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## Casting a vision for amputation rehabilitation

In my 4 years of clinical work as U.S. Army occupational therapist (OT) working with hundreds of amputee patients, I gained enthusiasm and hope for a brighter future for amputee rehabilitation. I believe that now is the time to leverage knowledge, creativity, and interest in prosthetic development and rehabilitation. I propose that a need exists to certify OTs and physical therapists (PTs) wishing to specialize in rehabilitative management of amputee patients; here I examine a future research agenda related to amputee rehabilitation.

First, let us consider the idea of a specialty certification available through professional OT and PT organizations. I believe that a specialty certification related to rehabilitative management of amputee patients would benefit therapists, prosthetists and, most importantly, patients. Rehabilitation of an amputee patient is a complex process that demands a knowledge base and skill level above that of an entry-level licensed OT or PT. Recent acceleration in prosthetic development contributes to the complexities of managing the amputee patient.

During my time working solely with amputee patients, I came to understand and appreciate the value of clinical experience. I know firsthand how steep the learning curve is for a therapist trying to navigate the maze of complexities related to amputee patient care. Many issues contribute to this learning curve, such as residual limb care; knowledge of mechanical operations of prosthetic equipment; the many choices of terminal devices; the psychological, social, and emotional repercussions of limb loss; phantom pain and sensations; adaptive equipment options; muscle retraining; and integration of a prosthesis into everyday movement patterns. The desired outcome for each patient is application, training, and integration of a prosthesis; however, quality rehabilitation goes beyond that outcome and accounts for individual variables that ultimately impact the entire calculus of successful rehabilitation. Interventions must be orchestrated in such a way that the timing facilitates the patient's acceptance of limb loss and ignites a desire to participate in the rehabilitation process. This rehabilitation process is one of overcoming a change in both form and function.

I worked in a treatment section with three other therapists who also provided rehabilitative services solely to amputee patients. Every new patient contributed to our knowledge, deepened our understanding, and refined our clinical skills. We consequently improved rehabilitation methods, established best-practice guidelines, and improved efficiency in delivery of services. This organization of specialized staff within the occupational therapy clinic led to information sharing among practitioners exclusively related to the holistic needs of amputee patients.

Establishment of a certification specialty program would facilitate a national standard of care, requiring therapists to demonstrate the knowledge and skills necessary to prove clinical competence. With this professional certification, therapists could define themselves as practitioners able and eager to provide rehabilitation services to amputee patients and physicians and prosthetists could

identify therapists who were competent in caring for their patients. Most importantly, consumers (patients and their families) could make better choices by seeking a referral to a provider with a speciality certification in amputee rehabilitation.

This certification would be a culmination of commitment to standards of care among professionals, appropriate accountability to patients and referring physicians and prosthetists, and recognition by both the American Occupational Therapy Association (AOTA) and American Physical Therapy Association (APTA) of the highly specialized rehabilitation needs of amputee patients. Ultimately, it would significantly advance the professions that contribute to quality-of-life improvements for amputees. Shared knowledge always accelerates the translation of basic science and engineering knowledge into improved health among unique populations of patients.

Currently, AOTA offers board certifications in gerontology, mental health, pediatrics, physical rehabilitation, as well as specialty certifications in driving and community mobility; environmental modification; feeding, eating, and swallowing; and low vision [1]. APTA offers board certifications in seven specialty areas: cardiopulmonary, clinical electrophysiologic, geriatric, neurologic, orthopedic, pediatric, and sports [2]. These certifications provide a way of verifying competence in a focused area of clinical practice. Specialty certifications lend professional accountability to career development and ultimately create standard performance benchmarks that result in improved services to consumers. Certifications allow the therapists to set themselves apart as subject matter experts. This type of focused learning allows for a higher level of practice and the ability to clinically manage patients with specific diagnoses.

Specialty certification would also reduce practice variation among providers by establishing uniform clinical performance standards. Uniform standards would allow therapists to seek and obtain knowledge and skills necessary to meet the rehabilitation needs of amputee patients. A network of qualified providers with certification would soon build, creating an improved exchange of information and momentum for new discoveries through research. Certification would make a statement to insurance companies on the policy of reimbursement for amputee patients

needing prosthetic equipment and services. Amputees are lifelong seekers of prosthetic care, and as they age, they will need customized treatment plans to manage their changing rehabilitation needs. Overall, we are obliged to create a specialty that could contribute to reducing the overall morbidity of amputee patients.

Another issue for consideration is a worthwhile research agenda. Research is a highly meticulous endeavor that requires teamwork and professional collaboration. Research contributes to clinical advances and improved patient outcomes only if it can be translated and disseminated appropriately. Researchers must build a research agenda related to amputee rehabilitation that translates into meaningful advancements in fields that contribute to improved care delivery and outcomes. Because minimal collaboration and synchronization have occurred in fields such as prosthetics, rehabilitation, engineering, behavioral psychology, and neurology, many innovative research projects have room to unfold. Our trend should move away from the silo approach to discovery and toward collaboration. By establishing research priorities likely to achieve high-yield results, interested fields can focus energies and efforts to maximize benefits.

Three main research priorities are important from a rehabilitation standpoint. The first is technologies used in rehabilitation. Virtual reality platforms—such as CAREN, (Computer Assisted Rehabilitation Environment), which allows the therapist to both manipulate and monitor the therapeutic training environment of the amputee patient—should be used to gather data related to both the outcome and process of integrating a prosthesis into movement repertoires. Other virtual reality systems are available and some, such as the Nintendo Wii™ (Nintendo of America, Inc; Redmond, Washington), are affordable and accessible to most practicing therapists. Virtual reality training environments offer many advantages over traditional therapeutic interventions because they allow therapists to create experiences that would be unrealistic or even unsafe for the amputee patient. The multiple data sets that can be gained through video capture also provide meaningful information to therapists working to gain knowledge about best-practice training interventions. These rehabilitation

training technologies should be fully exploited to move clinical practice areas forward.

The second research priority is neuroprosthetics and corresponding therapies [3]. Because this area is a new endeavor, therapies should be tracked closely for each clinical case, establishing a foundation of understanding related to the unique needs of patients undergoing such interventions. Therapists will need to track results, establish evaluation and intervention protocols to reproduce positive results, and follow patients longitudinally to gather information related to possible ongoing motor control adaptation. Patients want to fully understand their “best options,” and they will likely make judgements based on outcomes germane to therapists, such as return to work, endurance, pain, function, and frequency and type of complications. These types of research questions must be established at the outset to provide deliverables to consumers and ultimately provide information to funding sources, such as insurance companies, that might cover such procedures.

The third research priority is the possible explanatory variables related to the successful use of a prosthesis and its integration into an amputee patient’s daily movement patterns. This unexplored research area encompasses the art of rehabilitation. Collaborating with behavioral psychologists and prosthetists, therapists should work to untangle the pertinent variables related to prosthetic preference. Insights gained could aid in prosthetic prescription and corresponding training methods to improve overall rates of acceptance among amputees.

In summary, therapists working in amputee rehabilitation must be proactive in encouraging their professional organization to establish specialty certification in amputee care. This is a first step in recognizing the complexity and significance of therapy delivered in amputee populations. Certification will translate into tangible benefits for patients, practitioners, and policy makers. Research must be a top priority and should focus on translation of

results to immediate clinical implementation [4]. Research should be synergistic and rally the efforts of all interested parties, including those involved in providing commercialized products for amputees. Looking forward and proactively anticipating the future direction of amputee rehabilitation allows for vision casting. Specialty certification and a solid research agenda are integral links to creating a bright future for amputee rehabilitation.

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