siddiqui A, Almasri M, de SA D. Femoral tunnel malposition is the most common indication for revision medial patellofemoral ligament reconstruction with promising early outcomes following revision reconstruction: a systematic review. *Knee Surg Sports Traumatol Arthro*, e-Pub ahead of print, May 8, 2021.
2. Noyes FR, Huser LE, Palmer M. A biomechanical study of pivot-shift and Lachman translations in anterior cruciate ligament-sectioned knees, anterior cruciate ligament-reconstructed knee, and knees with partial anterior cruciate ligament graft slackening: instrumented Lachman tests statistically correlate and supplement subjective pivot-shift tests. *Arthroscopy*, 2021. 37(2): 672-681.
3. Krebs NM, Barber-Westin SD, Noyes FR. Generalized joint laxity is associated with increased failure rates of primary anterior cruciate ligament reconstructions: a systematic review. *Arthroscopy*, 2021. 37(7): 2337-2347.
4. Noyes FR, Barber-Westin SD, Sipes L. Blood flow restriction training can improve peak torque strength in chronic atrophic postoperative quadriceps and hamstrings muscles. *Arthroscopy*, 2021. 37(9): 2860-2869.
5. Cohen D, Slawaska-Eng D, Almasri M, Sheean A, de Sa D. Quadriceps ACL reconstruction techniques and outcomes: an updated scoping review of the quadriceps tendon. *Curr Rev Musculoskelet Med*, 2021. Nov 10. E-Pub ahead of print.
6. Lameire DL, Abdel Khalik H, Zakharia A, Kay J, Almasri M, de Sa D. Bone grafting the patellar defect after bone-patellar tendon-bone anterior cruciate ligament reconstruction decreases anterior knee morbidity: a systematic review. *Arthroscopy*, 2021. 37(7): 2361-2376.
7. Walker M, Maini L, Kay J, Siddiqui A, Almasri M, de Sa D. Femoral tunnel malposition is the most common indication for revision medial patellofemoral ligament reconstruction with promising early outcomes following revision reconstruction: a systematic review. *Knee Surg Sports Traumatol Arthrosc*, 2021. May 8. E-Pub ahead of print.

8. Flanigan DC, Sherman SL, Chillelli B, Gersoff W, Jones D, Lee CA, Toth A, Cramer C, Zaporozhan V, Carey J. Consensus on Rehabilitation Guidelines among Orthopedic Surgeons in the United States following Use of Third-Generation Articular Cartilage Repair (MACI) for Treatment of Knee Cartilage Lesions. *Cartilage*. 2021 Dec;13(1\_suppl):1782S-1790S. doi: 10.1177/1947603520968876. Epub 2020 Oct 30. PMID: 33124432; PMCID: PMC8808808

## Textbook Chapters

While hundreds of textbooks have been written regarding technical surgical details of total knee arthroplasty (TKA), little is available on critical rehabilitation principles and guidelines that allow return to recreational and sports activities. This represents the first textbook written for orthopaedic surgeons, residents, physical therapists, and other medical professionals that concentrates on modern rehabilitation strategies after TKA. Fourteen chapters written by the editors and internationally recognized surgeons and therapists focus on:

- Pathophysiology of muscle disuse in osteoarthritis
- Advances in surgical techniques for robotic computer-navigated total and tibiofemoral knee arthroplasty
- Effect of preoperative rehabilitation on postoperative knee function
- Specific rehabilitation principles to avoid complications and return to daily activities
- Advanced physical therapy concepts to return to recreational and sports activities
- Objective testing to determine strength and physical function in the arthroplasty athlete
- Recommended guidelines for recreational and sports activities
- Key factors for achieving high patient satisfaction and quality of life after surgery

The following chapters were written by Dr. Noyes and our research team:

1. Barber-Westin SD, Noyes FR: Chapter 1: Introduction: Epidemiology of Knee Arthroplasty in a Younger Patient Population
2. Noyes FR, Barber-Westin SD: Chapter 2: Preoperative Nutrition and General Health Concerns, Patient Indications, and Selection Criteria
3. Noyes FR: Chapter 4: Advanced Surgical Techniques for Tibiofemoral Knee Arthroplasty





4. Barber-Westin SD, Noyes FR: Chapter 6. Effect of Preoperative Rehabilitation on Clinical Outcomes and Function after Knee Arthroplasty.
5. Heckmann T, Noyes FR, Barber-Westin SD: Chapter 8: Postoperative Rehabilitation Part I: Strategies and Protocol to Avoid Complications and Return to Daily Activities in Weeks 1-12
6. Noyes FR, Heckmann T, Barber-Westin SD: Chapter 9: Postoperative Rehabilitation Part II: Strategies for Successful Return to Physical Activities and Athletics in Postoperative Weeks 13-52
7. Barber-Westin SD, Noyes FR: Chapter 10: Common Patient-Reported Outcome Measures for Knee Arthroplasty Patients
8. Noyes FR, Barber-Westin SD: Chapter 11: Common Objective Measurements for Strength and Function in the Arthroplasty Patient
9. Barber-Westin SD, Noyes FR: Chapter 12: Recommended Guidelines for Physical Activity and Athletics After Knee Arthroplasty.
10. Barber-Westin SD, Noyes FR: Chapter 14: Key Factors for Achieving Expectations in Patient Satisfaction and Quality of Life after Knee Arthroplasty.

### Manuscripts and Book Chapters Under Review/In Press

1. Noyes FR. Patellofemoral Arthroplasty in Active Patients Fifty Years of Age or Younger with Osteoarthritis, Trochlea Dysplasia, Patellar-Femoral Malignant and Failed Cartilage Restorations Procedures, In process.

### Current Major Studies

1. 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.
2. Virtual Blood Flow Restriction Training vs. Traditional In-Home Rehabilitation Program: Under the direction of Dr. Noyes, our research teams is evaluating strength gains following utilization of a virtual blood

flow restriction training program with the use of exercise bands. Patients with muscle atrophy are enrolled into this prospective study. The purpose of this study is to evaluate and report strength gains achieved following virtual blood flow restriction training. The study will consist of a 6-week at home program. Patients will be randomized into the control group (at home exercise band program alone) or the BFR group (at home exercise band program plus blood flow restriction training).

3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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 preoperatively and again at 1, 2, 5, 7, and 10 years post-operatively.
10. 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.

## Shoulder Division: Clinical Outcome Studies & Applied Clinical Research

The Shoulder Center under the direction of Samer S. Hasan, MD, PhD has had a productive 2021 and is aiming for an even more successful 2022. On the clinical side, surgical volume continues to grow, despite some of the challenges brought on by the pandemic. In 2021, Dr. Hasan performed over 500 shoulder and elbow surgeries, including nearly 150 arthroscopic rotator cuff repairs and nearly 200 shoulder replacement surgeries, including over 100 reverse shoulder replacements. To date Dr. Hasan has implanted nearly 2000 shoulder replacements, which is a milestone that has been achieved by only a few surgeons in the Midwest.

Dr. Hasan is also pioneering the use of the subacromial balloon spacer for treatment of massive irreparable rotator cuff tears. The spacer is an arthroscopically deployed, saline-filled, biodegradable balloon that helps recenter the humeral head in patients with chronic irreparable rotator cuff tears. The balloon helps improve shoulder comfort, active motion, and function. Between 2017 and 2019 Dr. Hasan's practice was one of 18 sites participating in a multi-center clinical trial that evaluated the subacromial balloon spacer. The randomized clinical trial demonstrated safety and effectiveness of the subacromial balloon spacer and upon review of the data submitted from the clinical trial, the FDA approved the use of the novel device in August 2021. Dr. Hasan currently performs the arthroscopic subacromial balloon spacer procedure and several of his patients who underwent the procedure in 2021 have already been discharged from his care with dramatic pain relief and substantial improvement in their shoulder function.

Dr. Hasan is also performing a broad array of tendon transfers to improve shoulder strength in patients with irreparable rotator cuff tears. These include lower trapezius transfer for irreparable posterior cuff tears and latissimus dorsi transfers for patients with subscapularis insufficiency. Dr. Hasan also combines the latissimus dorsi transfer with reverse shoulder replacement in select patients who lack both active shoulder elevation and external rotation.

In terms of leadership activity, Dr. Hasan has served as Chair of the Orthopedic Service Line for MercyHealth-Cincinnati and as Chief of Orthopedics at The Jewish Hospital. Dr. Hasan has been instrumental in recruiting to Mercy Health several orthopedic surgeons with subspecialty training and expertise. Dr. Hasan has been active in various capacities with the American Shoulder and Elbow Surgeons (ASES) society. Since October 2020 he has served as co-chair of the Education Committee, which is charged with developing education content for members of the society as well as orthopedic surgeons worldwide. Dr. Hasan has helped develop a self-assessment examination in Shoulder and Elbow that fulfills requirements of the American Board of Orthopedic Surgeons for Maintenance of Certification.

Dr. Hasan has also presented at virtual and in person educational meetings throughout 2021. He recently gave a lecture on anatomic total shoulder replacements for residents in the Department of Orthopedics and Sports Medicine at the University of Cincinnati. In August 2021 he gave an Instructional Course Lecture at the American Academy of Orthopedic Surgeons in San Diego, California. He has been a speaker, moderator, and panelist for various industry sponsored courses and symposia. In May 2022, Dr. Hasan plans to travel to San Francisco to present a study comparing the clinical results and healing rates following rotator cuff repair with and without collagen patch augmentation at the Arthroscopy Association of North American Annual Meeting.

Dr. Hasan has also published several editorial commentaries for Arthroscopy and Journal of Bone and Joint Surgery, which are two of the most impactful journals in orthopedics and sports medicine. He has also authored several peer reviewed journal articles and case reports. Two recently submitted manuscripts are likely to be accepted in early 2022 and there are several other manuscripts in various stages of preparation.

*Personnel: Cassie Fleckenstein, Jennifer Riccobene and Aimee Cannon*





## Publications

1. Khazzam M, Mahoney J.R., and Hasan, S.S., "Treatment of Acute Shoulder PJI: Debridement and Implant Retention". In: "Current Controversies in Periprosthetic Joint Infection: Clarifying Key Concepts for Patient Care", N.S. Piuze, V.J. Sabesan, C.A. Higuera, eds., Helio Inc., submitted, April 2021.
2. Hasan SS. Editorial Commentary: Biology and biomechanics must be carefully balanced for a durable rotator cuff repair. *Arthroscopy*, 2021. 37(1): 38-41
3. Hasan SS. Editorial Commentary: Superior capsule reconstruction works biomechanically but should be used selectively for genuinely irreparable tears. *Arthroscopy*, 2021. 37(1): 411-414.
4. Hasan SS. Do the ends justify the means? Commentary on an article by Xueying Zhang BS, et al.: "Assessment of mitochondrial dysfunction in a murine model of supraspinatus tendinopathy. *J Bone Joint Surg Am*, 2021. 103(2): e7.
5. Hasan SS. Editorial Commentary: Monitoring tendon and muscle recovery after rotator cuff repair using diagnostic ultrasound demonstrates that early repair is beneficial for many patients with reparable tears. *Arthroscopy*, 2021. 37(10): 3049-3052.
6. Best MJ, Harris AB, Bansal A, Huish E, Srikumaran U. Predictors of long-term opioid use after elective primary total shoulder arthroplasty. *Orthopedics*, 2021. 44(1): 58-63.
7. Taylor AL, Bansal A, Shi BY, et al. Optimizing fixation for distal biceps tendon repairs: a systematic review and meta-regression of cadaveric biomechanical testing. *Am J Sports Med*, 2021. 49(11): 3125-3131.

## Manuscripts/Textbook chapters under review, in press

1. Kohrs B, Hasan, S.S., "Chapter 3: Indications and Contraindications of Reverse Shoulder Arthroplasty", In: *Reverse Shoulder Arthroplasty: A Comprehensive Case-Based Approach*. J. Abboud, ed. SLACK Inc., 2021.
2. Mahoney JR, Hasan SS. "Total Shoulder Arthroplasty in the Young Patient", In *Shoulder Arthritis in the Young Patient*, G. Horneff, B. Grawe, and J. Abboud, eds. SLACK Inc. submitted, May 2021.

## 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. 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.

3. 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.
4. 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 multi-center randomized controlled clinical trial aimed at evaluating the effects of PEMF technology on promoting tendon to bone healing after arthroscopic rotator cuff repair.
5. 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.
6. 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.
7. Glenohumeral Shoulder Rotation and Arc 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.
8. BAND-Connect: This is an industry-initiated study to evaluate a new and novel tool for post-operative rehabilitation after rotator cuff repair or shoulder arthroplasty.



## Hip Division: Clinical Outcome Studies & Applied Clinical Research

Under the direction of Dr. Mahmoud Almasri, Dr. Ankit Bansal, and adjunct faculty, Dr. Michael Palmer, the hip division is responsible for every phase of patient related clinical outcomes studies. The Hip Arthroscopy and Joint Preservation Center provides patients with a cutting edge, multidisciplinary approach. Utilizing the latest techniques in arthroscopic and open surgery, injections, and non-surgical rehabilitation protocols, the Center aims to provide young, active individuals with the best evidence-based treatment for relieving hip pain, delaying the progression of end stage arthritis, and returning individuals to sports and function. 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 and Aimee Cannon*

### Current Studies

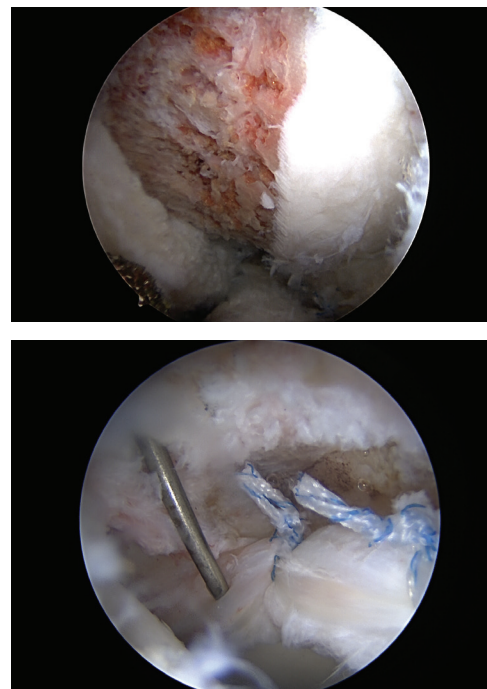
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1. ASIS Repair
2. Adhesive Capsulitis of the Hip
3. Abductor Repairs of the Hip Simplified: Double Pulley Knotless Technique
4. Return-to-Play Following Injuries to the Hip

### Publications

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1. AAlmasri M, Simunovic N, Heels-Ansdell D, Ayeni OR, FIRST Investigators. Femoroacetabular impingement surgery leads to early pain relief but minimal functional gains past 6 months: experience from the FIRST trial. *Knee Surg Sports Traumatol Arthrosc*, 2021. 29(5): 1362-1369.
2. Cohen D, Khan A, Kay J, Slawaska-Eng D, Almasri M, et al. There is no definite consensus on the adequate radiographic correction in arthroscopic osteochondroplasty for femoroacetabular impingement: a systematic review and meta-analysis. *Knee Surg Sports Traumatol Arthrosc*, 2021. 29(9): 2799-2818.
3. Almasri M, Simunovic N, Heels-Ansdell D, Ayenil OR, FIRST Investigators. Osteochondroplasty benefits the pragmatic patient with femoroacetabular impingement: analysis from the embedded prospective cohort of the femoroacetabular impingement randomized controlled trial (FIRST). *Arthroscopy*, 2021. July 9. E-pub ahead of print.
4. Scheidt M, Haber DB, Bhatia S, Ellman MB. Technical Pearls for Arthroscopic Labral Augmentation of the Hip. *Arthrosc Tech*. 2021 Mar 12;10(4): e1047-e1053. doi: 10.1016/j.eats.2020.12.004. PMID: 33981549; PMCID: PMC8085363.



### Awards/Recognitions

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1. Dr. Almasri: Recipient: Best Clinical Research Paper in Arthroscopy June 2021, Sports Medicine Category - Canadian Orthopaedic Association (COA) 2021 Annual Meeting, Awarded by the Arthroscopy Association of Canada, only 1 recipient out of over 100 sports medicine presentations at the annual meeting.

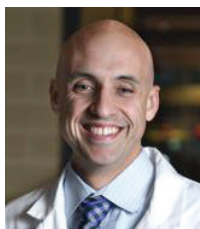
## Sports Medicine Division

The sports medicine division of the CSMOC faculty had a very busy 2021. The ongoing pandemic impacted team coverage greatly, and those surgeons' covering college, international and professional teams were subject to significant restrictions and testing. However, the division remained dedicated to providing high quality care to all our athletes.

**Marc Galloway, MD** had likely the most exciting season of coverage as head team physician for the AFC Champion Cincinnati Bengals, providing care from the opening of camp in July all the way to Super Bowl LVI in Los Angeles.



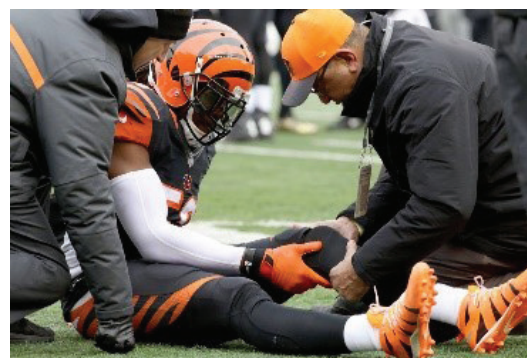
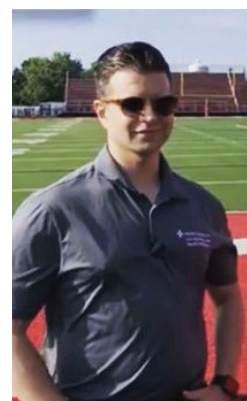
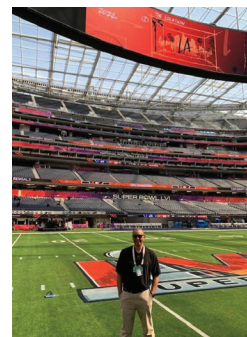
**Matt Busam, MD** provided soccer coverage for the opening of TQL stadium as Chief Medical Officer for FC Cincinnati in their third MLS season. He also provided local care for our men's and women's national soccer teams when they visited TQL, highlighted by the men's thrilling 2-0 win over Mexico in World Cup Qualifying.



**Brian Chilelli, MD**, team physician for Miami University, provided coverage for the RedHawks throughout the MAC season and their bowl game win over North Texas in the Frisco Football Classic. In addition to Miami, Dr. Chilelli covered Badin High School in their successful season all the way to the Ohio state championship game.



All the sports faculty, including Drs. Frank Noyes, Marc Galloway, Samer Hasan, Matt Busam, Brian Chilelli, and Mahmoud Almasri mentored our sports fellows in covering high school football as well, providing a well-rounded sports experience for all involved.





## 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.

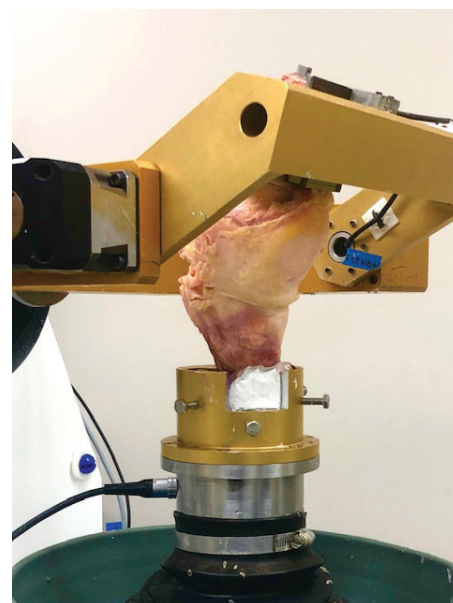
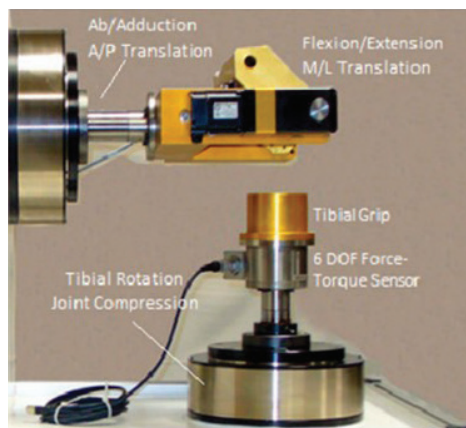
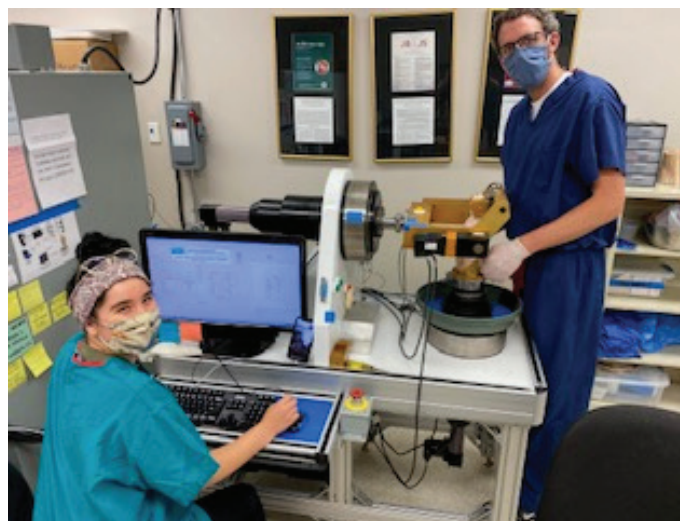
*Personnel: Edward S. Grood, PhD, Olivia Clark, BA, Lauren Huser, MEng, Clinical Fellows*

### Publications

1. Noyes FR, Clark OM, Grood ES, Johnson DJ. The function of the cruciate ligaments, posterior capsule and other structures in resisting knee hyperextension: A robotic analysis of cadaveric knees. Submitted to Journal of Sports Medicine.
2. Noyes FR, Huser LE, Palmer MP. A biomechanical study of pivot-shift and Lachman translations in anterior cruciate ligament-sectioned knees, anterior cruciate ligament-reconstructed knees, and knees with partial anterior cruciate ligament graft slackening: Instrumented Lachman tests statistically correlate and supplement subjective pivot-shift tests. *Arthroscopy*, 2021. 37(2): 672-681.

### Current Studies

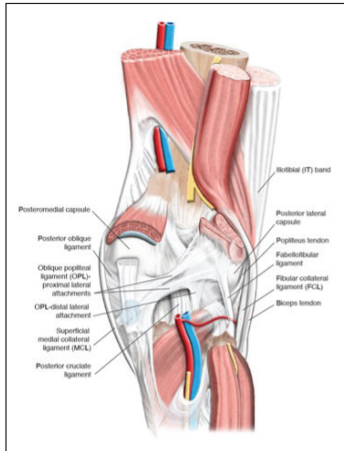
1. The Function of the Cruciate Ligaments, Posterior Capsule and Other Structures in Resisting Knee Hyperextension. A Robotic Analysis in Cadaveric Knees.





## Synopsis of Work

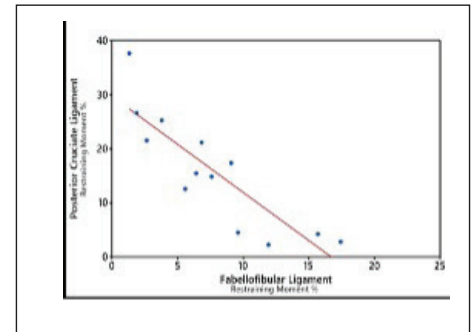
Our research is performed on a custom 6 degree-of-freedom robotic simulator that was developed and built by Edward S. Grood, PhD. Measurements of translations, rotations, and loads on all 3 axes are displayed and recorded in real-time. This year was spent teaching our newest addition, Olivia Clark, and updating the robotic system, as well as conducting a study to review the structures that actively resist hyperextension.



We are preparing a manuscript that uses data from 14 knee specimens tested via the robot during hyperextension. The goal of this study was to determine which of the 13 selected structures in the posterior aspect of the knee provide the greatest resistance to knee hyperextension.

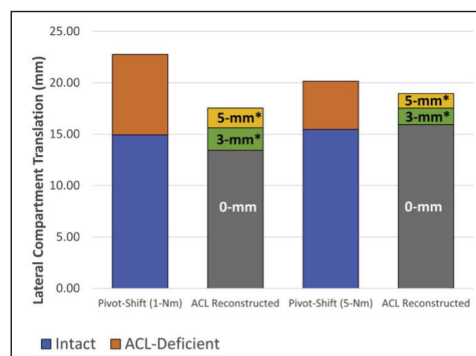
Each specimen was conditioned and then promptly hyperextended to the predetermined moment of 27N-m, as based on previous studies. The average degree of hyperextension was  $13.7^\circ \pm 6.7^\circ$ . In position-control, each of the structures was sequentially cut, providing a decrease in moment that was recorded. Upon the collection of the data, trends between structures, structure locations, and the degree of hyperextension were analyzed and compared for patterns. It was concluded that there is no single primary structure in preventing hyperextension, but rather a collection of major and minor structures that resist hyperextension.

Based on this study, those structures included the anterior cruciate ligament, posterior cruciate ligament, posteromedial capsule, and oblique popliteal ligament, which combined accounted for 54.7% of the restraining moment. It was also observed that there was a strong inverse relationship between the posterior cruciate



ligament and the fabellofubular ligament, as well as positive relationship between the PCL and the degrees of hyperextension (i.e., as the degrees of hyperextension increase, the role of the PCL increases). These results expand on results of previously published works and the understanding of the posterior knee.

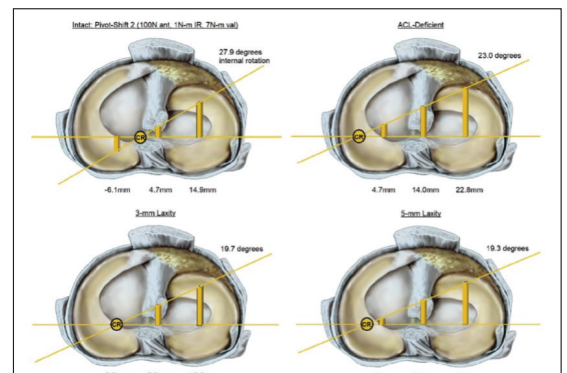
The second study was published in Arthroscopy in February of 2021. This research was to determine the statistical and predictive correlation between instrumented Lachman and pivot-shift tests with progressive loss of anterior cruciate ligament (ACL) function. It used kinematic correlations between pivot-shift and Lachman anterior tibial translations (ATTs) in ACL-deficient and ACL-reconstructed states and in partially lax ACL grafts which were determined with precise robotic testing in cadaveric knees.



The tibia was digitized to study the resulting medial, central, and lateral tibiofemoral compartment translations. The study consisted of two groups: group 1 had 15 knees with bone-patellar tendon-bone reconstructions tested first, followed by ACL graft loosening with 3- and 5-mm increases in Lachman ATT; group 2 had 43 knees that underwent robotic testing before and after ACL sectioning and underwent analysis of the effect of 3- and 5-mm increases in Lachman ATT and complete ACL sectioning on pivot-shift compartment translations. In group 1 knees, ACL graft loosening allowing a 3-mm increase in Lachman ATT resulted in increases in pivot-shift lateral compartment translation of only one-half of those required for a positive pivot-shift test finding. In group 2, for a 3-mm increased Lachman test, there were no positive pivot-shift values. In both groups, a Lachman test with an increase in ATT of 3 mm or less (100 N) had a 100% predictive value for a negative pivot-shift test finding. With ACL graft loosening and a 5-mm increase in the Lachman ATT, group 1 still had no positive pivot-shift values, and in group 2, a

positive pivot-shift test finding occurred in 3 of 43 knees (7%, pivot shift 1-Nm internal rotation). After ACL sectioning, a highly predictive correlation was found between abnormal increases in Lachman and pivot-shift translations ( $P < .001$ ).

Therefore, it was concluded that ACL graft slackening and an instrumented Lachman test with an increase in ATT of 3 mm or less were 100% predictive of a negative pivot-shift subluxation finding and retained ACL stability. Further graft slackening and a 5-mm increase in the Lachman ATT produced pivot-shift lateral compartment ATT increases still less than the values in the ACL-deficient state; however, 7% of the knees (3 of 43) were converted to a positive pivot-shift test finding indicative of ACL graft failure. These results provide insight into instrumented Lachman tests to provide objective data on ACL function and graft failure to supplement subjective pivot-shift tests and are highly recommended for single-center and multicenter ACL studies.



# Biomechanics and Robotics Division

The Foundation congratulates the authors who participated in our robotics studies over the past 7 years. In addition to the robotic engineering staff, these research efforts included 6 fellows and resulted in publications in the Journal of Bone and Joint Surgery, Arthroscopy, and American Journal of Sports Medicine. Results were presented as a podium presentation at the American Academy of Orthopaedic Surgeons annual meeting. This is an impressive list of peer-reviewed publications.

## Anterior Cruciate Ligament Function in Providing Rotational Stability Assessed by Medial and Lateral Tibiofemoral Compartment Translations and Subluxations

Frank R. Noyes,<sup>\*,†‡</sup> MD, Andrew W. Jetter,<sup>†</sup> BS, Edward S. Grood,<sup>§</sup> PhD, Samuel P. Harms,<sup>†</sup> MD, Eric J. Gardner,<sup>†</sup> MD, and Martin S. Levy,<sup>||</sup> PhD  
Investigation performed at Cincinnati Sports Medicine and Orthopedic Center, Cincinnati, Ohio, USA

American Journal of Sports Med, 2014

## Anatomic Single-Graft Anterior Cruciate Ligament Reconstruction Restores Rotational Stability: A Robotic Study in Cadaveric Knees

Samuel P. Harms, M.D., Frank R. Noyes, M.D., Edward S. Grood, Ph.D., Andrew W. Jetter, B.S., Lauren E. Huser, M.Eng., Martin S. Levy, Ph.D., and Eric J. Gardner, M.D.

Arthroscopy, 2015

## Effect of Anteromedial and Posterolateral Anterior Cruciate Ligament Bundles on Resisting Medial and Lateral Tibiofemoral Compartment Subluxations

Eric J. Gardner, M.D., Frank R. Noyes, M.D., Andrew W. Jetter, B.S., Edward S. Grood, Ph.D., Samuel P. Harms, M.D., and Martin S. Levy, Ph.D.

Arthroscopy, 2015

## Editorial Commentary: Lateral Extra-articular Reconstructions With Anterior Cruciate Ligament Surgery: Are These Operative Procedures Supported by In Vitro Biomechanical Studies?

Arthroscopy, 2016

## Anterolateral Ligament and Iliotibial Band Control of Rotational Stability in the Anterior Cruciate Ligament-Intact Knee: Defined by Tibiofemoral Compartment Translations and Rotations

Lauren E. Huser, M.Eng., Frank R. Noyes, M.D., Darin Jurgensmeier, M.D., and Martin S. Levy, Ph.D.

Arthroscopy, 2017

## Is an Anterolateral Ligament Reconstruction Required in ACL-Reconstructed Knees With Associated Injury to the Anterolateral Structures?

### A Robotic Analysis of Rotational Knee Stability

Frank R. Noyes,<sup>\*,†</sup> MD, Lauren E. Huser,<sup>\*,†§</sup> MEng, Darin Jurgensmeier,<sup>\*,†</sup> MD, James Walsh,<sup>\*,†</sup> DO, and Martin S. Levy,<sup>†</sup> PhD  
Investigation performed at Cincinnati Sports Medicine and Orthopaedic Center-Mercy Health, Cincinnati, Ohio, USA

American Journal of Sports Med, 2017

## Rotational Knee Instability in ACL-Deficient Knees

Role of the Anterolateral Ligament and Iliotibial Band as Defined by Tibiofemoral Compartment Translations and Rotations

Frank R. Noyes, MD, Lauren E. Huser, MEng, and Martin S. Levy, PhD

Investigation performed at The Noyes Knee Institute, Cincinnati, Ohio

Journal of Bone and Joint Surg, 2017

## 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.

Arthroscopy, 2018

## The Effect of an ACL Reconstruction in Controlling Rotational Knee Stability in Knees with Intact and Physiologic Laxity of Secondary Restraints as Defined by Tibiofemoral Compartment Translations and Graft Forces

Frank R. Noyes, MD, Lauren E. Huser, MEng, and Martin S. Levy, PhD

Investigation performed at The Jewish Hospital-Mercy Health and The Noyes Knee Institute, Cincinnati, Ohio

Journal of Bone and Joint Surg, 2018

## 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

Frank R. Noyes,<sup>\*</sup> MD, Lauren E. Huser,<sup>\*,†</sup> MEng, Brad Ashman,<sup>\*</sup> MD, and Michael Palmer,<sup>\*</sup> MD  
Investigation performed at The Jewish Hospital-Mercy Health and The Noyes Knee Institute, Cincinnati, Ohio, USA

American Journal of Sports Med, 2019

## A Biomechanical Study of Pivot-Shift and Lachman Translations in Anterior Cruciate Ligament-Sectioned Knees, Anterior Cruciate Ligament-Reconstructed Knees, and Knees With Partial Anterior Cruciate Ligament Graft Slackening: Instrumented Lachman Tests Statistically Correlate and Supplement Subjective Pivot-Shift Tests

Frank R. Noyes, M.D., Lauren E. Huser, M.Eng., and Michael Palmer, M.D.

Arthroscopy, 2021

## Biologics Division: Clinical Outcomes Studies and Applied Clinical Research

Under the direction of Dr. Brian Chilelli, the Cincinnati SportsMedicine and Orthopaedic Center — Mercy Health division of Orthobiologics continues to provide a high level of care to patients with a focus on the transparency of potential outcomes through an evidence-based approach to patient care. Treatment modalities have included platelet-rich plasma (PRP) and bone marrow aspirate concentrate (BMAC) to treat a multitude of degenerative, over-use, and acute musculoskeletal conditions.

In early 2021 the Orthobiologics committee became interested in expanding the products and interventions offered, and therefore met to discuss potentially exploring the use of micro-fragmented adipose tissue injections to treat osteoarthritis of the knee. After performing a rigorous analysis of the micro-fragmented adipose tissue literature, the committee approved its use for the treatment of knee osteoarthritis. The procedure involves obtaining adipose tissue from a patient's abdomen in the form of lipoaspirate using a needle and syringe. The lipoaspirate is then prepared via mechanical washing using proprietary equipment to obtain the final micro-fragmented fat product that is then injected into the knee. The advantages of using this adipose tissue product includes a higher percentage of mesenchymal stromal cells when compared to products from bone marrow and theoretical longer periods of relief from symptoms when compared to other Orthobiologic agents. As an initial pilot study, the first three micro-fragmented adipose injections were successfully performed by Drs. Brian Chilelli and Edward Marcheschi in late 2021 to treat patients with mild to moderate osteoarthritis of the knee. The patients are currently being followed prospectively and we are excited to analyze their outcomes throughout the 2022 year. In addition, we aspire to follow all our patients treated with various orthobiologic agents using a newly launched high-level patient reported outcome platform.



*Personnel: Cassie Fleckenstein, Jennifer Riccobene and Aimee Cannon*



## Biologics Division: Clinical Outcomes Studies and Applied Clinical Research

### Current Major Studies

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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 2021
  - c. This study specifically examines the role of BMAC in patients who are unable to undergo total knee replacement due to serious medical issues and have disabling pain effecting all activities of daily living. The goal is to determine if a reasonable measure of relief can be obtained to decrease patient pain, allow time for optimization for TKR and to avoid patient turning to opiates to relieve severe knee pain.
2. Prospective, Randomized Control Trial: Principal Investigators: Dr. Frank Noyes, Dr. Edward Marcheschi
  - a. Prospective RCT of a commercial platelet rich plasma (PRP) intraarticular knee injection based on a treated and control group of 100 patients.
  - 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 detailed and include subjective, objective, functional assessments and patient reported outcomes using validated knee scores.
  - d. The goal of this study is to make recommendations to Bon Secours – Mercy Health regarding the efficacy of specific PRP products in the Orthopaedic service line as well as publication of the results in peer reviewed journals.
3. Prospective, Randomized Control Trial: Principal Investigators Dr. Brian Chillelli, Dr. Frank Noyes
  - a. This trial will initiate in 2021 and involves a clinical outcome study in using microfragmented adipose tissue for the intra-articular knee injection for osteoarthritis. An RCT is currently in progress and decisions will be made as to conducting the study in this Division or joining a multicenter clinical trial.



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 and 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.
4. Effects of Sportsmetrics™ and Behavioral Training as a Vaping Diversion Program in High School Students

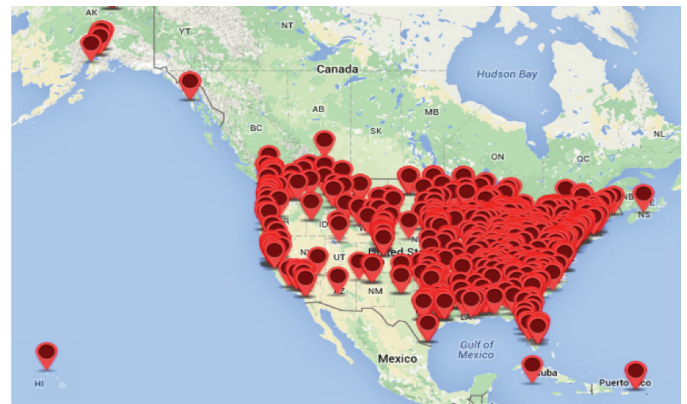
## Number of Athletes Trained

- Over 5,000 athletes trained in the Cincinnati area since 2001 with overall significant improvements in neuromuscular indices, strength and conditioning levels.
- 150 athletes in 2021

## 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 2500 individuals from over 1480 sites. We have certified trainers in all 50 states and 14 countries.

In 2021, 103 individuals were certified to offer the Sportsmetrics™ program to their communities. This year continued to present challenges with in-person education. We continued to offer virtual learning and found that we were able to offer the same quality of education as our in-person courses with a farther reach to individuals who would otherwise be unable to travel.

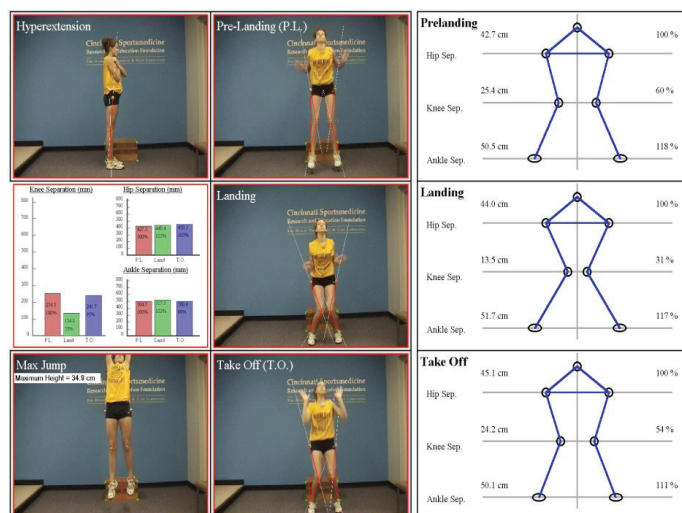






## International Sites

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



## 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
23. Hulst-Jepsen Physical Therapy (26): Grand Rapids, MI



# 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

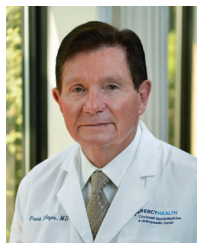
- An educational health initiative with a focus on health issues and considerations specifically relating to female athletes. Topics covered include nutrition, strength training, ACL injuries, bone health, hormones, female athlete triad and more.

### 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 & International Meeting Presentations

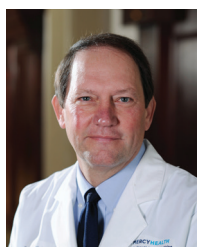
## Frank R. Noyes, MD



1. Patellofemoral Subluxation and Dislocation in the Adult. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29th, 2021.
2. Cincinnati SportsMedicine Studies on Meniscus Repairs. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
3. 2021 Updates on Meniscus Transplantation. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
4. Scientific Basis and Development of Sportsmetrics™ Neuromuscular Training Program. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
5. Risk Factors for ACL Surgical Failure. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
6. Diagnosis and Treatment of PCL and Posterolateral Ligament Injuries. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
7. Robotic Partial Knee Replacement- A Game Changer for Younger Arthritic Patients. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.

4. Lab Instructor, Arthrex Fellow Course, Naples, Florida, May 14, 2021
5. Treatment of the Massive & Irreparable Rotator Cuff Tear-2021 Update. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 28, 2021.
6. Advances in Surgical Treatment of Shoulder Instability. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 28, 2021.
7. Faculty and panelist, Stryker InSpace training and forum course, Chicago, Illinois, June 5-6, 2021.
8. Faculty and lab instructor, 8th Annual Revision Course in Shoulder Arthroplasty, panelist "Shoulder instability" and "Glenoid bone loss", and moderator "Shoulder Trivia", Tampa, Florida, June 11-12, 2021.
9. Co-chair, moderator, and panelist, "DJO Upper Extremity Course", Chicago, Illinois, June 25-26, 2021.
10. Faculty, Instructional Course Lecture, "The Art of the Historically Common but Sometimes Forgotten Shoulder Procedures", 2021 Annual Meeting, AAOS, San Diego, California, August 31 – September 3, 2021.
11. Panelist, Lunch and Learn: InSpace: A Breakthrough in Shoulder Care, 2021 Annual Meeting, AAOS, San Diego, California, September 3, 2021.
12. Faculty, Stryker Sports Medicine Course, Chicago, Illinois, September 17-18, 2021.
13. Panelist, Stryker InSpace Insider webinar, October 11, 2021
14. Moderator, Stryker InSpace Insider webinar, October 25, 2021.
15. Speaker, "Anatomic Shoulder Replacement", Shoulder Conference, University of Cincinnati, Department of Orthopaedic Surgery, December 10, 2021.
16. Panelist, Spotlight on the InSpace Subacromial Balloon Spacer, ASES Annual Meeting, Tampa, Florida, December 16, 2021.

## Thomas Lindenfeld, MD



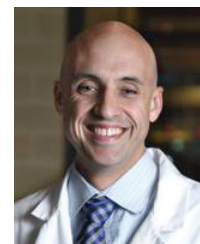
1. Importance of Range of Motion Measurements in the Shoulder. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 28, 2021.

## Samer S. Hasan, MD, PhD



1. Moderator, ASES Virtual Conference for Fellows – Practice Management Series, "Securing your first job and contract negotiations", January 7, 2021.
2. Faculty, lab instructor, presenter ("Complex revision cases"), panelist ("What I have learned since fellowship"), 9th Annual Fellows Course in Shoulder Arthroplasty, Tampa, Florida, April 16-18, 2021.
3. Faculty, lab instructor (DJO RSA demo), moderator (rotator cuff repair), and panelist (diagnosis and treatment of shoulder PJI), Current Solutions in Shoulder and Elbow Surgery, Tampa, Florida, April 22-24, 2021.

## Matthew Busam, MD



1. Diagnosis, Treatment, and Indications – Non-Operative vs. Operative Treatment. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 28, 2021.

## Michael Palmer, MD



1. Posterior Hip and Gluteus Hip Pain: Diagnosis and Treatment. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 28, 2021.

### Edward Marcheschi, MD

1. Tendinopathy-Biologic and Mechanical Treatment Options. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
2. Knee Arthritis and Orthobiologics- What is available and what works. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.



### Mahmoud Almasri, MD

1. Treatment of Hip Labral Tears and FAI. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
2. Trajectory of Improvement Following Femoroacetabular Impingement Surgery: Experience from the FIRST Trial – Award Winning (Best Clinical Research Paper)
3. *Virtual International Conference, Vancouver, Canada Award Winning.* June 2021
4. Hip Osteochondroplasty May Benefit The Non-Ideal Patient With Femoroacetabular Impingement: Analysis From The Embedded Prospective Cohort Of The First Trial. ISAKOS Global Virtual International Conference, South Africa. November 2021
5. Effect of Femoral and Acetabular Version on Outcomes Following Hip Arthroscopy: A Systematic Review and Meta-analysis. OSET-ISHA The Hip Preservation Society – 2021 Annual Scientific Meeting. Las Vegas, Nevada December 2021



### Ankit Bansal, MD

1. Hip Arthroscopy in the Setting of Dysplasia. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.



### Sanjeev Bhatia, MD

1. The Athlete's Hip: Diagnosis and Treatment of the Young Adult. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.



### Brian Chilelli, MD

1. Keeping the Knees in the Game: Knee Preservation, Virtual Webinar Presentation, Miami University of Ohio Department of Kinesiology, Nutrition, and Health. March 10, 2021.
2. Treating Articular Cartilage Defects of the Knee with MACI, Virtual Vericel Webinar Presentation, Cincinnati, OH. April 21, 2021.
3. Meniscus Root Tears-Clinical Experience and Techniques. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
4. 2021 Update on Knee Articular Cartilage Restoration Techniques. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
5. 2021 Update on ACL Graft Selection and Surgical Techniques in the Athlete. 35th Annual Advances on the Knee, Shoulder, Hip and Sports Medicine. Virtual Conference May 29, 2021.
6. Introduction to Meniscal Injuries and Meniscal Root Tears. Presentation and Moderator, American Academy of Orthopaedic Surgeons (AAOS). Meniscal Injuries of the knee: Evaluation and Management. July 20, 2021.
7. The Tight Knee: How I Get in Without Damaging Critical Structures. American Academy of Orthopaedic Surgeons (AAOS) Articular Cartilage Restoration Surgical Skills Course. Rosemont, IL. October 7 - 9, 2021.
8. Matrix-assisted autologous chondrocyte implantation: Introduction and surgical technique. Surgical Demonstration, American Academy of Orthopaedic Surgeons (AAOS) Articular Cartilage Restoration Surgical Skills Course. Rosemont, IL. October 7 - 9, 2021.
9. Patella Instability, Maltracking and Pain: A Case-Based Presentation. Panel member, American Academy of Orthopaedic Surgeons (AAOS) Articular Cartilage Restoration Surgical Skills Course. Rosemont, IL. October 7 - 9, 2021.
10. Articular Cartilage, Meniscal Repair or Resection: Management and Decision-Making. Panel member, American Academy of Orthopaedic Surgeons (AAOS) Articular Cartilage Restoration Surgical Skills Course. Rosemont, IL. October 7 - 9, 2021.





## 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 Research and Education Foundation, 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 Advances on the Knee, Shoulder, Hip, and Sports Medicine looked a little different in 2021. Due to the ongoing concerns of the COVID-19 pandemic, the 2021 Advances course was held virtually. Nearly 3,200 participants joined in from all 50 states and several countries to listen to 10 hours of presentations, case reports, and live demonstrations on treatment of the knee, shoulder, and hip.





### 2021 Course Faculty:

Frank R. Noyes, MD  
 Mahmoud Almasri, MD  
 James Andrews, MD  
 Ankit Bansal, MD  
 Matthew L. Busam, MD  
 Brian Chillelli, MD  
 Jeffrey R. Dugas, MD  
 Samer S. Hasan, MD, PhD

Thomas N. Lindendorf, MD  
 Edward Marcheschi, MD  
 Michael P. Palmer, MD  
 Shital Parikh, MD  
 Timothy P. Heckmann, PT  
 George J. Davies, DPT  
 Julie Jasontek, PT  
 Russell M. Paine, PT

Kevin E. Wilk, DPT  
 Dane Bolton, DO  
 Zubair Chaudry, MD  
 Daniel Johnson, DO  
 Andrew Kalthoff, DO  
 Carolyn T. Meder, ATC  
 Stephanie L. Smith, MS

We are purposely showing the events of the 2019 Hilton Head meeting to showcase this national event that has occurred every year for nearly four decades!

We look forward to our 2022 Advances on the Knee, Shoulder, Hip, and Sports Medicine conference when we return to our live, in-person national event.





# Sports Medicine Fellowship Program



Cincinnati SportsMedicine and Orthopaedic Center was one of the first Centers in the country to offer sports medicine fellowship training and since 1978 has worked to create one of the most comprehensive programs available. Our staff is dedicated to maintaining this high standard of excellence. Over 165 distinguished fellows have graduated from our program and are now in practice environments including private group practice, hospital-based institutions and academic practices. In January 2019, The Jewish Hospital Graduate Medical Education (GME) department became the sponsoring institution for our fellowship program. This partnership and collaboration with Jewish Hospital GME provides additional resources for our sports medicine fellows.

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 and Orthopaedic Center – Mercy Health 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 are also 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, Samer S. Hasan, MD, PhD, Matthew L. Busam, MD, Michael P. Palmer, MD, Brian Chillelli, MD, Mahmoud Almasri, MD, Ankit Bansal, MD, Andrew Kalthoff, DO, Cassie Fleckenstein, and 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
5. Instructional Video – Anterior Closing Wedge Osteotomy to Correct Abnormal Tibial Slope Prior to ACL Reconstruction
6. Reverse Shoulder Arthroplasty in Patients 90 Years Old or Greater

## Publications

1. Krebs NM, Barber-Westin S, Noyes FR. Generalized joint laxity is associated with increased failure rates of primary anterior cruciate ligament reconstructions: A systematic review. In press, Arthroscopy, 2021

## Manuscript In Preparation, 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

## Current Studies

1. Clinical and MRI Outcomes of Patients Undergoing Repair of Large and Massive Rotator Cuff Tears with Collagen Patch Augmentation: A Retrospective Cohort Study
2. Women's Sports Medicine Initiative
3. Review of Neuromuscular Training Programs: Systematic Review
4. Total Shoulder Arthroplasty in Patients >80 Years Old: Systematic Review
5. Fat Pad Resection: Indications and Clinical Outcomes





# University of Cincinnati Department of Biomedical Engineering

Collaboration with the University of Cincinnati Department of Biomedical Engineering continued into its 44th 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).



The Department of Biomedical Engineering was reformed in 2017 and has research focus areas in medical device design, medical imaging & bioinformatics, and regenerative medicine & biomechanics. In August 2020, the Department welcomed Thomas Talavage, PhD as the new Chair. Since 2017, it has grown to include 18 members and 30 secondary faculty members. During this past year, the Department of Biomedical Engineering added three new faculty members and 4 faculty members that transitioned from other departments within UC. In addition, there are 362 undergraduate students and 47 graduate students in the various programs offered by the Department of Biomedical Engineering.

Given the long-standing relationships between our Foundation and the University of Cincinnati Department of Biomedical Engineering, we are in the process of developing for 2022 a renewed collaboration with recently appointed faculty in order to continue innovative and groundbreaking research. These programs will have a translational application to the treatment of orthopaedic and sports medicine disorders.

## One- and two-strand posterior cruciate ligament reconstructions: Cyclic fatigue testing

Jason T. Shearn <sup>a,\*</sup>, Edward S. Grood <sup>a</sup>, Frank R. Noyes <sup>c</sup>, Martin S. Levy <sup>b</sup>

<sup>a</sup> Noyes Tissue Engineering and Biomechanics Laboratories, Department of Biomedical Engineering, University of Cincinnati, Mail Location 48, Cincinnati, OH 45221-0048, United States

<sup>b</sup> Department of Quantitative Analysis, University of Cincinnati, Cincinnati, OH, United States

<sup>c</sup> Cincinnati Sportsmedicine and Orthopaedic Center, Cincinnati, OH, United States

## Primary and Secondary Restraints of Human and Ovine Knees for Simulated In Vivo Gait Kinematics

Rebecca J. Nesbitt<sup>1</sup>, Safa T. Herfat<sup>2</sup>, Daniel V. Boguszewski<sup>3</sup>, Andrew J. Engel<sup>1</sup>, Marc T. Galloway<sup>4</sup>, and Jason T. Shearn<sup>1</sup>

## CURRENT CONCEPTS REVIEW

## The Role of Mechanical Loading in Tendon Development, Maintenance, Injury, and Repair

Marc T. Galloway, MD, Andrea L. Lalley, BS, and Jason T. Shearn, PhD

Investigation performed at the Cincinnati Sports Medicine and Orthopaedic Center, and the Engineering Research Center, University of Cincinnati, Cincinnati, Ohio



## 2021 Event Photos

### *Fellowship Graduation*











Cincinnati SportsMedicine  
Research & Education Foundation

Noyes Knee Institute

Mercy Health — Orthopaedics and  
Sports Medicine Institute



The Jewish Hospital — Mercy Health



Mercy Health — Fairfield Hospital



Mercy Health — West Hospital

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[noyeskneebookseries.com](http://noyeskneebookseries.com)

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