Innovative motion evaluation tool saves patients with back pain X-ray radiation exposure

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Those have undergone extensive back surgery and need repeated X-rays to monitor their progress may soon have access to a new technology that skips the X-rays and repeated radiation exposure, opting instead for an innovative, noninvasive, non-X-ray device that evaluates spinal movement. The technology was created and patented by two engineering undergraduate students who recently formed their own company to market the device.

The paper describing the technology appears in the current special issue of *Technology and Innovation - Proceedings of the National Academy of Inventors*, and was presented at the Second Annual Conference of the National Academy of Inventors hosted by the University of South Florida, last February 21-23, 2013.

"Surgical treatment is inevitable for some of the 80 percent of Americans who at some point in their lives suffer from back pain," said Kerri Killen of Versor, Inc. who, along with Samantha Music, developed the new technology while they were undergraduate students at Stevens Institute of Technology in New Jersey. "We developed an evaluation device that uses battery powered sensors to evaluate spinal motion in three-dimensions. It not only reduces the amount of X-ray testing patients undergo but also has the potential to save over $5 billion per year nationwide in health care costs."

According to co-developer Music, there are 600,000 spinal surgeries every year in the U.S. with an annual exposure of 2,250 mrem of radioactivity per patient before and after surgery. The "electrogoniometer" they developed can be used by surgeons prior to patient surgery and after surgery and also used by physical therapists to further evaluate the progression of a patient's surgery. The technology can also be used in other orthopedic specialties to reduce both costs and eliminate X-ray exposure.

"The electrogoniometer contains three rotary potentiometers, which are three-terminal resistors with a sliding contact that forms a voltage divider to control electrical devices, such as a rheostat. Each potentiometer measures one of the three spinal movements," explains Music. "It also contains a transducer—a device that converts a signal in one form to energy of another form—to measure the linear displacement of the spine when it curves while bending."

The developers add that the device is "easy to use" and requires minimal training for the health professional end-user. The vest-like attachment to a patient eliminates the need for any other special equipment and can be used during a routine clinical evaluation. "It is comfortable for the patient and efficient, providing immediate and accurate results," they add.

An additional use for the device, they said, could be for measuring movement spinal angles and could be used to determine when an injured worker might be able to return to work. By developing new ways to attach the device, different areas of the body can be evaluated for movement, whether hip, shoulder, knee, or wrist.

When Killen and Music developed the electrogoniometer in their senior design class while in undergraduate school at Stevens, they also received mentoring and assistance for establishing a small business to market the

device.

Provided by University of South Florida