CastMinder: Embedded Smart Sensors and Companion Software to Detect the Onset of Conditions Associated with Cast and Splint Complications and to Promote Patient Healing in Orthopedic Casts and Splints

Wulff, Alexander

The use of orthopedic casts and splints can be associated with harmful complications such as compartment syndrome, skin infection, delayed union, and pain. To combat these issues, I developed a total cast monitoring solution that monitors environmental conditions inside casts and splints while promoting patient healing and comfort. My “CastMinder” system consists of a series of embedded, wireless sensors that can track conditions such as pressure, moisture, and temperature. I also developed companion mobile software that communicates with these devices wirelessly. It can continuously monitor cast conditions, detect potentially harmful changes in the status of the cast, and alert both the patient and medical professionals to these changes. The system can also predict complications before they arise. In addition, my CastMinder system includes integrated “active healing” technology in the form of a combined transcutaneous electrical nerve stimulation device and a bone growth stimulator. This device can both lessen patient pain and increase the rate at which new bone is formed at the fracture area. My final system costs less than $30. Before testing, I built dozens of prototypes. Healthy adult testers wore casts with my monitoring devices embedded for over 200 hours. The sensors, battery, and companion application performed as expected. I also consulted several orthopedic physicians and incorporated their feedback. As demonstrated, I have developed a total cast and splint monitoring solution that can greatly improve fracture care, reduce complications, and lower medical care costs. In the future, I hope to take the device to market and expand it to encompass a total skin monitoring system that can detect conditions associated with diabetic foot ulcers, bed sores, and more.

Awards Won:

Fourth Award of $500

International Council on Systems Engineering - INCOSE: First Award of $1,000

International Council on Systems Engineering - INCOSE: First Award of $3,000

Patent and Trademark Office Society: First Award of $3,000