

THE COMPUTERWORLD HONORS PROGRAM

CASE STUDY



LOCATION:
*Boston, Massachusetts,
United States*

YEAR:
2006

STATUS:
Laureate

CATEGORY:
Medicine

NOMINATING COMPANY:
Cisco

ORGANIZATION:

Boston Medical Center

PROJECT NAME:

Real Time Nurse Call

Summary

When it became time for Boston Medical Center (BMC) to swap its aging Nurse Call system they opted for a solution that would integrate with IP Telephony. By incorporating Cisco core infrastructure and a new Nurse Call system, patients receive faster response and better care; nurses rate job satisfaction higher (enhancing the ability to recruit and retain high level staff); and administrators are recognizing gains in overall productivity. With wireless phones at their sides, nurses can get their jobs done with fewer steps and less effort. The result is patients and families who are better served by a staff able to achieve the hospital's mission of providing exceptional care without exception. And this is just the beginning, with nurses now able to receive real-time alerts from the bedside via the Cisco VOIP infrastructure, a new dynamic for medical communications has been established.

Introductory Overview

Four years ago, BMC upgraded its network infrastructure to support a new computer-based physician order entry (CPOE) system, making BMC among less than 10% of hospitals in the United States to fully implement such a system. The hospital deployed Cisco Aironet® 1200 Series access points across the campus, delivering 100 Mbps wireless connectivity to the CPOE with a high-capacity, fully redundant core connecting all 22 campus buildings. Two years after that, BMC extended applications running on the network directly to the bedside, helping BMC bring new applications, such as an electronic medical administration record (EMAR), directly into a patient's room.

The nurses and the patients they serve depended heavily on 2 aging nurse call systems purchased from different vendors prior to the 1994 merger that formed BMC. It became apparent that the systems could not keep pace with the hospital's physical growth and increased expectation of interoperability with critical clinical technology. The existing call system was rapidly becoming inadequate for the hospital's needs. Patients that required assistance had to press a call button at their bedsides, which caused a light to flash both outside their rooms and at the central nurses' station. The call would then be answered in one of two ways: Either by a nurse, who saw the flashing light or a staff person at the central station would send an overhead page over a unit-



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based public announcement system to find the nurse responsible for that patient. The overhead paging was distracting and annoying to patients and nurses alike.

“Noise pollution is a major concern for us,” says Kathleen Davidson, Chief Nursing Officer, Boston Medical Center. “Overhead pages impact our ability to maintain tranquility in the units.”

It was possible for pages to be missed or misunderstood by busy nurses and Meg Aranow, VP and Chief Information Officer wanted a new nurse call system that could take advantage of the hospital’s new wireless infrastructure.. “We wanted to extend our robust Cisco 802.11 to voice communications.” Aranow asked Cisco to work with Rauland-Borg, the vendor of the nurse call system, and Emergin Technologies, who provided the middleware between the nurse call system and Cisco CallManager call processing software.

BMC’s old nurse call systems were inefficient and couldn’t interface with the hospital’s computer systems or with some of the bedside clinical devices. Rather than simply updating the existing nurse call system, Aranow’s vision was more far reaching and included giving the nursing staff real-time communication with patients and physicians, providing them with real-time information they needed to be more responsive and proactive, and building the foundation that could integrate other systems and devices.

Cisco, Rauland-Borg, and Emergin collaborated with BMC to create an Extensible Mark Language (XML)-based application that allows the patient to push the bedside button and send a text message over the Cisco wireless network directly to the IP phone of the nurse assigned to that patient’s room.

Benefits

The nurse call system captures and transmits all patients’ requests and alarms and displays the information on the nurse’s wireless IP phone in real time. The nurses, who carry their IP phones with them, can look at their display; see the room and bed number, as well as the nature of each patient’s request. They can then speak directly to the patient via the room’s intercom in the bed’s headwall and also use the IP phone to immediately call the physician for consultation. The system has a built-in backup so that if the nurse cannot respond to the call, the alert is routed back to the central station for redirection.

In the future the phones will also notify nurses when, for example, IVs are running out or when ventilators are having problems.— “We’ve gotten overwhelmingly positive feedback (from nurses and patients),” Geralyn Saunders, BMC Clinical Applications Director says. “The nurses grasped the technology almost immediately and quickly discovered its benefits.”

In addition to improving the real-time processes that serve the patients, the Emergin database allows for a retrospective review and measurement of these functions, and supports continuous quality improvement initiatives. Nursing responsiveness to patient requests (“calls”) is a significant driver for patient satisfaction. Through the use of the new system, BMC is able to track call volumes and time to respond by time of day and day of week. This information serves as the basis for monitoring these important functions and taking required action to improve service.

Perhaps most importantly, the implemented architecture will serve as the basis for delivering the



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next generation of technology-supported patient care interventions.

Connecting bedside clinical devices to wearable display devices will ensure that the information is immediately available to the right clinician. JCAHO, the accreditation body for the nation's hospitals has identified a 2006 National Patient Safety Goal to "Improve the effectiveness of communication among caregivers". Specifically they ask hospital to address "hand-offs" (the verbal communication among collaborating clinicians). Using the network to replace these human hand-offs will reduce or eliminate the possibilities of omission, misunderstanding, and harmful delays. This is the future promise of the implemented architecture.

The Importance of Technology

BMC believes strongly in investing in technology and training to support higher levels of staff productivity and to aid the delivery of excellence in patient care. The hospital's commitment to its nursing staff is reflected in the fact that the turnover rate for their nurses is less than five percent. In a 2005 Survey completed by Massachusetts Hospital Association and Massachusetts Organization of Nurse Executives they found an over 7 percent turnover rate statewide, bring BMC a better than 2% rate increase in retention of nurses.

BMC initially chose Cisco for its original campus-wide wired and wireless infrastructure to provide the foundation for adding voice and other services without having to rebuild the network from scratch. Cisco Quality of Service (QoS) is used to prioritize bandwidth over the network, ensuring that adding voice does not degrade the existing data applications. Security was also of critical importance to BMC, both to guard against security breaches that could disrupt the network and affect delivery of services, and protecting patient confidentiality. BMC's wireless security solution is embedded with Cisco enterprise-ready, standards-based, WLAN security solutions that ensure confidential data will remain private and secure and that the network will be protected.

Networked Information Systems (NIS) conducted the wireless site survey for the pilot project, mapping out the optimum coverage and eliminating any signal conflicts between access points as nurses moved throughout the unit. About 15 additional wireless access points were added for the pilot project with another 120 deployed throughout the campus to fully implement the nurse call system. BMC used Cisco Catalyst switches with inline power, which allowed them to install access points in the best locations without requiring separate electrical lines to provide power.

Originality

This technology is transforming the healthcare delivery space by introducing personal mobile devices to the care-giving team, connecting nurses with their patients in more reliable way. In this case, increased deployment of technology is actually enabling the human touch so necessary to health and peace of mind in a hospital setting.

In addition to strengthening the nurse-patient connection, the IP phones area also strengthening the collaboration among members of the care-giving team. No longer must team members rely on a series of pages and call-backs to speak about issues of patient care, rather the nurses can communicate from the bedside with other members of the team, enabling the collaborative care model with real time decision-making. Communication has long been held as a key to im-



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proved patient safety, provided nurses with personal communication devices is one way Boston Medical Center is continuing its commitment to safety.

Success

Prior to the new system, nurses being paged on the overhead paging system were forced to waste valuable time running back to the patient's room to determine the problem. Now, when the nurse receives a page on the new wireless system, he or she can view the nature of the request on their IP phone screens and immediately address the problem. Noisy, distracting overhead paging has been virtually eliminated. "We expect to see a significant reduction in the number of repeat pages and calls because patients will reach the right person the first time," Aranow says.

Even physicians are benefiting from the new nurse call system. "Physicians have told us that they are able to locate nurses more quickly with the new system," Aranow says. "In fact, we've had quite a few physicians express interest in having Cisco wireless phones themselves."

"This solution is about delivering information directly to the caregiver to allow them to be more responsive to patients," Davidson says. "Our nursing staff appreciates that we are investing in systems to help them provide better patient care."

The solution gives BMC virtually unlimited potential in terms of the type of information nurses can receive. One example is the ability to integrate alarms from clinical devices in the patient's rooms, such as ventilators and IV pumps. Rather than relying on an audible alarm in the room and alerts at the central desk, the alert would be generated directly on the phone. Another example is having abnormal (critically high or low) lab results automatically trigger a text message alert on the nurse's wireless IP phone, rather than relying on lab personnel to call.

BMC also anticipates the ability to transmit data from the wireless IP phone, transforming the phone from a communications device to a fully equipped computing device. This, in turn, will help BMC incorporate capabilities like radio frequency identification (RFID) and other tracking technologies. "We know that we will continue to converge information over our network and Cisco has given us the infrastructure to do that," Aranow says.

Difficulty

The nurse call system includes call buttons integrated into a patient control device (which also controls the bed movements and television). This device requires specific hardwiring at the headwall of each bed. To wire the rooms and control the environmental in accordance with healthcare regulations, each of 366 rooms had to be taken out of service for 1 day. So as not to inconvenience patients or adversely effect revenues, only 3 rooms were offline at any given time. For this reason the full transition took longer then would have otherwise been true.