JRRD Guest Editorial

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Implementing outcome measures—The military physical therapist's perspective

Outcome measures are a necessary part of rehabilitation. Various methods and measures have been used to assess patient progress and as criteria for discharge from inpatient care, routine outpatient care, and long-term rehabilitation in a variety of patient populations for many years. In the sports medicine setting, outcome measures become especially important in determining when injured athletes are able to return to the playing field. In a military setting, similar to sports medicine, the use of outcome measures is necessary to help determine when the patient is able to return to duty or deploy. In the case of servicemembers with traumatic limb loss, the ultimate goal for many is to return to Active Duty as a "tactical athlete" and member of today's Army, Navy, Air Force, Marine Corps, or Coast Guard. Determining the functional level and ability to meet the demands they may face is a challenge for the military healthcare system (MHCS) and more specifically for the providers rehabilitating servicemembers with major limb loss.

The Armed Forces Amputee Patient Care Program is composed of three distinct centers: the Military Advanced Training Center (MATC) located at Walter Reed National Medical Center, the Center for the Intrepid (CFI) at Brooke Army Medical Center, and the Comprehensive Combat and Complex Casualty Care (C5) program center at the Naval Medical Center San Diego. Physical therapists caring for servicemembers with amputation at all three centers are particularly invested in making sure that the outcome measures we use systematically are appropriate. One of the challenges we faced early on was that most of the outcome measures used for people with amputation did not adequately measure the higher level of function that servicemembers with amputation need to return to duty. The majority of combat-related amputations occur in relatively healthy males under the age of 35, a very different population from the civilian population with amputation, in which the vast majority are older and have comorbidities such as diabetes mellitus, peripheral vascular disease, and cardiovascular conditions. The outcome measures used in the civilian amputee population suffer from a ceiling effect when used to assess the typical young, physically active servicemember with amputation. A new paradigm and approach to testing high-level function in people with amputation was needed for use in the military environment.

In practice, there are already many sophisticated and instrumented outcome measures in use in the Armed Forces Amputee Patient Care Program. These measures include those obtained in the motion analysis/gait laboratories and the Computer Assisted Rehabilitation Environment virtual reality (VR) systems. Motion analysis is a proven technology, and the use of VR with patients with amputation appears to be useful in both patient treatment and research activities. The benefit to the patients in both of these systems is the real-time

feedback they receive relative to weight bearing, lateral weight shifting, agility, pelvic obliquity, and shoulder symmetry. The learning that occurs with regard to agility, base of support, center of gravity, and proprioception is hidden underneath the façade of a video game. Biomechanical testing provides very detailed information on kinetics and kinematics of motion, but requires sophisticated equipment and expertise. These systems do not provide a relatively easy-to-administer test that culminates in a usable summary of abilities similar to the Amputee Mobility Predictor. Self-report measures can be used and are easier to administer than either biomechanical testing or performance-based tests. However, self-report measures, while they can be useful, are generally not strongly associated with actual performance-based measures. Many researchers feel that self-report measures alone do not adequately assess the broad concept of "function" and that performance-based measures are needed to capture the whole picture. The need for a performance-based outcome measure appropriate for testing servicemembers with major limb amputation(s) was recognized. Individual performance-based outcome measures such as hop testing, balance tests, etc., assess specific aspects but do not assess a broad spectrum of function in terms of type of task. This led to the development of a tool comprising a battery of functional tests appropriate for measuring function from a low level to a relatively high level appropriate for servicemembers with amputation returning to Active Duty or other physically demanding occupations and/or sports and recreation. The Comprehensive High-Level Activity Mobility Predictor (CHAMP) was developed to meet this need.

The number of individual outcome measures included in the CHAMP has changed during development. During phase I testing (nondisabled), the CHAMP consisted of seven measures of strength, balance, power, and agility. These measures were chosen from among the many measures already validated in other populations, primarily from the physical education and fitness literature. The measures included push-ups, sit-ups, Single Limb Stance (SLS), Medicine Ball Put Test, Edgren Side Step Test (ESST), the T-Test, and the Illinois Agility Test (IAT). During phase II testing (individuals with limb loss), the push-ups and sit-ups were determined to be unnecessary and eliminated, leaving only five tests. Overall results of the testing indicated that four measures—the SLS, ESST, T-Test, and IAT—would provide enough usable data to compile a composite score while keeping the test relatively easy to administer from both an equipment and manpower standpoint. We feel that not only is there significant value in each component of the test but also that the composite score is useful in providing feedback to the patient and therapist relative to current level of functional ability, fitness, and potential for return to duty.

That being said, there are challenges in utilizing the CHAMP. One of the biggest challenges is finding the time and space to conduct the testing. This can be overcome in the military setting by testing everyone on a routine basis as a group activity and may serve to motivate new patients. Teaching staff to correctly administer each portion of the test is extremely important. As with all performance-based functional testing, training to standard and correctly administering the tests is imperative in order to compare findings across the MHCS. The publication of the *CHAMP Test Manual* will increase the likelihood that testers are trained to standard and increase the reliability of the scores. Equipment to conduct the CHAMP is minimal; however, space is required and an open area without obstacles or traffic will be necessary. Military providers will usually have access to a gym or other suitable area. In a standard physical therapy clinic, this may be a more significant obstacle. We have used a variety of spaces, from basketball courts at a gym to biomechanics laboratories and hallways, to administer the test. It is important to keep safety in mind. The potential for falls exists, and each participant needs to be evaluated carefully to determine if he or she can safely perform the tasks prior to doing the test. Staff administering the CHAMP should stay alert and take appropriate precautions to prevent falls and potential injuries. The risk can also be reduced through careful instruction in how to perform each task. The instruction should not be taken lightly by the staff or the patient.

The benefits of an outcome measure as robust as the CHAMP will more than make up for the challenges of

actually implementing functional outcomes testing. The results provided by CHAMP testing will motivate patients in their personal goal-setting and assist providers in modifying and targeting interventions toward specific components of the test. Additionally, the findings will help providers to more clearly communicate with one another. The straightforward scoring system can be used to simplify documentation, potentially enhance clarity of billing, and facilitate treatment throughout the continuum of care and across healthcare systems.

In order to make this outcome measure meaningful, a plan must be developed to implement the CHAMP throughout the Armed Forces Amputee Patient Care system. Staff at the MATC, CFI, and C5 must be encouraged to utilize this resource. Timelines for formal testing of patients based on how long they have been ambulating with a prosthetic device(s) will enhance care as military patients are cross-leveled between sites when necessary. CHAMP scores and the interpretation of the findings must be communicated to those who dictate medical boards and determine fitness for return to duty.

But the usefulness of this tool is not limited to these sites. The Department of Veterans Affairs can implement CHAMP testing to assess functional status and measure progress of people with amputation undergoing evaluation or treatment. Although the CHAMP was developed and studied in the military setting, there is no reason to believe that it would not be valid in the civilian setting, especially for the younger traumatic or cancer-related patient with amputation. Further research is needed to validate the CHAMP in the civilian population, but we feel the CHAMP can be valuable when a performance-based outcome measure is needed to assess the function of ambulatory patients with amputation. Of course, it is important that each clinician use sound clinical judgment when deciding whether the individual patient they are evaluating is appropriate for this test.

We need to recognize that few if any of the patients seen at the MATC, CFI, or C5 have an amputation as their only injury. A significant number have multiple-limb amputations. Most have other injuries ranging from minor soft tissue wounds to severe injuries such as fractures, peripheral nerve injuries, compartment syndromes, partial spinal cord injuries, traumatic brain injuries, and posttraumatic stress disorder. These injuries, of course, can affect function and level of disability. The norms for any performance-based outcome measures in general, and the CHAMP in particular, are established and validated initially for patients within a more narrow or specific diagnostic category. It should be acknowledged that the scores obtained in the population used to validate the CHAMP may not be directly comparable in many of the wounded from Operation Iraqi Freedom, Operation Enduring Freedom, and Operation New Dawn. Many of these injured servicemembers have multiple comorbidities that would have caused them to be excluded from participation in the research study. This does not mean that the CHAMP is not useful when the specific patient tested does not perfectly match the characteristics of the population used in the research validating the test. One of the primary uses of outcome measures is to assess progress, which does not require comparison to other patients, only test-retest reliability.

In conclusion, we have been amazed over and over by the level of physical performance of the Wounded Warriors as they go through rehabilitation. For example, some of the patients with amputation who participated in the research to develop the CHAMP outscored people without amputation. Call it self-efficacy, willpower, mental toughness, or resilience, they have it, and we are inspired by them daily. As General Frederick Franks, USA (Retired), who has a transtibial amputation from Vietnam and served his country for over 35 years, said at the opening ceremonies of the MATC in September of 2007, let us remember our injured servicemembers for what they can do, not what they cannot do.

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