

The Division of Orthopaedic Surgery at The Children's Hospital of Philadelphia is making significant advances in patient care and research. We're proud of the work highlighted here because, like our colleagues across the country, we're devoted to the children to whom we provide care. We hope you find this update interesting and useful. Contact us at [orthopaedics@email.chop.edu](mailto:orthopaedics@email.chop.edu) for more information.



## Today at CHOP: Orthopaedics Update

### TEAM PLAYERS:

#### *Sports Medicine at The Children's Hospital of Philadelphia*

## News from your colleagues in Orthopaedics



**Team Players: Sports Medicine at  
The Children's Hospital of Philadelphia**

**Give the Man a Hand — And a Shoulder**

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The orthopaedic team at The Children's Hospital of Philadelphia is as passionate about Sports Medicine as their patients are about sports. Today, they have to be. Young people are playing heavy-impact sports at highly competitive levels. With club teams, many play year-round and play multiple sports — creating more opportunities for injury.

These talented players come to CHOP's Sports Medicine and Performance Center with persistent aches and shooting pains. They come with ruptured hamstrings and Achilles tendonitis and stress fractures and anterior cruciate ligament tears and osteochondritis dissecans. They all have one thing on their minds: healing and returning to the mat, to the field and to the court. At the Center, they find a team that respects not just their anatomy, but also their desire to get back to sports, as safely and as quickly as possible.

Sports medicine has been an important part of CHOP's Division of Orthopaedic Surgery since the late 1970s — the Hospital established one of the first pediatric sports medicine programs in the world. It is a collaborative, multidisciplinary venture between surgeons, sports medicine specialists, sports and developmental physical therapists, nurses, and nutritionists.

"Children and adolescents aren't the same as young adults as it relates to their skeletal maturity," says Lawrence Wells, M.D., an orthopaedic surgeon at CHOP. "Those issues are germane to treatment options. We have that skill and expertise particularly with the growth plate and the bone."

The varying degrees of skeletal maturity in the patient population offer one of the biggest challenges for the Sports Medicine team. Wells explains: "For the skeletally immature patient, we need to try and predict how much growth is remaining and tailor the treatment accordingly." That treatment could be a transphyseal

approach with an exclusively soft tissue graft, but the very young patient who has several years before growth plate maturity would require a much different procedure. "Treatment needs to be tailored to respect the growth plate," says Wells. "If we injure the plate, growth can stop prematurely."

With this in mind, the CHOP team has developed surgeries specifically for children. Ted Ganley, M.D., director of the Sports Medicine Program, recently developed the anatomic all-epiphyseal ACL reconstruction for skeletally immature patients. "This was essentially the first established technique to put both the graft and the fixation points within the epiphysis," says Ganley, whose recent articles on the subject have received wide acclaim. The presentation of this work in pediatric ACL reconstruction at the annual meeting of the American Orthopaedic Society for Sports Medicine received the award for best clinical paper of the year. "The philosophy is to be less invasive and to optimize the re-creation of normal anatomy," he says. Ganley adds that the technologically advanced imaging available at CHOP is invaluable to the surgical team. "There are very few centers that have 3-D CT scans and computer navigation to determine precise graft positioning."

Another innovation is a pain management technique that typically shortens hospital stays, often allowing patients to go home on the day of surgery. Since 2002, CHOP anesthesiologists have delivered pain medication through femoral and sciatic nerve catheters, which patients can remove themselves at home. "We can minimize the use of opioids for pain and the side effects are small," says anesthesiologist Arjunan Ganesh, M.B.B.S. "We place 400 catheters every year. We do it for foot and ankle surgery, hip surgery, shoulder, elbow, particularly the upper and lower extremities." This allows patients to convalesce at home, and families are relieved of the challenges — financial and otherwise — that hospital stays can bring.

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## Give the Man a Hand — And a Shoulder

In a place like The Children's Hospital of Philadelphia, it is not unusual to find the unusual — both in the patient population and the dedicated staff. In the Division of Orthopaedic Surgery, a recent addition to the staff brings a very particular expertise — one that is invaluable to the team. Robert Carrigan, M.D., specializes in surgery for the hand and upper extremities. "Shoulder to fingers," as he says, treating conditions including polydactyly, syndactyly, thumb hypoplasia and malformed thumbs. "My specialties are more anatomically based and less condition based," he says. His reach includes traumatic and neuromuscular conditions and sports-related injuries.

The anatomy Carrigan focuses on is extremely challenging: delicate children's hands, joints, tendons and vessels. In addition, with some congenital conditions, there are structures that are malformed or haven't formed, confusing the anatomy further. "I was really interested in some of the congenital conditions that kids have, and you really need to be at an institution like CHOP to help those children," Carrigan says. "I enjoy the anatomy, and I enjoy operating on a number of different tissue systems. It's the variety that I like best."

"If there are problems with the nerves, he's the one we call," says CHOP orthopaedic surgeon Wudbhav Sankar, M.D., who has known Carrigan since residency. "He has the expertise to do surgical work under a microscope. He operates on nerves that are a few millimeters large, much too small to be seen with the naked eye."

Carrigan came to CHOP in July 2009. Before that, he was in private practice. He received his medical training at the University of Pennsylvania and completed his residency and fellowship at the Hospital of the University of Pennsylvania.

There are very few pediatric hand surgeons, and even fewer who treat children with rare congenital conditions. But the rare, the exception, is part of Carrigan's value at CHOP. "We treat 100 elbow fractures a year, but there is a complication that we all stay up at night worrying about," says Sankar. "One or two a year will have a blood vessel problem. Carrigan will explore the artery and repair it. It's a big deal. It's essential that we have people at CHOP who have his expertise."

Carrigan is looking to the future as well. Among his goals: finding ways to improve nerve repair and improve outcomes with regard to tendon injuries. "CHOP is fantastic. I see a lot of kids. I work with excellent people. The enticing cases I do and the things I encounter on a daily basis are both challenging and rewarding," Carrigan says.

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The Sports Medicine team understands the needs of its patients from many perspectives. Angela Smith, M.D., is both an orthopaedic surgeon and a competitive figure skater who recently won two gold medals at the Masters National Championships. "How do you find someone who understands you as an athlete?" she says. "The key is that we do these sports and we understand the needs of young athletes and how important their sports are to them."

Smith's expertise is in sports that require both extreme flexibility and extreme strength and quickness — gymnastics, figure skating, dance and cheerleading. These patients have to be able to protect their loose joints, which becomes an issue during periods of growth. Typical problems Smith sees vary depending on the age of the patients. "The 8-to-10-year-old will have a problem with the growth plate of the heel, where the 11- or 12-year-old will be more likely to have a problem with the Achilles itself. The weak link shifts from one spot to another."

The intricate knowledge of these child athletes and their particular issues is what sets CHOP's team apart. "We see these children with these types of problems, and that is all we do," Smith says.

## Pediatric Specialty Day

At the annual meeting of the American Academy of Orthopaedic Surgeons in New Orleans in March 2010, the Pediatric Orthopaedic Society of North America hosted its Specialty Day Program. This year's program was designed and organized by Larry Wells, M.D., an orthopaedic surgeon at The Children's Hospital of Philadelphia.

"The focus was on adolescents and the medical and surgical issues that arise — for both patients and physicians — as they transition into adulthood," says Wells. "We had 30 faculty members from around the country and three international speakers who spoke about these specific pediatric orthopaedic issues."

Wells was curious as to what pediatric orthopaedists could learn from their adult medicine colleagues. How are patients doing beyond 21 years of age? What opportunities does CHOP's orthopaedic team have to modify or redesign treatment options that might improve long-term outcomes and facilitate effective ongoing care?

Five different symposia throughout the day yielded many actionable insights. "We learned, for example, that there is an opportunity for injury prevention for kids who have ACL sports injuries through an exercise program," says Wells. The leading research for this program comes from several national centers. "We have been following the research very closely, and we now have designed at CHOP a similar program, specific to adolescents and teens." Clinicians at CHOP's Sports Medicine and Performance Center are now actively promoting the program in their own clinic and in the community, working with coaches, schools and trainers to minimize injuries in young athletes. As Wells says, "This is a great example of shared learning leading directly to an improvement in care."

## A Rare Condition — A Unique Learning Opportunity

Experts at The Children's Hospital of Philadelphia are embarking on an unprecedented, in-depth review of soft tissue sarcomas — a rare form of pediatric cancer that makes up just 7 percent of all childhood tumors. This review, which will examine every sarcoma patient treated at Children's Hospital since 1987, will offer physicians new insight into treatment options and outcomes.

"There is not a lot of literature regarding this topic, and it is sparse because it is such a rare condition," says Patrick O'Toole, M.D., an Orthopaedics fellow at Children's Hospital. Soft tissue sarcomas are not only rare, but heterogenous as well, presenting even more challenges. "It is such a diverse group. It's like you're treating several different types of cancer under one umbrella," says O'Toole. "It's not like looking at a group with one type of breast cancer. We're looking at patients who have multiple different types of soft tissue sarcomas — each patient has a different tumor, different treatment, different outcome."

The review will examine more than 100 cases — researching clinical outcomes for patients who received chemotherapy, radiation and surgical treatment, and looking at statistics for amputations, survival

and development of metastatic disease. The review will also track changes in treatment over the past 20 years.

"We want to see if we can predict risk factors for this heterogenous group of patients. Are there any factors leading to a particular outcome? Does it depend on the age they are at diagnosis? We want to see whether, for example, people with soft tissue sarcomas in extremities might do better than those with tumors in the torso," says O'Toole. "We believe there is so much our data can tell us."

Children's Hospital is the ideal place for a review of this breadth and depth. A tertiary referral center like CHOP is especially well positioned to handle rare conditions such as soft tissue sarcomas. The institution's multidisciplinary treatment approach involving Orthopaedics, Surgery, Oncology, Radiology and Genetics attracts a significant volume of patients, providing an ample study sample necessary for the research.

"It's a rare condition even here," says O'Toole. "But if a child is diagnosed, for their parents it's not rare. It does exist and has to be treated in the best way possible."

## Recent Publications

**Approaches for the very young child with spinal deformity: what's new and what works.** Akbarnia BA, Blakemore LC, Campbell RM Jr, Dormans JP. *Instr Course Lect.* 2010;59:407-24.

**Case report: primary aneurysmal bone cyst of the epiphysis.** Chan G, Arkader A, Kleposki R, Dormans JP. *Clin Orthop Relat Res.* 2010 Apr;468(4):1168-72. Epub 2010 Jan 27.

**Fibula free flap reconstruction of the pelvis in children after limb-sparing internal hemipelvectomy for bone sarcoma.** Hubert DM, Low DW, Serletti JM, Chang B, Dormans JP. *Plast Reconstr Surg.* 2010 Jan;125(1):195-200.

**Humerus fractures in the pediatric population: an algorithm to identify abuse.** Pandya NK, Baldwin KD, Wolfgruber H, Drummond DS, Hosalkar HS. *J Pediatr Orthop B.* 2010 Jul 2. Epub ahead of print.

**Femur fractures in the pediatric population: abuse or accidental trauma?** Baldwin K, Pandya NK, Wolfgruber H, Drummond DS, Hosalkar HS. *Clin Orthop Relat Res.* 2010 Apr 7. Epub ahead of print.

**Composite playground safety measure to correlate the rate of supracondylar humerus fractures with safety: an ecologic study.** Park MJ, Baldwin K, Weiss-Laxer N, Christian JB, Mello MJ, Eberson C, Spiegel DA. *J Pediatr Orthop.* 2010 Mar;30(2):101-5.

**Epidemiology of surgical admissions to a children's disability hospital in Nepal.** Spiegel DA, Shrestha OP, Rajbhandary T, Bijukachhe B, Sitoula P, Banskota B, Banskota A. *World J Surg.* 2010 May;34(5):954-62.

**All-epiphyseal anterior cruciate ligament reconstruction in skeletally immature patients.** Lawrence JT, Bowers AL, Belding J, Cody SR, Ganley TJ. *Clin Orthop Relat Res.* 2010 Jul;468(7):1971-7. Epub 2010 Feb 20.

**Arthroscopic management of osteochondritis dissecans of the capitellum: mid-term results in adolescent athletes.** Jones KJ, Wiesel BB, Sankar WN, Ganley TJ. *J Pediatr Orthop.* 2010 Jan-Feb;30(1):8-13

**Bowing of the right lower leg in a 6-month-old infant.** Smith JR, Davidson R. *JAAPA.* 2010 Feb;23(2):69-71.

**Eleven years experience in the operative management of pediatric forearm fractures.** Flynn JM, Jones KJ, Garner MR, Goebel J. *J Pediatr Orthop.* 2010 Jun;30(4):313-9.

**Intraobserver and interobserver agreement in the measurement of displaced humeral medial epicondyle fractures in children.** Pappas N, Lawrence JT, Donegan D, Ganley T, Flynn JM. *J Bone Joint Surg Am.* 2010 Feb;92(2):322-7.

**Adolescent anterior cruciate ligament reconstruction: a retrospective analysis of quadriceps strength recovery and return to full activity after surgery.** Wells L, Dyke JA, Albaugh J, Ganley T. *J Pediatr Orthop.* 2009 Jul-Aug;29(5):486-9.

**Rotator cuff injuries in skeletally immature patients: prevention and indications for the orthopaedic nurse.** Kleposki RW, Wells L, Wilson M, Sehgal K. *Orthop Nurs.* 2009 May-Jun;28(3):134-8; quiz 139-40.

**Current treatment of clubfoot in infancy and childhood.** Horn BD, Davidson RS. *Foot Ankle Clin.* 2010 Jun;15(2):235-43.

**Comparison of complications among growing spinal implants.** Sankar WN, Acevedo DC, Skaggs DL. *Spine (Phila Pa 1976).* 2010 Jun 18. Epub ahead of print.

**Femoral anteversion in developmental dysplasia of the hip.** Sankar WN, Neubuerger CO, Moseley CF. *J Pediatr Orthop.* 2009 Dec;29(8):885-8.

**Predictors of the need for femoral shortening osteotomy during open treatment of developmental dislocation of the hip.** Sankar WN, Tang EY, Moseley CF. *J Pediatr Orthop.* 2009 Dec;29(8):868-71.

**Weight gain following vertical expandable prosthetic titanium ribs surgery in children with thoracic insufficiency syndrome.** Skaggs DL, Sankar WN, Albrektson J, Wren TA, Campbell RM. *Spine (Phila Pa 1976).* 2009 Nov 1;34(23):2530-3.

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