UF Spin-off Xhale Innovations' HyGreen System Makes Sure Health-care Workers Wash Their Hands

Sniffing

By John M. Dunn

Of all the high-tech machines in a modern hospital, the simple hand soap dispenser may save the most lives – but only if people use it.

About 1.7 million people contract healthcare-associated infections, or HAIs, annually in the United States and germy hands may be responsible for as many as half those infections.

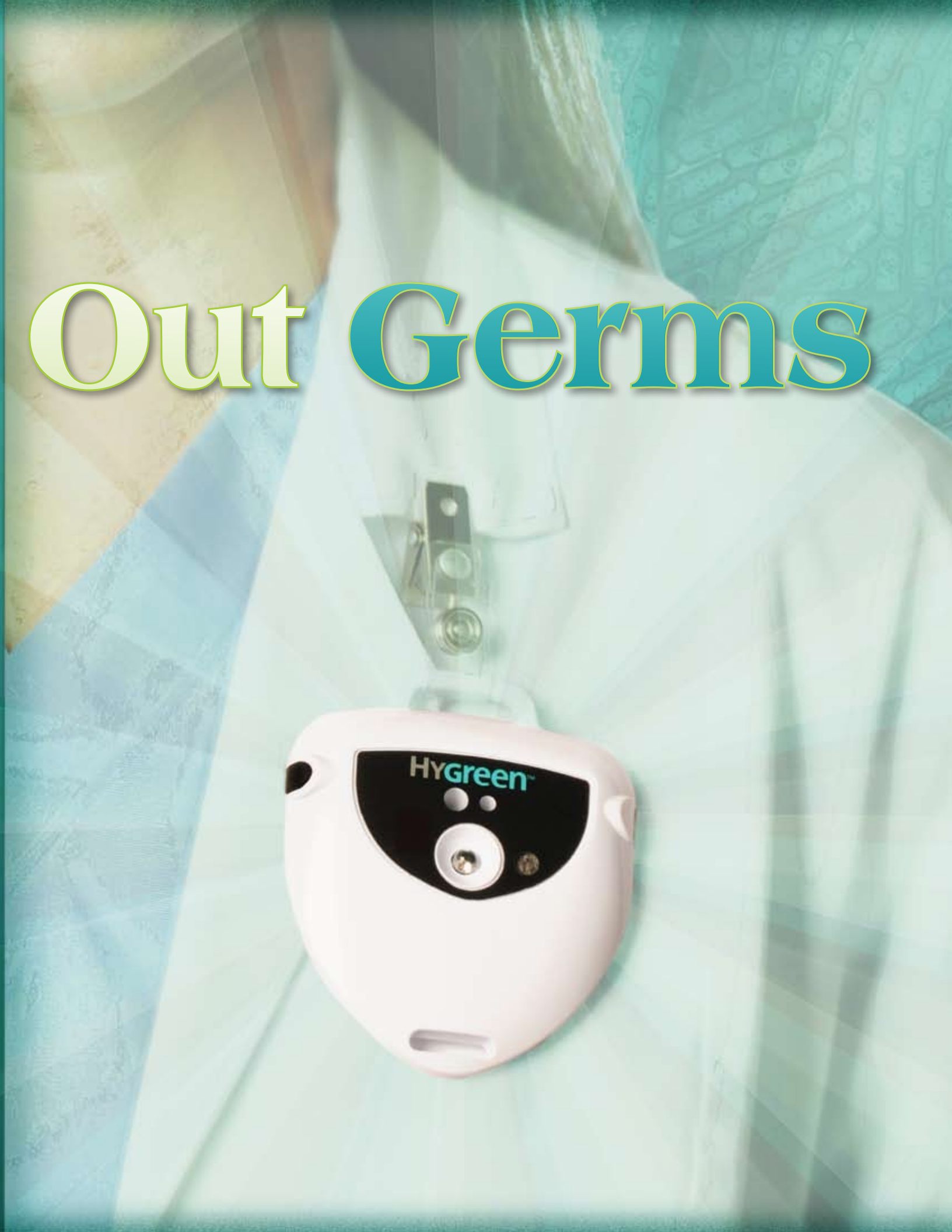
Health-care providers spend countless hours and millions of dollars annually educating their employees about the importance of hand-washing and monitoring their adherence to cleanliness protocols.

But numerous studies by the Centers for Disease Control and Prevention, the World Health Organization and other groups have found that health-care workers still wash their hands less than half the time after direct contact with patients. The reasons they give are many, including lack of time, sensitivity to the soaps or just plain forgetfulness.

UF anesthesiology Professor Richard Melker has more than 45 patents to his name, so when the subject of hand-washing came up a few years ago, his inventor's curiosity was piqued.

Melker began thinking about how a new generation of breath-detecting devices he and his colleagues at Gainesville's Xhale Innovations, Inc. were developing could be modified to address the hand-washing problem.

Photography by John Jernigan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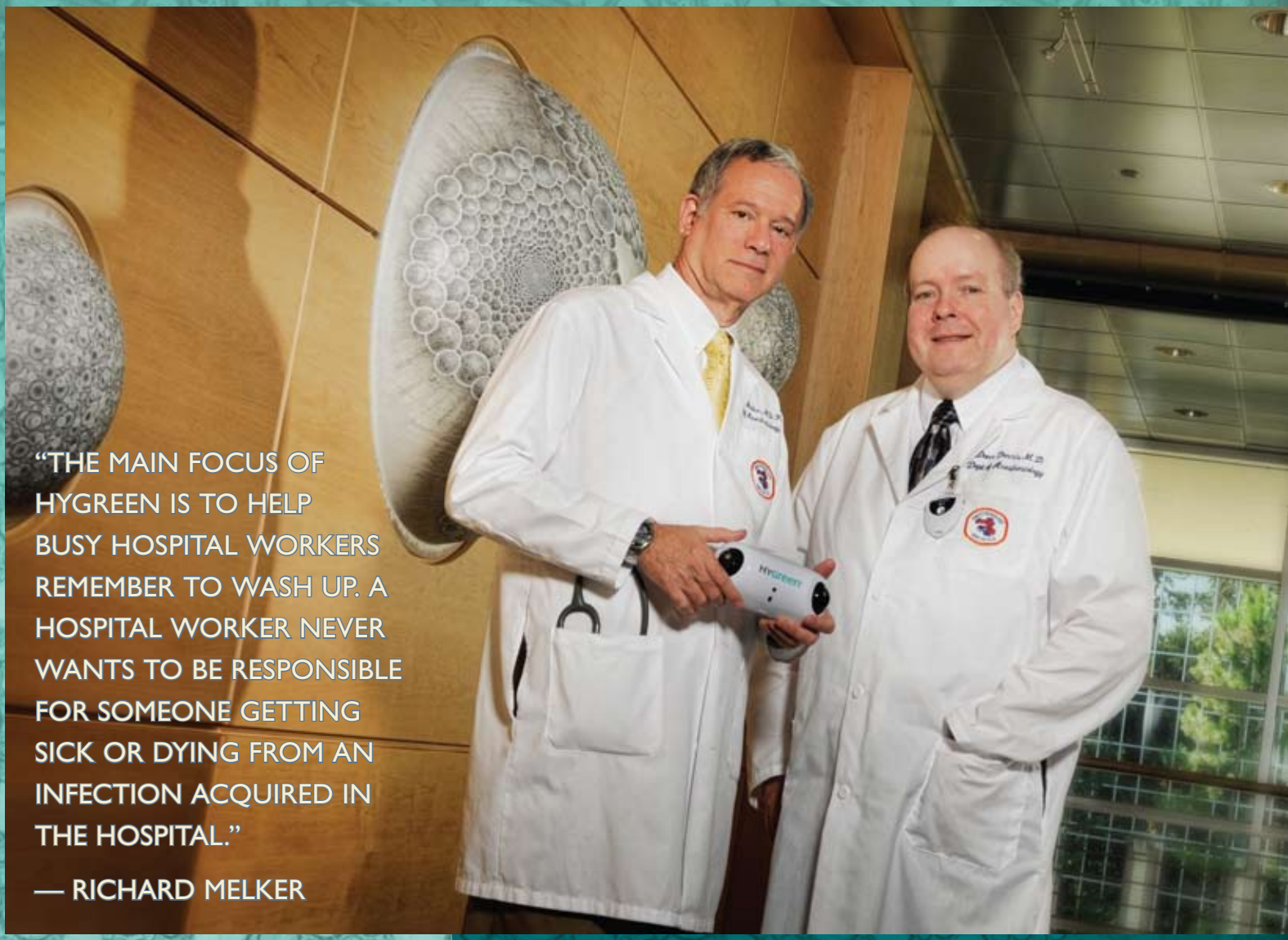

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Dr. Richard Melker and Dr. Donn Dennis, Xhale Chief Scientific Officer

One new device under development at Xhale — a UF spinoff Melker founded in 2006 with colleague Donn Dennis and local entrepreneur Richard Allen — could detect alcohol in human breath so precisely that the sample could be used as evidence in court.

The company was also developing a device to help physicians determine whether patients were taking their medications properly. A harmless substance — or tag — added to the prescribed medicine could later be detected on a patient's breath, telling doctors volumes about whether they complied with their prescriptions and about the efficacy of the treatment.

Since most hospital dispensers used alcohol-based antiseptic gels, Melker realized Xhale might already have the technology to get the job done.

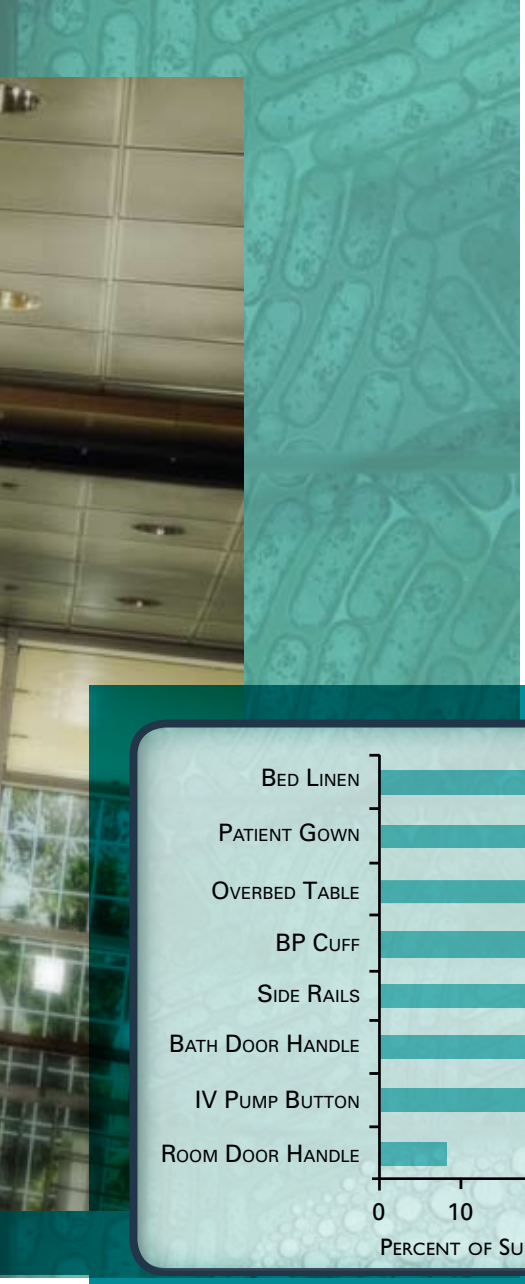
"The tag is already there for hand-hygiene detection and we're already working on alcohol detectors," Melker says.

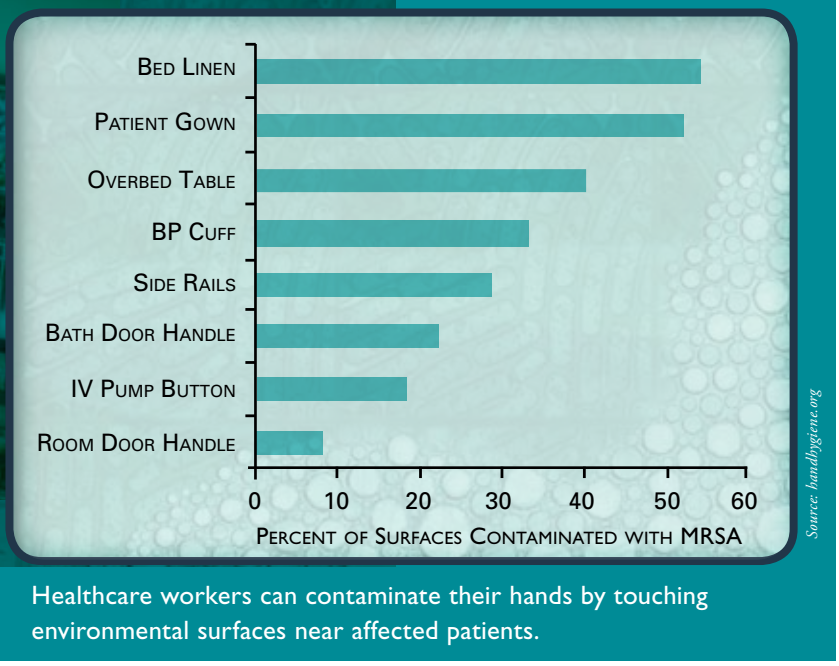
The result of that inspiration is HyGreen — a system that does what no other hand-hygiene monitoring system does.

"The main focus of HyGreen is to help busy hospital workers remember to wash up," says Melker. "A hospital worker never wants to be responsible for someone getting sick or dying from an infection acquired in the hospital."

After cleaning their hands with alcohol-based sanitizers (soap or gel), healthcare workers place them under a HyGreen sensor that sniffs for alcohol and sends a wireless "all clean" message to a badge worn by the healthcare worker. A wireless monitor mounted above the patient's bed searches for the message — if it's absent, the badge vibrates, reminding the healthcare worker to wash.

All interactions are recorded in real time, showing who is washing and who is not. The data allow the infectious disease staff to analyze who has been negligent, and decide on corrective action. Such data analysis could also help administrators track where and how an infection is being spread, says Loretta Fauerbach, Shands at UF director of infection control, who helped





Healthcare workers can contaminate their hands by touching environmental surfaces near affected patients.

write hand-washing guidelines for the CDC and lead a collaboration with HyGreen to evaluate the system in a hospital setting.

Having good records is important, because public and private health-care organizations are demanding improvements in hand-hygiene procedures at hospitals and clinics. In 2009, the Joint Commission — the private, non-profit accrediting agency for hospitals — mandated that all hospitals must implement hand-hygiene monitoring systems to fight against the spread of infections.

A strong economic incentive is also at work. The CDC estimates that HAIs cost the American health-care system more than $28 billion annually.

The Centers for Medicare and Medicaid Services (CMS) — the federal agency that administers Medicare and several other government medical insurance programs — has informed medical providers that it will no longer reimburse them for costs of extended hospital stays for patients who acquire HAIs, if these infections could have been reasonably avoided. CMS also won't let hospitals charge patients for this extra care.

All these forces have arrived at a good time for Xhale.

"The stars aligned for our product," says Melker.

While there are plenty of competing products on the market — including gloves, lotions and gels, automated dispensers, video cameras, staff training in best practices and radio-frequency identification systems — the people who've tested HyGreen have been impressed.

"HyGreen is better than the others that I've seen so far on the national level, because it can change behavior," says Dr. Lennox Archibald, hospital epidemiologist for Shands at UF and an adjunct professor of epidemiology. "Most of what you see at the conferences are fancy hand-washing machines."

Archibald and his staff recently installed a HyGreen system in the Neurosurgical Intensive Care Unit at Shands. This first step, he explains, was to "see whether the system worked as it is supposed to and to iron out wrinkles — that is, mechanical or electrical and logistical problems."

Now plans are under way to see whether HyGreen "shows significant improvements in patient outcomes — such as statistically significant decreases in blood and wound infections," says Archibald. Hospital officials also want to see how good the system is at getting hospital workers to adhere to a hand-hygiene regime. Success means a 90-percent or better compliance rate.

HyGreen is now also in place at Miami Children's Hospital, where, according to Archibald, "Data regarding adherence and effects on infection rates currently are being aggregated for the first time." Flagler Hospital in St. Augustine also is installing the system.

In addition, HyGreen is debuting in Chicago.

"Last year we were looking at our dismal record of hospital-acquired infections and wanted to see what HyGreen had to offer," explains Dr. James L. Cook, chief of infectious diseases at the University of Illinois College of Medicine. "We had used hand dispensers and monitored people, using a variety of spies, and we got anywhere from 40- to 80-percent compliance rate. But we wanted something more reliable and predictable. So, we looked at four or five other systems, including one that was conceptually similar to HyGreen, but it couldn't detect soap vapors [as HyGreen can]. And that's a problem because you can't use alcohol around some patients in ICU units."

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> — RICHARD ALLEN
> *CEO, Xhale Innovations, Inc.*

Plans also call for the HyGreen system to be set up on a whole floor of an intensive care unit at the University of Illinois Hospital, and at a major intensive care unit at nearby Jesse Brown VA Hospital in Chicago. Results of the studies will be compared with those recorded at similar areas elsewhere in the hospitals, where workers will continue to use direct observation to monitor hand washing. After six months hospital officials will conduct a preliminary review.

HyGreen has generated a lot of media interest. *Popular Science* magazine named the product one of its Top New Technologies for 2009, and major media outlets like National Public Radio have reported on it.

Xhale currently employs 35 people, with plans to add another 15 workers by the end of 2010, and maybe another 50 in 2011. Xhale's

How the HyGreen System Works...

Xhale has incorporated a handwashing monitor into a holder for the identification badge hospital employees are required to wear.

When a hospital employee washes his or her hands, a HyGreen detector "smells" the soap and sends a message to the monitor they're wearing, causing it to glow green. This also lets patients know the worker's hands are clean.

Gainesville headquarters houses research facilities and serves as a base for its installation crew. The company also has an engineering facility in Bowling Green, Ky.

"Our focus for the next six months is to get the system installed at every hospital in the United States," says company CEO Allen, adding that the company is also exploring other markets, including extended care and nursing home facilities, medical clinics, restaurants, food processing centers, cruise ships, schools and military facilities.

HyGreen's developers anticipate that hospitals will readily accept the system because not only can it help reduce infections, it also will pay for itself within a few months.

According to the American Hospital Association, there are more than 5,800 hospitals with 950,000 beds in the United States, so HyGreen's potential domestic market is enormous.

And HAIs are not just a problem in the United States. In Europe, HAIs account for an estimated 37,000 deaths and cost about 7 billion euro per year, according to the World Health Organization. The situation is even worse in developing countries.

"Something has to be done about hand washing," says Archibald, whose career includes a 10-year stint with the CDC. "Otherwise the bugs are going to win."

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Related website:
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If employees forget to wash their hands between patients, as they approach another bed the monitor they're wearing will begin to vibrate, reminding them to wash up.

The real-time data the HyGreen system records about all employee-patient interactions enable hospital administrators to address infection control issues immediately.