

An abstract, artistic illustration of a hand holding a mobile device. The hand and device are rendered in a translucent, olive-green color with a grid pattern, set against a white background with a subtle grid. The hand is positioned on the right side, with fingers curled around the device.

Revitalizing Healthcare Delivery with Mobile Communications

PART TWO:

Communication Devices in Healthcare

This four-part series examines the ways that wireless technology and mobile communications can enhance the efficiency and quality of institutional healthcare, improving the processes through which doctors, nurses, specialists and support staff members deliver medical treatment. Part Two takes a closer look at popular communication devices and considers their usefulness and effectiveness within healthcare facilities.

Introduction

Technology has spawned a dizzying array of communication devices—each with individual strengths and weaknesses. These devices, by virtue of their unique functionality, fit into niches within organizations to address very real problems. However, the varying kinds of specialized devices that have gained popularity complicate the communication picture. Healthcare professionals often find themselves relying on several different pieces of communication gear to stay in contact and get through the day.

Hospitals and clinics, for example, often employ pagers, cell phones, PDAs, VoIP house phones and other devices to satisfy communication requirements. Beyond the physical burden of ensuring that each device is fully charged and operable, this situation makes it necessary to monitor and respond to several different communication channels during the day. Maintaining and responding to several communication channels can create confusion and indecision in hospital workers and raise difficult questions, such as:

- Does a pager trump an incoming message on a smartphone?
- What is the protocol in force: for example, if a nurse wants to reach a doctor urgently, should she call his cell phone or page him?
- Who has access to the required numbers?
- Is a co-worker currently covering for a sick colleague?
- Will an email message be read and answered in time to resolve a patient issue?
- Did the maintenance worker get the task request about the broken water pipe in the bathroom?
- Was an important message even received?

These kinds of questions—and the decisions made as to how to address them—affect the overall efficiency of the facility and, often, the well-being of the patients receiving care.

Support and maintenance of a wide array of communication devices also adds to IT headaches within the organization. IT professionals must address a number of difficult issues resulting from device proliferation:

- Can data security and patient privacy be maintained for each communication device?
- Can vital information be freely and securely exchanged between different devices, such as a handheld PDA and the organization's database server?
- Can upgrades and maintenance of a wide range of devices be handled in a timely and efficient way?
- Can the cost of service be easily monitored and budgeted? Can bill reconciliation, usage policies and controls be effectively maintained?

Communication issues and IT issues can often be resolved by adopting a single communication device with converged functionality, as discussed in the following sections.



Prioritizing Requests

Doctors and nurses, as well as support staff members, are often bombarded with multiple requests throughout the day. This steady onslaught of requests and information can make it difficult to respond appropriately to the priority and urgency of messages. Just as triage techniques are used in the crisis center to ensure that the most critically ill patients are handled first, communication techniques must be coordinated in a way that ensures that staff members respond to critical alerts and vital requests in order of importance. When multiple communication devices are in use, prioritizing can be a nightmare. Healthcare professionals contend with an uncoordinated stream of answering machine messages, pager calls to return, unread emails, casual requests made while passing in the corridor and similar kinds of queries. Some devices—such as pagers—provide only limited information: a number to call rather than the context or reason for the call, making it difficult to know how to respond.

From Paper to Packets

Communication in the intensive care unit (ICU) at Trillium Health Center just outside Toronto used to be as basic as it gets. Nurses typically jotted down notes on a piece of paper to record the needs of patients; doctors took action when they discovered the notes. Since those days of paper-based communication, however, Trillium has advanced and unified their information processes by deploying wireless BlackBerry® smartphones throughout the ICU and the subsequent improvements in staff communication have resonated across the organization. The project initiator, Dr. Chris O'Conner, a critical care physician and medical informatics consultant (who has since been promoted to the Director of Medical Informatics and Critical Care Medicine), championed the BlackBerry smartphone approach to escape the disruptive nature of pagers and the uncertainty of handwritten notes, which were sometimes jotted on paper towels by the nursing staff (the most convenient supply of paper that was located next to the nursing station).

"We began by just giving the BlackBerry smartphones to the ICU's four physicians. The nurses had to log into their desktops to send their messages to the doctors," Dr. O'Conner said. "But that actually worked. It was a stunning success right from the start. It significantly defragmented the care process and improved the response time to messages."

From the earliest stages, the improvements in the process were striking. In recalling his first use of the technology, Dr. O'Conner said, "The nurse sent me a message [on my BlackBerry smartphone] suggesting that a certain patient

needed more anti-hypertension medicine. That seemed reasonable, so I touched the Reply button and typed 'Yes, go ahead.' then hit the Send button and it was done. Done in less time that it would usually take me to even find a phone to answer a page. It took my breath away."

The success of the initial pilot project quickly led to a more extensive deployment across the ICU and all staff members received BlackBerry smartphones as well, further increasing the flexibility and effectiveness of the approach. Staff members found that they could use short breaks during the day to respond to email messages and keep on top of pressing tasks. Testing determined that radio frequency interference did not pose any problems even in sensitive areas of the ICU. Since this testing, this finding has been further substantiated in a study by the Mayo Clinic titled the *Use of Cellular Telephones in the Hospital Environment*¹. BlackBerry smartphones are issued at the beginning of a shift and collected at the end, reducing the risk of any confidential data being moved offsite or stolen. Central control of BlackBerry smartphones through the BlackBerry® Enterprise Server includes the option of deleting data on any device identified as stolen, further minimizing privacy risks.

This BlackBerry solution has earned near universal acceptance from both doctors, nurses and staff members. As Dr. O'Conner commented, "Everybody likes it."

For more information, view the *Trillium Health Center Case Study: Hospital Sees BlackBerry Smartphones as a Way to Improve Patient Care and Save Lives* at www.blackberry.com/bettercomms.

¹ *Use of Cellular Telephones in the Hospital Environment*. Jeffrey L. Tri, MSEE; Rodney P. Severson, CBET; Linda K. Hyberger, MA, CCRC; and David L. Hayes, MD; *Mayo Clinic Proceedings*, March 2007.

Within such an environment, clinicians typically rely upon communications from colleagues who are known and trusted. Conversely, they sometimes block out others, limiting access to their personal cell phone numbers or e-mail addresses. To avoid work interruptions, clinicians rely on input from administrative assistants, nurses, and, secondarily, pagers and answering services, prioritizing contacts and tasks according to their own preferences and prerogatives.

A report from Spyglass Consulting Group, *Healthcare Without Bounds: Trends in Mobile Communications*², provided a number of insights into the difficulties faced by healthcare practitioners. In one example, an emergency department physician at a community hospital in Ohio stated, "I am constantly juggling and prioritizing the needs of my patients. Unnecessary disruptions affect my ability to deliver quality patient care. I do not have a standardized way to prioritize or manage incoming messages so I rely upon my nurse practitioner and my administrator to triage the situation."

Communication Device Strengths and Weaknesses

The unique capabilities and diverse functionality of various communication devices results in a mix of strengths and weaknesses for hospital and healthcare applications, as shown in Table 1.

Device Capabilities	Pager	In-Building Voice	Cell Phone	PDA	Smartphone	Tablet	COW's
Voice		☑	☑		☑		
Alerts	☑	☑	☑		☑	☑	☑
Data				☑	☑	☑	☑
Portability ***** = portable * = fixed	*****	****	****	****	****	**	*
Coverage	Pervasive	Wi-Fi	Cellular	Wi-Fi	Cell/Wi-Fi	Wi-Fi	Wi-Fi
Security / Privacy ***** = secure * = unsecured	*****	***	****	**	** ³	**	*****
T.C.O. **** = low cost * = high cost	*****	**	***	*****	***	*	*
Telco / IT Support ***** = low support costs * = high support costs	*****	**	*****	*****	***	*	*
Ideal Use	Alerts	Comms	Comms	PIM, Med Ref	Multi-Purpose	EHR Access	EHR Access
Drawbacks	Asynchronous	Single use Voice	Single use Voice	Single use Data	Screen size, data entry	Size, battery, no voice	Size, no voice, login

Table 1. Communication devices and their capabilities

² *Healthcare Without Bounds: Trends in Mobile Communication*. Gregg Malkary, Spyglass Consulting Group, November 2006.

³ BlackBerry Enterprise Server offers additional security capabilities enabling a BlackBerry Solution to work fully and effortlessly with a HIPAA compliant environment.

Many of these devices have become established in the healthcare work environment, but earlier devices sometimes fare poorly in comparison with more modern, converged functionality devices, as described in the following points:

- **Pagers:** Being an asynchronous form of communication, paging often results in endless telephone tag and delays in reaching a contact. This can negatively impact healthcare quality. Overhead paging is generally annoying and disruptive, with no guarantee that the intended message recipient will respond or even if she has heard the page.
- **In-building voice solutions:** These expensive, single-purpose devices are limited to campus-only applications and typically lack significant data capabilities. Hands-free operation creates issues with regulatory compliance (HIPAA, PIPEDA) and built-in voice recognition features often struggle with duplicate names, foreign accents or non-English languages.
- **Cellular phones:** Dedicated cellular phones provide an ideal, wide-area voice solution, but expensive service costs, restricted in-building coverage and electromagnetic interference (EMI) concerns impact the usefulness in hospital environments.
- **Smartphones and PDAs:** Highly portable smartphones and PDAs provide an ideal converged solution for the healthcare industry, although options, pricing and features vary widely. To be effective in healthcare applications, end-to-end security is necessary to protect patient data privacy and central management is essential. Wireless data plans can be quite expensive; a dual-band communication device that combines cellular and Wi-Fi is desirable for maximum flexibility and cost-effectiveness.
- **Tablets, COWS:** For data-intensive tasks, tablet computers and computers on wheels (COWS) provide an ideal solution, offering portability, ease of data entry, large screens and support for workflow processes. On the negative side, these issues impact the usefulness: logging in while attending patients, security management of unattended devices, relatively limited battery life and high equipment expense.

"I do not have a standardized way to prioritize or manage incoming messages so I rely upon my nurse practitioner and my administrator to triage the situation."

–Emergency department physician, community hospital, Ohio

Structured Communication for Quality Care

A messaging approach based on the SBAR format (Situation, Background, Assessment Recommendation) supports more structured communications among nurses and doctors. This can help improve care by promoting critical thinking and removing ambiguity about instructions (such as dosages of medications and frequency instructions). An essential component of this approach is conveying values (doses, measures, diagnostic readings) in both words and numerals.

Two modes of communication that offer this capability in mobile computing devices are:

- **Email (mobile):** Offers context, quick response and an audit trail. However, email communications require regular review and management with the possibility of misinterpretation.
- **Instant messaging (mobile):** Provides quick, reliable and unobtrusive communication among team members. However, instant messages are essentially disposable with a limited audit trail.

Mobile healthcare solutions that incorporate both email and instant messaging contribute to the goal of achieving flexible communications.

Adopting a Converged Communication Model

Given the problems and repercussions of disconnected communications discussed in previous sections, is it technologically possible to combine the functionality and capabilities of many different types of communications into a single device? Such a device would most likely take the highly portable form factor of a smartphone with:

- Voice (including VoIP) and data connectivity, by means of cellular and/or Wi-Fi connectivity
- Sufficient data processing power to run clinical and multimedia applications
- Intelligent power management for battery longevity
- Data compression for preserving network bandwidth
- A robust security framework

Functionality of a Pager...and More

In many ways, the communication tool that ideally suits the needs of the healthcare industry starts with the capabilities of the humble pager and then extends that functionality. The portability and simplicity of pagers are major advantages, but the restricted functionality, call-back requirement and lack of information context diminishes the utility of the device. Ideally, a hybrid communication device targeted to healthcare requirements should combine features and functions from other computing devices, from the rich data access of a notebook to the convenience and ease of use of a PDA. This new class of communication device should:

- Provide the connectivity and discretion of a pager (vibrating for a non-urgent notification or ringing for a code-blue alert), with additional context and priority on messages and voice capabilities for immediate response.
- Create a single focal-point for coordinating communications among in-facility staff members, combining cellular to VoIP calls, voicemail, email, instant messaging and alerts. An audit trail would track communications for compliance and accountability.
- Incorporate real-time synchronization to ensure that messages, critical alerts, and patient data are delivered to recipients automatically and unobtrusively.
- Feature organizing and scheduling tools to simplify staff interactions and coordinate tasks.
- Deliver ready access to essential information, such as emergency procedures, staff contact data, facilities information, medical references, patient data (EHR), and pharmaceutical data.
- Include security and privacy provisions consistent with industry best practices and compliant with legal requirements.
- Provide centralized management features that allow mobile devices to be updated, activated, deactivated or managed remotely with greater efficiency

"In 2002, we had a network outage that regressed the hospital by decades, making it look like the hospital of 1972 – doctors couldn't get their orders, couldn't prescribe drugs, and we couldn't diagnose the problem in the absence of a network. We began using PIN-to-PIN on BlackBerry smartphones to communicate during the network outage; this is now an integral part of our disaster recovery plan for situations when our other communication channels go down."

– Dr. John D. Halamka, CIO, Harvard Medical / Beth Israel Deaconess

Ensuring Continuity of Operations during Emergency Situations

During emergency situations, hospitals and clinics have a strong responsibility to patients and stakeholders to ensure continuity of operations (COOP). Without proper planning, disruptions to facility operations can cause unnecessary personal or property damage, as well as substantial financial losses. Countering emergency situations effectively requires a combination of well-established procedures, a responsive communication system and a technology framework in place that can circumvent potential power outages and network failures.

In emergency situations, communication among healthcare workers becomes absolutely critical to treating the injured and establishing an effective response to urgent needs. Extreme disasters, such as floods, tornadoes, hurricanes and earthquakes, often disrupt primary communication services. Even lesser emergencies, such as power blackouts, fires and personnel evacuations, can put a severe strain on normal communication channels. In these kinds of situations, emergency responders and primary staff members can benefit from specialized applications that take advantage of wireless communications and smartphones.

Applications from independent software vendors such as Wallace Wireless and Onset Technologies provide specialized capabilities tailored to business continuity planning and continuity of operations. PIN-to-PIN communication, a unique point-to-point method of communication available on the BlackBerry platform, ensures effective operation even when central servers or power lines are down. Essential information, including crisis management checklists, contact numbers of emergency response teams, facility maps, inventory lists and similar data, can be accessed during times when voice calls and computer access have been disrupted.

For more information on this topic, read [Improving Communication in Emergency Situations: Mobile Business Continuity Planning Solution](http://www.blackberry.com/bettercomms) at www.blackberry.com/bettercomms.

Part Three of this series addresses the key issues surrounding the selection and adoption of a wireless solution within the healthcare industry. As the industry moves toward technology to counter the multiple challenges faced, mobility solutions offer proven techniques and effective methods to transform the healthcare industry. Producing a unified communication framework can set the foundation for improved efficiency and better coordinated work processes.