

Children's Memorial Hospital in Chicago was no exception until recently. The hospital is part of Northwestern University's Feinberg School of Medicine. It is now ranked as the best children's hospital in Illinois and one of the best in the United States. In 2006, the 1,100 pediatric specialists treated over 100,000 patients and had more than 365,000 outpatient visits.

For many years the hospital had a hodgepodge of communications technologies: landline phones, a local network to support cell phones, a wireless surveillance system, pagers, a radio frequency system for tracking the electronic tags that doctors wear, and a variety of patient-monitoring systems. It did not have a way to ensure accurate drug administration, and this was one reason to reconsider the hospital's communication infrastructure.

Often, one signal interfered with another, creating several areas where cell phones and pagers could not function. Structural challenges also presented problems. Hospitals are built from steel floors and many concrete walls. Thick concrete and lead walls are built around radiation rooms. All of these materials weaken radio signals or block them out altogether.

The hospital's Director of IT started to look for a comprehensive solution. This would include not only better communications, but also improved technologies for the bedside staff and computerized drug prescription entry. He preferred a single system that would address their many challenges. After an extensive search, he selected a company called InnerWireless to deploy a broadband system. InnerWireless produces a system it calls Medical-grade Wireless Utility.

The system uses passive wireless, which means that the devices the staff uses activate the networking circuitry. In active wireless, electronic devices must provide electric power to convert radio signals. Passive systems do not need to be powered. Therefore, with Medical-grade Wireless Utility, fewer access points had to be installed and maintained. Other systems would require more access points and still would not totally eliminate dead spots. The InnerWireless system requires few access points but still provides uninterrupted communications throughout the building. The technology also includes a distributed antenna system. This allows the same wireless systems to support cellular phones, pagers, Wi-Fi (IEEE 802.11), two-way radio for facilities management, and first-responder radio for fire, police, and emergency medical teams.

InnerWireless specializes in in-building wireless communication, and has installed its system in several hospitals. It customizes the deployment for every hospital to ensure that communication is available throughout each building. Typically, a wireless router is installed in the basement. From the

router a cable is run up through the building's "spine," and a distribution system is located on each floor.

Now, physicians enter drug prescriptions into a database for each patient. The hospital's pharmacy receives the transmitted prescription and prepares the drug, then attaches the proper bar-code to it. Nurses use carts equipped with a small networked computer that is also equipped with a bar-code scanner. On their rounds, before they administer drugs to patients, they scan the bar-code. The data is automatically communicated to the pharmacy database, and the nurse can see if the drug and dosage are the right ones for the patient. Nurses can also use email through the same computers. The error rate of drug administration has decreased significantly.

Electronic medical records (EMRs), wireless devices, and mobile technology have increased the importance of hospital information technology networks. Wi-Fi allows wireless blood pressure cuffs to automatically store and transfer readings to a patient's records. Doctors can then view patient records on their iPads. Radiology images have also migrated from the use of film to electronic imaging. These images can now be stored, viewed, and distributed by medical personnel without having to find the traditional film images.

The reliance on technology networks becomes more imperative. CIO Cathy Bruno from Eastern Main Healthcare Systems says "To have a single unified electronic patient record across all our locations, so that information is available no matter where our patients access are, we need network connectivity." While it reduces the need for traditional hardcopy patient records, it also means that network connectivity must be available without downtimes or reduction in download speeds. The introduction of portable tablets has promoted the need for electronic patient recordkeeping. Medical personnel can now "carry" the technology with them. The availability of wireless medical devices such as blood pressure cuffs, must be able to ID a patient and transmit the data securely and accurately.

Sources: Anonymous. (2007). Children's Memorial Hospital, Chicago. from <http://www.childrensmemorial.org>; O'Connor, F. (2012). Hospital networks take key role in healthcare. *Network World*, 29(14), 11-11,16; Pettis, A. (2006). Patient Care Goes Wireless; Children's Memorial Hospital, Chicago, is like many of the facilities that serve the critically ill. *eWeek*, 23(15), 1-N1,N4.

Thinking About the Case

1. The hospital already had bar-coding before the new networking system was installed. What can be done now that could not be done before to reduce drug administration errors?