Tech4POD

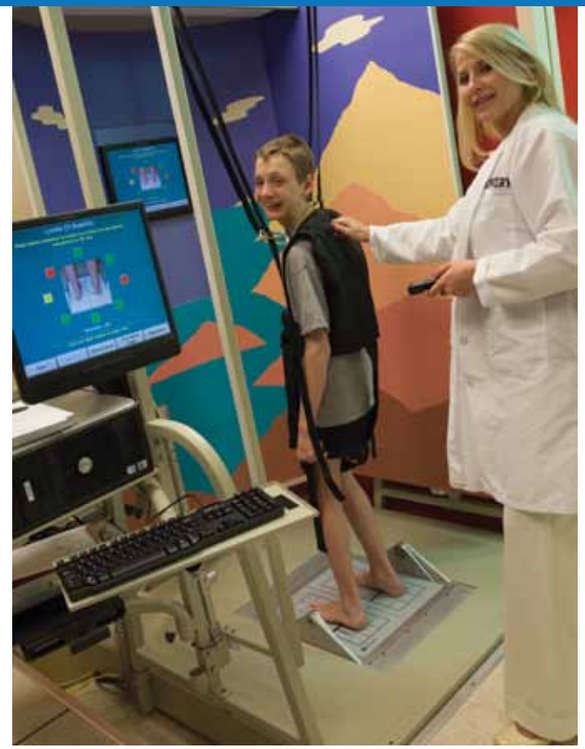
TECHNOLOGIES FOR PEDIATRIC ORTHOPAEDIC DISABILITIES

Marquette University
Rehabilitation Engineering Research Center

Using research to help children with orthopaedic disabilities

Tech4POD is a consortium of institutions (Marquette University, Shriners Hospital for Children® — Chicago, the Rehabilitation Institute of Chicago, the Medical College of Wisconsin, the University of Wisconsin–Milwaukee and Milwaukee School of Engineering) dedicated to improving the quality of life for children with orthopaedic disabilities. The U.S. Department of Education in 2010 designated the consortium a national Rehabilitation Engineering Research Center at Marquette University.

This combined research focuses on developing new tools, better technologies, and improved treatment strategies for children with cerebral palsy, clubfoot, spina bifida, spinal cord injuries, osteogenesis imperfecta (brittle bone disease) and other orthopaedic conditions.



“Everything we are undertaking is designed to have a direct impact on children, to improve their care, rehabilitation and quality of life.”

Gerald F. Harris, Ph.D., P.E.
Program director
Marquette University—RERC on Technologies for Children with Orthopaedic Disabilities

Training and dissemination

Training and dissemination are vital components of this grant. Activities include online training, distribution of publications, educational courses, conference workshops, symposia and presentations, newsletters, accessible registries, and state-of-the-art information for clinicians, parents, participants, other health care professionals and researchers. The composite website for dissemination and training is tech4pod.org.

For more information

(414) 288-0697
(855) 499-8583
tech4pod.org
info@tech4pod.org

Peter A. Smith, M.D.
Shriners Hospitals for Children® — Chicago and Principal Investigator, Marquette University—RERC on Technologies for Children with Orthopaedic Disabilities

Shriners Hospitals for Children® · Marquette University Be The Difference. · Medical College of Wisconsin · Rehabilitation Institute of Chicago · University of Wisconsin Milwaukee · MSOE

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Research activities

R1: Nano and microstructual tissue characterization for osteogenesis imperfecta and clubfoot

By studying how children with osteogenesis imperfecta (brittle bone disease) walk, researchers can analyze the strain on the leg and arm bones in those using crutches. This study will enable researchers to recommend activity changes and design better devices to absorb the strain and prevent fractures.

Researchers will also analyze the treatments available for clubfoot in infants to assess the effectiveness of casting and if a better design can be developed. This will help identify the best possible treatments and may allow parents/caregivers to provide in-home treatment, particularly in impoverished nations.

R2: Brain activity related to restoration of limb function in cerebral palsy

For children with cerebral palsy, researchers will determine if there are changes in brain activity as a result of surgery and robotic-assisted rehabilitation of the arms and legs. This will be accomplished used MRI and fMRI imaging.

R3: Home-based robot-assisted therapy and teleassessment

Researchers will assess whether combining home-based robot-guided therapy with teleassessment and interactive game elements improves effectiveness in maintaining mobility and therapy interest in children with cerebral palsy.

R4: Advanced mobility modeling to improve function and transitional care

Researchers will study the movement of children with orthopaedic disabilities. They will determine the relationship between internal joint-forces, assistive devices, ankle implants and longer-term tissue level effects as they relate to pain and function in children.

Development activities

D1: Therapeutic elliptical machine

A rotating pedal device and interactive gaming elements are integrated into robotic-assisted therapy for children with cerebral palsy.

Desired outcome: Improved neuromuscular control and stability while keeping children interested in therapy

D2: Three-dimensional robotic gait training

A less restrictive, more affordable cable system with interactive gaming elements is integrated into robotic-assisted gait training for children with cerebral palsy.

Desired outcome: Improved ability to walk and greater access to in-home treatment for children

D3: Biplanar, dynamic *in vivo* foot and ankle motion analysis

Through the use of two X-ray generators and data collectors, multiple 3-D images are collected during therapy, helping researchers see the motion of bones inside the foot.

Desired outcome: Better fitted and more effective shoes and braces customized for individual patient's needs

D4: Customized orthotics for severe pediatric flatfoot

Foot pressure is recorded using sensor technologies. The measurements are then put into a mathematical model to create a customized brace using rapid protoyping technology for children with flatfoot.

Desired outcome: Reduced production time and cost while making a more effective and comfortable brace