A few years ago, the University of Pittsburgh Medical Center (UPMC) and IBM decided to build on their shared vision of the future of healthcare by forming a unique and far-reaching partnership aimed at developing and commercializing new clinical solutions. One of UPMC's defining qualities as an organization is a pervasive entrepreneurial culture, driven by an intense commitment to improving patient care through clinical innovation. IBM's partnership with UPMC taps directly into this quality and demonstrates how a shared vision of healthcare innovation can produce real results.

As the current national discussion around healthcare reform has shown, the battle to improve healthcare delivery—to make it safer, more efficient and more cost effective—has many fronts. One of the most important is the inpatient nursing unit environment within hospitals, which in many ways represents the backbone—the “front line”—of the healthcare delivery system. As the point of most intensive contact between caregivers and patients, nursing units are the scene of a constant choreography of activities, the majority of which are routine and predictable. Patients are monitored and tested, administered medications, and, if necessary, repositioned while in their beds to avoid pressure ulcers—all in strict accordance with guidelines around timing, frequency and dosage. That's just a sampling.

**Overview**

**The Need**

UPMC sought to improve the workflow efficiency in its nursing units to enhance the quality of care, reduce costs/errors and leverage its nursing resources more effectively.

**The Solution**

Supported by its innovative partnership with IBM, UPMC developed SmartRoom, a workflow optimization system that leverages clinical intelligence to guide nursing decisions and activities.

**What Makes It Smarter**

As nurses address ad hoc challenges on the fly, SmartRoom’s underlying clinical algorithms automatically adapt the prioritization of tasks, ensuring that patients get the right treatment at the right time—thus improving care and reducing errors.

**The Result**

“Our aim is to provide the right care, at the right time, all the time. SmartRoom is an example of how our partnership with IBM is helping us meet that goal.”

— Tami Minnier, RN, Chief Quality Officer, UPMC

**Mixing the routine and the unpredictable**

Around this core framework of tasks, nursing staff are also required to respond to ad hoc situations that routinely pull them away from their more structured regimen. This may include consulting with attending physicians, handling emergency situations, answering questions from patients’ families and above all providing compassionate care at the patient’s bedside. It also includes the kind of critical thinking required to spot and solve problems. On top of all this, nursing units need to make a seamless handoff from one shift to the next to ensure not only continuity of care, but also that clinical “red flags” are not missed in the transition. For nursing staff, it’s a tall order that relies heavily on memory, direct face-to-face communication and lots of walking.

Within this task mix, UPMC saw the opportunity to improve the quality
Instrumented
In-room sensing devices authenticate nursing staff, and trigger the retrieval and display of relevant patient information.

Interconnected
SmartRoom connects UPMC’s clinical knowledge base and best practices in realtime to nurses on the floor.

Intelligent
Algorithms developed by UPMC clinical staff control the prioritization of nursing tasks, ensuring the right treatment at the right time.

Business Benefits
- Reduction in time spent completing documentation of nursing tasks
- Expected reduction in medical errors
- Additional time that nurses can use to focus on compassionate care-giving
- Easier allocation of work among nursing unit staff
- Improved patient satisfaction
- More seamless handoff of patient information between shifts
- Improved identification and tracking of patient problems
- Helps to ensure timeliness of tasks performed such as turning patients at risk on bed ulcers
- Nursing management has better data on what time requirements are needed on nursing units each and every hour

Bringing intelligence to the bedside
UPMC’s SmartRoom solution is supported by real-time linkages back into key clinical systems such as pharmacy and lab services. At any given time, the underlying workflow module compiles a list of required tasks from various backend systems, using algorithms derived from UPMC nursing staff activities that indicate the order in which tasks should be done. To control access to this information, SmartRoom employs indoor positioning technology from IBM Business Partner Sonitor Technologies, which uses in-room ultrasound sensing devices to identify the nurse—or any other hospital staff member—entering the room. Once authenticated, the nurse calls up the task list on the display screen within the room. Upon performing the task, the nurse can easily confirm on the touch screen that it completed, which triggers the automatic updating of the appropriate electronic records. Additional clinical information can be pulled up in the room with the patient’s permission.

Importantly, UPMC designers realized that the true test of SmartRoom’s effectiveness is its ability to adapt to the decidedly nonlinear nature of the average nurse’s task sequence. Interruptions in
the core workflow can range from brief (getting a blanket for a patient), new physician orders, to prolonged (an extended discussion with a patient’s family). In any case, time lapses—and priorities change. The intelligence of the UPMC solution is seen in its ability to dynamically adapt the task list based on the comparative time sensitivity of the different tasks on the list. This means, for instance that a task initially placed fourth on the priority list could be escalated to number one priority if not performed within a specific timeframe. This rules and intelligence-based adaptability ensures that UPMC patients receive the right treatment at the right time. While technology enables this intelligence in the form of algorithms, the logic that guides it comes directly from the clinical knowledge of UPMC nurses and physicians. Rather than trying to industrialize nursing or deploy a new gadget, this technology is making routine tasks easier and allowing nurses more time to do what they are trained for—critical thinking and spending time with patients at the bedside.

UPMC’s SmartRoom solution is a textbook example of the technology and strategic benefits of its partnership with IBM. After developing its own prototype of the solution using home-grown technology, UPMC worked with IBM to create more open interfaces with backend systems. Using IBM WebSphere Message Broker to create an enterprise service bus between the solution and its clinical systems, UPMC was able to redesign the solution using a service-oriented architecture with open interfaces. In addition to making it easier to deploy the SmartRoom solution more broadly within UPMC, this SOA-centric approach also facilitates UPMC and IBM’s joint strategy of offering innovative clinical solutions like SmartRoom to other healthcare providers as commercial offerings. Moreover, UPMC can deploy such solutions on its existing virtualized infrastructure (powered by IBM hardware and software), helping guarantee the high levels of availability that all clinical applications require.

Improving patient care is the fundamental driver behind all of UPMC’s clinical innovations, and represents the primary benefit of the SmartRoom initiative, explains David Sharbaugh, Senior Director of UPMC’s Center for Quality Improvement and Innovation.

“SmartRoom improves the quality of care by providing information directly to the bedside—where it’s needed most—not to a computer in the hallway or to a workstation at the nursing desk.”

—David Sharbaugh, Senior Director of UPMC’s Center for Quality Improvement and Innovation

Solution Components

Software
- IBM WebSphere Message Broker
- IBM WebSphere Application Server

Servers
- IBM BladeCenter HS21

Services
- IBM Global Business Services
- IBM Global Technology Services

Business Partner
- Sonitor Technologies

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Changing the patient experience

UPMC also designed the SmartRoom solution to alleviate the disorientation that hospital stays can induce in patients. The ability to send and receive e-mails, for example, provides patients with a crucial link to friends and family. More powerful is the way SmartRoom removes the “mystery” element of hospital stays by letting patients know who just entered the room, what tests or procedures they have scheduled that day and what they can expect to experience. These are just some of the ways UPMC expects greater control can translate into higher patient satisfaction.

Chief Quality Officer Tami Minnier, RN sees the SmartRoom project as embodying the vision that guides UPMC’s innovation efforts. “Our aim is to provide the right care, at the right time, all the time,” says Minnier. “SmartRoom is an example of how our partnership with IBM is helping us meet that goal.”