By Massoud Safaee

Advanced Technology: Enhancing Patient Experience

Would you rather spend a day in the hospital or on an airplane? Given the amenities patients enjoy in today's high-tech hospitals—and the trials and tribulations of travelers held hostage on the runway without food or water—this perhaps is no longer just a rhetorical question. At least from the perspective of creature comfort, hospitals have become rather pleasant places.

Wireless IV systems now allow mobile patients to walk hospital corridors relatively unencumbered. They may even be allowed to congregate in the aisles! And interactive entertainment with video on-demand, interactive television and Internet access as well as video games, make time in the hospital bed fly quickly, and with more legroom than on your average trip overseas.

Needless to say, the primary goal of hospital technology is not to show patients a good time. Aside from the marketing bonus it provides in an increasingly competitive healthcare environment, state-of-the-art medical technology is designed to reduce in-patient and staff cost as well as the risk of medical error.

Just like the ultimate goal of air travel is to get the passenger quickly and safely to his desired destination—with in-flight entertainment only an added bonus—the use of advanced technology in the medical field serves the purpose of getting the patient from the scene of the accident to the emergency room, and ultimately back home as quickly and with as few complications as possible.

A Patient's Journey

So let's follow our patient—we'll call him Jules V.—on his journey through the medical system of the 21st century after suffering a serious accident. After receiving a cell phone call from an eyewitness on the scene, the ambulance determines within 100-sq.-ft. accuracy the location of the accident thanks to wireless enhanced E911 technology. Using a Global Positioning System, the medics rush Mr. V. to the closest hospital, choosing the shortest distance available under existing traffic conditions. En route they employ an emergency medical communication system to tap into the hospital's database, making sure the facility has both the capacity to take in the patient as well as the medical equipment and specialists on staff to save his life.

Even before Mr. V. reaches the emergency room, hospital staff review his electronic medical records (EMR) to learn about pre-existing conditions and allergies, while getting the ER ready. The moment Mr. V. is admitted, he is tagged with a bar-coded armband that will not be removed until he leaves the hospital. Not only is this unique code associated with his EMR, it also allows hospital staff to track Mr. V's whereabouts as he is transferred from the ER to the Intensive Care Unit and ultimately to the bed where he will stay until his release.

Left: An ICU patient room at Mercy Gilbert Hospital, Gilbert, Ariz. Below: The Cath Lab at Mercy Gilbert Hospital.

After the successful completion of the necessary medical procedure, Mr. V's doctor uses the hospital's Computerized Physician Order Entry to transmit to the pharmacy an electronic prescription for all of Mr. V's required oral medications. At the appointed time of day, the nurse will hand Mr. V. his medication in individually wrapped and bar-coded packages.

Using a scanner the nurse will compare the bar code on Mr. V.'s wristband with that on the medication wrapper to ensure the correct medication is being administered in the proper dosage. Should the doctor determine that Mr. V. requires less of a particular medication or a different one, the unopened packages will be returned to a medication dispensing system (Pyxis) and re-wrapped and coded for the next patient.

The only sounds in Mr. V's room are the beep of the heart rate monitor. Any other ringing noises would alert nurses that a surgery tool had accidentally been left in Mr. V.'s body, thanks to a Radio Frequency Identification chip that not only allows surgery tools to be tracked, but also lets medical staff know if the tool has been sterilized or a new one needs to be ordered.

As Mr. V. recovers from his surgery, he will be spotted walking freely about the hospital, since wireless patient monitoring will allow the hospital staff to track him at all times. At some point he may decide to take a look at his EMR through the Clinical Point-of-Care System to learn more about his procedure and diagnosis. Mr. V may discover that students at the local medical school will watch a digital recording of his operation, and that an out-of-town specialist was consulted by the operating physician via Live Remote Consultation when Mr. V's life hung in the balance.

When all is said and done, Mr. V. owes a great deal to medical technology. Now he just has to pay for it. As part of the electronic discharge procedures he will receive detailed billing information as well as a breakdown of what percentage will be covered by insurance.

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A surgery room at St. Joseph's Hospital & Medical Center, BNI Tower, Phoenix, Ariz.

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Looking Behind the Scenes

Much of the scenario described above already is reality in large metropolitan areas across the United States and in hospitals constructed during the past three to four years. What has been holding back a more widespread use of such complex medical technology and, more importantly, wireless interconnectedness between medical facilities, are regulatory issues, both in terms of data protection and manufacturing standards.

The Health Information Patient Privacy Act of 1996 has created potential liability issues that have discouraged institutions from establishing systems to share patient information electronically. Currently, a patient's EMR card is proprietary and only can be used within one medical facility. Large medical care providers and insurers like Kaiser Permanente have lobbied for legislation to make it easier to share information across institutional and state borders without compromising confidentiality.

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At the same time, the U.S. government has budgeted $250 million to develop standards for manufacturers of medical equipment and technology. The lack of interoperability between systems, and subsequently cost, has prevented hospitals from retrofitting and upgrading their building systems. Once common standards and a common infrastructure have been achieved, it no longer will be necessary to install a different cabling system for each facility within a hospital.

From a design and construction point of view it is important to keep in mind that while digital technology is mostly wireless for the end-user, it does require a considerable network of wires and cables to make it work. Architects and designers need to be aware of technology plans early on in the programming stage in order to account for space and configuration requirements. Design specs have to respond to the environmental needs of highly sensitive medical equipment such as 24/7 air conditioning or clean power.

The "wireless ready" hospital will enable owners and operators to develop a flexible system that can accept future frequencies and technologies. Wireless medical applications are

wide-ranging, from refrigerator alarms to building automation to energy management system control, to medical wireless applications such as IV alarm, RFID, PDA, and wireless laptops for electronic charting. Another important application is the enhancement of police and fire department wireless frequencies that will allow communication with hospital emergency operations via their walkie-talkies.

For bandwidth-intensive applications, such as digital imaging and video distribution/distance learning, healthcare facilities are starting to rely on high-speed fiber optics. In rural areas, fiber optics allow for high-speed connections between a main hospital and satellite healthcare facilities. However, for the foreseeable future copper will continue to be the choice for connecting devices to the main system (horizontal distribution/connection) within a hospital.

The transformation to digital has had an impact on hospital space planning as well. For example, the large amount of space previously allocated for paper file storage may no longer be necessary. But the space required for telecom rooms has grown substantially to support electronic medical systems. Additional space also will be necessary for larger data centers that serve as the brains of many healthcare facilities on a 24/7 basis. That's also why emergency generators and uninterrupted power systems that are dedicated to the IT functions have become a vital part of any hospital infrastructure.

So What Will it Be?

Given all of this, where would I rather spend my day? In the hospital or on a plane? Air travel will let me visit distant friends and family and experience new and exciting places, but it will cost me money and I will have jet lag. With insurance a hospital stay might be cheaper. If all goes well, I will end up right where I am now. But chances are my loved ones will be right by my side when I wake up. I guess the deal-breaker is going to be the food. ■

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