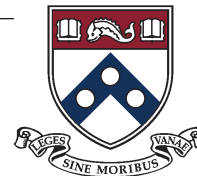




The Children's Hospital of Philadelphia

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Hello from the Division of Orthopaedic Surgery at the Children's Hospital of Philadelphia (CHOP)! The CHOP orthopaedic faculty had another exceptional year, excelling in both our clinical and research programs. We are also pleased to announce that CHOP Orthopaedics has been ranked again as the number one Pediatric Orthopaedic Surgery Program in the United States and shares the number one spot with Children's Hospital Boston as the top pediatric institutions in the country, as determined by the 2012 US News and World Report.

Clinical Program

Our orthopaedic faculty (Figure 1) continues to expand and is currently comprised of twenty one total providers, including eighteen specially trained pediatric orthopaedic surgeons (thirteen operative and five non-operative), and three pediatricians with sports medicine training.



Figure 1. Members of the CHOP Orthopaedic team and visiting professor Dr. Peter Waters, MD during the Jesse T. Nicholson Visiting Professorship event in June, 2012.

CHOP Orthopaedics is thrilled that Keith Baldwin, MD, MSPT, MPH (Figure 2A) joined the department in August of 2012 as an attending surgeon after completing his clinical fellowship here at CHOP in 2011-12. Dr. Baldwin obtained his medical training at Robert Wood Johnson Medical School in New Brunswick, NJ, and completed his residency at the University of Pennsylvania. Dr. Baldwin has a highly specialized skill set and is working with Dr. David Spiegel in adult and pediatric neuromuscular disease and trauma. Dr. Baldwin is splitting his time with University of Pennsylvania and is establishing a transitional program from pediatric to adult treatment.

Additionally, we are excited to announce the new collaboration with Dr. Helen Horstmann, MD (Figure 2B) as a part-time, non-operative pediatric orthopaedic surgeon.



A



B

Figure 2 (A-B). From left to right, A) Dr. Keith Baldwin and B) Dr. Helen Horstmann.

Dr. Horstmann joins us from University of Pennsylvania and specializes in neuromuscular scoliosis.

CHOP has also recently developed a partnership with Virtua Hospital to provide pediatric services at Virtua's facilities in Voorhees and Mount Holly. Orthopaedics, in particular, provides both outpatient clinic visits as well as day surgery at Virtua's Speciality Care Center in Voorhees (Figure 3).

Our department also staffs twelve nurse practitioners, two registered nurses, six physician's assistants, four cast technicians, and two athletic trainers who are able to evaluate, diagnose, and treat the full range of musculoskeletal disorders, as well as an additional staff of 41 office personnel.

Teaching

CHOP Orthopaedics currently funds four one-year clinical fellowships, and four one-year research fellowships. The 2012-2013 **clinical fellows** are Martin Morrison, MD (Figure 4A); Laura Gill, MD (Figure 4B); Sean Kearney, MD (Figure 4C); and Nanjundappa Harshavardhana, MD (Figure 4D). This year's **research fellows** are Dino Colo, MD from Utrecht, Netherlands (Figure 5A); Hooman Bakhshi, MD from Iran (Figure 5B); Indranil Kushare, MD (a fellow of the CHOP/SICOT fellowship) from Mumbai, India (Figure 5C); and Bibek Banskota, MD from Kathmandu, Nepal (Figure 5D). Following completion of their clinical fellowships, Dr. Morrison is seeking an academic position in Orthopaedic Surgery on the West Coast along with his wife, who is a pediatrician; Dr. Gill, originally from Barbados, is currently looking for an academic position in pediatric Orthopaedic Surgery; Dr. Kearney will practice Pediatric Orthopaedic Surgery in the U.S. Army (location to be determined); and Dr. Harshavardhana

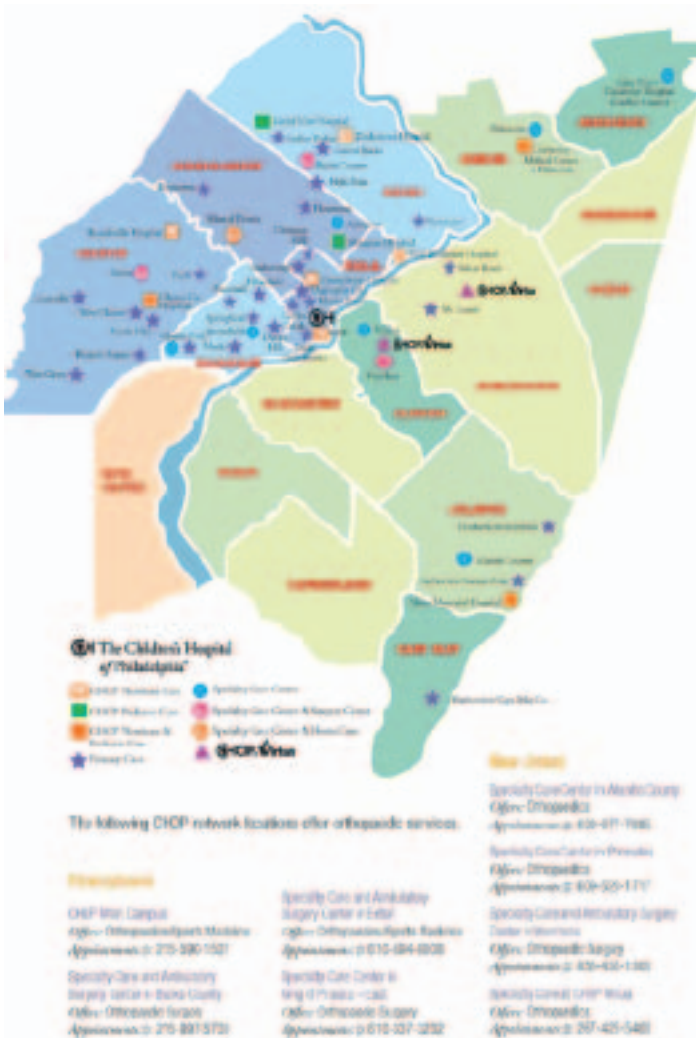


Figure 3. Map of CHOP's network locations that offer orthopaedic services.

would like to pursue another clinical fellowship in Pediatric Orthopaedics or spinal surgery in the U.S. After completing his research fellowship, Dr. Colo plans to return to the Netherlands to finish his PhD and his orthopaedic training; Dr. Bakhshi plans to continue research, concentrating in the field of pediatric spine, musculoskeletal tumors, and orthopaedic infection; Dr. Kushare is pursuing a clinical fellowship in the United States before returning to Mumbai; and Dr. Banskota will return to Nepal where he works with underprivileged

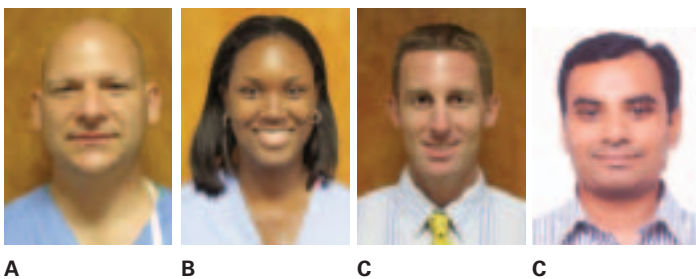


Figure 4 (A-D). From left to right, the CHOP Orthopaedic 2012-2013 clinical fellows: A) Dr. Martin Morrison, B) Dr. Laura Gill, C) Dr. Sean Kearney, and D) Dr. Nanjundappa Harshavardhana, MD.



Figure 5 (A-D). The CHOP Orthopaedic research fellows, from left to right: A) Dr. Dino Colo from the Netherlands, B) Dr. Hooman Bakhshi from Iran, C) Dr. Indranil Kushare from India, and D) Dr. Bibek Banskota from Nepal.

children with physical disabilities under a non-profit charitable organization called Hospital and Rehabilitation Center for Disabled Children (HRDC), the only pediatric orthopaedic care facility in Nepal.

The Division of Orthopaedic Surgery continues to reach out to the international community of specialists by participating in the Visiting International Scholars Program (VISIP), a program designed to provide international orthopaedic surgeons with the opportunity to observe clinical care of pediatric patients in a high volume, university, academic setting. Over the past year, CHOP Orthopaedic Surgery has had numerous Visiting International Scholars, including Alaa Azmi Ahmad from Palestine, David Farrington from Spain, Indranil Kushare from India, Juan Pretell from Peru, Chasanal Rathod from India, Josip Vlais from Croatia, Ziming Zheng from China, Liu Zhenjiang from China, Jacky Hua from China, Muayad Kadhim from Syria, Li Lianyong from China, and Harska Kanumalla from India. Some of our Visiting International Scholars have gone on to be accepted as a Research or Clinical fellow here at CHOP, or another institution in the United States.

Research Program

The past year has been an exciting and productive one for our Orthopaedic Basic Research Program, led by Maurizio Pacifici, PhD, (Figure 6) with many activities and research initiatives



Figure 6. A group picture of the CHOP Orthopaedic Translational Research team led by Maurizio Pacifici, PhD. From left to right (back row): Masahiro Iwamoto, Colleen Larmour, Cheri Saunders, Kenta Uchibe, Rebekah Decker, Julianne Huegel, Eiki Koyama and (front row): Motomi Enomoto-Iwamoto, Agnese DiRocco, Maria Elena Candela, Leslie Cantley, Jiyeon Son, Federica Sgariglia, Maurizio Pacifici, Jennifer Rosa.

related to a number of skeletal pathologies. Our faculty members and their associates continue to work diligently on the aims of our several current NIH R01 grants to understand the pathogenic mechanisms of pediatric and adult conditions including Heterotopic Ossification (HO), Fibrodysplasia Ossificans Progressiva (FOP) and Multiple Hereditary Exostoses (MHE), and to clarify processes including tendon and cartilage repair. An exciting new development is that one of our faculty members, Dr. Masahiro Iwamoto, has recently received a new grant from the Muscular Dystrophy Association to study skeletal muscle repair and regeneration, thus linking nicely current efforts on the overall musculoskeletal system. The new data and insights have generated publications in top peer-reviewed journals.

In our efforts to strengthen the position and resources of our Division in MHE's clinical and research fields, we organized and hosted the 4th International Research Conference on MHE here at CHOP/Penn from November 1 to 4, 2012. The Conference was attended by more 60 researchers and clinicians from all over the world gathered at The Inn at Penn for an intensive three day workshop that allowed presentations of the most recent findings but also many opportunities and time for lively discussions about future goals and possible treatments for this and related diseases. The Conference was co-sponsored by the National Institutes of Health, the MHE Research Foundation, the CHOP Research Institute, the Division of Orthopaedic Surgery at CHOP and Shriners Hospitals for Children, a demonstration of the strong interest, importance and broad relevance of this biomedical research field. We have also been working hard to strengthen our ties with other research groups -including one from the University of California San Diego and one from UCSF- to coordinate and encourage research on MHE on a national level.

A similarly exciting biomedical development this year is that our basic research on HO and FOP has made advances toward possible clinical trials. Papers we published in 2010 and 2011 showed that synthetic agonist ligands for the nuclear retinoic acid receptors are very potent inhibitors of HO/FOP in experimental subcutaneous, intramuscular and genetically-driven mouse models of the diseases. A Canadian-



Figure 7. A group photo at the 4th Annual Multiple Hereditary Exostoses Research Conference in Philadelphia in November, 2012.

based pharmaceutical Company is now working closely with us and with our colleagues at the Penn FOP Foundation to organize and implement a phase 2 trial in the very near future.

We are also finalizing collaborative plans with a Swiss pharmaceutical company to test the efficacy of synthetic sulfated polymers in our mouse models of MHE. The outcome of these experiments could provide proof-of-principle that exostosis formation can be inhibited or even blocked altogether by pharmacological means.

CHOP Orthopaedics is also working in collaboration with the Center for Applied Genomics (CAG) to compile a database of DNA samples obtained from patients and families with a variety of orthopaedic conditions, including targeting families with multiple individuals affected with adolescent idiopathic scoliosis (AIS). In 2011, CAG and Orthopaedics won the Scoliosis Research Society (SRS) Russell Hibbs Award for Best Basic Science Paper in 2011 for their study entitled "A Genome Wide Association Study Identifies IL17RC as an Adolescent Idiopathic Scoliosis Locus." Currently, whole exome sequencing is being performed on familial AIS blood samples with the goal of further understanding the influence of genetics on the development of AIS.

CHOP Orthopaedics, in collaboration with the Center for Childhood Cancer Research (CCCR) and the Abramson Family Cancer Research Institute (AFCRI), has developed a position to establish, maintain, and oversee extramurally funded research projects in basic mechanisms of sarcoma pathogenesis and progression.

The CHOP Orthopaedic Surgery division is currently conducting 93 ongoing, active clinical research and basic science projects. Investigators within the division have been awarded funding from both internal and external sources to conduct these studies. In the past two years, the division has published over 100 articles in major orthopaedic journals, including (but not limited to) *JBJS*, *Spine*, *JPO* and *CORR*.

Our pediatric orthopaedic faculty continues to present research studies at orthopaedic conferences around the world, including the American Academy of Orthopaedic Surgeons (AAOS), the Pediatric Orthopaedic Society of North America (POSNA), the European Pediatric Orthopaedic Society (EPOS), the Scoliosis Research Society (SRS), the American Orthopaedic Society for Sports Medicine (AOSSM), the Musculoskeletal Tumor Society (MSTS), the Societe Internationale de Chirurgie Orthopedique et de Traumatologie (International Society of Orthopaedic Surgery and Traumatology, SICOT) and many more.

In 2009, our department initiated an annual Benjamin Fox Scholarship Award for current medical students who are interested in conducting a year of clinical research within Orthopaedics. In June, our department awarded Itai Gans, an upcoming fourth year medical student at the Perelman School of Medicine at the University of Pennsylvania and Eric Sarkissian, a fourth year medical student at Drexel University with this scholarship (Figure 8). While at CHOP, Itai has concentrated his research on developmental dysplasia of the hip (DDH), tibial eminence fractures, osteochondritis dissecans (OCD), and quality, safety, and value of Orthopaedic Surgery procedures. Eric is focusing on anterior cruciate

ligament tears in children, and healing mechanisms in patients with osteochondritis dissecans.

Recognitions and Achievements

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

Robert Campbell, MD was recently recognized by the Federal Drug Administration (FDA) as one of 30 Heroes who have made clinical, research, advocacy, and regulatory contributions over the 30 years since the enactment of the Orphan Drug Act for his work with the VEPTR. His Center for Thoracic Insufficiency Syndrome at CHOP continues to expand clinically and new research initiatives are ongoing.

Denis S. Drummond, MD, CHOP Orthopaedic's Chief Emeritus, currently serves as the co-director of the CHOP Orthopaedic Fellowship Program. Additionally, Dr. Drummond was the director of clinical research until December, 2012.

John M. Flynn, MD will assume his role as President of the Pediatric Orthopaedic Society of North America (POSNA) in the Spring of 2014 and he will host the 46th Annual meeting of POSNA in Hollywood, California. Dr. Flynn also recently completed his last year of 4 years as the chair of the International Pediatric Orthopaedic Symposium (IPOS). Dr. Flynn has recently been selected Chair of the American Academy of Orthopaedic Surgeons CME Courses Committee. He also ran the Scoliosis Research Society (SRS) Grants Committee, and he currently serves as the Vice President of the Chest Wall and Spinal Deformity Study Group.

Theodore J. Ganley, MD, is the Sports Medicine Director at CHOP supporting the clinical, research and outreach initiatives which continue to expand, including the new planned sports medicine center in King of Prussia. Dr. Ganley collaborated

on the creation of a new sports medicine fellowship, the Penn/Children's Hospital of Philadelphia orthopedic sports medicine fellowship which will commence in August of 2013 with Dr. Sennett as well as departmental chairmen Drs. Levin, and Dormans. He was selected as moderator or instructor at instructional course lectures for the following annual meetings: the American Academy of Orthopedic Surgeons, American Academy of Pediatrics, American Orthopedic Society for Sports Medicine, International Pediatric Orthopedic Symposium, and Pediatric Orthopedic Society of North America this past year. He was an advisory board member for IPOS and ran the sports medicine section of their first annual Surgical Simulation lab. Dr. Ganley was also the Presidential Guest Speaker at the Pediatric Orthopaedic Club of New York.

B. David Horn, MD is the editor of the 2013 Pediatric Orthopaedic Special Interest Examination to be published by the American Academy of Orthopaedic Surgeons (AAOS) in March, 2013.

John Todd Lawrence, MD, PhD was American Board of Orthopaedic Surgery Board Certified this year. He also completed an OmeGa Core Competency Grant for the 2011-2012 academic year. This funding will support resident education as it pertains to fracture care through the development and implementation of a simple distal radius fracture reduction and casting simulation-based teaching program.

Wudbhav Sankar, MD continues to build and direct the adolescent and young adult hip program at CHOP, and has established a comprehensive clinical hip database. Additionally, Dr. Sankar and the Division of Orthopaedic Surgery was recently awarded a Scholler Foundation grant to fund a portable ultrasound machine.

David Spiegel, MD traveled to Somalia twice this year to Hargeisa and Mogadishu, both as a World Health Organization consultant. He also traveled to Nepal and China. Additionally, he was appointment to the American Academy of Orthopaedic Surgery's international committee and was appointed to the Board of Orthopaedics Overseas. Along with his professional achievements this year, Dr. Spiegel and his wife welcomed their first child, a daughter named Sophia, on March 6, 2012.

Lawrence Wells, MD is the section editor for the orthopaedic section of Nelson's Textbook of Pediatrics 20th edition. Dr. Wells is also the program chair elect for the Philadelphia Orthopaedic Society and is a member of the executive committee for the Section on Orthopaedics for the American Academy of Pediatrics.

John P. Dormans, MD, FACS, Chief of Orthopaedic Surgery at CHOP, was elected into the Presidential Line of the Scoliosis Research Society (SRS) and will host the SRS 50th Anniversary meeting as president in Minneapolis, Minnesota in 2015. Dr. Dormans completed his term as *President of Société Internationale de Chirurgie Orthopédique et de Traumatologie (SICOT) - United States* last year. He also completed his term as President of the Pediatric Orthopaedic Society of North America in 2010. Dr. Dormans is President Elect of the *World Orthopaedic Concern (WOC)* for the 2014-2016 term.



Figure 8. 2012-2013 Benjamin Fox Research Fellows, Eric Sarkissian (left) and Itai Gans (right). Eric and Itai are upcoming fourth year medical students who have taken a year to do clinical research in pediatric orthopaedic surgery at CHOP.