

Reducing medical errors with wireless technologies

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Jeff Reed, director of Wireless@Virginia Tech and the Willis G. Worcester Professor of Electrical and Computer Engineering, Jung-Min “Jerry” Park, an associate professor of electrical and computer engineering, and Taeyoung Yang, a research scientist in the Department of Electrical and Computer Engineering, are working together to bring wireless technology to the forefront of health care.

Medical mistakes happen every day, even with the best doctors and

nurses. One way to reduce medical errors is to adopt new wireless technologies that improve health care and reduce costs, according to researchers with Virginia Tech's Institute for Critical Technology and Applied Science.

Hospitals are dense electromagnetic environments with multiple wireless devices working in one room. The problem is these devices do not work well together and often interfere with each other.

To address the challenges of the increasingly cluttered wireless spectrum and identify related applications, Wireless@Virginia Tech is partnering with the Center for Advanced Engineering and Research and the Mid-Atlantic Broadband Cooperative to form the Spectrum Management Research Testbed for Healthcare Group.

Even in modern hospitals, the majority of the patient medication administration depends on a manual process.

Today, there is no sophisticated way in which devices themselves can track that medicine is delivered to the patient.

Nurses must input a record of the administered medication manually. Perhaps even more importantly, some patients at home do not remember if they took their medicine, how much they took, or when they took it. Mistakes in taking medication can hinder a patient's recovery and could even be fatal.

To improve patient safety, the group is working on a prototype for a smart medicine bottle. The system uses chipless [radio frequency identification](#) and [cognitive radio](#) to sense the status of the bottle.

The cognitive radio is able to sense the level of medicine inside a bottle and can detect when the lid opens and closes. If an overdose is about to

occur or if a patient is about to miss the time window for taking the medicine, the cognitive radio will automatically alert the user or their caregiver through their smart phone.

"The cognitive wireless communication capabilities are an indispensable infrastructure in the future [health care](#) environment," said Taeyoung Yang, a research scientist in the Department of Electrical and Computer Engineering. "It will offer an improvement in patient quality of care, and in operating efficiency. The cognitive [wireless technology](#) can make real-time diagnostics and customized treatment regimens affordable, allow for more efficient personnel management, reduce liabilities through safer drug control, and increase ability to wirelessly deliver secure data about patients."

The group is exploring ways to capitalize on a Federal Communications Commission ruling to share the 3550-3650 megahertz band, previously designated only for military and satellite operations, for use in [medical applications](#).

Applications include locating doctors with their identification badges, securely reconfiguring hardware and firmware on the fly, creating medical cloud services, automatically switching commercial phones to support bring-your-own-device capabilities, communicating with patients and accessing their data, and being able to adjust airflow directions based on pathogen-spreading situations.

Provided by Virginia Tech

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