Children's Hospital of Philadelphia

Jack Flynn, MD, Ryan Quinn, MHA, and Divya Talwar, PhD, MPH

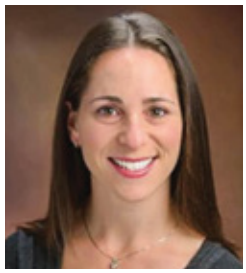
Pediatric Faculty


John Flynn, MD


Jason Anari, MD


Alexandre Arkader, MD


Keith Baldwin, MD, MPH, MSPT


Naomi Brown, MD, FAAP, CAQSM


Patrick Cahill, MD


Robert Carrigan, MD


Benjamin Chang, MD, FACS


Richard Davidson, MD


Vincent Deeney, MD


Malcom Ecker, MD


Theodore Ganley, MD

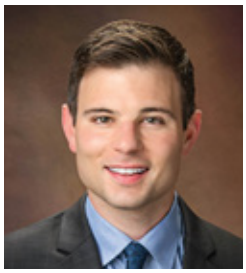

B. David Horn, MD


J. Todd Lawrence, MD, PhD


Ines Lin, MD


Kathleen Maguire, MD


Christina Master, MD, FAAP, CAQSM, FACSM


Christopher Renjilian, MD


Wudbhav Sankar, MD

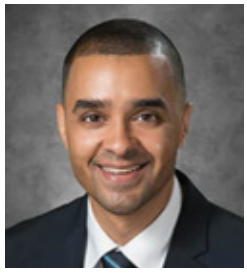

Apurva Shah, MD, MBA


David Spiegel, MD


Brian Vernau, MD, FAAP, CAQSM


Kristy Weber, MD, FACS


Lawrence Wells, MD


Brendan Williams, MD


Jennifer Winell, MD


Joseph Yellin, MD

Introduction

The Division of Orthopaedic Surgery at the Children's Hospital of Philadelphia (CHOP) had another successful and productive year of significant growth, accomplishment, and innovation. For the third time in four years, CHOP Orthopaedics was recognized by US News as the top pediatric orthopaedic program in the nation.

In 2023, CHOP Orthopaedics welcomed a new sports medicine orthopaedic surgeon and sports medicine pediatrician to our team, participated at national and international conferences, won awards for our research work, maintained enrollment of three FDA Phase IIIb investigational drug trials and a feasibility device trial, published ~200 articles, and obtained significant extramural funding from major funding agencies such as National Institutes of Health (NIH), Department of Defense (DoD), and National Science Foundation (NSF).

Clinical Program

Our Orthopaedic faculty continues to expand and is currently comprised of thirty members: eighteen specially trained pediatric orthopaedic surgeons (including three transition-to-adult care faculty), four non-operative physicians, six sports medicine-trained pediatricians, and two collaborating plastic surgeons. In March 2023, we welcomed Dr. Joseph Yellin (Figure 1), who joined us as an Attending Surgeon in Sports Medicine. He completed his medical degree at the University of Pennsylvania, residency at the Harvard Combined Orthopaedic Residency Program, Pediatric Orthopaedic Fellowship at CHOP and another Orthopaedic Sports Medicine Fellowship at the University of Pennsylvania. Our division also welcomed faculty member, Dr. Thomas Swaffield (Figure 2) as a new sports medicine pediatrician. He earned his medical degree at George Washington University in Washington, DC. Dr. Swaffield completed his residency at Penn State Milton S. Hershey Medical Center, then a primary care sports medicine fellow at CHOP.

Education Program

CHOP Orthopaedics currently funds four one-year clinical fellowships. The 2023-2024 clinical fellows are Stefano Cardin, MD (Figure 3); Joel Turtle, MD (Figure 4); Lee Haruno, MD (Figure 5); and Christopher DeFrancesco, MD (Figure 6). For next year, Dr. Cardin will start as an Assistant Professor at Orlando Health—Arnold Palmer Hospital for Children. Dr. Turtle will work at Spencer Fox Eccles School of Medicine at the University of Utah as an Assistant Professor. Dr. Haruno will begin his journey as Clinical Assistant Professor at Hawaii Pacific Health. Dr. DeFrancesco will complete a Sports Medicine Fellowship at Boston Children's Hospital. The 2023-24 research fellow was Dr. Akbar Syed, MD from India (Figure 7). While at CHOP, Dr. Syed focused his research efforts on clinical research related to pediatric trauma, hand, neuromuscular conditions, tumors, and sports injuries. He will stay with our division for another year.

Figure 1. Joseph Yellin, MD

Figure 2. Thomas Swaffield, MD

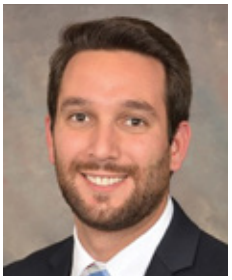


Figure 3. Stefano Cardin, MD

Figure 4. Joel Turtle, MD

Figure 5. Lee Haruno, MD

Figure 6. Joseph Yellin, MD

Figure 7. Akbar Syed, MD

To celebrate the graduation of the 2022-2023 clinical fellows, the Division hosted the Nicholson Visiting Professor Program and Fellows Graduation & Reunion in June 2023. This year's Visiting Professor was Dr. Michelle S. Caird. Dr. Caird is the Harold W. and Helen L. Gehring Professor and Chair of the Department of Orthopaedic Surgery at the University of Michigan in the Division of Pediatric Orthopaedics. Clinically, she treats multiple pediatric orthopaedic conditions including fractures, spinal deformity, and lower extremity deformity. As the director of the University of Michigan Osteogenesis Imperfecta Multidisciplinary Clinic, her areas of special expertise include treating fractures and spinal deformity in children with osteogenesis imperfecta, and in the laboratory she investigates bone healing in this disease and other pediatric low bone mass diseases with NIH grant support with her collaborators.

The 2023 Drummond Rising Star Visiting Professor was Gertrude Ying Li, MD. Dr. Li is a Clinical Associate Professor of Orthopaedic Surgery and Chief of Pediatric Orthopaedic Surgery. Dr. Li's primary clinical and research focus is on pediatric spinal deformity. She is an active member of the Pediatric Spine Study Group and serves on the Research Council. Dr. Li currently serves as the Chair of the Outcomes and Benchmarking Committee of SRS. She also has an interest in pediatric orthopaedic trauma and is a member of the FACTS and CORTICES study groups.

Research Program

Basic Science and Translational Research

This past year, the Translational Research Program in Pediatric Orthopedics (TRPPO) at CHOP, led by Dr. Maurizio Pacifici, has made impressive progress in researching rare pediatric musculoskeletal disorders. The TRPPO scientists have generated novel insights on key aspects of the mechanisms of skeletal development and growth in children and how abnormalities in these basic mechanisms occur and can cause disease. Comprised of the labs of Drs. Fanxin Long, Veronique Lefebvre, Eiki Koyama, and Maurizio Pacifici, the TRPPO has 12 NIH grants and receives additional research support from the Eagles Autism Foundation, Pediatric Orthopedic Society, Lamb-Shaffer Syndrome Organization, MHE Research Foundation, and other private organizations. Some of the disorders the TRPPO studies include Fibrodysplasia Ossificans Progressiva (FOP), Hereditary Multiple Exostoses (HME), Achondroplasia, Hjadu-Cheney syndrome, pediatric bone fragility diseases, and juvenile diabetes.

Wyss Campbell Center for Thoracic Insufficiency Syndrome (CTIS) Research Program

The Division's Center for Thoracic Insufficiency Syndrome (CTIS) continued developing innovative projects in translational research. The CTIS program strives to develop novel imaging techniques, construct new metrics for clinical outcomes, and establish reliable evidence to support innovative surgical strategies and devices through its research. These efforts are made possible by the collaboration of a multidisciplinary team of specialists from clinical research, image processing, informatics, and basic sciences/biomechanics. Currently, the CTIS Basic Science Lab is developing an animal model of TIS that will provide a platform for testing novel devices. The animal surgeries and biomechanics testing will be performed at Penn Vet's New Bolton Center. In addition, the CTIS team in collaboration with Medical Image Processing Group were awarded an NIH R01 grant to develop novel dynamic functional metrics for TIS patients by establishing a comprehensive normative database of dMRI images and anatomic and functional models and metrics, and to translate these to develop biomarkers of TIS and of its corrective-surgery outcomes.

With the generous philanthropic support, Dr. Campbell's legacy was strengthened with the continued establishment of *Wyss/Campbell Center for Thoracic Insufficiency Syndrome*, enabling CHOP to discover countless more breakthroughs in research and care for TIS children.

Genetic Research

CHOP Orthopaedics continues to work in collaboration with the Center for Applied Genomics (CAG), led by Dr. Hakon Hakonarson and Dr. Struan Grant, to compile a registry of DNA and RNA samples. These samples are obtained from patients and families with a variety of orthopaedic conditions including adolescent idiopathic scoliosis (AIS), osteochondritis dissecans (OCD) of the knee, Tibial Spine fractures (TSF) and multiple hereditary exostoses (MHE). The team is investigating further genetic characterizations of the EXT1/EXT2 mutations harbored by each exostosis and identify second hit(s) across exostoses from the same patient. This pilot project represents the first biomedical research focused on MHE and will provide novel and broadly relevant information. The goal is to translate the findings to prognostic tools based on the severity of the disease and to identify therapeutic means to counter the effects of EXT1/EXT2 plus "second hit" mutations. Dr. Ganley is collaborating with CAG to identify if patients who have experienced traumatic ACL ruptures or tibial spine fractures may also have a genetic predisposition toward these injuries. The aim of this collaboration is to perform polygenic risk assessment analyses with the more long-term goal of being able to provide individuals unique genetic risk assessment scores that would be applicable among patients with ACL injuries, tibial spine fractures, and unique cartilage conditions such as osteochondritis dissecans of the knee.

Clinical Research

The Division of Orthopaedic Surgery is currently conducting more than 236 IRB-approved clinical research projects. This includes more than 100 prospective and observational studies. CHOP Ortho faculty are also members of a number of multicenter study groups, including the Harms Study Group (HSG), the Pediatric Spine Study Group (PSSG), Research in Osteochondritis Dissecans of the Knee (ROCK), SCFE Longitudinal International Prospective Registry (SLIP), Tibial Spine Prospective Cohort (TSF-PC), The Fox Pediatric Spinal Deformity Study (Fox PSDS), Pediatric ACL: Understanding Treatment Operations (PLUTO), Medial Epicondyle Outcomes Multicenter (MEMO) study and International Hip Dysplasia Institute (IHDI), Children's Orthopedic Trauma and Infection Consortium for Evidence based Studies (CORTICES), Congenital Upper Limb Differences Registry (CoULD), Research in Osteochondritis of the Elbow (ROCKET), Sports Cohort Outcomes Registry (SCORE), and International Perthes Study Group (IPSG). Investigators within the division have been awarded funding from both

internal and external sources to conduct these studies. In 2023, the Division published over 200 articles in major orthopaedic journals, including *JAMA, JBJS, JPO*, and *CORR*. Members across our division presented more than 224 presentations at international and national conferences last year alone.

Our Benjamin Fox Research Fellowship for medical students between 3rd and 4th years welcomed Nathan Chaclas (Geisinger Commonwealth School of Medicine), David VanEenenaam (SUNY Upstate Medical University), and Vineet Desai (Harvard Medical School). (Figure 8-10).

Figure 8. Nathan Chaclas

Figure 9. David VanEenenaam

Figure 10. Vineet Desai

Recognition and Achievements

Our faculty have assumed several leadership roles within the pediatric orthopaedic community over the past year.

Jason Anari, MD served as international faculty member at the Salzburg Medical Seminar in Pediatric Orthopedics in Salzburg, Austria. Dr. Anari continued his work as PI from Pediatric Orthopaedics Society of North America (POSNA) titled, "*Managing failure to lengthen in MCGR: Best practice guidelines"*.

Alexandre Arkader, MD is the Vice Chair for the Pediatric Orthopaedic Society of North America (POSNA) Educational Course Committee. He served as a sub-committee chair for Global Courses. Dr. Arkader continues to serve as a reviewer for *Journal of American Academy of Orthopaedic Surgeons, Journal of Bone and Joint Surgery Essential Surgical Techniques, BMC Musculoskeletal Disorders, Journal of Pediatric Orthopaedics B, Journal of Children's Orthopaedics, Current Orthopaedic Practice, Clinical Orthopaedics and Related Research, and Pediatric Radiology*. He is also on the Surgical Advisory Board for Orthopediatrics. Dr Arkader continues to serve as Editor for tumors section, *JPOSNA*. He also received a Cell and Gene Therapy Seed Grant as Co-PI with Dr. Fanxin Long titled "*Wnt-based gene therapy for bone repair*." Dr. Arkader is an active member of CORTICES study group. Lastly, to continue his collaboration with our translational research program with Dr. Pacifici, Dr. Arkader was awarded a POSNA Research Grant.

Keith Baldwin, MD, MSPT, MPH is the Associate Director of Orthopaedic Trauma in the Division of Orthopedic Surgery. Dr. Baldwin is a Resident Advisory board member for the American Journal of Orthopaedics. He currently serves as a reviewer for several journals including the *BMC Medical Education, BMC Musculoskeletal Disorders, BMJ Open, Journal of Pediatric Orthopaedics, Annals of Internal Medicine, Journal of Bone and Joint Surgery—American*, *American Academy of Pediatrics, Clinical Orthopaedics and Related Research, Indian Journal of Orthopaedics, Journal of Orthopedic Trauma, International Research Journal of Medicine and Medical Sciences, PM & R Journal*. He also serves as an associate editor for Journal of Orthopedic Trauma and an editorial board member of the *American Journal of Orthopedics, Current Orthopaedic Practice* and *World Journal of Orthopedics*. He serves as a section editor for The Journal of Bone and Joint Surgery Reviews. Dr. Baldwin is an active member of CORTICES Study Group and CORTICES Research Committee. He continued his research work supported by the prestigious *Standard Research Grant* from Scoliosis Research Society.

Patrick Cahill, MD started his term as Board of Director for Pediatric Cervical Spine Study Group. He serves as Chair for Health Policy Committee and a member of the Governance Council, Pediatric Device Task Force, and Program Committee at Scoliosis Research Society. He is also a member of POSNA's Quality, Safety, Value Initiative Committee and Advocacy Committee. He continues to serve as an Associate Editor for *Spine Deformity Journal* and as a reviewer for the *Journal of Bone and Joint Surgery – American* and the Thrasher Research Fund. Dr. Cahill is an active member in the Harms Study Group, Pediatric Spine Study Group, and Fox Pediatric Spine Deformity study group, which are multi-center groups prospectively researching care improvements for complex pediatric spine deformities. Dr. Cahill continues to serve as co-PI from Scoliosis Research Society titled, "*New Strategies for Pulmonary Assessment in Spinal and Chest Wall Deformity*". He is the Director for *Wyss/Campbell Center for Thoracic Insufficiency Syndrome*.

Robert Carrigan, MD continues to serve on the ASSH Fellows Conference Committee, AAOS Appropriate Use Committee, and POSNA Resident Newsletter Committee. He also serves as a reviewer for *Journal of Hand Surgery* and *Clinical Orthopaedics and Related Research*.

Richard Davidson, MD has continued to serve as an associate editor for Foot & Ankle, International. He also serves as a reviewer for *Clinical Orthopedics and Related Research*. Dr. Davidson serves on the editorial board for, Children's Doctor, a publication of the Doctors of The Children's Hospital of Philadelphia.

B. David Horn, MD continues to serve as a reviewer for journals, such as *Clinical Orthopaedics and Related Research (CORR), Pediatric Emergency Medicine, and Pediatrics*.

Jack Flynn, MD, Chief of the Division of Orthopaedics, continues to serve as a Director on the American Board of Orthopaedic Surgery and continued his term as the President of the Pediatric Spine Study Group/Pediatric Spine Foundation. He continued to serve on the JBJS Board of Trustees. Dr. Flynn is a co-editor of *Lovell and Winter's Pediatric Orthopaedics, Rockwood's Fractures in*

Children, Operative Techniques in Pediatric Orthopaedics. Dr Flynn serves on the Editorial Board of *Journal of Spinal Deformity*. He was the invited lecturer for Hawaii Orthopaedic Association, the residency graduation speaker at Wake Forest University and in 2023 served as Visiting Professor at Texas Children's Hospital, Montefiore Medical Center and Columbia University.

Theodore Ganley, MD is the Sports Medicine Director at CHOP, was the second VP of the Pediatric Research in Sports Medicine (PRISM) group, co-founder and executive board member as well as President for the Research in Osteochondritis Dissecans of the Knee (ROCK) group, executive committee member for the American Academy of Pediatrics, advisory board member for the International Pediatric Orthopaedic Symposium, and program chair for the Philadelphia Orthopaedic Society. Along with his leadership roles, he continues to be actively involved in biomechanical studies utilizing cadaver specimens in collaboration with the *Biedermann Lab for Orthopaedic Research* and *Human Motion Lab*. He is leading a nationwide initiative on Tibial Spine prospective study group with 14 sites currently participating and it was funded by *Arthur H. Huene Memorial Award* from POSNA. Additionally, he is the site leader for the FDA clinical trial for studying the efficacy and safety of autologous cultured chondrocytes on porcine collagen membrane (MACI). Dr. Ganley also serves as the site PI for recently NIH funded grant "*IMPACCT: Infrastructure for Musculoskeletal Pediatric Acute Care Clinical Trials*".

Chrissy Goodbody, MD is one of our new faculty members continuing her work at Limb Extremity Deformities. She currently serves as a peer reviewer for the *Journal of Bone and Joint Surgery* and table instructor for Baltimore Limb Deformity Course. Dr. Goodbody is also a member of Limb Lengthening and Reconstructive Society and Philadelphia Orthopaedic Society.

John Todd Lawrence, MD, PhD continued his collaborative work with Dr. Leo Han at Drexel University. Funded by the National Science Foundation, the project focused on conducting in vitro studies for a novel cartilage repair strategy. Dr. Lawrence is an active member of sports medicine multicenter research groups such as PLUTO and he leads a 12-site study group MEMO, which is the largest group studying medial epicondyle fractures and injuries. He continues to serve as a reviewer for the *American Journal of Sports Medicine (AJSM)*, *Journal of Shoulder and Elbow Surgery (JSES), Journal of Children's Orthopaedics (JCO), Journal of Bone and Joint Surgery (JBJS), and Clinical Orthopaedics and Related Research (CORR)*. Dr. Lawrence continues to serve as a co-PI from NIH titled "*A Low-Cost, Collaborative Tool for the Tracking of Youth Activities to Reduce Risk of Physical Injury*" and site Co-PI for recently NIH funded grant "*IMPACCT: Infrastructure for Musculoskeletal Pediatric Acute Care Clinical Trials*".

Kathleen Maguire, MD is an active member of AAOS Emerging Leaders Program, POSNA, American Orthopaedic Society for Sports Medicine, American College of Sports Medicine, Arthroscopy Association of North America and the American Medical Association. Dr. Maguire serves as a reviewer for the *American Journal of Sports Medicine*.

Wudbhav Sankar, MD is the Director of the Young Adult Hip Preservation Program at CHOP. Dr. Sankar currently serves as Secretary for the Pediatric Orthopaedic Society of North America (POSNA) and co-director of the International Hip Dysplasia Institute. He remains active in several study groups including Academic Network of Conservational Hip Outcomes Research (ANCHOR), SCFE Longitudinal International Prospective Registry (SLIP) and International Perthes Study Group (IPSG). Also, he serves as co-director for the International Hip Dysplasia Institute (IHDI) Medical Advisory Board. Dr. Sankar is currently a reviewer for the *Journal of Bone and Joint Surgery, Journal of Pediatric Orthopaedics, Clinical Orthopaedics and Related Research, Journal of Pediatric Orthopaedics*. Dr. Sankar also serves as an Editorial Board Reviewer for *Techniques in Orthopaedics and Journal of Children's Orthopaedics*.

Apurva Shah, MD, MBA continues his tenure as the Director of Clinical Research. He continued to serve as co-PI on the grant from Orthopaedic Trauma Association titled, "*Opioid utilization after rotational ankle fractures*". Dr. Shah is currently a reviewer for the *Journal of Bone and Joint Surgery* and *Journal of Pediatric Orthopaedics*. Dr. Shah is also serving as the PI for Angela S.M. Kuo Memorial Award from POSNA for his research project "*Opioid vs. Non-Opioid Analgesia in Pediatric Supracondylar Humerus Fractures*." He also serves as the site Co-PI for recently NIH funded grant "*IMPACCT: Infrastructure for Musculoskeletal Pediatric Acute Care Clinical Trials*". He received a research grant from UPenn Center for Human Appearance and POSNA Microgrant to continue his research work on Brachial Plexus injuries.

David Spiegel, MD continued his work with the Children's Hospital of Philadelphia Global Health Pilot Grant. He currently is the chair for the International Scholars Program at AAOS. Dr. Spiegel continued to be active academically internationally, giving lectures in Iraq, Nepal, and Pakistan.

Lawrence Wells, MD is the Associate Director of the Sports Medicine Performance Center at CHOP. Dr. Wells currently serves as the President of Board of Directors for the Philadelphia Orthopaedic Society and as Vice Chair for Inclusion, Diversity and Equity at the Perelman School of Medicine.

Brendan Williams, MD continued his work at our Sports Medicine Performance Center. Dr. Williams serves on AAOS Emerging Leaders Program and a member of American Academy of Orthopaedic Surgeons, American Academy of Pediatrics, POSNA, Pediatric Research in Sports Medicine, and PRISM. He continued his tenure as Board of Directors for Children Beyond Our Borders. Dr. Williams serves as an ad hoc reviewer for *Pediatrics, The Journal of Bone and Joint Surgery—Case Connector, and The American Journal of Sports Medicine*.