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JRRD Guest Editorial

Research update: VA study to optimize DEKA Arm

In 2005, the Defense Advanced Research Projects Agency (DARPA) announced its Revolutionizing Prosthetics program and funded the development of the DEKA prosthetic arm. The DEKA Arm System incorporates major technological advances such as flexible socket design, innovative control features, software, and hardware that together enable enhanced functionality that promises to surpass any currently available prosthetic device. In 2008, the Department of Veterans Affairs (VA) entered into an agreement with DARPA to conduct clinical evaluations of the prototype DEKA Arm System, a prosthetic device system still under development and not yet available commercially. Studies of the DEKA Arm System have been underway at VA sites since late 2008, with the first subject fitted with a DEKA Arm in early 2009.

The primary objective of the VA study is to provide user and clinician feedback to support optimization of the DEKA Arm System to best suit patient needs. Specifically the study aims to (1) evaluate the person with amputation's experience of using the DEKA Arm; (2) evaluate the clinicians' (prosthetists and therapists) experience of fitting, setting up, and training subjects with the DEKA Arm; and (3) evaluate improvements in the DEKA Arm and its software as it is optimized by DEKA throughout the study.

The VA study involves five sites. The Providence VA Medical Center, Providence, Rhode Island, is the study coordinating site. There are four data collection sites. The Manhattan campus of the VA New York Harbor Healthcare System in New York City, New York, and the James A. Haley Veterans Hospital, Tampa, Florida, have been collecting data since 2009, and the VA Long Beach Healthcare System, Long Beach, California, and Center for the Intrepid at Brooke Army Medical Center, San Antonio, Texas, became active study sites in early 2010. At its completion, the VA study sample will consist of up to 40 subjects with upper-limb amputation, the majority of which will be veterans. Subjects include persons with amputations at any of four levels (transradial, transhumeral, shoulder disarticulation, and forequarter) who have lost one or both upper limbs.

The VA study uses a multiple-case study design with a mixed-methodology approach. We collect data from three sources: subjects, prosthetists, and therapists. Our data collection tool kit includes several standardized outcome measures used to assess function, daily activities, and prosthetic satisfaction. We also collect qualitative data derived from interviews, video observations, and surveys. This multiplicity of data sources enables us to better understand subjects' experiences using the DEKA Arm and their perspectives on its usability, as well as recommendations for improvement.

We synthesize data from each of our VA subjects into a case study report and share our findings with DEKA shortly after the subject completes study activities. The case studies that we develop summarize the information from

the subject, prosthetist, and therapist and identify main themes related to the central research questions. Case study findings are being used by DEKA in conjunction with data from their own trials to inform the design efforts leading to the development of a new, revised version of the DEKA Arm System. Although the results of the VA Study to Optimize the DEKA Arm are not ready for public release, selected movies and images of subjects from the VA study highlight the range of functional activities performed by subjects in our study (videos 1, 2, 3, and 4 available online).

The VA is currently planning for additional studies of the next generation of the DEKA Arm System when this design is finalized and available. My hope is that the fruits of these collaborative efforts will be a refined, highly usable, commercially available product that will improve the quality of life and functional independence of people with upper-limb amputation. The participation of multiple VA and Department of Defense (DOD) sites in this research endeavor is helping to build the expertise and experience within the VA and DOD systems of amputee care to prescribe, fit, and train patients in the use of this type of advanced technology.

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