MEGAN L. GILL: People who have suffered a spinal cord injury suffer with mobility issues, and the purpose of looking at exoskeleton systems and their use within the community and the rehabilitation role is imperative because we want to provide them opportunities to experience life in other situations other than sitting in their wheelchair. It also gives us an opportunity to look at the advances in their recovery while up on their feet standing and walking. An exoskeleton device is a robotic tool that allows people who have complete paralysis or no motor or sensory function below their level of injury to get up, stand, and walk.

The purpose of this study is to take a look at those who have no ability to walk or those that do have a little bit of ability to walk to see how that lets them function in the community. We wanted to see if the exoskeleton lets them walk across the street comfortably and safely. We also want to take a look at the potential of recovery and for those that have the potential to get better and stronger by using exoskeleton.

So exoskeletons were initially devised to help soldiers out in the fields to help carry heavy backpacks and to conserve their energy to be able to walk long distances. It's emergent the health care field more now to help those who are paralyzed and don't have the ability or the power to stand and walk. Mayo Clinic has been investigating the use of exoskeletons for quite a few years now, and we've been waiting for a device that had all the capabilities that we were looking for.

This device is allowing us to look at those potentials and the use with the spinal cord population. Functional electrical stimulation allows us to use electrical stimulation to the actual muscle groups to stimulate a motor contraction. It can be used in a functional setting such as walking-- so stimulating the muscles specifically needed to achieve that activity of standing and stepping. It's the lightest weight of all the exoskeletons, which makes it more marketable for patients, and easiest to put together and to use for the clients.

Mayo Clinic tends to serve the highest number of population of atraumatic spinal cord injured population, which results in incomplete injury diagnoses, which ultimately results in possibility for more recovery. So this exoskeleton device that allows us to work at different levels of assists will let us address that population to improve their function and their motor recovery. With using the exoskeleton device for recovery and rehabilitation, it may allow us to decrease the labor effect on the therapist and the clinicians needed for their recovery activity.

The hypotheses that we're looking at for the exoskeleton device is looking really at the health benefits of the machinery-- possibly decreased pain, decrease spasiticity, improvement in bowel and bladder function, as well as body mass index. We're also looking at the recovery potential with using an exoskeleton system. Community ambulation and the community use is another hypotheses that we're looking at with using exoskeletons system.

KRISTEN ZHAO: I'm Dr. Kristen Zhao. I'm director of the assistive and resort of technology laboratory in the rehabilitation medicine research center. This study has three phases.

The first phase will involve use of the device as it currently exists. We'll test eight subjects at the Mayo Clinic, four of which will have ambulatory function-- so some ability to walk-- and four which will have no ability to walk. So the second phase of this study will involve eight subjects as well, four with ambulatory function and four with no ambulatory function. And in that phase, we will look at the addition of functional electrical stimulation in the exoskeleton device.

The third phase will involve home use of the exoskeletal device. At the Mayo Clinic, we will test two subjects. We will allow them to take the device home, and we will measure outcomes pre and post home use.

This project is funded by the Department of Defense. It's a clinical trials grant with three sites. The primary site is Vanderbilt University led by Michael Goldfarb. The second site is Mayo Clinic Rochester, and then the third site is the Tampa VA led by Samuel Philips.

So the overall recruitment for this project is 24 individuals with spinal cord injury. This project is being carried out in the assistive and restorative technology laboratory at the Mayo Clinic in Rochester. It's a new laboratory that was formed a few years ago as part of the rehabilitation medicine research center.

So this research is a really great example of the capability of the Mayo Clinic to do translational research in a powerful way. The idea for this project came from the clinical practice migrated obviously into a collaborative environment in the laboratory, where clinicians and researchers worked together to solve this problem and address this problem clinically. And then we will translate our findings back to the clinical practice.