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Proteus Biomedical prescribes 'smart pill'

Photo caption: Proteus Biomedical has three devices in clinical testing. On CEO Andy Thompson's fingertip is a medical device that activates when swallowed. In his hand is a device used to measure functions of the heart.

Silicon Valley / San Jose Business Journal - by Lisa Sibley

Grandma forgot to take her prescriptions again. Dad got his confused, and
Mom took too many.

Non-compliance to medication leads to 3.5 million hospital admissions in the United States annually and 11 percent of all admissions to the emergency room. In the elderly population, an estimated 40 percent of all admissions are due to medication problems.

To reduce that error rate, Proteus Biomedical Inc. has developed a chip-embedded pill that beams reports to doctors and family when a medicine is taken. The Redwood City company is also developing a way to track how the patient is responding to the medication and whether the dosage is appropriate.

The private, early-stage company is pioneering "intelligent medicine," an emerging field that integrates electronics, sensors and wireless communications into medical devices and pharmaceuticals. Proteus aims to provide information tools that simplify and improve a person's daily lifestyle, according to Chief Executive Officer Andrew Thompson.

The company has filed more than 250 patents to date, with three products in clinical trials. It plans to launch its first product in late 2009 or early 2010. Proteus has received $60 million in financing -- $45 million in equity and $15 million in debt.

With the company's "smart pill," an individual swallows a chip-embedded drug that is activated and transmits a signal to a receiver. The receiver is located inside the patient or on them -- similar to a Band-Aid.

"The data we've developed inside you stays inside you unless you give permission to have it go outside of you," Thompson said.

The information can then be sent to a family member's or doctor's mobile device or PC, letting them know how many pills a patient is taking, what the drugs are and when they are taken. The process also helps family members monitor the patient's diligence in taking the prescribed medicine.

"It enables that person to call up and say, "Mum, you forgot to take your pill today," Thompson said.

While Thompson does not want to divulge the details of the products until they hit the market, he points out that the company is building smart medicine into already existing products, such as prescription drugs and medical devices. The current market for those products is about $2.5 billion annually, Thompson said, and there is significant opportunity to expand that market. Guido Neels, a private investor in Proteus, estimated a $5 billion to $20 billion market for the "smart pill" alone.

"The way we like to think about the company is that it puts intelligence in medicine," Neels said. "It's intelligence for the patients, the family and the health care provider."

Cardiac application

Proteus announced April 24 it has initiated a clinical study of its novel way -- called cardiac electric tomography -- to assess heart function in patients using a pacemaker equipped with a chip-embedded wire it has developed. This could help nearly 5 million Americans and about 22 million people worldwide who suffer from heart failure, according to the American Heart Association.

Cardiac resynchronization therapy, a treatment for selected patients with heart failure, can improve cardiac function by restoring the mechanical sequence of ventricular activation and contraction. The method is costly, can be unreliable and offers no way to measure how well the patient is doing, Thompson said.

Dr. Mark Hlatky, a professor of health research and policy and of cardiovascular medicine at Stanford University, said the therapy has generally been cost effective in appropriate patients because of benefits such as preventing later readmission. While it does improve the quality of life in some people, he said, not everyone seems to respond to it.

Dr. Leslie Saxon, chief of cardiovascular medicine at the University of Southern California, is involved with six of the 30 patients enrolled in the trials. Saxon said Proteus is evaluating a way to use electrical signals to understand how the heart is pumping mechanically in acute testing. If the promising method works, it would then be incorporated into the Proteus wire, which is embedded with computing.

"It enables us to very flexibly program how we stimulate the patient, but in addition, it enables us to directly measure, using the same (wire), the mechanical performance of the heart," Thompson said.

"What we're doing is creating machine readable data in real time within the existing procedure, so instantly the physician knows what's going on, and that's a beautiful thing," he said. "And we're doing it without any additional equipment, no new procedure, no changes in the workflow, no changes in the reimbursement. We're taking what is today a dumb device and making it into an extremely intelligent device."

While he wasn't familiar with Proteus, Hlatky said if the device is proven to help more people respond to the therapy, it could be a good thing.

Saxon has been impressed not only with the Proteus founders' philosophy for how "technology can liberate medicine," but also their ability to move the ideas along and execute the products they dream up.

Much to prove

Thompson said Proteus still has to prove the power of its technology through its products, develop additional collaborations and work with the patient and the clinical community to show these systems are valuable. Thompson estimated the existing resynchronization therapy market to be as much as $12 million in the U.S. alone, and Proteus could partner with companies that specialize in cardiac rhythm management such as Boston Scientific Corp. and Medtronic Inc.

Thompson isn't sure whether Proteus is likely to try an initial public offering, license some of its technology to another company or await a buyer. He says he's more focused on building and financing the company and helping investors understand the potential revenue streams of intelligent medicine. The company's investors include Adams Street Partners LLC, Asset Management Co., The Carlyle Group, Essex Woodlands Health Ventures, Fletcher Spaght Ventures LP, Kaiser Permanente Ventures and Spring Ridge Ventures.

Neels, who is also Essex's managing director, said the company has a significant stake, 10 to 20 percent, in Proteus. He estimated the resynchronization therapy market to be $2 billion to $3 billion.

Thompson said there are companies that have pioneered radio-frequency identification as well as specific, sensor-based diagnostic applications such as CardioMEMS Inc. and St. Jude Medical Inc., which acquired a company called Savacor Inc. for its technology. However, Proteus is one of the first companies to have taken on this type of vision for intelligent medicine.

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