

SETTING THE STANDARD FOR PEDIATRIC ORTHOPEDIC CARE

CHILDREN'S MERCY DEPARTMENT OF ORTHOPEDICS AND MUSCULOSKELETAL SCIENCE

With 19 orthopedic faculty members, the Children's Mercy Kansas City Department of Orthopedic Surgery and Musculoskeletal Science is one of the largest in the nation in a freestanding pediatric hospital. *U.S. News & World Report* ranks the program as one of the top in the country. Using a multidisciplinary collaborative approach, this team routinely answers questions surrounding the most complicated pediatric cases and is leading the way to new, more effective treatments through a robust research program.

The department provides a broad range of trauma, hand, musculoskeletal, sports medicine and general orthopedic services for children of all ages. The department also offers specialized evaluation and treatment of spine disorders in patients from birth through early adulthood, including early onset scoliosis.

For athletes, Children's Mercy developed the Sports Medicine Center. Here, patients benefit from the Human Performance Lab, which offers state-of-the-art 3D-motion analysis. This helps identify underlying causes for abnormalities and helps doctors plan the appropriate treatment for both student-athletes and pediatric patients with neuromuscular disorders.



A TOP-RANKED PROGRAM

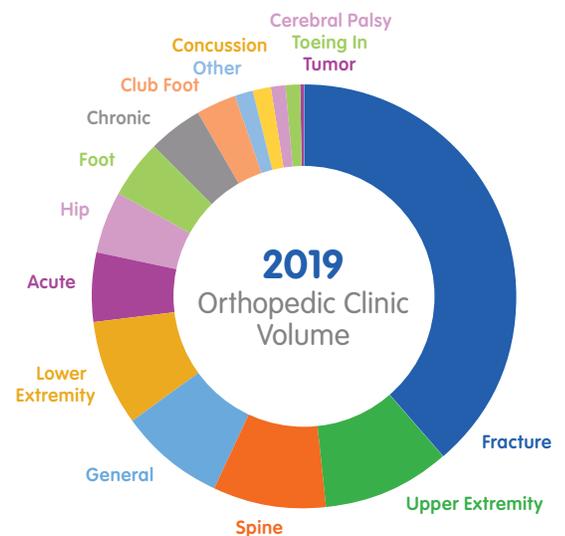
One of the top-ranked pediatric orthopedic programs in the nation, according to *U.S. News & World Report*.

BY THE NUMBERS

- 44,000+ Orthopedic clinic visits in 2019
- 19 Pediatric orthopedic faculty
 - 13 Operative
 - 6 Non-operative
- 21 Nurse practitioners
- 3 Physician assistants
- 10+ Fully dedicated physical therapists
- 30 Athletic trainers

RESEARCH STATISTICS

- 23 Peer-reviewed publications
- 29 National or international research presentations
- 27 Invited lectures
- 4 Book chapters
- 26 Retrospective IRB-approved studies
- 5 Prospective studies
- 6 Approved registries



COMPREHENSIVE CLINICAL CARE

Children's Mercy offers a clinically diverse orthopedics and musculoskeletal science program, with a faculty that is committed to providing the highest quality of care to patients and delivering the best outcomes.

SPINE CARE

For children with significant spinal curvature, our surgeons provide options such as vertebral body tethering (VBT), MAGEC (magnetic adjustable) growing rods, and a Vertical Expandable Prosthetic Titanium Rib (VEPTR) device. For most spine surgeries, children are in the hospital for just over three days, and we have historically low or non-existent infection rates after surgery for adolescent idiopathic scoliosis.

NON-SURGICAL TREATMENT FOR SCOLIOSIS

We also have a full range of non-surgical treatment options for kids with scoliosis, including both the Rigo 3D brace and Boston brace. We partner with Rigo-Cheneau-trained orthotists and certified Schroth method physical therapists for bracing, and our established infantile scoliosis program offers MEHTA/RISSER casting from our experienced physicians.

HAND SURGERY

Children's Mercy is one of only a few hospitals in the nation to have two full-time, board-certified hand surgeons on our team with a dedicated Hand Surgery program focused only on kids.

- Prosthetics
- Splinting, stretching and/or manipulation by physician or therapist
- Surgery
- Therapy to strengthen, stretch and improve function of the hand
- Multidisciplinary Brachial Plexus Clinic

SPORTS MEDICINE

The Sports Medicine team brings together a wide range of board-certified sports medicine specialists to help student-athletes reach their peak performance.

- Performance management that includes mental wellness, nutrition and injury prevention
- Injury management offering pediatric-focused treatment and rehabilitation
- Adaptive sports medicine for children with disabilities or impairments



Nigel Price, MD, Chief of Spine Section (R) and Brian Kerl, Orthotist (L) with scoliosis patient wearing Rigo 3D bracing.

- Physical therapy services that include:
 - Aquatic therapy
 - Dry needling and instrument assisted soft tissue mobilization
 - ACL return to sport testing
 - Alter-G treadmill
 - Blood flow restriction
 - Isokinetic testing
 - Vestibular therapy

Children's Mercy is the official health care partner for Sporting Kansas City. The partnership works to improve youth health, access to pediatric sports medicine and provide soccer-specific curriculum for the Sporting Club Network.

LEVERAGING TECHNOLOGY TO IMPROVE OUTCOMES

Using technology like 3D printing and motion analysis, the Orthopedic team at Children's Mercy can precisely visualize the capabilities and challenges that result from a range of complex conditions.

HUMAN PERFORMANCE LAB

Through the Human Performance Lab, athletes utilize advanced technology to both prevent and recover from injuries; and our experts in spine and neuromuscular surgeries analyze their patients' body mechanics,

carefully planning their surgical strategies. The lab uses special cameras and sensors to record electrical activity in muscles and provides a full analysis of how patients walk and move.

3D MODELING

The 3D Printing Lab at Children's Mercy produces 3D models that are used in developing surgical plans, particularly for minimally invasive procedures. Specifically, models of the hip are frequently used to prepare for complex procedures with accuracy and precision in the Hip Preservation Program. This approach has resulted in better patient outcomes and reduced hospital costs.

LEADING THE WAY THROUGH CLINICAL STUDIES

The department is improving outcomes for its patients through innovative research. All faculty members engage in research on an extensive variety of topics, ranging anywhere from lawnmower injuries to the opioid epidemic.

NONOPERATIVE TREATMENTS FOR ADOLESCENT IDIOPATHIC SCOLIOSIS

Adolescent idiopathic scoliosis, or AIS, affects approximately 4% of children ages 10-18. Although surgery is sometimes indicated for the treatment of this condition, nonsurgical treatments continue to evolve – including the use of effective bracing.

In the past six years, the body of knowledge related to bracing outcomes in AIS was significantly expanded when an NIH-funded study was published in the *New England Journal of Medicine*. Called the BrAIST study, it was conducted in 25 centers across the U.S. and Canada. Nigel Price, MD, Spine Surgery Section Chief at Children's Mercy, was a principal investigator in the study, and Children's Mercy was the largest contributor, with nearly 10% of the patients studied. This study provides the first rigorously validated model predicting a short-term outcome of untreated AIS. The resultant estimates can serve two important functions: 1) setting benchmarks for comparative effectiveness studies and 2) most importantly, providing clinicians and families with individual risk estimates to guide treatment decisions.

In response, the Children's Mercy Orthopedics team is investigating and implementing new nonoperative bracing techniques to provide patients with the best treatments available. Children's Mercy is offering a Rigo-Cheneau-trained surgeon and orthotist on site, and partners with

certified Schroth method physical therapists. Its team members have traveled internationally to train with the leading experts in these nonsurgical treatments for scoliosis. Then they work closely with each patient to create a brace and exercise plan that is optimized for them.

LAWNMOWER INJURIES IN CHILDREN: A NATIONAL 13-YEAR STUDY OF URBAN VERSUS RURAL INJURIES

Although the American Academy of Orthopedic Surgery, American Academy of Pediatrics, and Pediatric Orthopedic Society of North America have established lawnmower safety guidelines, a notable number of injuries continue to occur. In a recent, collaborative study, Richard Schwend, MD, Pediatric Orthopedic Surgery Director at Children's Mercy, along with colleagues from various national pediatric institutions, sought to elaborate on the epidemiology of lawnmower injuries in the pediatric age group and compare urban versus rural injuries.

A total of 1,302 lawnmower injuries were identified. Results showed elevated rates of incidence, higher rates of infection, and higher percentages of patients requiring inpatient stay in rural areas. Additionally, surgical complication rates were higher in rural areas and a significant difference was observed with the age group, length of stay, income, surgical complication and presence of infection at the bivariate level with $P < 0.05$. Rural areas also had a higher overall amputation rate, compared to urban areas.

The findings of this study show that numerous geographic and locale disparities exist in pediatric lawnmower injuries and reveal the need for improved safety awareness, especially in at-risk rural populations.

PRIMARY SPINAL EPIDURAL/ EXTRAMEDULLARY EWING SARCOMA IN YOUNG FEMALE PATIENTS

A recent, collaborative study involving Children's Mercy's Richard Schwend, MD, Pediatric Orthopedic Surgery Director and John Anderson, MD, Pediatric Orthopedic Surgery, as well as Eugenio Taboada, MD, Pediatric Pathology Chair, explored two particular cases of primary spinal epidural/extramedullary Ewing sarcoma (ES), a rare extrasosseous lesion. Extrasosseous ES has a similar demographic as osseous ES, primarily affecting adolescents and young adults of male propensity. Reported five-year survival is 0% to 37.5% for spinal extrasosseous ES.

The study involved two girls, 19 and 14 months old, who presented with progressive lower extremity paraplegia and incontinence. Both had a compressive epidural/

extramedullary mass without metastases and underwent decompression with multilevel laminectomy and tumor excision. Primary spinal epidural/extramedullary ES was diagnosed. Following treatment, case 1 is walking and disease-free five years post treatment; case 2 also is walking and disease-free at eight years follow up.

These cases are the youngest presentations reported for primary spinal epidural/extramedullary ES and suggest that toddlers have a better prognosis for survival than older children and adolescents.

CHILDREN'S MERCY RESEARCH INSTITUTE

The Children's Mercy Research Institute (CMRI) at Children's Mercy Kansas City is an integrated research environment where no boundaries exist between science and medicine. Here, physicians, scientists, academic colleagues and philanthropic partners are collaborating to change the future for children. CMRI areas of emphasis provide the supportive structure for all research conducted at Children's Mercy. Research may fall under one or more of these areas and include Genomics, Precision Therapeutics, Population Health and Health Care Innovation. To enhance its research endeavors, a new building, future home to the CMRI, is under construction. The institute has been carefully designed so research and clinical care work as cross-functional teams, aligned together, to find answers to pediatric medicine's most challenging questions.

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