New Technology Designed to Boost Health and Cut Deaths in Diabetics

They call it the "White Coat Syndrome." Many people get stressed out when they visit their doctors, which makes their blood pressure readings go sky-high. The White Coat Syndrome is only one factor contributing to why the care for diabetics with high blood pressure is described as "woefully inadequate" – especially since two-thirds of diabetics suffer from high blood pressure, and their medication is based on intermittent office visits. To address this dangerous problem, industrial engineer Jenna Marquard is a key researcher in an almost $2-million project.

Her research is studying the effectiveness of a low-cost technology that allows diabetics to test their blood pressure in the comfort of home and then send those readings automatically to nurses so their medication can be adjusted as frequently as needed.

"They just have to plug it in," says Marquard about using a simple blood pressure instrument for reporting readings to nurses.

The collaborative $1,965,027 project being carried out by the UMass Medical School, the UMass Amherst College of Engineering, and Fallon Clinics in Central Massachusetts – a large multi-specialty medical group practice with more than 250 doctors providing healthcare services in more than 20 medical facilities – is supported by the Agency for Healthcare Research and Quality, a federal organization affiliated with the National Institutes of Health. The principal investigator is Dr. Barry Saver of the UMass Medical School, and the College of Engineering portion of the grant is $342,228.

The system being tested, a form of "health information technology," teaches a diabetic how to use a blood-pressure measuring device at home. The blood-pressure instrument in turn is plugged into a computer and feeds the readings automatically into the patient's centralized electronic health records, and from there is sent directly to the patient's nurses.

"My main component in the study is to understand how people use this technology and how it supports the goals of this whole preventative healthcare process," explains Marquard, a faculty member in the UMass Amherst Mechanical and Industrial Engineering Department. "We're trying to understand how this specific technology contributes to Fallon's intervention goals for diabetics with high blood pressure."

The particular problem addressed by the study is that diabetics with poorly controlled high blood pressure are vulnerable to many serious health risks, ranging from strokes and heart attacks to death.

Beyond that problem, the study has a much wider application. It aims to develop a system of collaborative patient-provider management for many chronic health conditions that can be monitored and managed at home. The study uses hypertension control in

diabetics as a test case, but the system it is testing is designed to be implemented inexpensively for a wide variety of medical conditions, clinical settings, and healthcare organizations.

The study will involve recruiting 400 diabetics with uncontrolled hypertension who receive care through Fallon Clinics. Half of them will act as the control group by continuing to receive standard medical care from Fallon. The other half will each receive an automated blood pressure cuff capable of uploading readings through a computer. The test patients will also receive instructions on how to use their cuffs at home, connect them to a computer, and upload their readings into the free Microsoft HealthVault personal health record system, which allows them to store their health information from many sources in one location so that it's always organized and available online. The blood pressure data will then be transferred automatically into Fallon Clinic's electronic health record system, where it will alert a team of diabetes-care nurses to patients who need medication changes.

Marquard's role in the project is to assess how well these 200 test patients adopt and adapt to the technology. "In our case," says Dr. Marquard, "my team is testing how patients use electronic blood pressure instruments to connect with HealthVault. The goal is to control their blood pressure more effectively and adjust their medication in a much more timely and effective way. You need frequent and accurate blood pressure readings in order to change their medication appropriately."

Right now, those readings are typically taken during doctors' visits every few months, when patients often suffer from White Coat Syndrome.

"So, from a medical perspective," notes Marquard, "it would be beneficial to do something that allows patients to take their blood pressure frequently and accurately in the safety of their own homes and send those readings to their healthcare teams so that, on the fly, they can be adjusting their blood pressure medication."

One result of the project will be a mass intervention for patients whose blood pressure falls outside the target range. The research team will set up electronic flags to alert nurses whenever some kind of intervention with a patient is needed. In response to each alert, nurses can use standard protocols to alter that patient's blood pressure medication and thereby bring the blood pressure into a healthful range.

Marquard's team is also responsible for creating the instructional material that, along with in-person demonstrations by nurses, will teach patients how to use the technology. In addition, the study will measure a range of secondary outcomes, including costs of the intervention, medication utilization, and a variety of patient-reported outcomes. Furthermore, researchers will interview and observe study subjects and care providers to gain a better understanding of factors affecting uptake and use of the intervention.

"If we do all that," observes Marquard, "hopefully it will improve the patients' health, their outcomes, cut down on emergencies, decrease costs for everyone, and ultimately reduce deaths." (February 2011)