Orthopaedics

RESEARCH AND TRAINING DETAILS

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<td>Direct Annual Industry Support</td>
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CLINICAL ACTIVITIES AND TRAINING

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Research Highlights

Donita Bylski-Austrow, PhD; Eric Wall, MD; Viral Jain, MD; and Alvin Crawford, MD - Translational spine surgery research shows both safety and proof-of-concept in scoliosis patients in FDA IDE clinical study at two year follow-up

A novel spine implant designed and developed in the department has been shown to modify spine growth in early adolescent scoliosis patients. The safety study was conducted under an investigational device exemption (IDE) granted by the US FDA, as well as partially funded by a grant from the FDA. Two-year results showed variable radiographic outcomes, but included proof-of-concept of curve correction by asymmetric spine growth modification. Improvements in procedures and enhancements to the implant have been submitted in preparation for the second phase of the translational research, which has been approved by the FDA.

Roger Cornwall, MD – Neonatal brachial plexus injury and neuromuscular contractures

Cerebral palsy and neonatal brachial plexus palsy both lead to functionally disabling contractures that limit joint flexibility. Existing therapies cannot cure these contractures because the cause of the contractures is unknown. Dr. Cornwall’s research, using basic science, computational modeling, and clinical imaging approaches, has demonstrated that impaired growth of denervated muscle is sufficient to produce the contractures and bony deformity seen in the shoulder following neonatal brachial plexus injury. Furthermore, with motion analysis and the first ever clinical use of a novel needle microendoscope to nondestructively measure muscle sarcomeres, the intracellular building blocks of muscle, Dr. Cornwall’s research is discovering paradigm-changing similarities between contractures in neonatal brachial plexus injury and cerebral palsy. This year, Dr. Cornwall also founded the Neuromuscular Development Group at Cincinnati Children’s, bringing together principal investigators and laboratories from five divisions within Cincinnati Children’s to accelerate collaborative investigation of basic biological processes involved in a variety of clinical problems, such as amyotrophic lateral sclerosis (ALS), muscular dystrophy, spinal cord injury, muscular pain and childhood paralysis.

Kevin Little, MD - Unexpected returns to outpatient hand clinics

The aim of this Quality Improvement (QI) project was to decrease the number of children who were returning to clinics unexpectedly during their treatment. The goal was to reduce the burden for the family for urgent medical care related to their orthopedic treatment by improving the quality of care they received. The main reasons that children were returning to clinics were for cast issues or for issues related to education regarding the normal course of their injury or illness. Over the course of the project, the rate of unexpected returns to the clinic were decreased from approximately two per 100 patient visits to 0.6 per 100 patient visits; which was more than the 50% target goal. The number of these unexpected return patients was decreased by offering alternative treatments to casting that are equally effective, and also eliminate the need for some additional follow-up appointments. This additionally saved families the direct and indirect costs associated with medical appointments. The project also standardized the education given to patients by incorporating EPIC .dot phrases and smart text functions into a patient's after visit summary as well as creating Knowing notes for many of the common injuries we see that frequently lead to unexpected returns to clinic. Overall, this project led to a substantial cost savings to patients and their families, while improving the efficiency of orthopedic care in clinics by reducing the number of patients who had to be fit into the already busy clinic schedules due to unexpected issues.

Eric J. Wall, MD - OsteoChondtitis of The Knee

Dr. Eric J. Wall and the Research in OsteoChondritis of the Knee (ROCK) Group published their first multicenter publication. The ROCK group is a consortium of sports physicians at 13 Children’s Hospitals whose aim is to cure Osteochondritis Dissecans (OCD). OCD is a rare condition of the joint surface that can lead to cartilage loss in the knee of young athletes, and is often refractory to non-surgical and surgical treatment. In its worst form, OCD can cause early onset degenerative arthritis. This study tests the rater reliability to agree on the classification of several radiographic features of
OCD that may be predictive of outcome with surgical and non-surgical treatment. Each reliable feature may now be worked into an algorithm to guide the best treatment of this rare and vexing disease.

Creating a safer environment in the Operating Room
The department has dedicated resources to ensuring we are providing the safest operating environment possible to all of our surgical patients. A simulation training program has been implemented which serves to let the entire operating team practice urgent scenarios that can occur unexpectedly (e.g. neuromonitoring alert events, hemorrhage, etc.). These trainings strengthen protocol compliance, and technical and non-technical skills including teamwork and communication based on Composite Risk Management principles. In addition to the simulation training program, pre-brief team meetings and morning-of-surgery huddles have been implemented for every patient.

Significant Publications


Early onset scoliosis (EOS), a spinal deformity diagnosed in children younger than five years of age, has high rates of morbidity and mortality due to reduced spine, chest, and lung growth. In severe cases, surgical treatment is required using instrumentation that distracts the spine to allow for growth. These “growing rods” save lives, but have many complications. Expected adverse events include fusion of vertebrae, rod fractures, loss of fixation, and junctional failure above the instrumentation, some of which are due to the high stiffness of the metal rods. With the long-term goal of improving growing rod implants to reduce complications due to biomechanical causes, the purpose of this pilot study was to determine the feasibility of using a more flexible, polymeric, rod material. Biomechanical tests were conducted using porcine thoracic spines. Results indicated that, with a two-rod spinal construct, polymer rods would likely provide sufficient stability to correct the curve while allowing for more spine motion, which may be expected to reduce the frequency of biomechanical complications in young children with EOS. This study received the Sevastik Award in the “Best Treatment” category at the 2014 biannual meeting of the International Research Society for Spinal Deformities in Sapporo, Japan.


Neonatal brachial plexus injury (NBPI) is the most common cause of upper extremity paralysis in children, and the most common injury sustained at birth. Even though the nerve injury typically recovers at least partially, affected children are often left with disabling stiffness of the affected joints, termed contractures. These contractures cannot be cured by existing therapies because the cause of these contractures is unknown. Through development of a mouse model of NBPI we discovered that contractures are caused by impaired longitudinal muscle growth, resulting from loss of normal nerve input during a critical neonatal window of muscle development.

Recently, we translated these findings to the human shoulder in two studies using complimentary approaches. First, we used magnetic resonance imaging to study a previously unexplained contracture of the shoulder.

The abduction contracture, where the shoulder cannot be brought fully against the body, is the chief complaint for many patients yet has no effective treatments, largely because it has never been reliably assessed and its cause is unknown.
Using magnetic resonance imaging of affected shoulders, we developed a method to measure the abduction contracture and correlate it to muscle atrophy. Our findings support the conclusion from the laboratory that joint contractures following NBPI are due to shortening of paralyzed muscles. Next, using computer modeling of human shoulder movement and forces, we found that simulating impaired growth of muscles affected by the nerve injury is sufficient to cause the shoulder contractures and deformities seen clinically.

This study validates our findings from the mouse model and changes the paradigm of thinking about how these contractures form, opening the door to novel and potentially curative treatments. More importantly, novel treatments developed in the laboratory using the mouse model can be translated first to humans using computer modeling to determine the effect of improved muscle growth on human shoulder function.


Triplane ankle fractures are among the most complicated of all growth plate injuries. Proper treatment is predicated upon proper fracture classification. Our study showed that computed tomography (CT scans) had an important positive impact on fracture classification and treatment planning. This was the first study to ever evaluate the reliability of the six category classification system (Rapariz classification) of pediatric triplane ankle fractures.


Clavicle fractures are frequent sports injuries and the most common fracture about the shoulder in children. We studied over 150 children with clavicle fractures and found that those kids with an incomplete fracture (angulation only) had an almost 20% risk of re-fracturing the same collarbone in the future. This information allows us to better counsel patients and families about future risks following return to sports activities.

Division Publications


Faculty, Staff, and Trainees

Faculty Members

James McCarthy, MD, MHCM, Professor
  Leadership Division Director, Pediatric Orthopaedic Surgery
  Research Interests Limb Deformities, Cerebral Palsy and Motion Analysis

Steven Agabegi, MD, Assistant Professor
  Research Interests Scoliosis natural history

Donita Bylski-Austrow, PhD, Associate Professor
  Leadership Director of Biomechanics Research
  Research Interests Spine Biomechanics

Sheila Chandran, MD, Assistant Professor
  Research Interests Gait Deformities

Roger Cornwall, MD, Associate Professor
  Leadership Co-Director, The Hand and Upper Extremity Center
  Research Interests Hand and Upper Extremity

Viral Jain, MD, Assistant Professor
  Research Interests Scoliosis

Kevin Little, MD, Assistant Professor
  Leadership Compliance Officer
  Research Interests Hand and Upper Extremity

Charles Mehlman, DO, MPH, Professor
  Leadership Director, Pediatric Orthopaedic Resident Education
  Research Interests Spine Bracing and Evidence-Based Medicine

Shital Parikh, MD, Associate Professor
  Research Interests Sports Medicine

Jaime Rice-Denning, MD, Assistant Professor
  Leadership Safety Officer
  Research Interests Patient safety, trauma, foot and ankle conditions

Joel Sorger, MD, Associate Professor
  Research Interests Musculoskeletal Oncology

Peter Sturm, MD, Professor
  Leadership Director, The Crawford Spine Center
  Research Interests Scoliosis and other disorders of the spine

Junichi Tamai, MD, Assistant Professor
  Leadership Director, Physician Assistant Program
  Research Interests Pediatric Hip Disorders
Eric Wall, MD, Professor
Leadership Director, Orthopaedic Sports Medicine Program; Director, Pediatric Orthopaedic Fellowship Program
Research Interests Orthopaedic Sports Medicine, Minimally invasive scoliosis correction without spinal fusion

Patrick Whitlock, MD, PhD, Assistant Professor
Research Interests Regenerative medicine; biomaterials; musculoskeletal development; naturally-derived tissue scaffolds; clinical outcomes.

Clinical Staff Members
- Lance Bolin, PA-C, Lead Physician Assistant
- Angela Hildebrandt, PA-C
- Adriana Glazier, PA-C
- Sarah Gilday, PA-C
- Lori Mascall, PA-C
- Stephanie Pinkstock, PA-C

Trainees
- Alan Aiken, DO, PGY1, Wellmont Hospital
- Seema Azher, DO, PGY2, Bethesda Family Medicine
- Kandice Beenkin, DO, PGY4, McLaren Hospital
- Kiel Beltinck, DO, PGY4, McLaren Hospital
- Chirag Berry, MD, PL7, Mass General Hospital
- Elizabeth Browning, DO, PGY2, Bethesda Family Practice
- Adam Burzynski, MD, PGY4, University of Cincinnati
- Camille Connelly, MD, PGY4, University of Cincinnati
- Leah Cobb, MD, PL6, Medical College of Wisconsin, WI
- Daniel Cowley, DO, PGY3, Millcreek Hospital
- Stephen Dailey, MD, PG1, University of Cincinnati
- Kris Danielson, DO, PGY1, Metro Hospital
- Albert d'Heurle, MD, PGY3, University of Cincinnati
- Tonya Dixon, MD, PGY4, University of Cincinnati
- Tyler Duncan, DO, PGY1, Wellmont Hospital
- Landon Fine, DO, PGY4, McLaren Hospital
- Brian Fuller, MD, PGY4, Bethesda Sports Medicine
- Kimberly Grueneisen, DO, PGY2, Bethesda Family Medicine
- Chad Hanson, DO, PGY4, Oklahoma State University
• Paul Henkel, DO, PGY3, Wellmont Hospital
• Brandon Horn, DO, PGY4, McLaren Hospital
• Lauren Hruskewycz, DO, PGY1, Bethesda Family Medicine
• Eric Jackson, DO, PGY4, York Hospital
• Brad Jaquith, MD, PGY1, University of Cincinnati
• Bryan Jarvis, DO, PGY3, Millcreek Hospital
• Micah Jones, MD, PL6, The Kleinert Kutz Hand Institute, KY
• Andrew Jimenez, MD, PGY1, University of Cincinnati
• Steven Jung, MD, PGY2, Bethesda Family Medicine
• Sara Kaja, MD, PGY3, Bethesda Family Medicine
• Kevin Keith, DO, PGY3, Millcreek Hospital
• Kelly Grueneisen, MD, PGY2, Bethesda Family Medicine
• Brad King, MD, PGY1, University of Cincinnati
• James Klunk, DO, PGY1, York Hospital
• Brandon Kohrs, DO, PGY1, Grandview
• Scott McDonald, DO, PGY3, Wellmont Hospital
• Patrick Massa, MD, PGY2, Bethesda Family Medicine
• William McClellan, MD, PGY2, University of Cincinnati
• Max McCray, DO, PGY1, York Hospital
• Ashley Miller, MD, PGY1, University of Cincinnati
• Tyler Noble, DO, PGY4, York Hospital
• Zach Nollin, DO, PGY4, Oklahoma State University
• Michelle Obrien, MD, PGY4, University of Cincinnati
• Andrew Pick, DO, PGY4, McLaren Hospital
• Caleb Pinegar, DO, PGY4, Western Reserve
• Wendy Quiles, MD, PGY2, Bethesda Family Medicine
• Christopher Redman, MD, PL6, Allegheny General Hospital, PA
• Nick Romeo, DO, PGY2, York Hospital
• Philip Ross, MD, PGY2, University of Cincinnati
• Mark Shoreman, MD, PGY4, Bethesda Sports Medicine
Preetha Sinha, MD, PGY2, University of Cincinnati

Travis Small, DO, PGY4, Millcreek Hospital

Stephen Steffes, DO, PGY4, Western Reserve

Jarrod Steimie, DO, PGY1, Grandview

Ryan Tarr, DO, PGY1, Grandview

Ruberte Theile-Ramon, MD, PGY1, University of Cincinnati

Eric Varley, DO, PGY3, Metro

Kent Walker, DO, PGY3, Wellmont Hospital

Justin West, MD, PGY4, University of Cincinnati

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**Grants, Contracts, and Industry Agreements**

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<td>The Role of Satellite Cell Notch Signaling in Contracture Formation Following Neonatal Brachial Plexus Injury</td>
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<td>The Role of Muscle Satellite Cells in Contracture Formation Following Neonatal Brachial Plexus Injury</td>
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<td>John and Marcella Fox (Washington University)</td>
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<td>Scoliosis Surgery Outcome Database Registry: A Prospective, MultiCenter Database Registry of the DePuy Spine Harms Study Group</td>
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<td>Setting Scoliosis Straight</td>
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**Current Year Direct** $87,950

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**Current Year Direct Receipts**

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|          |                     | **$109,911**       |
Pediatric orthopaedic surgeons around the country remain baffled by a rare condition called osteochondritis dissecans (OCD), a degenerative cartilage disorder that strikes the knees of active, athletic teenagers. The surgeons teleconference frequently and meet several times a year to share information about their rare cases to better understand a condition with no known cause, and no proven best treatment.

Their collaborative team, Research in OsteoChondritis of the Knee (ROCK) Group, has cleared one hurdle by reaching baseline agreement on the key anatomical features that mark the condition. Results of the team’s first Cincinnati-led, multi-center study appeared in the February 2015 issue of *The American Journal of Sports Medicine*.

In the ROCK study, seven orthopaedic specialists rated X-rays of 45 different knees for nine or more specific OCD characteristics. The study showed highly reliable agreement among the doctors on features such as growth plate maturity, condylar width and lesion size, and the ability to differentiate medial and lateral lesions in the knee. Other characteristics were less reliable for identifying OCD.

“We all hate osteochondritis dissecans because it’s so nebulous and so debilitating,” according to Eric Wall, MD, study coordinator and Director of Orthopaedic Sports Medicine. Aided by new data, doctors will now focus on how specific OCD features correlate to treatment outcomes, Wall says.

With treatment failure rates of 30 percent, some OCD-diagnosed adolescents must drastically reduce physical activities for up to two years as cartilage recovers, and others can develop early onset degenerative arthritis. Affected knee tissue, Wall says, “looks like a Cincinnati road after a hard winter, with a big deep pothole in the knee cartilage. But asking a 10-year-old to rest for up to two years — that’s a lot of time out of a young life. Our goal is to cure it in the next decade.”
These knee images show the articular side of osteochondritis dissecans (OCD) lesions with predominantly (A) convex, (B) linear, or (C) concave contours. The images were part of a multi-center study reporting that certain radiographic features can be reliably classified by multiple observers. This will allow for the determination of predictors of OCD healing with non-operative or operative treatment.

“We all hate osteochondritis dissecans because it’s so nebulous and so debilitating.”