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Innovations to Improve the Quality of Life!

Smart E-Pants:

In EDMONTON, approximately two dozen Albertans are helping test a new technology called Smart-e-Pants. The custom electric underwear stimulate gluteus muscles to help prevent pressure ulcers or bed sores. An electrical current lasting 10 seconds zaps the Albertans' buttocks every 10 minutes; however, the units require tweaking to better allow women to go to the bathroom. The latest Smart-e-Pants prototypes resemble trendy boxer briefs with zippers in the front and eight electrodes hidden inside pockets in the back. A Walkman-sized pack attached to the waist programs the jolts and records data. Experts in Rehabilitation Medicine and at least five other disciplines, including Neuroscience, worked together at the University of Alberta to develop Smart-e-Pants,



which stands for **Sensory Motor Adaptive Rehabilitation Technology**. "It's a smart system," said key researcher Dr. Vivian Mushahwar with Alberta Innovates Health Solutions. The group helped fund the \$5 million project with support from Alberta Health and Wellness. She said people who can use their legs don't develop pressure ulcers even if they sit all day because they subconsciously fidget several times an hour. Smart-e-Pants mimic those movements. "Pressure ulcers are a complicated and unresolved medical issue that needs our attention," Mushahwar said. Complications due to pressure

ulcers killed Christopher Reeve, the star of the "Superman" movies, who was left a quadriplegic after a horse-riding accident. Mushahwar added that the ulcers cost the Canadian health-care system \$3.5 billion each year. In the United States, the figure rises to \$11 billion. Dr. Ming Chan said nursing staff normally turn patients every two hours to help prevent the sores, even though it's almost a certainty they will develop. He estimates a pair of Smart-e-Pants costs about \$2,000.00, and the most expensive part is the stimulator pack. The actual underwear, which can be tossed in the washing machine once the electrical component is disconnected, only runs up to \$70.00. Pilot Tests have shown the underwear doesn't harm patients. Chan said the next phase of testing will determine how effective they are at preventing the sores. Even without proven success, Project Researchers are working with commercial partners in Alberta and the U.S. and planning to mass produce the underwear. Chan expects Smart-e-Pants could be on the market in two years.

iPhone 4S:

In October of 2011, Apple introduced the iPhone 4S with their implementation of Siri, an intelligent software that uses a natural language user interface. It answers questions, makes recommendations and performs actions by delegating requests to a set of web services which I'm sure you've seen advertised; however, what you may not know is that the new



iPhone 4S also includes an equally revolutionary screen reader, and other innovative accessibility features that make it easier to use for those with impaired vision. VoiceOver uses simple gestures that let you physically interact with items on screen. You simply touch the screen to hear a description of the item under your finger, then gesture with a double-tap, drag or flick to control the phone. Traditional screen readers describe individual elements on the screen; however, they struggle to communicate where each element is located or provide information about adjoining objects. VoiceOver will provide, perhaps for the first time, a true sense of how things appear on screen in 36 languages. The new iPhone 4S also comes with Wireless Braille Displays, Zoom and White on Black contrast.

Thought Controlled Wheelchairs:

Ambient developed and markets the Audeo system. Audeo was initially envisioned as a way for severely disabled people to communicate; however, Ambient expanded the control systems to include the ability to control a wheelchair or interact with a computer. The Audeo is based on the idea that neurological signals sent from the brain to the throat area to initiate speech still get there even if the spinal cord is damaged or the motor neurons and muscles in the throat no longer work properly. Thus, even if you can't form understandable words, neurological signals that represent the intended speech exist. This is known as sub-vocal speech. Everyone performs sub-vocal speech. For example, if you think a word or sentence without saying it out loud, your brain still sends the signals to your mouth and throat. A lightweight receiver on the subject's throat or Adam's apple intercepts these signals. It functions much like an Electroencephalogram. The sensors detect the tiny electric potentials that represent neurological activity. It then encrypts those signals before sending them wirelessly to a computer. The computer processes the signals and interprets what the user intended to say or do. The computer then sends command signals to the wheelchair or to a voice processor. The computer knows the signals for different words and phonemes, so it interprets the signals and processes them into a sentence. If you want to control a wheelchair, the process is similar, except you learn certain sub-vocal phrases that the computer interprets as control commands rather than spoken words. The user thinks, "*forward*," and the Audeo processes that signal as a command to move the wheelchair forward. Audeo uses a National Instruments CompactRIO controller to collect the data coming from the sensors. Embedded software known as LabVIEW then crunches the numbers and converts the signals into control functions, such as synthesized words or wheelchair controls. Ambient has developed the communication aspect of Audeo to the point that users can create continuous speech, rather than speaking one word at a time.



Clearly, these innovations improve the quality of life for people with disabilities, so until next time!

Take care,

Dan Thompson, RRP, RVP, CLCP

