The design and prescription of ankle foot orthoses (AFOs) for individual patients remains a challenging endeavor. There are many different types of AFOs and clinicians must determine the optimal design for each patient’s unique gait pattern. Due to these complexities, improvements in gait with AFOs are variable and many individuals abandon use. To improve design and prescription of AFOs we need tools to examine the effect of AFOs on pathologic gait and identify optimal, patient-specific AFO properties.

The aim of this presentation is to share new tools and techniques using musculoskeletal modeling and simulation which may improve AFO design and prescription. In particular, we will discuss how muscle function changes with AFOs and how AFOs may either prevent or contribute to secondary musculoskeletal deformities. We will share two recent investigations that examined the impact of different types of AFOs on gastrocnemius function in both individuals with stroke and cerebral palsy. Additionally, we will examine how advances in manufacturing techniques, including 3D printing and scanning, may enhance orthotic design and customize orthotic properties to an individual’s gait pattern.

Selected references and resources:
- University of Washington Ability Lab – Updates on research results and publications (http://faculty.washington.edu/kmsteele/).
- OpenSim – Free, open-source software for musculoskeletal modeling and simulation (https://opensim.stanford.edu/).
- A-Footprint – EU-based research initiative led by Glasgow Caledonian University seeking to improve prescription of customized foot and ankle orthoses using 3D printing and rapid prototyping technology (http://www.afootprint.eu/).
- E-nabling the Future – Design community creating 3D-printed prosthetics and orthotics with open-source 3D printed designs (http://enablingthefuture.org/).