



Children's Hospital of Philadelphia

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Pediatric Orthopaedics Faculty



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Alexandre Arkader, MD



Keith Baldwin, MD, MPH, MSPT



Patrick Cahill, MD



Robert Campbell, MD



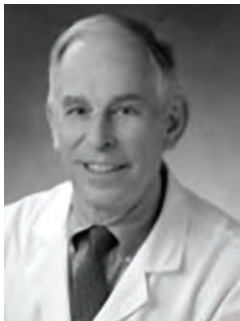
Robert Carrigan, MD



Richard Davidson, MD



Theodore Ganley, MD



Malcolm Ecker, MD



David Horn, MD



John Lawrence, MD



Wudbhav Sankar, MD



Apurva Shah, MD, MBA



David Spiegel, MD



Lawrence Wells, MD



Jennifer Winell, 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. Upholding our mission and vision to provide the most comprehensive care to our patients, we have continued to expand our clinical, research, and teaching programs. In 2017, *US News and World Report* ranked the Division of

Orthopaedic Surgery 2nd in the nation in pediatric orthopaedic surgery.

In 2017, CHOP Orthopaedics continued the Nicholson Visiting Professorship, hosted major conference meetings and Food and Drug Administration (FDA) reviewers, started a FDA investigational device trial, expanded our research coordinator team, obtained significant extramural funding from major funding agencies such as National Institutes of Health (NIH), Centers for Disease Control and Prevention (CDC), National Science Foundation (NSF), renovated the Fellowship recruitment and interviewing process, and hired Quality Safety and Value advisors to improve efficiency and value initiatives in orthopaedic surgery.

Clinical Program

Our orthopaedic faculty continues to expand and is currently comprised of twenty-eight total providers, which consists of nineteen specially-trained pediatric orthopaedic surgeons (fourteen operative and five non-operative), four sports medicine-trained pediatricians, two active plastic

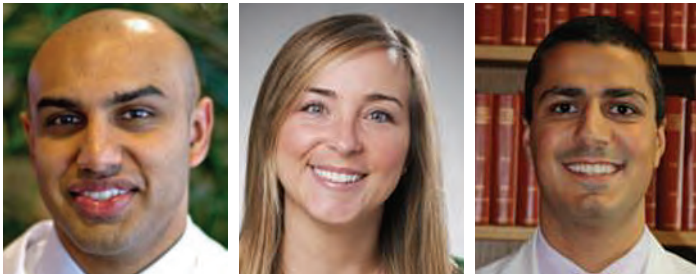


Figure 1. Neeraj Patel, MD **Figure 2.** Ariana Trionfo, MD **Figure 3.** Amirhossein Misaghi, MD

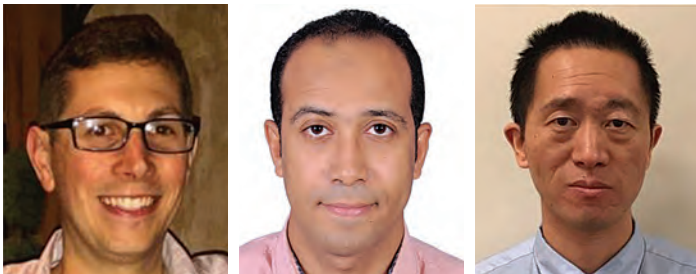


Figure 4. Jason Anari, MD **Figure 5.** Mahmoud El-Magd, MD **Figure 7.** Dr. Dongliang Shi, MD

surgeons, and three transition-to-adult care faculty.

Education Program

CHOP Orthopaedics currently funds four one-year clinical fellowships and one one-year research fellowship. The 2017-2018 clinical fellows are Neeraj Patel, MD (Figure 1); Ariana Trionfo, MD (Figure 2); Amirhossein Misaghi, MD (Figure 3); and Jason Anari, MD (Figure 4). This year's research fellow is Mahmoud El-Magd, MD from Egypt (Figure 5) and Dr. Dongliang Shi, MD from China (Figure 6). While at CHOP Dr. El-Magd has focused his research efforts on trauma and lower limb deformities; Dr. Shi has concentrated on research projects related to sports injury.

To celebrate the graduation of the 2016-2017 clinical fellows, the Division hosted the Nicholson Visiting Professor Program

and Fellows Graduation & Reunion in June 2017. This year's Visiting Professor was Dr. Dennis Wenger, who is the director of the International Center for Pediatric and Adolescent Hip Disorders at Rady Children's Hospital-San Diego and the Rady Children's/UC San Diego Pediatric Orthopedics and Scoliosis Fellowship. The program consisted of a mix of short lectures and discussions, a cocktail reception, and research and end-of-the-year remarks from the four fellows.

We continued to hold our Drummond Rising Star Visiting Professorship in October 2017. Visiting professors are nominated by current CHOP staff. The 2017 Drummond Rising Star Visiting Professor was Jonathan G. Schoenecker, MD (Figure 7). Dr. Jonathan G. Schoenecker, Associate Professor of Orthopaedics, visited us

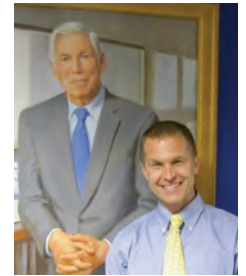


Figure 3. Dr. Jonathan G. Schoenecker,

from Vanderbilt University Medical Center. He is an orthopaedic surgeon-scientist dedicated to caring for children with orthopaedic trauma and hip conditions, educating future surgeon-scientists, and conducting high impact translational research.

The Division also continued to host visiting scholars to provide them with an opportunity to observe clinical care of pediatric patients in a high volume, academic setting. Over the past year, the Division hosted Dr. Angela Shrestha from Nepal.

Research Program

This past year, our basic and translational medicine researchers (Figure 8) led by Maurizio Pacifici, Ph.D. have made impressive progress and generated novel, exciting, and far-reaching insights on key aspects of skeletal biology and growth and pediatric musculoskeletal pathologies. Our faculty members and their associates, including postdoctoral fellows, visiting scientists and research technicians, continued to tackle and fulfill the goals of several current NIH R01 grants and one Department of Defense (DOD) grant. These biomedical research projects aim to advance current understanding of basic cellular, biochemical and genetic mechanisms that regulate the behavior and function of skeletal forming cells. These basic and key insights and observations are used to predict what may subtend and lead to pediatric pathologies including Multiple Hereditary Exostoses (MHE), Fibrodysplasia Ossificans Progressiva (FOP) and Temporomandibular Joint dysfunction.

Center for Thoracic Insufficiency Syndrome (CTIS) Frontier Translational Research Program

Through funding from the Frontier Program, the Division's Center for Thoracic Insufficiency Syndrome (CTIS) continued



Figure 8.

developing innovative projects in translational research. The CTIS program's mission is to advance care for patients with thoracic insufficiency syndrome (TIS) through basic science research, advanced imaging techniques, and clinical outcomes research.

The CTIS Basic Science Research Lab is developing a rabbit model of thoracic insufficiency syndrome. Dr. Casey Olson, a bioengineer, leads this lab to better understand the mechanisms of thoracic insufficiency syndrome and to provide biologic platforms for testing of new devices to treat thoracic insufficiency. To this end CTIS research lab has prepared for survival animal surgeries, pulmonary and electrophysiology evaluation, medical image processing, necropsy lab, pathology lab, and biomechanics lab.

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, and multiple hereditary exostoses (MHE). To investigate further genetic characterizations of the EXT1/EXT2 mutations harbored by each exostosis and identify second hits across exostoses from the same patient, Dr. Arkader was awarded a competitive faculty award from Division of Orthopaedics. 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.

Orthopaedic Engineering

Dr. Saba Pasha, Director of Orthopedic Engineering, continues her research on the application of 3D imaging and computer simulation in surgical planning, use of predictive models in surgical decision-making, and the exploration of gait and motion analysis for a more personalized treatment. For her research, Dr. Pasha was awarded grants by POSNA and SRS.

With new emerging technology, such as the EOS x-ray imaging system, comprehensive information about a patient's condition is now readily available. Dr. Pasha's work utilizes advanced imaging and motion analysis to collect data on a range of conditions and patient populations.

Clinical Research

The Division of Orthopaedic Surgery is currently conducting 167 IRB-approved clinical research projects. This includes 74 prospective and observational studies. CHOP Ortho faculty are also members of several multicenter study groups, including the Harms Study Group (HSG), Research in Osteochondritis Dissecans of the Knee (ROCK), The Fox Pediatric Spinal Deformity Study (Fox PSDS), Pediatric ACL: Understanding Treatment Operations (PLUTO), and International Hip Dysplasia Institute (IHDI). Investigators within the division have been awarded funding from both

internal and external sources to conduct these studies. In 2017, the Division published over 138 articles in major orthopaedic journals, including *JBJS*, *JAMA Pediatrics*, *JPO*, and *CORR*. Members across our division presented 122 presentations at international and national conferences last year alone.

The Division successfully continues to award the annual Benjamin Fox Fellowship Award for medical students who are interested in conducting a year of clinical research within orthopaedics. In July, Nakul Talathi (Perelman School of Medicine at the University of Pennsylvania), Alexander Adams (Thomas Jefferson University) and Jigar Gandhi (Rutgers Robert Wood Johnson Medical School), were awarded with the fellowship (Figure 9-11).



Figure 9. Nakul Talathi

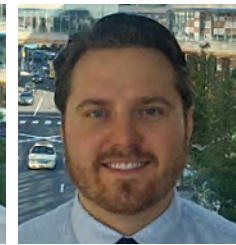


Figure 10. Alexander Adams



Figure 11. Jigar Gandhi

Recognition and Achievements

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

Alexandre Arkader, MD co-directed the 5th Combined SLOATI/POSNA/EPOS/ meeting, Sao Paulo Brazil Oct 2017. He also served as an International Faculty at the Salzburg Medical Seminar in Pediatric Orthopedics in Salzburg, Austria. Dr. Arkader continues to serve as a reviewer for *Current Orthopaedic Practice*, *Journal of Bone and Joint Surgery*, *Clinical Orthopaedics and Related Research* and *Journal of Pediatric Orthopaedics*. He was invited as a lecturer for Grand Rounds at Louisiana State University, New Orleans LA.

Keith Baldwin, MD, MSPT, MPH is the current Director of Clinical Research and Associate Director of Orthopaedic Trauma in the Division of Orthopedic Surgery. Dr. Baldwin continued his term as president of the Orthopaedic Rehabilitation Association and served as course director for the 2017 Orthopaedic Rehabilitation Association Annual Meeting. He currently serves as a reviewer for several journals including the *BMC Medical Education*, *BMC Musculoskeletal Disorders*, *Journal of Bone and Joint Surgery—American*, and the *American Academy of Pediatrics*. He also serves as 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*. Dr. Baldwin is an active member of CORTICES study group.

Patrick Cahill, MD continued his term as chair of the SRS research grants committee and is a member of POSNA's Quality, Safety, Value Initiative 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, Children's Spine Study Group, and Fox Pediatric Spine Deformity study group,

which are multi-center groups prospectively researching care improvements for complex pediatric spine deformities. He successfully started the FDA Investigational Device trial on Vertebral Body Tethering device.

Robert Campbell, MD continues to expand his multidisciplinary research center of Center for Thoracic Insufficiency at CHOP through the CHOP Frontier Grant. Dr. Campbell and Dr. Udupa (Perelman School of Medicine) continued their work on the NIH R21 Grant for their project, "Dynamic MRI Image Analysis for Studying Thoracic Insufficiency Syndrome". He continues to serve as a member of the Early Onset Scoliosis Task Force, FDA Grants for National Non-Profit Pediatric Device Consortia, and FDA Office of Orphan Product Development. Along with Drs. Cahill and Baldwin, he continues to develop and direct *Pediatric Spinal Surgery Symposium for FDA Reviewers*.

Robert Carrigan, MD continues to serve on the AAOS CAQH Test Validation 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*. Additionally, along with Dr. Apurva Shah and Shriners Hospitals for Children - Philadelphia, he co-hosted the 2017 Annual Pediatric Hand Study Group Meeting at CHOP.

Richard Davidson, MD has continued to serve as an associate editor for *Foot & Ankle, International*. He also serves as a reviewer for *Clinical Orthopaedics and Related Research* and *Advances in Orthopaedic Society*.

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 Orthopaedic Surgery, continues to serve his 10-year term as Director of the American Board of Orthopaedic Surgery. Dr. Flynn is co-editor of *Lovell and Winter's Pediatric Orthopaedics, Rockwood's Fractures in Children, Operative Techniques in Pediatric Orthopaedics*. He is President of the Children's Spine Study Group and is active in the Harms Study Group, a multicenter collaboration of researchers studying care improvements for pediatric spine deformity surgery. In the past year, Dr. Flynn also was invited as the graduation speaker at Mayo Clinic and visiting professor at Harvard/Boston Children's Hospital, Brown University, St. Luke's Bethlehem, University of Utah, University of Florida, Medical University of South Carolina, Rady's Children Hospital, Temple University, Japanese Orthopaedic Association, and Northwestern University.

Theodore Ganley, MD is the Sports Medicine Director at CHOP, continued growth of clinical, research initiatives. Dr. Ganley has continued in several leadership roles with national organizations, such as the chairman for the POSNA Evidence Based Practice Committee, second vice president of the Pediatric Research in Sports Medicine (PRISM) group, co-founder and executive board member 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*. Additionally, he was invited as a consultant and advisor for the International Olympics Committee to develop a consensus protocol for treatment of pediatric ACL injuries.

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. He also served as an international faculty member at the Salzburg Medical Seminar in Pediatric Orthopedics in Salzburg, Austria. Dr. Lawrence is an active member of sports medicine multicenter research groups such as PLUTO and MEMO. He continues to serve as a reviewer for the *American Journal of Sports Medicine (AJSM)* and *Journal of Shoulder and Elbow Surgery (JSSES)*.

Wudbhav Sankar, MD is the Director of the Young Adult Hip Preservation Program at CHOP. Dr. Sankar currently serves as the chair of the POSNA Fellowship committee 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) and International Perthes Study Group. Dr. Sankar is currently a reviewer for the *Journal of Bone and Joint Surgery, Journal of Pediatric Orthopaedics*, and an Editorial Board Reviewer of *Techniques in Orthopaedics*. Dr. Sankar was awarded best eposter award at POSNA.

Apurva Shah, MD, MBA continued to serve as co-PI on the POSNA Directed Research Grant entitled, "Improving value delivery in pediatric distal radius fracture care." The grant aims to assess practice pattern variation and compare treatment costs across institutions and low- and high-volume centers. Dr. Shah also received a new grant as co-PI from Orthopaedic Trauma Association titled, "Opioid utilization after rotational ankle fractures". He continued to serve as team leader and traveled to Sigua Tepeque, Honduras for a pediatric hand surgery medical mission. Dr. Shah was invited as a visiting professor at Curtis National Hand Center, Baltimore, Saint Peter's University and MedStar Georgetown.

David Spiegel, MD continued his work with the Children's Hospital of Philadelphia Global Health Pilot Grant. He currently is the chair for International Scholars Program at the American Academy of Orthopaedic Surgeons (AAOS). In collaboration with Dr. Bibek Banskota in Nepal, Dr. Spiegel is conducting the longest follow-up in the world's literature of patients treated by the Ponseti method in a low-middle income country. Dr. Spiegel continued to be an active academic internationally, giving lectures in Iraq, Nepal and Pakistan. In recognition of his dedication to improving the lives of children with orthopaedic conditions in underdeveloped countries, AAOS presented Dr. Spiegel with the prestigious 2017 Humanitarian Award.

Lawrence Wells, MD is the Associate Director of the Sports Medicine Performance Center at CHOP and Director of Quality, Safety, Value, and Patient Experience in the Division of Orthopaedic Surgery. Dr. Wells currently serves as the President of Board of Directors for the Philadelphia Orthopaedic Society.