

SCOTTISH RITE



**2022 RESEARCH
ANNUAL REPORT**





Allison, of Ennis

IN THIS ISSUE

Scottish Rite for Children Accolades & Awards	4
Letter From the Chief of Staff	5
Scottish Rite for Children Overview	6
Research News & Updates	7
2022 Research by the Numbers	8
Research Spotlights	10
2022 Grants.....	18
Staff Spotlights.....	22
MSRF and CORA Spotlights.....	24
Fellowships.....	26
Construction Updates.....	30
Center for Excellence in Limb Lengthening and Reconstruction.....	32

On the cover:
Knox, of
The Colony



Purity, of Kenya

SCOTTISH RITE FOR CHILDREN

Scottish Rite for Children trains physicians and allied health professionals in multiple pediatric orthopedic disciplines. Scottish Rite's history of excellence includes expert, compassionate care and leading-edge research. NRC Health presented Scottish Rite for Children with the 2022 Excellence in Patient Experience Award for receiving the highest patient satisfaction ratings in NRC's nationwide pediatric category. *U.S. News & World Report* ranked Scottish Rite for Children, in collaboration with Children's Medical Center Dallas and UT Southwestern Medical Center, as the No. 3 pediatric orthopedic program in the country in 2022.



TOP 100
PLACES TO WORK 2022

The Dallas Morning News

LETTER FROM THE CHIEF OF STAFF



DANIEL J. SUCATO, M.D., M.S.
Chief of Staff

Leading-edge Research, One-of-a-Kind Care

At Scottish Rite for Children, research forms the critical foundation that drives forward-thinking education and exceptional patient care. Through basic research, our scientists strive to uncover the underlying causes of pediatric musculoskeletal disorders by discovering and identifying genes, as well as other important mechanisms. Our applied science group collaborates with our scientists and clinicians to transition pioneering research from the lab to the clinic by developing new treatment methodologies, as well as enhancing and inventing product solutions. Finally, our clinical research team conducts studies across the gamut of pediatric orthopedic disorders, as well as related arthritic, neurological and other specific learning disorders. Their findings translate into treatment recommendations that fit the needs of each child. All three research facets inform each other to advance education and provide best-in-class patient care at Scottish Rite and beyond.



The objective of the Sarah M. and Charles E. Seay Center for Musculoskeletal Research is to support our holistic approach to treatment by bringing clinicians, researchers and other health care professionals together to collaborate on relevant research for challenging pediatric disorders.

In 2022, our multidisciplinary research and medical teams have demonstrated yet another successful year with more than 240 active research projects, 149 presented abstracts and 109 published articles. Among the tremendous accomplishments coming out of our six Centers for Excellence — Spine, Hip, Foot, Hand, Limb Lengthening and Reconstruction and Sports Medicine — we will spotlight the Limb Lengthening and Reconstruction team and the incredible impact they have had on our patients.

Thank you to all of our partners and staff for the life-changing work that you do every day. As we integrate our specialized skills, expertise and experience, we strengthen our collaborative culture, which not only furthers the discipline but also transforms the lives of children and their families.

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Dan



SCOTTISH RITE FOR CHILDREN OVERVIEW

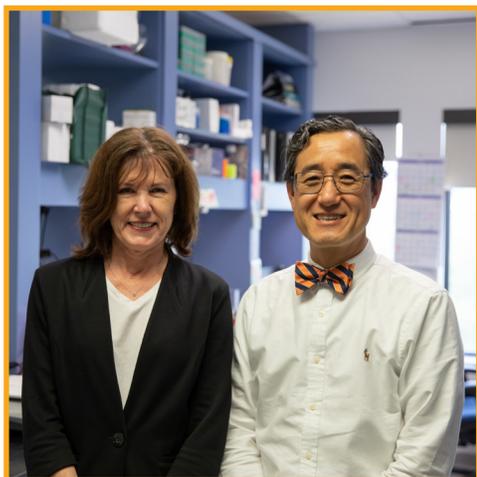
Scottish Rite for Children opened its doors to the children of Texas in 1921 after a group of Texas Scottish Rite Masons approached Dallas' first orthopedic surgeon, W. B. Carrell, M.D., about caring for children with polio. For more than 100 years since that auspicious beginning, more than 360,000 patients have been treated, and the facility has emerged as a world leader in pediatric orthopedic research, treatment and education. The organization primarily cared for children with polio until the 1950s when the Salk and Sabin vaccines virtually eradicated the disease in the Western Hemisphere. This allowed the medical staff at Scottish Rite to expand treatment for a wide range of orthopedic conditions.

Now led by the organization's fourth chief of staff, Daniel J. Sucato, M.D., M.S., and President/CEO Robert L. "Bob" Walker, Scottish Rite is one of the nation's leading pediatric orthopedic centers. The facility treats a wide range of orthopedic conditions, including sports injuries and fractures, as well as certain arthritic, neurological and learning disorders, such as dyslexia. The multidisciplinary approach to care tailors treatment to the individual needs of each child and family. Through the generous support of friends in the community, patients are treated regardless of their ability to pay.

In 2018, Scottish Rite opened a second facility within the larger Dallas-Fort Worth metro area. The Scottish Rite for Children Orthopedic and Sports Medicine Center is located in Frisco, Texas. This facility offers orthopedic outpatient clinics, a fracture clinic that accepts walk-in patients with no physician referral, and a leading-edge Movement Science Lab with specialized capabilities for sport-specific training and testing that is co-located with several state-of-the-art physical therapy gyms. The Frisco campus has operating rooms for day surgeries and on-site radiology services, dedicated space for psychology, an infusion lab, and other ancillary patient services.



RESEARCH NEWS & UPDATES



Carol A. Wise, Ph.D., ranked No. 13 and **Harry Kim, M.D., M.S.**, ranked No. 66 in the Orthopedics Principal Investigator category of the Blue Ridge Institute for Medical Research 2022 Rankings of NIH Funding, with more than \$2 million in grant awards from the NIH combined.



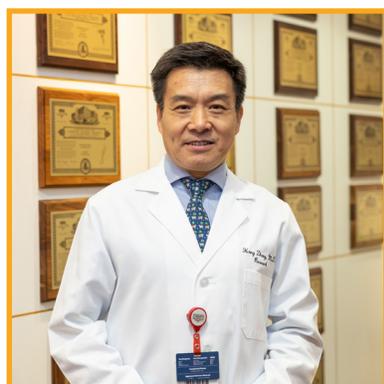
Jonathan J. Rios, Ph.D., director of Molecular Genetics, was recently awarded a grant from the NIH that will bring new opportunities to discover genetic causes of clubfoot. Rios' team also published the largest genetic association study for clubfoot, which included an analysis of approximately 8 million genetic markers in more than 8,000 individuals. As a part of this effort, his team identified the first gene, **FSTL5**, associated with clubfoot using this approach.



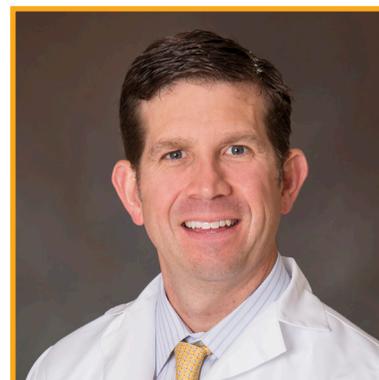
Scottish Rite for Children celebrated the installment of Chief of Staff **Daniel J. Sucato, M.D., M.S.**, as President of the Pediatric Orthopaedic Society of North America.



With 23 staff members from the Scottish Rite Sports Medicine team attending, the Sports Medicine team had a strong presence at the Pediatric Research in Sports Medicine Society's annual meeting. Congrats to our Movement Science team for receiving the 2023 Kevin G. Shea Award for Best Scientific Poster.



Daniel J. Sucato, M.D., M.S., and researcher **Hong "Johnny" Zhang, M.D.**, recently shared their latest research at the Scoliosis Research Society's 30th International Meeting on Advanced Spine Techniques. Their work has also led to a patent for Scottish Rite for Children's Research team.



Medical Director of Clinical Research and pediatric orthopedic surgeon **Henry B. Ellis, M.D.**, was named President of the Texas Orthopaedic Association, 2023-2024.

For more Research news & events, visit scottishriteforchildren.org/news-events

2022 RESEARCH BY THE NUMBERS

Figures represent totals since 2020 for the Dallas and Frisco Campuses

Patients enrolled into prospective research studies:

5,205



Patients enrolled in Basic Science Studies:

74

Patients with Cerebral Palsy enrolled:

333

Patients enrolled in Movement Science Lab testing:

768



Patients enrolled with Rheumatology and Juvenile Arthritis:

150

Number of Publications:

126

WHAT JOURNALS WERE SUBMITTED TO THE MOST:

Journal of Bone & Joint Surgery (JBJS)
Journal of Pediatric Orthopedics (JPO)
Spine Deformity
Orthopaedic Journal of Sports Medicine

Total funds generated by grants this year:

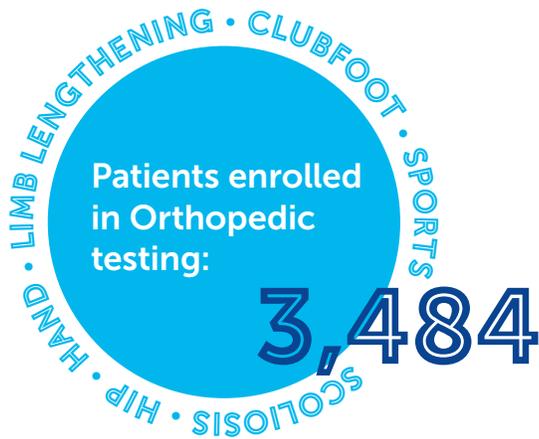
\$271,892

Since 2020, Scottish Rite has hired six new orthopedists.



SCOLIOSIS FACT:

An average of 250 to 300 new patients are prescribed a scoliosis brace annually.



CLUBFOOT FACT:

Scottish Rite offers two nonoperative treatment methods for clubfoot, as well as a prenatal program for mothers who receive a clubfoot diagnosis in utero.

CONCUSSION FACT:

Our concussion study group has enrolled 3,000 patients with concussions in North Texas.

OCD FACT:

300 Osteochondritis Dissecans (OCD) lesions treated and studied at Scottish Rite.

Patients tested in other departments (Physical Therapy/Psychology/Radiology):

145

Patients with spina bifida enrolled:

251

To see a list of all publications, scan the code:





Carol A. Wise, Ph.D.
Director of the Center for Pediatric Bone Biology and Translational Research

What Causes Adolescent Idiopathic Scoliosis? Ask the Genome!

Carol A. Wise, Ph.D.

Purpose of Project: The most common developmental disorder of the spine is scoliosis, a rotated, lateral deformity in the shape of the spinal column. In adolescent idiopathic scoliosis (AIS), the typical presentation is an isolated symptom in otherwise healthy adolescent children. AIS has challenged pathogenic understanding, in part, due

to its genetic complexity and to the lack of well-defined models from which to learn. The disease is also remarkable in that females are at more than five times greater risk of progressive deformity than males.



Nandina Paria, Ph.D., Genetic Research

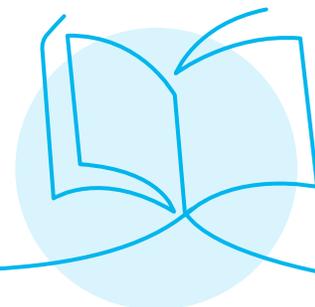
Summary of Findings: Breakthroughs have come from recent genome-wide association studies (GWAS) and next generation sequencing (NGS) of human AIS patient cohorts. Analyses of genetic datasets have highlighted a role for cartilage biogenesis and the development of the intervertebral disc (discs are in between spinal vertebra) in disease susceptibility. Moreover, next generation sequencing in AIS families, as well as modeling in vertebrate systems, has revealed that rare deficiencies in proteins of the cartilaginous extracellular matrix (ECM) collectively contribute to AIS.

Why This Matters:

Like putting together a jigsaw puzzle, the pieces coming together from multiple biologic studies suggest that deficiencies in the structural integrity and homeostasis of spinal cartilages are culprits in AIS susceptibility. We also suggest a molecular model in which interaction of the hormonal environment with genetic susceptibility may increase risk of this common disorder of childhood.



Yared Kidane Ph.D., Genetic Research





DANIEL J. SUCATO, M.D., M.S.
Chief of Staff and Director of
the Center for Excellence in
Scoliosis

Surgical Approach and Its Effect on PFT in Patients with Adolescent Idiopathic Scoliosis: A Chest or Back Approach May Not Matter

Gregory Moore, 2nd Year Resident; Anna Booth B.S.N.; David Thornberg, B.S.; Daniel J. Sucato, M.D., M.S.

Purpose of Project: This study aims to examine pulmonary function outcomes (PFT) in patients with adolescent idiopathic scoliosis (AIS)

undergoing posterior spinal fusion (PSF = back) with an anterior thoracoscopic release (chest wall) compared to those undergoing PSF alone.

Summary of Findings: A review of patients with AIS over a nine-year period at Scottish Rite was conducted. Patients were divided into two groups: PSF with video-assisted chest wall approach (PSF/VATS) and patients receiving a posterior spinal fusion (PSF) alone. Patient outcomes included X-rays and PFTs before surgery and two years after surgery. A total of 110 patients were included in the study: 12 in the PSF/VATS cohort and 98 in the PSF-only cohort. Patients undergoing PSF/VATS were younger than the PSF-only cohort (12.6 vs. 14.6, $p=0.003$) had larger spinal curves (80.8° vs. 60.7° , $p=0.001$) and worse preoperative PFTs (64.7% vs. 79.6%, $p=0.018$). At two years, the percent spinal curve correction was greater in the PSF/VATS group (67.9% vs. 48.4%, $p<0.001$) and two-year PFTs were the same FVC% (77.3% vs. 83.7%, $p=0.562$), which was due to a greater improvement over the two years in the PSF/VATS cohort FVC% (12.7% vs. 4.1%, $p=0.112$).

Why This Matters: AIS patients who have a chest wall approach in addition to posterior fusion have improved spinal curvature correction and improved pulmonary function compared to posterior fusion alone. Despite more severe spinal deformity and worse baseline pulmonary function in the patients who received an additional chest wall approach.





ALEX LOEWEN, M.S.
Bioengineer in Movement Science Lab

Changes in Lower Extremity Kinematics Based on Jump Distance of a Drop Vertical Jump

Alex Loewen, M.S.; Ashley Erdman, B.S., M.B.A.; Kirsten Tulchin-Francis, Ph.D.; Sophia Ulman, Ph.D.; and PRiSM Motion Analysis Research Interest Group

Purpose of Project: Subjects performed three different drop vertical jump (DVJ) tasks that varied by distance based on participant height from a box onto two force plates. Detailed descriptions and task instructions are included in Table 1 below, and a diagram of the task setup is shown in Figure 1.

DVJ	Box Distance (x)	Instructions
DVJhalf	1/2 subject height	Jump horizontally landing with one foot on each FP, then perform a maximal vertical jump
DVJthird	1/3 subject height	Jump horizontally landing with one foot on each FP, then perform a maximal vertical jump
DVJdrop	Adjacent to FP	Drop off the box landing with one foot on each FP, then perform a maximal vertical jump

Table 1: Detailed descriptions and task instructions

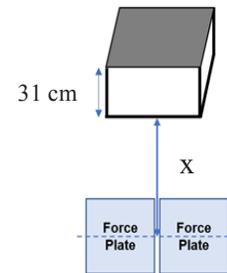


Figure 1. Diagram of box placement relative to FPs.

Summary of Findings: A shift in landing strategy is seen during the horizontal jump. Additionally, as the box distance increases, the legs are more outstretched in front of the body requiring increased hip flexion and a straighter knee. These findings emphasize the importance of understanding the different movement patterns associated when assessing variations in the DVJ. For example, the DVJdrop may be more appropriate early in a patient’s rehabilitation program given that max hip flexion and vGRF were both reduced. In contrast, a patient cleared to return-to-sport who has improved neuromuscular motor control may be tested using the DVJhalf in order to determine how they biomechanically respond to increased impact.

Why This Matters: Motion analysis of high-impact, dynamic tasks can be utilized in sports medicine to inform treatment. However, whether a movement assessment is used to track progress during rehabilitation or to identify injury risk in relatively healthy athletes, it is important to understand the biomechanical response elicited by each task in order to accommodate different populations.



Marina Makarov, M.D.
Division Director of Tissue
Adaptation & Growth Modulation

Estimation of Skeletal Maturity Using Artificial Intelligence and Modified Fels Formula for the Management of Leg Length Inequality in Children

Marina Makarov, M.D.; John G. Birch, M.D. FRCSC; Dylan Kluck, M.D.; Chan-Hee Jo Ph.D.; Yassine Kanaan, M.D.; Raymond Liu, M.D.; Ryan Furdock, M.D.

Purpose of Project: The purpose of the study was to compare the accuracy of leg length predictions at maturity using newer methods for skeletal age estimation compared to more traditional manual reading of hand-and-wrist films using Greulich and Pyle atlas (GP).

The contemporary methods were the reading those films using a proprietary machine-learned artificial intelligence (AI) program and the modified Fels (MF) system using radiographs of the knee instead of the hand.

Summary of Findings: Skeletal ages of the patient group identified by MF system compared to the GP atlas were about 2.4 months younger, averaging 6 months younger for girls but comparable values for boys. AI ages compared to GP were about 2.4 months older for the entire cohort, averaging 6 months older for boys but almost identical for girls. Leg length predictions with AI ages were more accurate than with MF and GP. Both new methods of skeletal maturity estimations have advantages over GP atlas. Overall, similar ages achieved by different methods can give confidence to treating physicians in determining the proper timing for surgery. Most importantly, the need to individualize care for each patient must be kept in mind.



Why This Matters: Skeletal maturity assessment is an important part of leg length inequality management in children. Remaining bone growth and expected leg length discrepancy (LLD) at maturity are key factors when planning the timing of surgeries for these patients.



Heather Roberts, Ph.D., O.T.
Research Occupational Therapist

Pirate Camp: A Blinded, Randomized Trial Comparing Constraint Induced Movement Therapy with Virtual Reality to Constraint Induced Movement Therapy Alone and the Correlation of Patient Characteristics With Responsiveness to Intervention

Heather Roberts, Ph.D., O.T.; Angela Shierk, Ph.D., O.T.R.; Kirsten Tulchin-Francis, Ph.D.; Sophia Ulman, Ph.D.; Nancy Clegg, Ph.D.; Deborah Baldwin, B.A., Jonathan VanPelt, M.H.A.; Fabiola I. Reyes, M.D.; Mauricio Delgado, M.D.

Purpose of Project: A child with unilateral cerebral palsy (UCP) will experience challenges with daily activities due to decreased function and use of their affected upper limb. Successful interventions could have lifelong positive outcomes for the child's independence and alleviate significant financial burden from their parents. A key challenge is knowing which interventions will be most effective based on the child's presentation. The proposed study aims to address this significant problem.

Summary of Findings: Fourteen school age children participated in the two-week Pirate Camp in the summer of 2021. Eight participants were randomized to the traditional camp and six were randomized to participate in the camp along with virtual reality equipment. All participants made significant gains in independence with meaningful daily activities. Data analysis is underway to understand improvements in upper limb movement and use of two hands together during daily tasks.

Why This Matters: Cerebral palsy (CP) refers to a group of childhood-onset disorders that affect a person's ability to move and maintain posture. The most common type is UCP. The Constraint Induced Movement Therapy (CIMT) program known as Pirate Camp is an established intervention to improve upper limb function in school age children with UCP. The research team implemented a more rigorous study design to look at the impact of augmented rehabilitation utilizing technology on upper limb function. This is the next step in understanding which interventions optimize upper limb outcomes for children with UCP.



Patient Curtis at Pirate Camp





Angela Shierk, Ph.D., O.T.R.
Research Occupational Therapist

Feasibility and Effectiveness of Therapy Together: An Intensive Upper Limb Therapy Program for Young Children With Cerebral Palsy and Their Caregivers

Angela Shierk, Ph.D., O.T.R.; Heather Roberts, Ph.D., O.T.; Nancy Clegg, Ph.D.; Deborah Baldwin, B.A.; Jonathan VanPelt, M.H.A.; Fabiola I. Reyes, M.D.; Mauricio Delgado, M.D.

Purpose of Project: Shaping is a strategy in which tasks are introduced at a rate that promotes success as the difficulty of the task slowly increases with the goal of increasing the use of the affected limb. Pediatric Constraint Induced Movement Therapy (P-CIMT) for children with unilateral cerebral palsy (UCP) shows positive outcomes, but additional research is needed. The purpose of this study is to fill in knowledge gaps related to optimal dosage and age for intensive interventions, as well as gain understanding of the impact of the setting (group based), environment (online or in person) and model of intervention (caregiver coaching) on outcomes.



Patient Adelynn in P-CIMT

Summary of Findings: Ten preschool age children with UCP and their families have completed the Therapy Together program. Initial analysis reveals that participants demonstrated clinically significant changes in bimanual performance with a large effect size, and improvements in occupational performance and satisfaction were clinically and statistically significant.

Why This Matters: P-CIMT involves restraining the noninvolved limb for a period of time and providing structured practice, or shaping, for children with UCP. Therapy Together is a promising P-CIMT intervention program for preschoolers with UCP. The program incorporates caregiver education and coaching with caregiver-led home therapeutic activities to improve children's hand skills and occupational performance while addressing barriers to intervention access.





Sophia Ulman, Ph.D.
Division Director of Movement
Science Lab

Sometimes the Best Way to Learn How Injuries Occur Is to Evaluate Children and Young Athletes Who Are Not Injured

Purpose of Project: The Movement Science Lab in Frisco leads the Sports-specific Assessment and Functional Evaluation (SAFE) program. Led by Sophia Ulman, Ph.D., SAFE is a project that invites sports teams of all skill levels and ages to perform a variety of sports-related and other tasks to assess balance, mobility, agility and strength. More than ever, young athletes are concentrating on a single sport, which has resulted in an increase of overuse injuries due to a lack of variation in their training and no real off-season. Data collected from the SAFE Program will be a great resource to help our team identify who might be at the greatest risk of injury.

Summary of Findings: Through the SAFE Program, healthy athletes go through a series of performance tests that evaluate their strength, speed, agility and flexibility. In addition, the Movement Science team uses high-speed motion capture to analyze each athlete's motion during dynamic movements, such as running and jumping, and sport-specific tasks based on their primary sport, like penalty kicks, layups or back handsprings. Small reflective markers are placed on the athlete's body during this motion analysis testing to help our team accurately measure how each joint moves in 3D. One of the most important aspects of the SAFE Program is injury surveillance. Each athlete receives a monthly survey asking if they have sustained an injury in the previous month. If so, they are asked follow-up questions regarding details about where and how the injury occurred. Athletes who are interested may come back for a second round of testing after six months or a year. This will provide our team the opportunity to analyze changes in performance due to growth, improvement or an injury.



Healthy athlete during SAFE testing



Why This Matters: The SAFE Program will allow the Movement Science team to create a database of assessments in hundreds of athletes across all ages, sports and skill levels. Then, injury surveillance after SAFE testing will provide our experts with additional information to see if any of the movement or performance measures could potentially point to a future injury. Ultimately, the goal is to create an injury prevention program, using these same SAFE tests, that can provide athletes with an individualized, comprehensive performance report, which includes an injury risk assessment. SAFE will eventually allow us to help determine injury risk and interpret prevention strategies, helping athletes stay safe and in the game.

Meet Audrey, a Scoliosis Research Participant

How did it make you feel, knowing that you were involved in something that will help others?

It made me feel very good. It was nice to know that something that seemed small to me could help so many other people. Since I participated in this study, I've actually had surgery on my ankle at Scottish Rite. In a way, this is like bonding the patients together - patients helping out other patients.

Why did you participate?

We have to do scoliosis screenings at school at the pediatrician, and I know that I'm the age girls are often diagnosed. I felt like it was really neat to be able to help out other girls who are my exact same age.

Would you participate again, in another study?

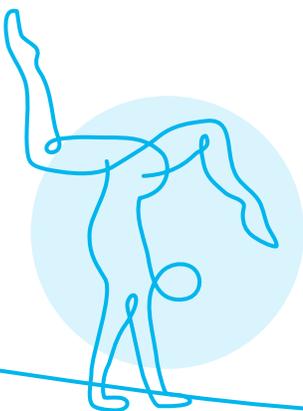
Yes. I think it is important for people to help out other people, when they are able. It is also good for doctors and scientists to learn new things. I'm also very interested in science and medicine and want to become an orthopedic surgeon.

Can you describe the study you were involved in?

I was part of a scoliosis study. The researchers studied how I moved my body, to learn more about making more comfortable scoliosis braces. They put sensor dots on me and then I did things like walk, stand on one leg or bend over. Because of the sensors, I could see my body moving on the TV, like I was about to be in a video game.



Audrey, of Richardson



2022 GRANTS AWARDED



U.S. DOD GRANT

Recipient: Jonathan J. Rios, Ph.D.
Amount: \$97,645



DHART SPORE GRANT

Recipient: Jonathan J. Rios, Ph.D.
Amount: \$73,375



POSNA GRANT

Recipient: Chi Ma, Ph.D.
Amount: \$30,000

POSNA MICRO GRANT

Recipient: Kelly Jeans, M.S.
Amount: \$1,000



SRS RESIDENT/FELLOW RESEARCH GRANT

Recipient: Aaron Shaw, D.O. (Fellow)
Amount: \$9,000



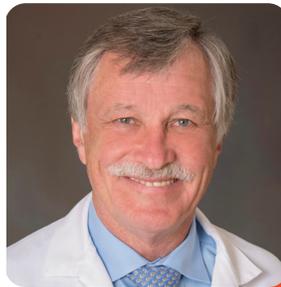
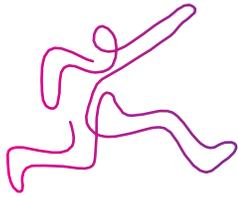


POSNA GRANT

Recipient: Carol A. Wise, Ph.D.
Amount: \$29,840

P01 COMPETITIVE RENEWAL

Recipient: Carol A. Wise, Ph.D.
Amount: \$1,427,879 at all three sites for Y1
but \$6,643,734 over five years at all three sites



POSNA GRANT

Recipient: John G. Birch, M.D., FRCS
Amount: \$29,032



POSNA MICRO GRANT

Recipient: Jaysson T. Brooks, M.D.
Amount: \$1,000



VUMC GRANT

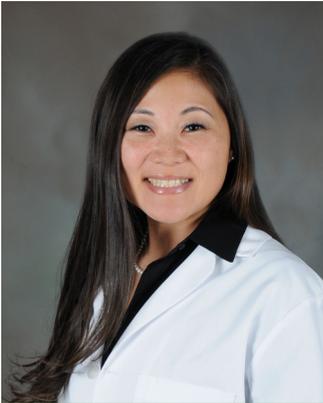
Recipient: Anthony I. Riccio, M.D.
Amount: \$5,240



AMSSM GRANT

Recipient: Jane S. Chung, M.D.
Amount: \$24,928

2022 GRANTS HIGHLIGHTS



Jane S. Chung, M.D.
Sports Medicine Physician

Biomechanical Analysis of Pediatric Ballet Dancers With and Without Pain

Sophia Ulman, Ph.D.; Henry B. Ellis, M.D.; Shane M. Miller, M.D., FAAP; Jacob C. Jones, M.D., RMSK; Ashley L. Erdman, M.B.A.; Jessica Dabis, P.T., D.P.T., O.C.S.; Hannah M. Worrall, M.P.H., CCRP; Jane S. Chung, M.D.

Purpose of Project: Biomechanics of lower extremity injuries vary in aesthetic athletes, such as dancers, as they perform repetitive leaps, jumps and rotational movements. These skilled maneuvers involve excessive hip abduction and extension, which can cause unique axial loading of the lower extremity, and lead to injuries including ankle/foot sprains, hip impingement/instability, low back pain and subsequent time away from activity. The purpose is to evaluate range-of-motion as well as movement and muscle activation patterns with a series of classical ballet movements, including static postures (five classical ballet positions), and low and high impact dynamic dance movements (développé and grande jeté) in pediatric, pre-professional ballet dancers without pain and with pain during activity and/or rest.

Summary of Findings: Dancers will complete a one-time, approximately 7-minute survey regarding dance history and pain characteristics. Subsequently, anthropometrics and passive range-of-motion will be measured followed by biomechanical testing in which kinematics and muscle activity will be recorded during five static postures and two dynamic, ballet-specific movements. We hypothesize that dancers reporting lower extremity or back pain will exhibit decreased passive range-of-motion, compensatory strategies to successfully perform static postures, and asymmetrical movement patterns and muscle activity with dynamic tasks compared to dancers with no reported pain.

Why This Matter: Findings from the proposed study may help instructors and dancers progress dance movements in a safer manner and technique. Additionally, these findings may support the development of ballet-specific, evidence-based injury prevention programs and may contribute to development of a standardized en pointe readiness assessment to be shared throughout the dance community.



Devin, of Frisco

SCOLIOSIS RESEARCH SOCIETY GRANT

How Do Patients with Surgically Treated Early Onset Scoliosis Fare at Five Years After Surgery Based on the Parent's View

Aaron Shaw, D.O.; Anna Booth, B.S.N.; Brandon A. Ramo, M.D.

Purpose of Project: The purpose of this project is to investigate the impact of distraction-based surgical instrumentation on early onset scoliosis patients at a time point 3 to 5 years postoperative using disease-specific, parent-reported, health-related quality of life assessments.

Summary of Findings: This study will focus on children who underwent surgical treatment with distraction-based, growth-friendly instrumentation for early onset scoliosis from within the pediatric spine study group database. While other treatment modalities exist, we focus on distraction-based instruments because they are the most commonly employed tools used in the majority of EOS patients, particularly the youngest of EOS patients. Our main outcome variable will be parent-reported, health-related quality of life as assessed using the Early Onset Scoliosis Questionnaire (EOSQ). We will restrict our study cohort to children who have preoperative EOSQ data and have follow-up EOSQ data in an intermediate time point from initial surgical treatment, within the 3 to 5 year follow-up period. These children will then be divided according to the type of surgical instrumentation (traditional growing rods, magnetically controlled growing rods, rib-based anchors, etc.) used for treatment and assessed for the change in EOSQ outcome measures over the treatment course while controlling for the underlying curve etiology, as defined using the Classification of Early Onset Scoliosis (C-EOS) etiology modifier. We are specifically excluding "growth modulation" patients treated by stapling or tethering as they generally reflect an older patient population and a more homogeneous cohort of idiopathic scoliosis patients than our targeted population.

Why This Matters: Understanding the most efficacious treatment modality in the management of early onset scoliosis is critical to optimizing patient outcomes while minimizing surgical complications. Early onset scoliosis surgical treatments present additional risk of complications and more challenging assessment of outcomes given the relative heterogeneity of underlying health concerns in this patient population. This project directly aligns with the mission of the Scoliosis Research Society in fostering the optimal care of children with spinal deformity and aides in the understanding of a critical question regarding the impact of specific distraction-based instrumentation systems in the treatment of early onset scoliosis. While previous studies have indicated that instrumentation may not differ in the clinical outcomes of children with early onset scoliosis, this has not been investigated while controlling for the underlying curve etiology. Previous work by this research team has shown that curve etiology is the most significant factor driving parent-reported quality of life measures in early onset scoliosis.



Aaron Shaw, D.O., and Dr. Sucato

STAFF SPOTLIGHT



Laura Mayfield, M.P.H. Clinical Research Manager

How long have you worked at Scottish Rite?

I have worked at Scottish Rite for four years.

What do you do for the Hip team?

I am the primary research coordinator for several studies, but the largest is our prospective infantile hip dysplasia study. I also manage several hip research staff including coordinators, clinical orthopedic research assistants (CORA) and our medical student research fellow.

What are some of your favorite things about working at Scottish Rite?

I love our mission of “giving children back their childhood.” Everyone who works here really seems to value what we do for our patients. It is evident in the way we do everyday tasks, whether our roles are patient-facing or not.

What are some of your favorite things about working on the Hip team?

I get to work with very talented people with a variety of backgrounds – from principal investigators who are top orthopedic surgeons to Movement Science Lab biomechanists to the data experts on the Empower team. Each person has such unique skills, and I love watching us all come together to complete research projects.

What is your favorite change or advancement you have seen in Hip while working for the team?

The new CORA program. We have two CORAs on the Hip team, and they do a phenomenal job helping move our research projects forward. At the same time, we get to help them gain the experience to meet their goals of going to medical school.



STAFF SPOTLIGHT



Ila Oxedine, M.S. Cell & Tissue Culture Core Coordinator

How long have you worked at Scottish Rite for Children?

Thirteen years – it has gone by so fast.

What do you do for the Basic Research team?

I am a research assistant. I collaborate with labs in basic research and work on different portions of projects (from lab ordering to bench work) with various people due to my unique skill set and people skills. My longest project has been the tissue bank repository study. I started with tissue cell cultures, then I began organizing REDCap® and now I am a clinical coordinator.

What are some of your favorite things about working at Scottish Rite?

The people, the camaraderie and the hospital vibe! I have met and worked with various people from different departments who have taught me so much about work ethic, joy, personal drive and kindness. I love volunteering at the water/Gatorade and cheer stations during the BMW marathon. I was lucky to participate in team relays with research coworkers, and Spring to Health activities are a blast! I also love playing bocce ball. It's great meeting so many people from different departments.

What are some of your favorite things about working on the Basic Research team?

As a team, we have very different personalities and backgrounds. We have a wealth of cultural experiences that help shape our ideas and customs, which frame our outlooks. These come into play in assays, basic experiment designs and lab knowledge. It's fascinating how we were each trained and mentored in our research journey. Being a people person, I love it. I have done background reading on workplace psychology as well as work behavior and how that influences one's approach to work and life. Before COVID-19, I loved the department pot lucks with food and games.



MSRF SPOTLIGHT

Scottish Rite for Children offers a Medical Student Research Fellowship (MSRF) for medical students interested in gaining experience in clinical research. Fellows work with a lead faculty mentor throughout the year and several project supervisors who are Scottish Rite pediatric orthopedic faculty.



Adam works with Brandon A. Ramo, M.D., in the Center for Excellence in Spine.

Adam Jamnik

Former Medical Student Research Fellow

From the outset, Dr. Ramo has supported me through every step of the research process. My experience at Scottish Rite has allowed me to further develop an understanding of the research process as well as the skills needed to conduct research, such as developing good research questions, selecting appropriate inclusion and exclusion criteria, identifying the variables needed to answer a given research question and ultimately publishing results. I am confident that this experience will improve the quality of the research that I conduct throughout my career and will likely influence the practice setting I ultimately select for my career. I am

so grateful for all the resources they've provided me. The work that is done here for patients is absolutely incredible, and it is very rewarding to have played a small part in that. This one year will benefit me and my career for decades to come. I am confident that through those years, I will leverage this experience for the benefit of my patients.

For 2023, Adam matched with UT Southwestern Medical School.

Adam's Work at Scottish Rite for Children:

Manuscript Published:

"The evolving stall rate of magnetically controlled growing rods beyond 2 years follow-up"

Manuscripts Submitted/In Revisions

Repeat Surgical Interventions Following "Definitive" Instrumentation and Fusion for Idiopathic Scoliosis: A 30 Year Update - Submitted to SRS

Radiographic and Clinical Outcomes After Definitive Spine Fusion for Skeletally Immature Patients with Idiopathic Scoliosis - Poster at POSNA, submitted SRS

Health-Related Quality of Life and Clinical Outcomes for Magnetically Controlled Growing Rod Graduates - Poster at POSNA, submitted SRS

The Evolution of Pre-operative SRS Scores over Time in Patients with Adolescent Idiopathic Scoliosis - Podium at POSNA, submitted SRS

The Postoperative Decline in Health Related Quality of Life for Adolescents with Idiopathic Scoliosis Undergoing Spinal Fusion - Submitted SRS

The Effect of Antibiotic-Impregnated Calcium Sulfate Beads and Medical Optimization Clinic Attendance on Surgical Site Infection Rate in High-Risk Scoliosis Patients - Submitted SRS

Effects of Central Sacral Vertical Line Drawing Methods on Adolescent Idiopathic Scoliosis Spinal Fusion Outcomes - Submitted SRS

Spine Deformity Surgery in Beals Syndrome Has a High Risk of Complications and Revision Surgery - Submitted SRS

The effects of socioeconomic status on patient reported outcomes after spine fusion for adolescent idiopathic scoliosis - Submitted to SRS

Declining longitudinal health related quality of life after spinal fusion for idiopathic scoliosis - Submitted to SRS

Other Podium/Posters

Complications Associated with Growing Rod Surgery for Scoliosis in Patients with Prader-Willi Syndrome at Minimum 4 Years - Podium at ICEOS

CORA SPOTLIGHTS

Clinical Orthopedic Research Assistants (CORA) are hired at Scottish Rite for Children to assist our experts in performing clinical research tasks and collaborating on research projects. CORA staff are also mentored by our physicians and researchers and given valuable advice and guidance for their future.

Emily Lachmann

Former Clinical Orthopedic Research Assistant

Dr. Amy L. McIntosh was my first mentor, and she was quick to make an impact on me. The CORA program gave me invaluable experiences that were both helpful toward my immediate goal of medical school and will be helpful toward my long-term career goals. The experience working with patients, learning how to collaborate with principal investigators, and understanding the ins and outs of clinical research will have endless benefits. All these experiences have grown my confidence in communicating with patients and the various medical teams, applying to medical school and in my abilities as a researcher.



Paola Sparagana

Former Clinical Orthopedic Research Assistant

While working here, I have had the opportunity to learn from some truly impressive individuals. The CORA program has unquestionably already impacted my career path. This experience has solidified my interests in medicine while giving me clinical experience that goes beyond most entry-level positions. I believe this program has solidified the foundation for my professional career while reinforcing my personal development. I have had the opportunity to work with multiple departments such as Rheumatology and Pediatric Developmental Disabilities. Working with different departments has enhanced my workplace flexibility while also allowing me to step outside my job description and create new opportunities for myself. As I have grown more comfortable in my role, I have felt confident in accepting new tasks and projects that had once seemed daunting. Experience has only made me more confident in myself! The CORA positions are a great opportunity at an outstanding institution with world-class medical staff and colleagues. I give the program my most heartfelt endorsement!



DOROTHY & BRYANT EDWARDS FELLOWSHIP IN PEDIATRIC ORTHOPEDICS



Kelsie Coe, M.D.

Dr. Coe received her undergraduate degree at the University of Missouri and then earned her M.D. at the University of Missouri School of Medicine. She completed her residency in orthopedic surgery at Carolinas Medical Center in June 2022.

Dr. Coe's Edwards Fellowship Projects:

- Relationships between pedobarographic findings in pediatric patients with flexible flat feet and patient reported outcomes
- A novel technique for resection of talocalcaneal coalitions



Stephanie Goldstein, M.D.

Dr. Goldstein received her undergraduate degree at Yale University and then earned her M.D. at UT Southwestern Medical Center. She completed her residency in orthopedic surgery at the University of Wisconsin Hospital and Clinics in June 2022.

Dr. Goldstein's Edwards Fellowship Project:

- Proximal Femoral Osteotomy for Post-SCFE Deformity: 2-Year Gait Outcomes

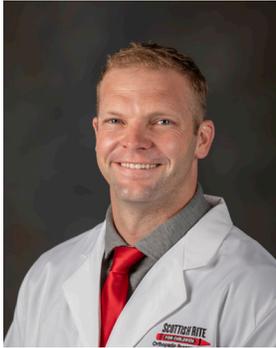


Michael O'Sullivan, M.D.

Dr. O'Sullivan received his undergraduate degree and M.D. at National University of Ireland, Galway. He completed his orthopedic surgery residency training at Cappagh National Orthopaedic Hospital.

Dr. O'Sullivan's Edwards Fellowship Projects:

- Efficacy of the Scarf Osteotomy for Symptomatic Juvenile Bunion Deformity
- Determining the etiology of Cavovarus feet in the pediatric population, improved diagnostic yield with Scottish Rite protocol



Aaron Shaw, D.O.

Dr. Shaw received his undergraduate degree at Butler University and then earned his D.O. at Kansas City University of Medicine and Biosciences. He completed his orthopedic surgery residency at Dwight D. Eisenhower Army Medical Center in June 2022.

Dr. Shaw's Edwards Fellowship Projects:

- Postoperative CT Imaging to Characterize Fusion in Pediatric and Adolescent Vertebral Column Resection
- Skeletal Maturity in Legg-Calvé-Perthes Disease: Significant Discrepancy Present Between the Hand and the Hip



Shane Strom, M.D.

Dr. Strom received his undergraduate degree at the Colorado College and then earned his M.D. at Louisiana State University Health Sciences Center, School of Medicine. He completed his residency in orthopedic surgery at The University of Alabama at Birmingham in June 2022.

Dr. Strom's Edwards Fellowship Projects:

- Two Year Follow-up for Femur Fracture Patients with Greater than 2 cm Shortening, Treated with Spica Cast
- The Collateral Damage of Being a Pediatric Orthopedic Fellow During the Pandemic: A Multi-center Evaluation of Spinal Fusion Case Volumes



RHEUMATOLOGY FELLOWSHIP



Hannah Bradfield, D.O.

My name is Hannah Bradfield, and I'm a third-year pediatric rheumatology fellow. Growing up, I enjoyed solving logic puzzles. When I discovered the field of rheumatology, with its many puzzles and challenging diseases, I fell in love. In fellowship, I have dedicated my time to researching how mental health difficulties affect our patients with lupus, specifically with regard to their schooling and future academic success. In addition, I have a passion for and obtained additional training in musculoskeletal ultrasound. I have recently become involved in research related to its use in diagnosis, treatment and monitoring of our disease processes. After graduation this summer, I will be moving to Houston where I have accepted a job as a pediatric rheumatologist at Baylor College of Medicine/Texas Children's Hospital. Even though I will be moving, DFW will always be home, and my colleagues at Scottish Rite will always be family.



Kristina Ciaglia, M.D.

My name is Kristina Ciaglia, and I am a second-year pediatric rheumatology fellow. I am originally from the Chicago area but moved to Texas for residency and fellowship, so this is now home. I got interested in medicine at a young age when I developed complications that led to limited use of my left hand. I love working in the rheumatology department because I get to meet amazing children and their families every day. I also love getting to see my patients get better! Next year, I will continue at Scottish Rite as a third-year fellow and plan to stay in DFW when I graduate.

SPORTS MEDICINE FELLOWSHIP

SCOTTISH RITE FOR CHILDREN ADDS ACGME-ACCREDITED SPORTS MEDICINE FELLOWSHIP PROGRAM

Scottish Rite for Children and UT Southwestern Medical Center are beginning a new Accreditation Council for Graduate Medical Education (ACGME)-accredited Sports Medicine fellowship program with a specialized pediatric focus. Led by program director Henry B. Ellis, Jr., M.D., and associate program director Philip L. Wilson, M.D., the program will take place primarily at the Scottish Rite for Children Orthopedic and Sports Medicine Center in Frisco. The first in the North Texas region, this new program is one of a small number of subspecialty training programs that provides significant exposure to the care of young and growing athletes.

The field of pediatric sports medicine includes operative and nonoperative management of sport-related injuries and consideration of how conditions and treatment affect long-term athletic development during continued physical and mental maturation. The program provides in-depth training for managing common and complex conditions, including ACL injuries, osteochondritis dissecans, patellar instability, meniscus, hip preservation, shoulder instability and more. In the United States, approximately 45 million children between the ages of 5 and 18 participate in organized sports according to a paper published in the International Journal of Sport Communication, which makes the need for specially trained pediatric sports medicine physicians and surgeons important for the well-being of today's youth.



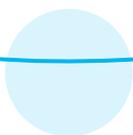
Henry B. Ellis, M.D.
Medical Director of Clinical Research



Philip L. Wilson, M.D.
Assistant Chief of Staff

Fellows are frontline members of the sports medicine care team at Scottish Rite for Children Orthopedic and Sports Medicine Center in Frisco. In addition, they rotate with sports medicine surgeons at UT Southwestern and other colleagues who treat adult patients for the full gamut of operative sports training. Additionally, the fellow assists in the management of pediatric fractures and acute orthopedic conditions at Children's Medical Center Dallas, one of Texas' only Level 1 pediatric trauma centers.

The one-year fellowship program is available to postgraduate surgeons who have completed an orthopedic residency. The fellowship provides the recipient the opportunity to pursue advanced study, in-depth training, management and research in sports medicine, musculoskeletal and complex injuries. The fellowship accommodates one fellow and begins on August 1.



STATE-OF-THE-ART SURGICAL SUITE

Orthopedic surgeons have used tools to help our patients since the specialty began. In this modern age, many of the tools we employ are intertwined with technology, including the six new operating rooms recently opened at Scottish Rite for Children. From the moment you enter an OR, you see numerous monitors that display content in 4K quality and a large interactive touch screen called the OR1® CollaboratOR. The research opportunities afforded by this new technology is exciting.



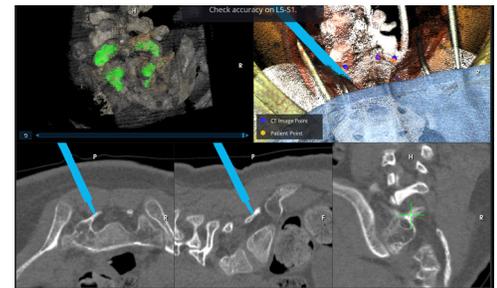
One of the new Operating Rooms



Jaysson T. Brooks, M.D., at the CollaboratOR

The CollaboratOR can load any imported content, and then allows the user to draw over the content using a special electronic pen. Every room is equipped with video that allows Scottish Rite to project surgical cases and record activity occurring in the room. We believe numerous Quality Improvement projects can be created around these enabling technologies related to best practices in positioning OR items and best practices in staff turnover during a case. In addition, the CollaboratOR allows the focused teaching an annotation of content which has many potential research applications.

The size of these innovative ORs have also allowed us to utilize new navigation systems that have been used to more safely insert pedicle screws in the spine (see figure right), evaluate the adequate reduction of dislocated hips, and better determine if physeal bars have been completely resected. Little research has been done to determine if these navigation systems truly make surgery safer for patients or improve outcomes; research questions that now Scottish Rite physicians and staff are better poised to answer.



ORTHOPEDIC SURGICAL SIMULATION LAB

As an accredited fellowship training institution, Scottish Rite for Children's Dallas campus is home to a state-of-the-art Surgical Simulation lab, which is the primary clinical anatomy and surgical simulation training site for the Orthopedics team. The lab provides mentored, hands-on training that is critical to ensuring patient safety and effective surgical practice. In the lab, surgeons and trainees gain proficiency not only in technical skills but also in skills such as adaptability and agile decision-making, communication, leadership and teamwork, and time management, which are critical to conducting successful surgeries. The same equipment, including lights, booms and systems, is available as well as the ability to display a range of images (radiology, patient photos, notes, etc.) using our advanced video technology. Skills sessions focus on general surgery topics and techniques that are appropriate to the surgical year as well as the expectations of practice. Training also includes advanced laparoscopic techniques that stress suturing instruction and practice.



A lab in the new Biomechanics Suite

CENTER FOR EXCELLENCE IN LIMB LENGTHENING AND RECONSTRUCTION

OUR TEAM



David A. Podeszwa, M.D.

Clinical Director, CELLR



Alexander Cherkashin, M.D.*

Research Director, CELLR



Elizabeth W. Hubbard, M.D.

Pediatric Orthopedic Surgeon



Mikhail Samchukov, M.D.**

Product Development Director, CELLR



Marina Makarov, M.D.***

Division Director of Tissue Adaptation & Growth Modulation, CELLR



John G. Birch, M.D., FRCSC

Founding Director and Consulting Physician

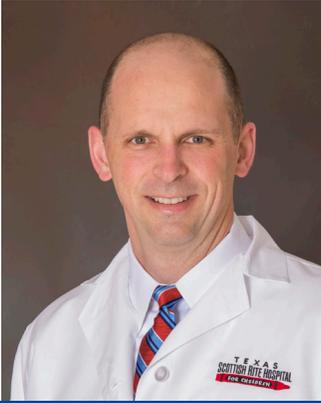
Researchers at Scottish Rite for Children are committed to finding ways to improve the treatment and care of our patients. Scottish Rite for Children began its limb lengthening and reconstruction research program in 1992. The Center for Excellence in Limb Lengthening and Reconstruction employs a unique multidisciplinary team approach including collaboration between our orthopedic surgeons alongside nurses, psychologists, physical and occupational therapists and researchers of varying backgrounds and expertise.

**Medical degree from Novosibirsk State Medical University, Russia*

***Medical degree from Khabarovsk State Medical School, Russia*

****Medical degree from Omsk Medical School in Russia*

CELLR PROJECT SPOTLIGHT



David A. Podeszwa, M.D.

Center for Limb Lengthening and Reconstruction Research Registry

David A. Podeszwa, M.D.

Study initiation year:

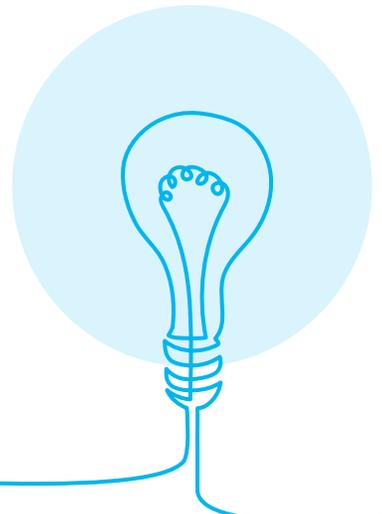
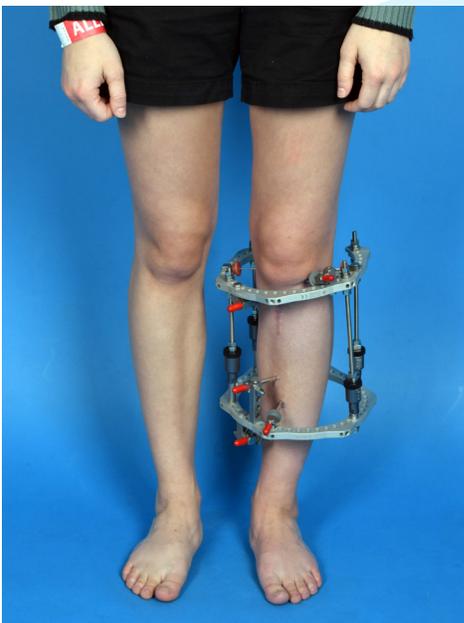
2015

Number of participants enrolled:

100+

Criteria for the Study:

This prospective registry is open to all patients at our institution 25 years of age or younger who may undergo or have recently undergone a lengthening for limb length differences and/or deformity correction using an external fixator technique or via an intramedullary device.



Purpose of Study: To follow patients through their treatment at Scottish Rite with various research activities, such as questionnaires, strength testing, clinical photographs, videos and gait motion capture. Using data through these activities, the study team aims to provide better care and treatment for patients undergoing lengthening procedures.



Future of the Study: This study is comprised of numerous collaborative efforts and sub-studies since the study's initiation. The team will continue to grow the patient cohort and follow up with patients long-term to assess the full treatment and outcome of these patients.



CENTER FOR EXCELLENCE IN LIMB LENGTHENING AND RECONSTRUCTION TIMELINE

Researchers at Scottish Rite for Children's Center for Excellence in Limb Lengthening and Reconstruction are committed to finding ways to improve the treatment and care of our patients. Throughout the decades, CELLR has led the way in limb lengthening innovations. Learn more below.

Dr. John Birch and Dr. Charles Johnston attended a leg-lengthening course and connected with Dr. Ilizarov, who is known for the Ilizarov limb lengthening technique.



*Spring
1988*

*Winter
1989*

The Ilizarov limb lengthening technique is taught to Scottish Rite physicians and organized by Dr. Birch.



1990



Dr. Mikhail Samchukov, Dr. Marina Makarov and Dr. Alex Cherkashin join Scottish Rite's staff to implement the technique at the institution.



1998

The TRUE/LOK™ External Fixation System was put into production and is now manufactured and marketed by Orthofix, Inc.



Dr. Birch didn't just bring the frame improvements but also developed a full program with pre-op planning and multi-division collaboration (Psychology, Movement Science Lab, Physical Therapy and many more).



Present

30 YEARS OF THE TRUE/LOK™ SYSTEM



The CELLR team is celebrating 30 years of using the TRUE/LOK™ system. The team has been involved in the development of this innovative frame system throughout the decades and has utilized many different iterations of the system. The newest model of external fixation is known as the TRUE/LOK™ Evolution Frame. With this new model, the CELLR team aims to better patient care as a result of its lighter composition, its versatile uses and its ability to be modified in the clinic space.



LIMB LENGTHENING PATIENT SPOTLIGHT

Overcoming Hardship With Humor and Hope

Before finding Scottish Rite in the spring of 2021, Mikaylin endured years of extensive treatments and setbacks that left her and her mother, Laneesha, feeling despondent. What began as pain in her legs while playing basketball turned out to be stress fractures. A doctor surgically implanted rods into her legs, but the bone in her right leg became infected. They tried to fight the infection through multiple surgeries without success. Finally, the doctor said that she needed to consider amputation.

"I was at a point where I was like, 'I just want to get this over with. Just take the leg away from me,'" Mikaylin says. Laneesha researched other options and consulted with another physician who referred Mikaylin to Scottish Rite. "When we arrived, Mikaylin was really down," Laneesha says. "But after our first visit, her outlook completely changed because they gave her hope."

Experts from Scottish Rite's Center for Excellence in Limb Lengthening and Reconstruction (CELLR) designed a customized treatment plan to save Mikaylin's leg. Dr. Podeszwa and a team of specialists surgically removed more than four inches of infected bone from her leg and attached the TRUE/LOK™ External Fixation System, a device that would support the reconstruction of her bone throughout the next year.

"The day after surgery, Mikaylin got out of bed and put weight on her leg for the first time in 18 months," says Emily Elerson, R.N. "When I saw the look in her eyes, I knew that was the turning point for her."

Next, the team conducted a bone transport — a procedure to grow new bone where the infected bone was removed. To facilitate this surgery for Mikaylin's specific case, new equipment was invented and attached to the fixator. "Mikaylin will be remembered long after we're gone," Dr. Podeszwa says, "because of the complexity of her treatment and how resilient she was with postoperative rehabilitation."

In August, Dr. Podeszwa removed the fixator from Mikaylin's leg. For a month, Mikaylin was on crutches, but at her next appointment, she received the big news: She could finally walk on her own. "We talk about how sad we'll be when we don't get to come to Scottish Rite anymore," Laneesha says. "Mikaylin loves everybody there. They've become a huge part of her life."



Mikaylin, of Forney



The first X-ray from July of 2021 shows the external fixator attached to Mikaylin's leg. The infected bone was removed and filled with antibiotic beads to heal the infection. The second X-ray from September of 2022 shows Mikaylin's healed bone after the fixator was removed.

CELLR STAFF SPOTLIGHT



Meghan Wassell, B.S. CELLR Program Coordinator

How long have you worked at Scottish Rite for Children?

19 years, all in the Center for Excellence in Limb Lengthening and Reconstruction

What do you do for the Limb Lengthening and Reconstruction team?

I am the CELLR program coordinator, which means that I coordinate many of the items for the CELLR team. I go to clinics to see patients and make sure that their patient folders are all kept up to date. I also coordinate and set up trainings for our surgeons, as well as those who are from other countries. I work with our local manufacturing company to obtain materials for trainings, as well as for our patients. I am in charge of several studies that follow our patients' progress throughout their treatment.

What are some of your favorite things about working at Scottish Rite?

I love the connections that I have made during my time here. I also enjoy the atmosphere as it is not like any other pediatric facility.

What are some of your favorite things about working on the CELLR team?

I have been blessed to work with the CELLR team during my tenure at Scottish Rite. The doctors and nurses that I work with are truly amazing and so gifted!

What is your favorite change or advancement you have seen in CELLR while working for the team?

During my time at Scottish Rite, I have seen the evolution of the TRUE/LOK™ device. I am amazed at how much it has progressed, even in the last five years! I am excited to see what the next stage will be.





Antoria, of Rockwall; Brock, of Lee's Summit, Missouri; Chloe, of Arlington; Isabelle, of Frisco; Truth, of Richardson; Irais, of Mesquite

At Scottish Rite for Children, the Sarah M. and Charles E. Seay Center for Musculoskeletal Research supports and encourages collaboration between researchers and physicians as they search for new ways to solve patients' individual challenges. Medical breakthroughs and new technologies developed through Scottish Rite's research efforts, such as the TSRH® SILO™ 5.5 Spinal System, TRUE/LOK™ External Fixation System and the discovery of the first gene associated with idiopathic scoliosis, have dramatically impacted the lives of not only children treated at Scottish Rite but also children throughout the world. To date, more than 50 of Scottish Rite's discoveries have been patented.

To learn more about Research at Scottish Rite and potential giving opportunities, scan the code:



SCOTTISH RITE



scottishriteforchildren.org