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Easy-to-Use Device to Measure Range of Motion in Knee During Post-Operation Recovery

Market and Background

In the United States, approximately 5.2 million knee replacement surgeries were performed in the 11 years between 2000 and 2010, and U.S. hospital costs from total knee replacement were estimated at $41.7 billion in 2014. The number of these procedures in the U.S. is anticipated to be over 3.4 million in 2030 alone.

One standard indicator of progress in post-operation recovery is range of motion of the knee joint, which is typically measured by a physical therapist using a handheld, protractor-like device called a goniometer. Although simple, a goniometer can be easily misaligned, causing up to 5 degrees of measurement error. In addition, it requires a second individual besides the patient to make a reading while the knee is stationary. This need for another person increases numbers of visits to the physical therapist and therefore increases cost. The patient can also experience discomfort or pain while having to hold the joint still for measurement.

Research and Development Status

Inventors at University of Wisconsin-Platteville have developed a novel device that enables an individual to reliably measure range of motion of his or her own knee joint while avoiding the discomfort of holding it stationary. The core function of the device relies on commercially available sensors containing a flexible electroactive polymer that measures movement and stretching. The battery-powered device aligns to the knee using braces secured by Velcro straps to the patient's thigh and lower leg, and the sensors are connected to these braces. As the lower leg moves relative to the thigh, digital measurements are transmitted by wireless signal to a handheld device such as a smartphone or tablet and can be read instantaneously by the patient or shared remotely with a doctor or physical therapist. The device can measure angles as the knee moves and does not require the joint to be held still for an extended time.

Preliminary studies indicate that measurements taken by a prototype of this range of motion device are at least as accurate as a standard goniometer. These results support this new device as a powerful new tool that can enhance patient comfort and reduce the cost of post-operation care. Future development could adapt this technology for use on other hinged joints such as elbows. WiSys is currently seeking a strategic partner for further development, validation, manufacture, sales, and distribution of this device.

Applications and Key Benefits

- Measures range of motion of the knee; May be adapted for other hinge joints such as the elbow
- Use in post-operation physical therapy following total knee replacement; Monitors mobility of joints in patients with movement disorders such as cerebral palsy
- Lowers cost of physical therapy by decreasing number of visits to or from the physical therapist: Can be used by individual to measure own joint movement, rather than needing physical therapist to read
- Enhances patient comfort: Measurements can be taken while joint is in motion rather than held stationary
- Fast measurements, easy record-keeping: Digital measurements recorded by app on handheld device

Intellectual Property

A U.S. Provisional Patent Application has been filed for this technology. For more information, please contact Jennifer Cook at jennifer@wisys.org or by phone at 608-316-4131.