Value Proposition
For medical device companies that are looking for a competitive edge in the market for bone surgery, the Sound Sentinel is a diagnostic medical device that prevents injuries due to over-penetration of surgical drills. Unlike image-based navigation, our technology provides greater accuracy and is affordable to a global market. The Sound Sentinel provides value for medical device companies through differentiation from competitors, stronger customer relationship with repeat sales, and cutting of labor costs. The Sound Sentinel technology is complementary to key product categories of medical device companies: powered instrumentation, surgical navigation, intraoperative nerve monitoring, and robotic surgery.

Market Opportunity
The surgical drill market is a mature market dominated by a few large medical device companies. Sound Sentinel technology will be licensed to medical device companies with customized solutions for different companies, surgical products, and clinical applications. The primary market for Sound Sentinel is powered instrumentation ($634M in US), of which approximately 40% is cutting instruments such as surgical drills. The biggest markets for these companies are neurosurgery and orthopedic surgery. More than 465,000 spinal fusions were performed in the United States in 2011. The global spine market is estimated to reach $9.3B by 2017. Other high growth markets include navigation systems and robotic surgery (CAGR of 12% from 2013-18).

Competitive Landscape
Competitive technologies include surgical navigation systems (Medtronic, Stryker, and Brainlab). The navigation systems produced by these companies are expensive ($150,000) with limited availability and do not provide adequate spatial resolution. The Sound Sentinel is a complementary technology as well as an economical substitute when navigation is not available. Sound Sentinel will be priced to be less expensive than a surgical drill and not trigger major budgetary review by hospitals.

Funding
Investments to date include CMI grant F 029-2012 ($25,000) and support services from Idea Foundry (valued at $15,000).

Technology
Surgeons are trained to listen to the sound of drilling (change in pitch) to predict when the overlying bone is getting thin. This is the basis for SoundSentinel™, a stand-alone medical device that uses non-invasive sensors to monitor surgical bone drilling and alert surgeons when critical bone thickness is reached. Key components of the Sound Sentinel include a microphone to measure sound from the bone drilling, a processing unit with proprietary diagnostic algorithms, and an audible and visible alert to signal the surgeon. Future developments will allow the incorporation of other non-invasive sensors, e.g., an accelerometer, to provide additional diagnostic information.

Stage of Development
A prototype using off-the-shelf technology and proprietary diagnostic algorithms is currently under development and will be ready for clinical testing within a year. Using current diagnostic algorithms, we have achieved 95% accuracy in initial clinical testing in a “noisy” operating room environment. Further testing is in progress.

IP Status
Provisional patent application titled “Surgical Tool Monitoring System and Methods of Use,” is broad and includes the use of sensors to detect acoustic, vibrational, and temperature data from a “surgical tool with a cutting member” to identify the “proximity of critical structures” and the “health condition” of the surgical tool. This patent application does not limit our patent to surgical drills or neurosurgical procedures but is restricted to medical applications. Final patent application is pending.
FEATURED INNOVATORS:

_Carl Snyderman, MD, MBA_

Dr. Snyderman is a head and neck surgeon at the University of Pittsburgh Medical Center with a secondary appointment in Neurosurgery. He has over 30 years of clinical experience and is internationally recognized as a leader in surgery of the cranial base. Dr. Snyderman is a consultant with multiple medical device companies on the development of new surgical technologies.

**Education**

BA, 1978; Indiana University, Bloomington, Indiana

MD, 1982; University of Chicago, Pritzker School of Medicine, Chicago, Illinois

Surgical Internship, 1982-83; Western Pennsylvania Hospital; Pittsburgh, Pennsylvania

Otolaryngology Residency, 1983-87; University of Pittsburgh School of Medicine; Pittsburgh, Pennsylvania

Fellowship, Cranial Base Surgery, 1987-89; University of Pittsburgh School of Medicine; Pittsburgh, Pennsylvania

MBA, 2011; University of Pittsburgh, Katz Graduate School of Business, Pittsburgh, Pennsylvania

**Publications**


_Jeffrey S. Vipperman, PhD_

Dr. Vipperman is a Professor of Mechanical and Bioengineering. He has over 25 years of experience in the measurement and analysis of acoustics and vibration. This work leverages nearly $900K in Department of Defense (DoD) funding that culminated in the commercialization of a technology that can classify different noises around military bases.

**Education**

BS, Mechanical Engineering, 1990, VA Tech, Blacksburg, VA

MS, Mechanical Engineering, 1992 VA Tech Blacksburg, VA

PhD, Mechanical Engineering, 1997 Duke University, Durham, NC

**Publications**


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