2022 ANNUAL REPORT

Hanger Institute

FOR CLINICAL RESEARCH & EDUCATION®

Hanger Institute

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Embedded within Clinical and Scientific Affairs at Hanger Clinic, the Hanger Institute for Clinical Research and Education® is an assembly of experts and resources dedicated to advancing clinical practice and improving patient outcomes through leading-edge research, evidence-based care, and quality education.

Through strategic collaboration, Hanger Institute Associates and their partners accelerate the mission of Hanger Clinic to benefit patients requiring orthotic and prosthetic (O&P) rehabilitation. Our mission is to explore, expand, and facilitate opportunities that advance the science and care in orthotics and prosthetics.

Driven by evidence, we empower human potential.

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From Our Chief Clinical Officer

I am delighted to introduce and share the Hanger Institute for Clinical Research and Education **Annual Report**. Embedded within Clinical and Scientific Affairs, the mission of the Hanger Institute is to explore, expand, and facilitate opportunities that advance science and care in orthotics and prosthetics. This report reflects the efforts that we are making to advance and provide evidence-based care.

Translating knowledge to the broader rehabilitation community and disseminating results are key components that define clinical research. Scientific peer review is the standard through which research is judged and critiqued by the established expert community. Our clinical research efforts are robust and have resulted in 32 publications in peer-reviewed literature in the last four years. Through this process, our research can be translated into evidence and subsequently help improve clinical care. With a high focus on strategic collaboration and partnerships with a wide range of academic and clinical institutions, the Hanger Institute has attracted 12 federally funded grants to further support our research efforts.

At the foundation of our clinical research is the commitment and dedication of our teams to collect clinical outcomes across more than 900 Hanger Clinic locations nationwide. By adopting outcomes collection as a basic standard of care, Hanger is uniquely positioned to understand the life journey of individuals who undergo amputation.

Let's review some of the highlights contained in this report. The **MAAT Series** is comprised of seven separate landmark studies that represent one of the largest multicenter retrospective analyses of mobility among users of lower limb prostheses. This series seeks to clarify the concept of prosthetic mobility as it relates to such considerations as satisfaction, quality of life, comorbid health conditions, and prosthetic component choices. The **OASIS Series** compares the effectiveness of a variety of orthotic and prosthetic components across different patient groups to ultimately impact and enhance patient outcomes.

We have taken a special interest in individuals who undergo amputation due to diabetes/dysvascular disease in the **Resilience of Prosthetic Mobility and Well-Being Following Amputation as a Result of Diabetes** section. In addition, you'll have the opportunity to learn about our focused effort to **Enhance Our Understanding of Well-Being Among Users of Upper Limb Prostheses**, which is a complex construct for individuals who have undergone upper limb amputation as it is affected by a range of considerations. As you review the report, you will also observe that we have extended our work relating to mobility to **Understand and Quantify Mobility Constraints Among Users of Lower Limb Orthoses**.

I would like to acknowledge and express my sincere appreciation for the work and dedication of the Hanger Institute Associates and Affiliates, the collaboration from our clinical, academic, and industry partners, and the guidance provided by our external advisory board. In closing, a special thank you to my colleagues across Hanger Clinic – the outcomes you continue to collect on a daily basis as **a basic standard of care** are invaluable and fundamental to the mission of the Hanger Institute.

James H. Campbell, PhD
SVP and Chief Clinical Officer

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Caring for Those Who Have Experienced an Amputation Due to Diabetes or Dysvascular Disease

With a commitment to outcomes across more than 875 Hanger Clinic locations nationwide, Hanger is uniquely positioned to understand the life journey of those individuals who undergo amputation due to diabetes or dysvascular disease. This patient group is seen with the greatest frequency in our clinics across the nation, and we have witnessed their daily successes and accomplishments.

Disparities in the Incidence of Amputation Following Diabetic Foot Ulceration

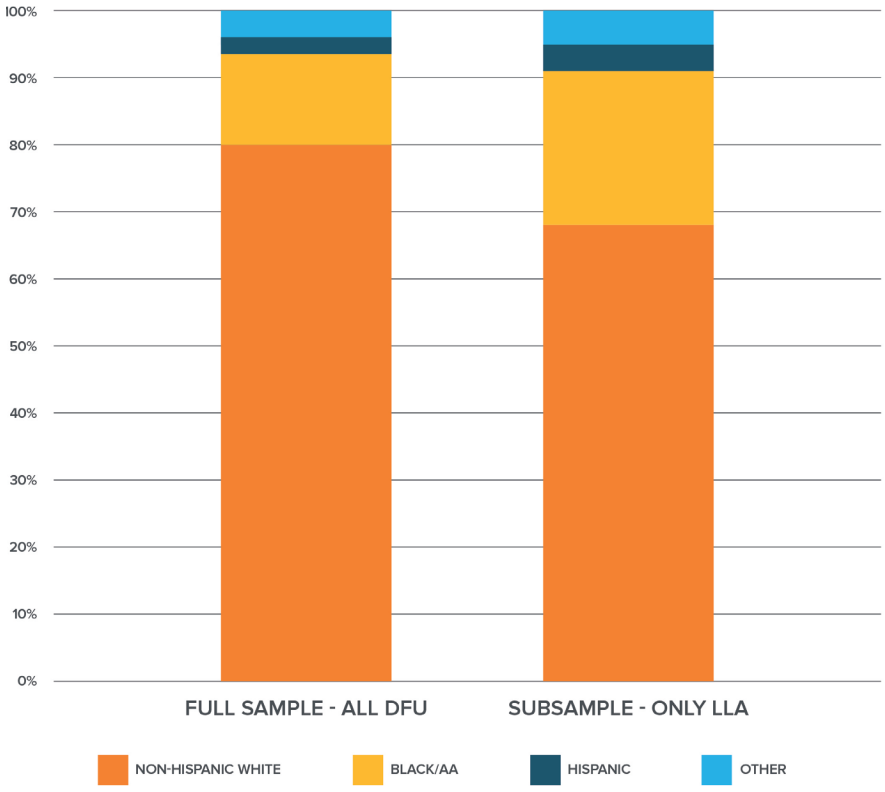
One of our recent papers, published in the nationally recognized journal *Diabetes Care*, represented a collaboration between the Hanger Institute and Care Journey, a healthcare analytics company, and examined risk factors associated with the progression from a diabetic foot ulcer (DFU) to lower limb amputation (LLA).

This analysis, informed by over 600,000 patients (of which nearly 70,000 went on to lower limb amputation), found that Black patients were roughly two times more likely than their non-Hispanic white peers to progress from a foot ulcer to an amputation within the first year after their initial ulceration (Miller et al, 2022; Figure 1).

As a next step, we are taking a deeper dive into this data set to better understand the relationship between an earlier amputation and long-term outcomes.

2x

"Black patients were roughly **two times more likely** than their non-Hispanic white peers to progress from a foot ulcer to an amputation within the first year after their initial ulceration."



Proportion of Individuals With Diabetic Foot Ulcer within the Full Sample and Subsample

Figure 1: Prevalence of patients by race among those with initial diabetic foot ulcer (DFU; Full Sample) and subsequent lower limb amputation (LLA; Subsample). A higher percentage of Black individuals progressed to lower limb amputation in the first year following their diabetic foot ulcer.

Mobility Trends by Age, Amputation Level, and Etiology

While the field has long recognized the associations between amputation level, amputation etiology, patient age, and prosthetic potential, our recent analysis of 30,000 subjects has begun to identify the average prosthetic mobility values that might be associated with a given composite presentation (Fylstra et al, 2022; Figure 2).

These values allow clinicians and patients to place their prosthetic mobility in context with their closely matched peers to establish reasonable expectations and identify areas where functional improvements should be pursued.

With additional data and analysis, these curves will be able to demonstrate the impact of certain components on prosthetic mobility expectations. For example, the enhanced mobility observed with the use of microprocessor knees (MPKs) is both more striking and seen at younger ages among individuals with dysvascular amputation relative to their peers with traumatic amputation.

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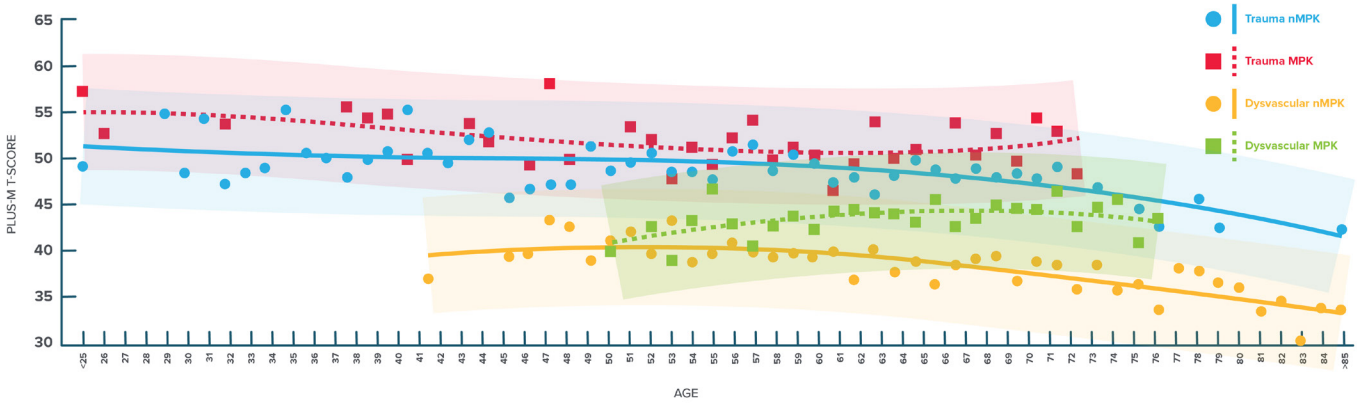


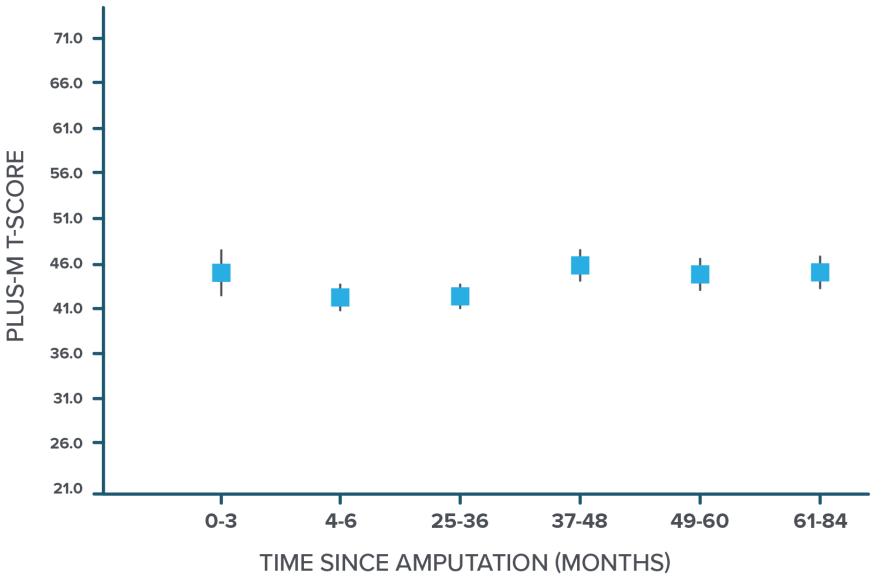
Age vs. Mobility – Above-Knee Amputation (AKA)

Figure 2: Anticipated prosthetic mobility curves for individuals with transfemoral amputation by etiology and type of prosthetic knee. The use of a MPK is associated with improved prosthetic mobility across age ranges, especially among older users in their 60s and 70s.

Resilience of Prosthetic Mobility and Well-Being Following Diabetic Amputation

Hanger's early efforts in analyzing and understanding prosthetic mobility among older patients with amputation due to diabetes/dysvascular disease were described in the Mobility Analysis of AmpuTees (MAAT) series. This series was recently brought to a close with the successive publications of MAAT 6 and MAAT 7. MAAT 6 reported a cross-sectional analysis of older patients with amputation secondary to diabetes and the relationship between their number of years post-amputation along with variables such as mobility, quality of life, and satisfaction.

This analysis observed that among patients who retained sufficient health and motivation to sustain their prosthetic rehabilitation, these important variables appear to be relatively stable with increasing time since amputation (Wurdeman et al, 2021; Figure 3).



Mobility for Lower Limb Prosthesis Users: Diabetes/Dysvascular Amputation Etiology

Figure 3: Average prosthetic mobility values observed among individuals with amputation due to diabetes or dysvascular disease from 0-3 months to 5-7 years post-amputation. Individuals who sustained their prosthetic rehabilitation demonstrated stable levels of prosthetic mobility in the years following their amputation.

Establishing Normative Expectations for Congenital Limb Deficiency and Amputation Secondary to Tumor

While prosthetic mobility values have been previously reported for patients with traumatic and diabetic/dysvascular amputations, the data aggregated in MAAT 7 defined similar expectations for the smaller populations of individuals with amputations due to congenital limb deficiency and tumors (England et al, 2022). This data allows populations with congenital limb deficiency and tumors to identify their anticipated potential among their peers with similar life experiences.

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Understanding the Impacts of Different Prosthetic Components

There are a wealth of prosthetic components for prosthetists and referring physicians to consider as they work with patients to identify the most appropriate solution for their current situation. Historically, these decisions were based on an understanding of the underlying biomechanics of various components but were uninformed with respect to objective outcomes.

By continuing to collect outcomes across tens of thousands of patient encounters, the Hanger Institute is raising the bar associated with the accountability between proposed component solutions and realized outcomes.

Reducing Risk of Injurious Falls Following Transfemoral Amputation

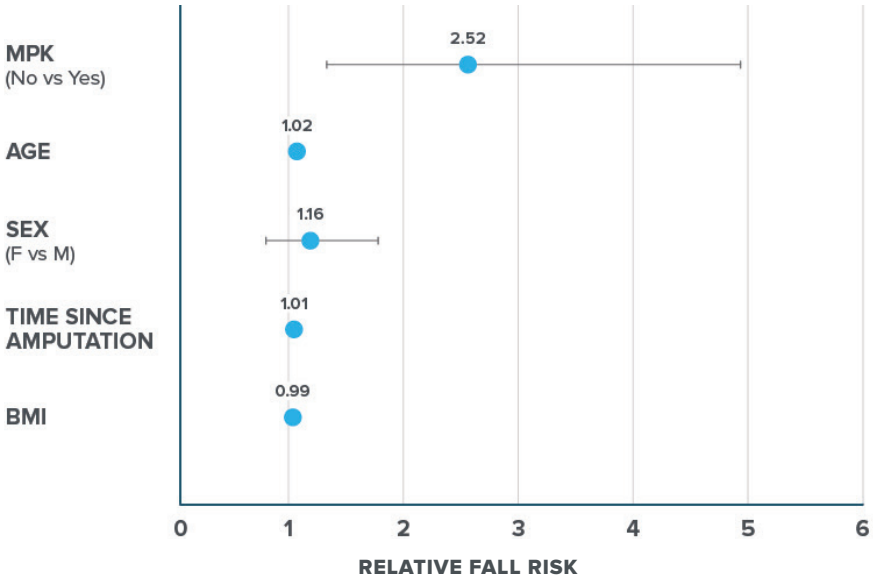
The SAFE-AMP 1 study stands out among these efforts. Injurious falls represent a common concern in the management of individuals using a transfemoral prosthesis, particularly if the users are older or have experienced amputations as a result of diabetes/dysvascular disease. One proposal to mitigate this fall risk is the judicious use of prosthetic knee joints equipped with microprocessors that monitor the knee's performance and behavior in real time to adapt to interruptions in walking that might suggest a falling event.

In reviewing the falls data as reported by nearly 900 patients with unilateral transfemoral amputation secondary to diabetes/dysvascular disease, we found that patients with traditional knee joints (i.e., no microprocessor) were 2.5 times more likely to sustain significant injury in a falling event in the previous six months (Wurdeman, et al 2022; Figure 4).

Evidence like this is instrumental in optimizing prosthetic rehabilitation for those who have experienced a lower limb amputation. Recognizing the importance of knowledge translation from peer review into the clinic, the Hanger Institute has aggregated recent data relative to the benefits of MPKs into a narrative literature review (Stevens, 2021). These benefits include reducing the cognitive burden of ambulation, enhancing patient safety, having favorable impacts on healthcare economics, and expanding prosthetic mobility.

2.5x

"Among individuals with unilateral transfemoral amputation secondary to diabetes/dysvascular disease, patients with traditional knee joints (i.e., no microprocessor) were **2.5 times more likely** to sustain significant injury in a falling event in the previous six months."



Impact of Knee Type on Relative Fall Risk

Figure 4: Odds ratios of individuals with transfemoral amputations due to diabetes/dysvascular disease experiencing an injurious fall. Among examined risk factors, the use of MPKs is uniquely efficient in their ability to reduce fall risk.

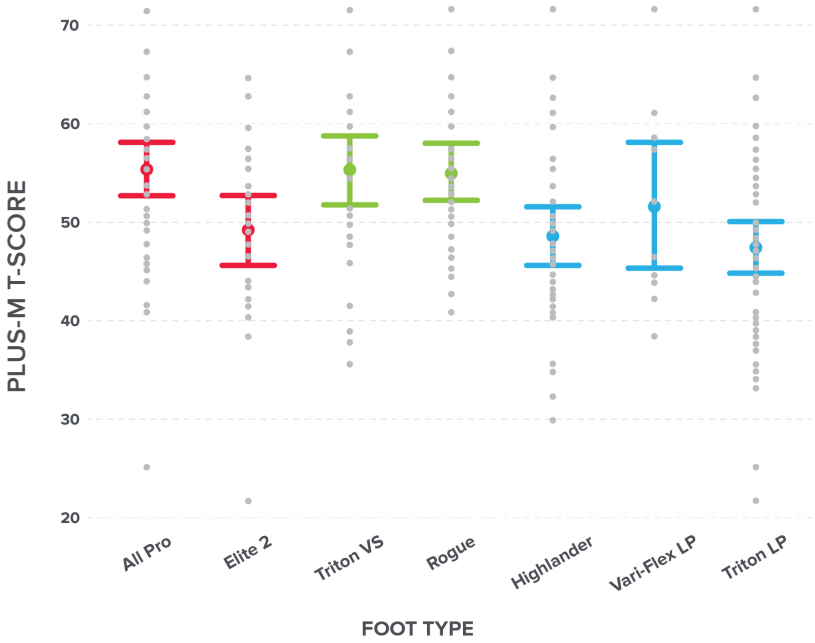
Observed Relationships Between Foot Design and Prosthetic Mobility

Similar approaches have been taken to understand the impact of discrete prosthetic components on factors such as prosthetic mobility, well-being, and fall prevention in the Outcomes ASessement and DISsemination (OASIS) study series. Following the important findings of the OASIS 1 manuscript with respect to the comparative efficacy of different commercial MPKs on injurious fall rates and well-being (Campbell, et al 2020), the second study in this informative series was released this year. The OASIS 2 manuscript analyzed the mobility of specific prosthetic feet chosen as representative of certain coding profiles. In an attempt to investigate recent policy decisions made to prosthetic coding based on the presence or absence of distinct mechanisms rather than functional performance, the effort tracked the mobility associated with:

> "Functional outcomes may be preferable to visible mechanical features as a pathway towards identifying those components associated with higher levels of performance."

1. Control feet (Legacy L5981 – shown in blue);
2. Shock-absorbing feet with characteristic discrete proximal shock-absorbing units (Legacy L5987 – shown in green); and
3. Feet with similar shock-absorbing functionality that had historically been coded as L5987 feet but were recently reassigned based on their lack of distinct shock mechanisms (Reassigned feet – shown in red).

This study found similar mobility values between some of the Reassigned feet and the L5987 feet, well above the mobility values associated with L5981 feet. Accordingly, this study highlighted the importance of considering patient outcomes alongside any visual assessment of prosthetic feet, as the appearance of a foot may not entirely represent its functional benefits (Miller et al, 2022; Figure 5).



Comparison of Mobility Across Different Prosthetic Feet

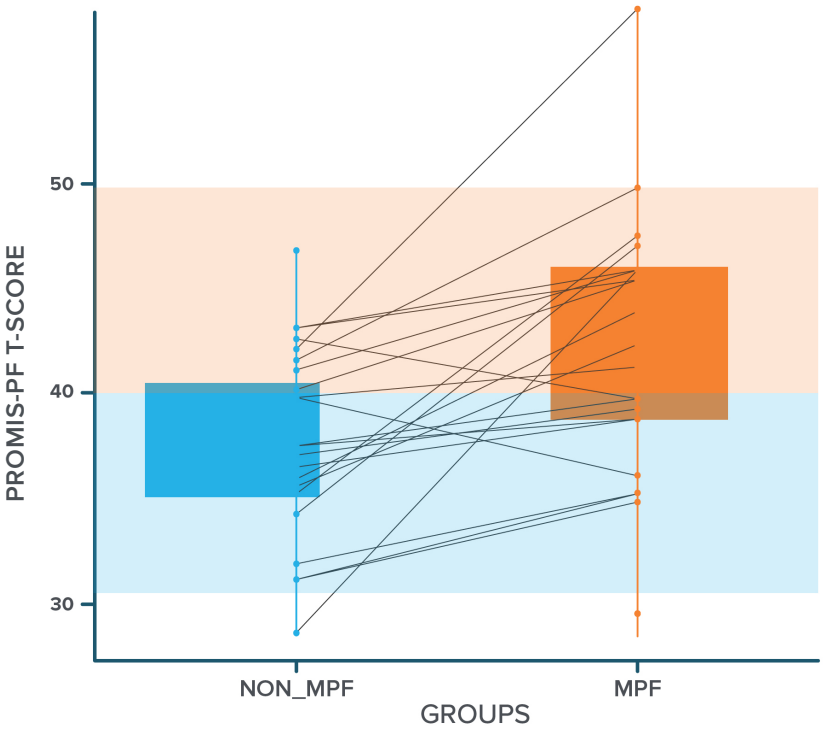
Figure 5: Prosthetic mobility associated across a range of specific foot options. We observed that some Reassigned feet (red) performed at a similar level of L5987 feet (green) and well beyond the performance of most Legacy L5981 feet (blue).

Defining the Benefits of Microprocessor Feet

In addition to the robust analysis of the clinical outcomes observed with different energy-storing feet, the Hanger Institute recently announced the publication of a paper focusing on the comparative efficacy of microprocessor-regulated prosthetic foot and ankle units (MPFs) compared to traditional non-microprocessor feet (Weber et al, 2022).

In this analysis, targeted patient-reported outcomes were used to define the clinically and statistically significant benefits associated with the transition to microprocessor feet with respect to considerations such as the navigation of environmental obstacles like slopes and stairs, the performance of household transfers, and the users' perception of their socket comfort and low back pain.

"Transitioning from traditional feet to microprocessor feet led to improvements in physical function, as well as improved socket comfort and reduced low back pain."



PROMIS-PF Scores With Physical Function

Figure 6: Improved Physical Function (PF) observed with the transition from traditional prosthetic feet to microprocessor feet, noting that mean physical function values significantly improved.

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Enhancing Our Understanding of Well-Being Among Users of Upper Limb Prostheses

Well-being is a complex construct for individuals who have undergone upper limb amputation. It is affected by a range of considerations, including limitations to an individual's ability to perform day-to-day tasks and activities, restrictions to participation in home and work environments, functional upper-limb capacity, prosthetic performance, and day-to-day pain experiences.

To better understand these complex relationships, the Hanger Institute recently reported well-being data from 250 patients along with aggregated clinical outcomes (Stevens et al, 2022). This analysis found that well-being is closely correlated with self-reported activity and participation levels, both of which correlate strongly with bimanual physical function and high prosthetic satisfaction scores. By contrast, gender, age, time since amputation, and daily prosthesis use did not correlate with well-being in this population.

Objective Measures of Prosthesis Engagement

This analysis can be compared to observations from a related clinical trial performed in collaboration with the University of Missouri (Frey et al, 2022). In this exercise, individuals with transradial prostheses were asked to wear accelerometers bilaterally on their wrists and upper arms for several successive days to document engagement patterns with their two limbs. This analysis found average prosthesis wear times of approximately 11 hours. While unilateral engagement of the prosthesis occurred on a limited basis (20 minutes per day), the data suggested that upper limb prostheses were engaged with much greater frequency in bimanual activities (four hours per day).

4hrs/day

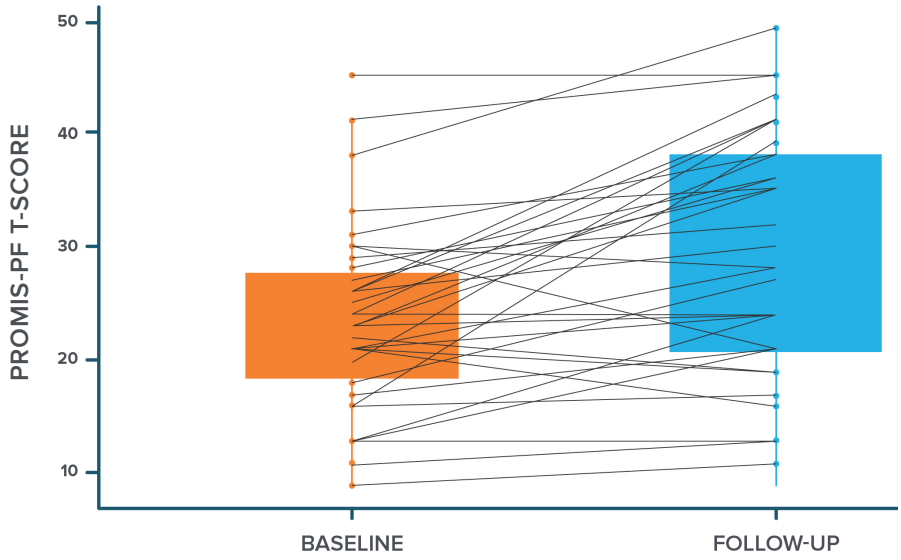
"Upper limb prostheses were engaged in bimanual activities an average of **four hours per day.**"

Influence of an Upper Limb Prosthesis on Bimanual Function

Recognizing the importance of assessing bimanual activities among users of upper limb prostheses, the Hanger Institute set out to validate a custom questionnaire focusing on these activities. The resulting survey instrument consisted of nine bimanual tasks taken from the Patient-Reported Outcomes Measurement Information System (PROMIS) Measure of Upper Limb Physical Function. Validation analyses of this custom PROMIS short form were recently published in the *American Journal of Physical Medicine and Rehabilitation* (England, et al 2021).

This outcomes tool is now used across our national network of clinics, with a recent analysis demonstrating the ability of this measure to quantify the improvements associated with the receipt of a new prosthesis (England, et al 2023; Figure 7).

"The Hanger Institute set out to **validate a custom questionnaire** focusing on bimanual activities among upper limb prostheses users."



Improved Physical Function Associated With the Receipt of an Initial or Replacement Upper Limb Prosthesis

Figure 7: Longitudinal assessment of bimanual physical function after receipt of prosthesis.

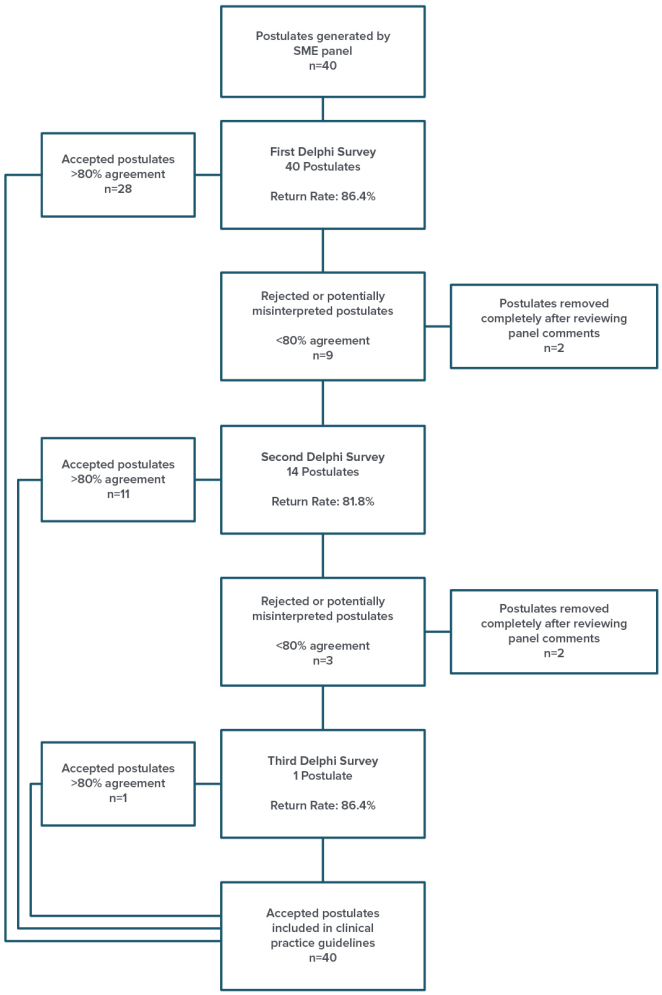
Establishing Clinical Practice Guidelines for Transradial Prosthetic Rehabilitation

Given the correlation between bimanual physical function, prosthesis satisfaction, activity, participation levels, and well-being, there is a clear need to ensure that upper limb prostheses are appropriately designed and provided to those who experience transradial amputation or limb deficiency.

Recognizing the relative novelty of this population in many prosthetic clinics, the Hanger Institute utilized a Delphi Survey exercise among high-volume, experienced upper limb prosthetic specialists to establish a set of clinical practice guidelines for the appropriate prosthetic management of those with unilateral transradial amputation (O'Brien et al, 2021; Figure 8).

These guidelines provide considerations associated with general prosthetic candidacy, body-powered versus myoelectric control systems, and terminal device selection to ensure comprehensive care in the development of prosthetic treatment plans.

> "**Clinical Practice Guidelines** developed by Hanger Clinic provide considerations associated with general prosthetic candidacy, body-powered versus myoelectric control systems, and terminal device selection."



The Delphi Process Used to Determine Subsequent Clinical Practice Guidelines

Figure 8: Flowchart representing the development process used to establish consensus standards for the prosthetic management of unilateral transradial amputation. The resulting guidelines established 40 postulates and reflected the clinical expertise of Hanger Clinic's most experienced upper limb prosthetists and therapists.

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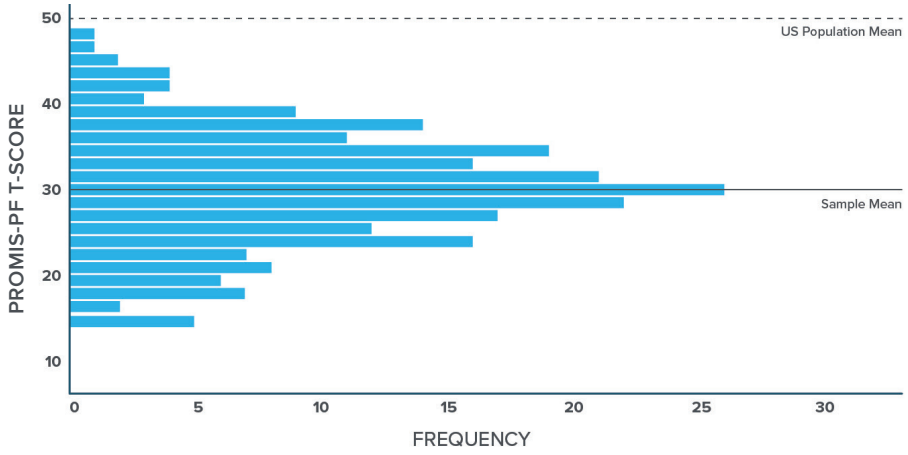
Quantifying Mobility Constraints Among Users of Lower Limb Orthoses

Several years ago, in an attempt to better understand the mobility constraints frequently observed among individuals who require lower limb orthoses, members of the Hanger Institute performed an initial validation of a custom short form of the PROMIS Physical Function measure (Weber et al, 2018). The use of this nationally indexed measure allowed us to establish the extent of the mobility deficit experienced by the average stroke survivor who required a lower limb orthosis. This deficit was subsequently quantified with an average T-score of 30, indicating that the physical function observed in this population was, on average, two standard deviations below the national mean (DiBello et al, 2022; Figure 9).



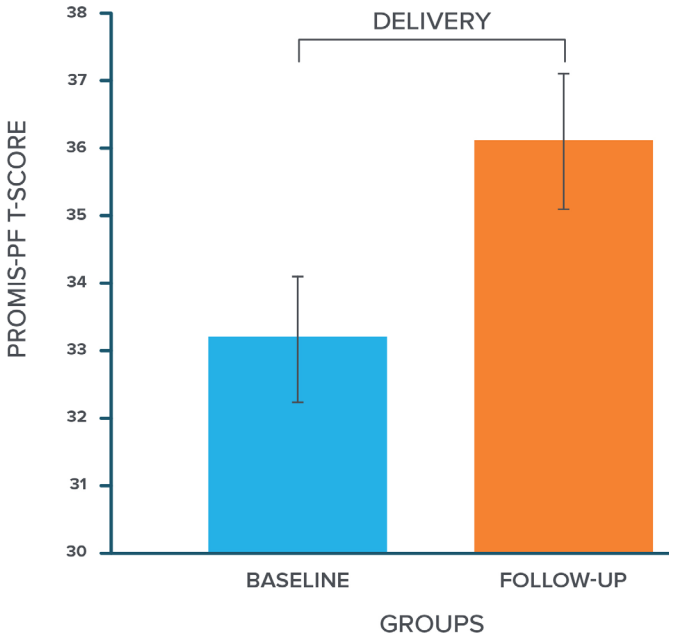
Distribution of Physical Function T-Scores for Individuals Seeking AFO Intervention

Figure 9: Physical function observed among stroke survivors who require an ankle-foot orthosis (AFO) for ambulation. The sample mean reported a physical function value two-standard deviations below the national population mean, underscoring the mobility deficits faced by this population.

Improving Physical Function Through Lower Limb Orthoses

In a subsequent analysis among all lower limb orthosis users, we found that the receipt of a first or replacement AFO was associated with a significant increase in physical function as measured by the custom short form from the PROMIS Physical Function (Miller et al, 2022; Figure 10).

Notably, the baseline physical function prior to intervention approximated the average physical function demonstrated by individuals with a positive fall history, while the post-intervention follow-up approximated the average physical function of those with a negative fall history.



Improvements in Physical Function With the Receipt of a New or Replacement AFO

Figure 10: Average physical function values observed at baseline and follow-up among AFO users receiving their first or a replacement device.

Developing a Validated Population-Specific Measure of Mobility

Recognizing the need for a measurement tool that would be sensitive enough to detect the changes in mobility that might accompany a transition between orthosis designs, members of the Hanger Institute have partnered with the University of Washington to:

1. Define the health-related profiles of lower limb orthosis users (Hafner et al, 2022);
2. Describe orthosis utilization patterns in this population (Balkman et al, 2022); and
3. Develop and validate the Orthotic Patient Reported Outcome of Mobility (OPRO-M) (Balkman et al, 2022).

The collaborative development of this measure continues as associates from the Hanger Institute and University of Washington are actively conducting a multisite prospective evaluation of the measure's reliability and validity.

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Defining the Relationship Between Time to Prosthetic Fitting and Overall Healthcare Costs and Utilization

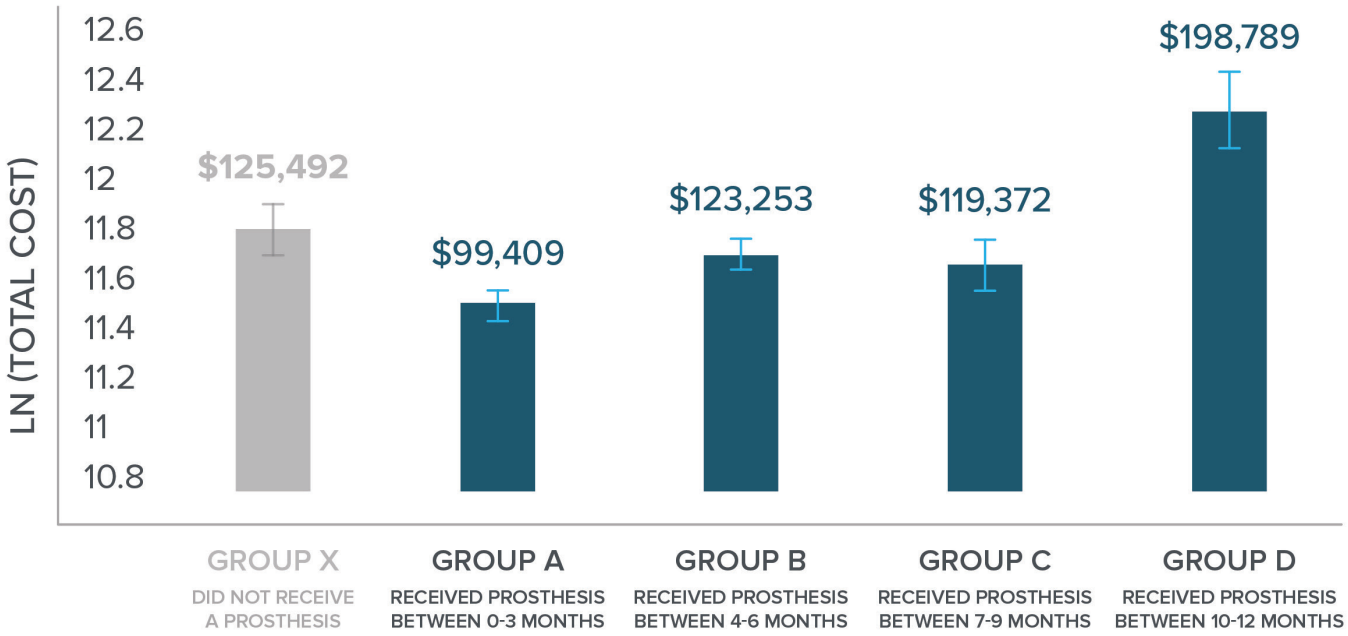
Our experience has suggested that the best way to reduce healthcare utilization and associated costs among individuals who have undergone lower limb amputation is to quickly restore their ability to transfer, stand, walk, and return to their daily activities. In an effort to validate those perceptions, the Hanger Institute has published a series of manuscripts examining these important relationships.

Healthcare Economic Implications of the Timing of Prosthetic Fitting

Drawing retrospectively from data obtained from a national commercial adjudicated claims database (Watson), members of the Hanger Institute determined that patients who received their first prosthesis within three months of their amputation saved 25% in total healthcare costs compared to those who did not receive a prosthesis (Miller et al, 2020; Figure 11).

3 months

"Patients who receive their first prosthesis within three months of their amputation experience reduced healthcare utilization and cost."

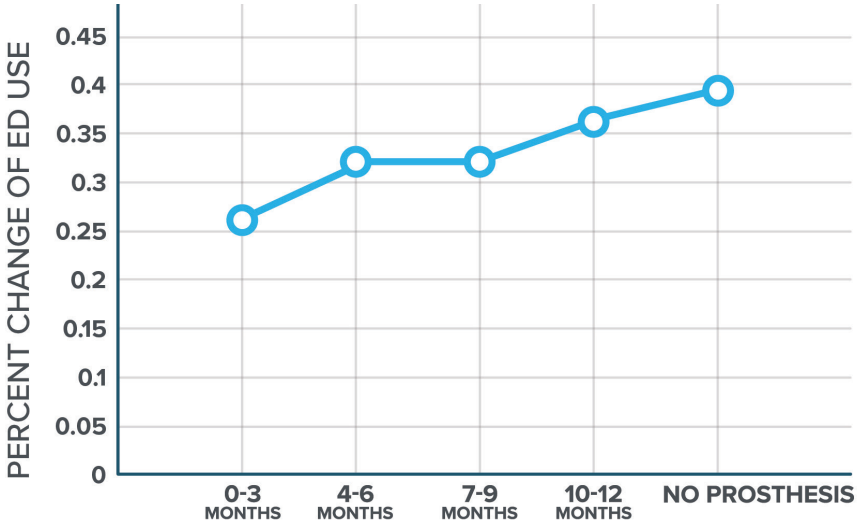


Reduced Total Costs of Healthcare With Earlier Prosthesis Receipt

Figure 11: Average total healthcare costs as a factor of the time between amputation and initial prosthetic fitting. The lowest overall costs were associated with receipt of a prosthesis within the first three months following amputation.

A subsequent analysis confirmed related findings relative to healthcare utilization, with those who received their prosthesis within the first three months post-amputation being nearly 50% less likely to receive care in an emergency department setting (Miller et al, 2021; Figure 12). In general, the longer the latency between amputation and prosthetic use, the greater the utilization of additional healthcare services.

In the most recent installment, the same data set was analyzed to determine which factors might be associated with earlier or delayed prosthetic fittings (Miller et al, 2022). We were surprised to observe that in this cohort, individuals with diabetes/dysvascular disease were more likely to receive an earlier first prosthesis. Also of note, female patients appear to experience greater delays between amputation and initial prosthesis fitting. Both of these findings suggest areas for future study, understanding, and potential remediation.



Percentage of Emergency Department Use by Group

Figure 12: Emergency Department (ED) use as a measure of overall healthcare utilization, analyzed by length of time between amputation and initial prosthesis fitting. Delays in prosthetic fitting were associated with progressive increase in healthcare use.

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- Miller, T. A., Paul, R., Forthofer, M., & Wurdeman, S. R. (2022). Factors that influence time to prosthesis receipt after lower limb amputation: A Cox proportional hazard model regression. *PM & R: The Journal of Injury, Function, and Rehabilitation*, 10.1002/pmrj.12781. Advanced online publication. https://doi.org/10.1002/pmrj.12781

Translating Knowledge to the Broader Rehabilitation Community

As we continue to develop as clinicians and healthcare providers, we believe that education is key to ensuring our clinicians and partners have current information to facilitate the best care for the patients we serve.

Pediatric Series

Through the Hanger Institute Virtual Classroom series, top experts from Hanger Clinic and other leading healthcare partners collaborated on a collection of courses that focused on a number of diagnoses impacting our pediatric orthotic and prosthetic patient populations.

Our annual Pediatric Symposium is an evidence-based virtual program designed to provide healthcare professionals with insight into the role of orthotic and prosthetic intervention for optimal management of a wide range of pediatric diagnoses. This year, the Hanger Institute and Hanger Clinic partnered with several community therapists to model the multidisciplinary collaborative approach in pediatric care.

With over 750 healthcare partners attending the virtual event, orthotists and therapists from Hanger Clinic and AbilityKC (Kansas City, MO) came together to further learners' knowledge of common pediatric diagnoses, presentations, and the role of orthotic intervention in delivering positive patient outcomes.

The symposium was then followed up with several sessions attended by over 450 peers and colleagues focused on optimizing prosthetic design to improve patient outcomes. Finally, the Hanger Institute closed out the series with a focus on providing optimal proactive versus reactive care for patients with cerebral palsy. Featuring top experts in the field, this session delivered a holistic care approach through interactive case studies with over 300 in attendance.

Together, the pediatric-focused Hanger Institute Virtual Classroom series included over 1,500 learners from around the world, proving that education is a key component of continuing to understand and share new research, techniques, and best practices with the entire healthcare team.

Knowledge Translation

Through landmark research studies, the Hanger Institute, in partnership with leading researchers and professionals, develops programs to meet the needs of the patients we care for. Disseminating that research is the first step in ensuring we understand how the decisions we make today can impact care tomorrow. Through the Hanger Institute Virtual Classroom, our team hosted two sessions focused on top-tier research publications to disseminate research.

Our first course, Prosthetic Research and the Impact on Patient Outcomes: A Journey Begins With One Step, took participants through a story of patient recovery and demonstrated how current research is an integral piece to the success of every patient. With over 400 learners, the course featured four recent publications and series, including MAAT, OASIS, IMPACT, and SAFE-AMP, to help tell the story of Leslie, a patient who underwent a journey of loss, recovery, and empowerment.

For our final course in the Virtual Classroom, the OASIS 2 study took center stage as we discussed structural changes in the reimbursement landscape. We presented objective outcomes data to illustrate the importance of considering realized function over visible features and determining the classification of prosthetic feet.

Professional Education: A Year-in-Review

Our commitment to improving patient outcomes drives us to organize and provide evidence-based learning for providers across the continuum of patient care.

In 2022, our focus included closing the gap in pediatric knowledge in the field, along with keeping our learners current with research publications and the impact this has on treatment for the amputee population.

1,500+
Pediatric Education Attendees

550+
Research Education Attendees

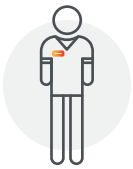
WE PROVIDE QUALITY EDUCATION FOR PROFESSIONALS ALONG THE CONTINUUM OF PATIENT CARE

Physicians

Nurses

Case Managers

O&P Clinicians



Physical Therapists

Occupational Therapists

What our attendees are saying

COLLABORATIVE LEARNING

"It is always great to learn from orthotists! I love collaborating and hearing their perspective for evaluation and treatment for orthotics."

–Physical Therapist

INNOVATIVE LEARNING

"I learned a different approach to orthotic intervention that most colleagues in my region are not familiar with."

–O&P Clinician

EVIDENCE-BASED LEARNING

"Great presentation with a patient's perspective and data to go along with it."

–Nurse Case Manager

"The course was excellent because I feel like this is an area that a lot of therapists don't always know the most current research/information or what resources are available to our patients."

–Physical Therapist

"Great way to learn more about the research being done and how other clinicians are using it for treatment."

–O&P Clinician

Hanger Clinic O&P Residency Program

Since 1996, the Hanger Clinic O&P Residency Program has been the gold standard and pillar of excellence in clinical education, having trained more than 800 orthotic and prosthetic residents. Our investment in the next generation of clinical experts is unparalleled, ensuring that patients across the country have access to care delivered with empathy and expertise for years to come.

The Hanger Clinic O&P Residency Program helps prepare new graduates for competent, autonomous clinical practice in the field of orthotics and prosthetics. We utilize a comprehensive, gradual experiential model within a broad-based professional and academic environment conducive to the education and training of tomorrow's industry leaders.

We count on our residents to continue our storied tradition by offering a comprehensive, state-of-the-art, patient-oriented training environment that focuses on the development of new clinicians in the most efficient and effective manner possible. We provide elevated education and requirements above and beyond the standards of our resident credentialing board NCOPE. Residents are required to perform advanced activities, including viewing surgeries and participating in advanced evaluation clinics for our patients.

150 residents

Each year, Hanger Clinic trains approximately 75 first-year and 75 second-year residents, most of which stay to continue their professional development.

Residents also participate in our biannual mock exam process, where they are run through mock situations to prepare them for their board exams. This process results in Hanger residents passing the board exam at levels higher than the industry standards.

The Hanger Clinic O&P Residency Program has a management structure that allows continuous check-in by national and regional leaders (resident liaisons). Each year, Hanger Clinic trains approximately 75 first-year and 75 second-year residents, most of which stay with the organization to continue their professional development.

Who We Are:
Meet the Institute Teams

The Hanger Institute is fortunate to have access to many motivated and talented professionals. These include internal associates that oversee its day-to-day operations and affiliates that support several Hanger Institute initiatives, in addition to their primary responsibilities within Hanger Clinic and other segments of Hanger, Inc. In addition, the Institute is engaged in a number of research collaborations with academic partners as well as research and development projects with industry collaborators.

Associates

The Hanger Institute core faculty is comprised of a team of dedicated professionals in their disciplines of clinical care, research, and education.

James Campbell, PhD
SVP & Chief Clinical Officer

Todd Castleberry, PhD
Research Scientist

Dwiesha England, MSEng
Research Associate

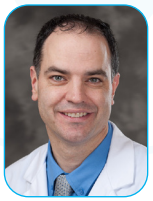
Bretta Fylstra, PhD
Post-Doctoral Researcher

Liliana Komraus, MS
Senior Manager,
Professional Education

Molly McCoy, CPO
Clinical Documentation
Specialist

Erin O'Brien, CPO, FAAOP
Clinician & Clinical
Education Specialist

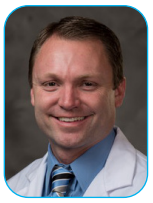
Shannon O'Shea, CPO
Area Clinic Manager & National
Clinical Specialist, Pediatrics



Matthew Parente, MS,
PT, CPO, FAAOP
Clinical Education Specialist

Doug Reber, L/CO
Director, Education &
National Residency

Sophia Saenz
Research Assistant



Phil Stevens, MEd,
CPO/FAAOP
Director, Clinical &
Scientific Affairs

Eric Weber, CPO, FAAOP
Clinician & Clinical
Research Associate

Shane Wurdeman, PhD,
CP, FAAOP (D)
Director, Clinical Research

External Advisory Board

To provide guidance around our mission to explore, expand, and facilitate opportunities that help advance leading-edge research, evidence-based care, and quality education in O&P, the Hanger Institute formed an external advisory board composed of highly respected, experienced members of the healthcare community.

Biykem Bozkurt, MD, PhD
Director, Winters Center for Heart Failure Research
Associate Director, Cardiovascular Research Institute
Baylor College of Medicine | Houston, Texas

Judith M. Burnfield, PhD, PT
Director, Institute for Rehabilitation Science and Engineering
Director, Movement and Neurosciences Center
Clifton Chair, Physical Therapy and Movement Sciences
Madonna Rehabilitation Hospitals | Lincoln, Nebraska

Catrine Tudor-Locke, PhD, FACSM, FNAK
Dean, College of Health and Human Services
Professor, College of Health and Human Services
The University of North Carolina | Charlotte, North Caroliina

Douglas Smith, MD
Professor Emeritus, Department of Orthopaedic Surgery
University of Washington | Seattle, WA
Professor, Department of Physical Medicine and Rehabilitation
Uniformed Services University of the Health Sciences and the Henry Jackson Foundation for the Advancement of Military Medicine | Bethesda, Maryland

Academic Partners

Collaborative research remains a core activity of the Hanger Institute, with team members pursuing patient-centered research questions across a broad spectrum of patient populations and interests. Several of our partners in such efforts include:

Center for Adaptive Systems of Brain-Body Interactions
George Mason University

OrthoCarolina Research Institute
Charlotte, North Carolina

Department of Physical Medicine and Rehabilitation
Northwestern University

Physical Medicine and Rehabilitation-Physical Therapy Program
University of Colorado

Department of Physical Therapy and Rehabilitation Science
The University of Iowa

The Rehabilitation Neuroscience Lab
University of Missouri

Walker Department of Mechanical Engineering
The University of Texas at Austin

Department of Physical Therapy
Virginia Commonwealth University

Department of Rehabilitation Medicine
University of Washington

External Grant Funding

As the Hanger Institute and its collaborators continue to pursue our diverse and ongoing research efforts, we constantly acknowledge and thank the associated funding mechanisms and sources that support our activity through various research grant awards. These entities include the following:

Department of Defense – Congressionally Directed Medical Research Programs
National Institutes of Health
National Institute on Disability, Independent Living, and Rehabilitation Research
US Department of Veterans Affairs
Center for Orthotic and Prosthetic Learning

Industry Collaborators

The Hanger Institute recognizes the need to ensure optimal patient outcomes across a range of patient populations and technologies. Accordingly, we continue to partner with several industry colleagues, including:

Infinite Biomedical Technologies
Baltimore, MD, US

LTI – a Coapt R&D company
Holliston, MA, US

Össur
Reykjavik, Iceland

Ottobock
Duderstadt, Germany

Parker Hannifin Corporation
Cleveland, OH, US

Point Designs
Lafayette, CO, US

WillowWood
Mount Sterling, Ohio, US

Zimmer Biomet
Warsaw, IN, US

QR-Enabled Library of Institute Publications

MAAT Series

SAFE-AMP Series

CPG Series

OASIS Series

ORION Series

IMPACT Series

Assessment of a Nine-Item PROMIS Upper Extremity Instrument

Feet Improve Prosthetic Mobility and Physical Function Relative to Non-Microprocessor Feet

Clinical Outcome Measures to Evaluate the Effects of Orthotic Management Post-Stroke: A Systematic Review

Quantifying Orthotic Correction of Trigonocephaly Using Optical Surface Scanning

Modified Cephalic Index Measured at Superior Levels of the Cranium Revealed Improved Correction With Helmet Therapy for Patients With Sagittal Suture Craniosynostosis

Learn more about our published research.