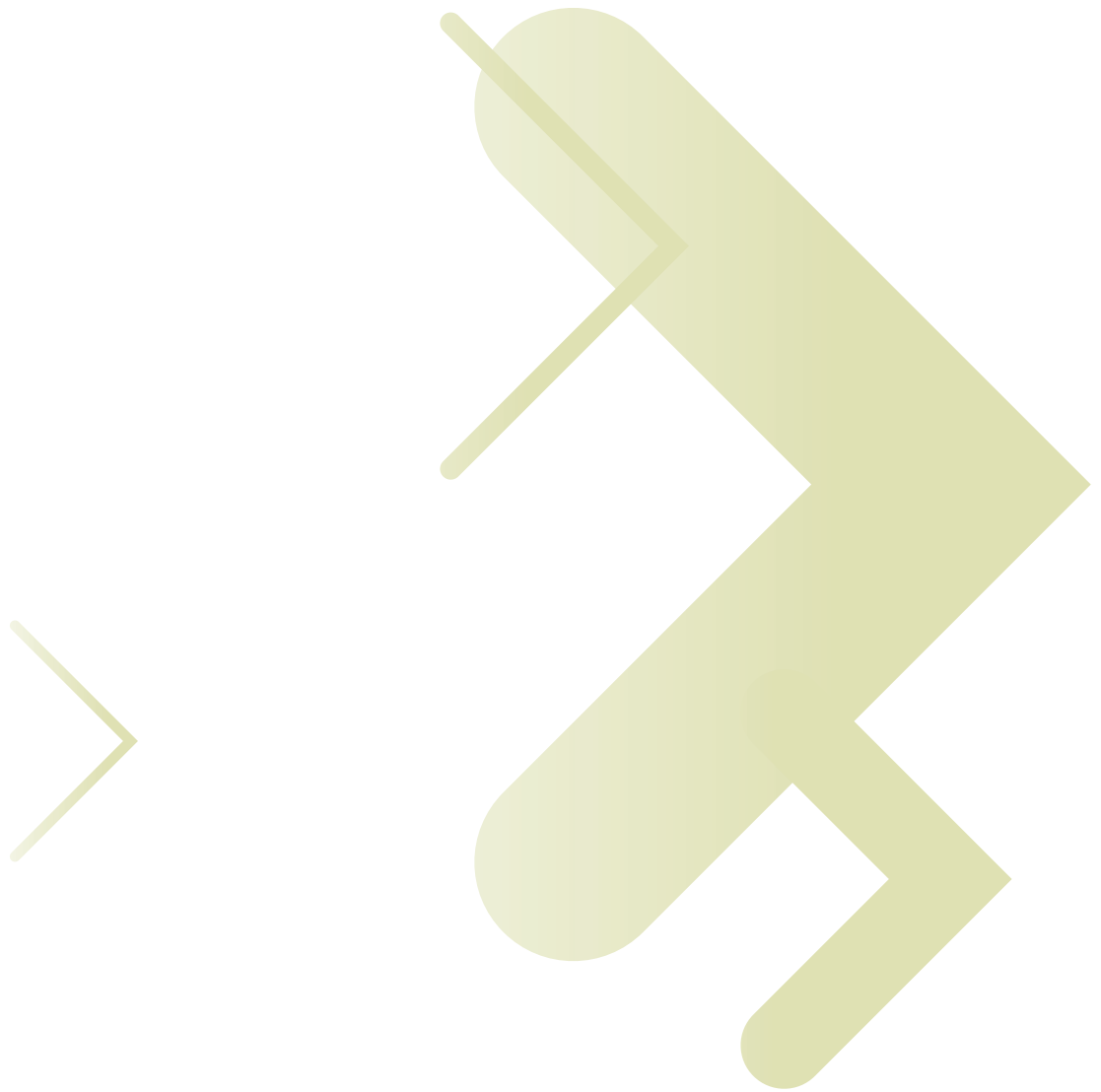




Wireless Networks Enable Safer, More Efficient Healthcare



"...by giving doctors, nurses and other caregivers access to correct, up-to-the-minute information wirelessly, hospitals can work more efficiently and virtually eliminate potential mistakes..."

- Dr. Liza Heslop, Director, Centre for Health Services Operations Management



Healthcare – What Ails the Industry

The business of healthcare, whether at a doctor's office, hospital, outpatient facility or long-term care facility, is often a delicate balancing act of urgency, accuracy, privacy, regulations and technology. This balancing act can make solving issues in the healthcare industry seem like a daunting task, but with the right wireless solution, many improvements can be seen quickly and easily.

Arguably, two of the largest issues facing the healthcare industry today are worker productivity and error rates.

While computers and networks have been used for some time in healthcare settings, they are still often tied to a specific, physical location, requiring the presence of the clinician to be used. Communication among healthcare workers in different areas often takes place via fixed telephones, because most hospital regulations prohibit the use of cell phones in many areas of the facility. For clinical professionals such as nurses and physicians – every moment they are tethered to a desktop computer or a fixed-wall phone is one moment they aren't spending at the bedside with their patients or on the move to their next task. Increased mobility for these professionals means increased productivity.

A more pressing issue than productivity, however, is the need to reduce the number of errors that take place every day — errors that are measured not just in dollars, but also in harm to patients. The Institute of Medicine reported in a recent study that medication errors alone cause sickness, injury or death to at least 1.5 million patients in the U.S., at a conservative cost of \$3.5 billion each year. In that same report, one of the recommendations is to use information technologies to reduce medication errors.

Clearly, few industries have a greater or more compelling need for computing mobility than

the healthcare industry. After all, immediate access to patient data from anywhere in the facility can significantly reduce potentially life-threatening errors while increasing healthcare workers' productivity. This, in turn, improves the quality of patient care and reduces costs.

Even so, regulations around patient privacy and safety can make implementing such technical solutions tricky without the help of experienced technology partners. Solutions must enable the facility to be HIPAA-compliant, and disruption during installation in a functioning facility must be kept to a minimum.

Technology for the Healthcare Industry

Mobile computing in a healthcare setting requires more than a notebook computer on a cart. True mobility, in the form of handheld "pocket" or wearable devices using wireless communications for real-time connectivity, requires a next-generation mobile computing infrastructure. Such an infrastructure includes the data capture technologies (such as bar-code scanning) to improve the efficiency and accuracy of the user when entering information; the mobile computers (such as PDAs) that can be used to access patient data at the point-of-care, the wireless networks to securely connect the users to the servers, and the software to manage and monitor it all.

The network should be highly scalable, with high availability for maximum up-time, and it should support functions such as locationing, used to aid in inventory management, and voice over IP (VoIP), used in nurse call and other communication applications. Obviously, it needs to support HIPAA security standards, and an added bonus of wireless networks is minimal disruption to the surrounding environment during installation, which can be critical in a healthcare setting.



Motorola's enterprise mobility products are liberating doctors and nurses from desks, paper and PCs, and giving them fast, secure, mobile access to life-saving information – where and when it's needed. With the help of our leading clinical IT partners, Motorola offers end-to-end solutions that let healthcare professionals review patients' medical histories, update patient information, check for drug interactions, and look at lab results and x-rays – all from the point of activity: the bedside, the exam room, the front office, in surgery or on the go. The result is increased productivity and a reduction in errors.

Every day, in healthcare facilities around the world, Motorola products help medical personnel:

- Match patients with medications
- Track samples from bedside to lab
- Positively identify patients
- Track blood from donation to transfusion
- Quickly locate critical equipment any where in the facility
- Communicate, both with patients and other personnel
- Download appointment schedules
- Capture charges
- Order lab tests and view results
- Manage inventory

All Motorola Enterprise Mobility products are optimized for mobility, and wireless networks from Motorola are no exception. A Motorola wireless network prioritizes data to provide high quality of service (QoS) and it can support a whole range of both wired and wireless devices. Devices within the wireless infrastructure enable specific applications so valuable to the healthcare environment, such as VoIP and locationing. Layer 3 roaming allows a user to remain connected anywhere on the networked campus. Integrated power optimization features of

the Motorola WLAN help extend the battery life of mobile units, and battery life is maximized when used in conjunction with appropriate Motorola mobile units. Mesh-enabled access points allow personnel to access mission-critical information even outside the building, such as in an ambulance bay. Self-configuring and self-healing, they can also be used to set up a temporary network in a makeshift triage situation, if necessary.

Mobility is critical in a healthcare environment, but not at the cost of security. That's why all Motorola wireless networking products provide security per HIPAA standards – data isn't transmitted in the clear. The Motorola wireless intrusion protection system alerts system administrators to security breaches such as attempts to hack into the network, and risks such as rogue networks, as well as providing reports to support HIPAA compliance.

It may sound like a lot to keep track of, but regardless of size, a Motorola network is easy to manage. The network can be administered from one central location, and additional tools like Motorola's Mobility Services Platform (MSP) automate many repetitive tasks, making deployment, day-to-day management, and troubleshooting simple

Mobile Healthcare Solutions in Action

Motorola and its partners have over thirty years of experience in providing mobile technology to healthcare facilities. During that time, they've helped countless hospitals, clinics, and long-term care facilities implement wireless solutions to improve productivity and quality of care. Sunnybrook Health Sciences Centre, the Health Services Operations Management (CHSOM) at Monash University and Beloit Memorial Hospital are all such facilities, and are discussed here .

"In a traditional model, access to clinical information systems meant walking to the PCs located at centralized nursing stations. Understanding the potential of Wi-Fi, we decided to take advantage of the 'anytime, anywhere' approach and provide information directly at the point of care."

- Oliver Tsai Director of Information Technology, Sunnybrook

Sunnybrook Health Sciences Centre is among Canada's premier academic health sciences centers. A key mission at Sunnybrook is continual improvement in patient care and safety, and IT has always played a key role in serving this mission. Oliver Tsai, Director of Information Technology at Sunnybrook, realized that his department could continue to serve the hospital's mission using wireless technology. *"We recognized that to improve the delivery of care, we needed to put access to clinical information systems into the hands of our users, regardless of where they may be. In a traditional model, access to clinical information systems meant walking to the PCs located at centralized nursing stations. Understanding the potential of Wi-Fi, we decided to take advantage of the 'anytime, anywhere' approach and provide information directly at the point of care,"* explained Tsai.

Having had a previous experience with wireless that did not meet the hospital's needs, Tsai emphasized that the ideal Wi-Fi infrastructure needed to address security, usability, ease of management and scalability. Only Motorola and Bell Canada brought it all together for Sunnybrook. Now four virtual networks running on the same wireless infrastructure allow the hospital to provide Internet access to patients and their guests, while keeping private health information separate.

"Staff productivity is vital...any information staff members are authorized to access, they can interact with from any location on our campus, precisely when they need it," said Tsai. Having access to the data at all times enables hospital staff to spend more time at the patient's bedside.

Tsai also emphasized the importance of technology in improving patient safety at Sunnybrook, particularly with regard to medication accuracy. *"Patient safety is a top*

priority for our organization" said Tsai, citing a pilot program by Dr. Jeannie Callum, the director of Sunnybrook's Transfusion Medicine Department.

The pilot program involved bar code scanning with a handheld device to identify the patient and ensure that the right blood product is going to the right patient. At the bedside, nurses can validate the transfusion product they are providing.

The results of the pilot program to date, specifically in the oncology in-patient unit, are dramatically successful: Tsai says the nursing staff refused to give up the pilot equipment because it improved patient care and safety so much.

Manageability and scalability of the wireless infrastructure are key to the Sunnybrook IT department, making Motorola's Mobility Services Platform (MSP) a key enabler. *"We have the volume of a very large company, but limited IT resources. Using Symbol's thin access points, we have a Wi-Fi network that is very easy to manage and also highly responsive to change. Whether it's a firmware patch, a security improvement, or even a configuration change based on a technical or business policy requirement, Symbol's infrastructure will allow us to make that change across the entire network extremely quickly while barely using any of our network resources,"* said Tsai.

"This technology will allow the hospital to run more efficiently, enabling us to treat more patients and provide a better level of care. Instead of spending hours waiting to access information, hospital staff will be able to treat and discharge patients quickly and accurately. By making a more comprehensive array of information more readily accessible where it is most needed, we can improve patients' hospital experiences dramatically."

- Dr. Liza Heslop, Director,
Centre for Health Services Operations Management

The Monash Medical Centre in Victoria, Australia is a major teaching, research and referral hospital affiliated with Monash University and provides specialist care to around 700,000 people in the state's southeast and employs more than 9,000 staff.

The Centre for Health Services Operations Management (CHSOM) is part of the Faculty of IT and Faculty of Medicine Nursing and Health Sciences at Monash University, and aims to facilitate better healthcare outcomes by improving quality of service and reducing costs to ensure more efficient use of health care resources.

“A clinical ward typically has a high proportion of mobile workers, which means it’s not always easy to get information to them quickly and accurately,” said Dr. Heslop. “There is evidence that doctors and nurses make more efficient decisions about their patients if relevant information is delivered to them more promptly. If incoming messages are missed, it can mean delays in patient care.”

“Some healthcare quality studies have shown that adverse events in hospitals are related to information management. By speeding up the flow of information and increasing accuracy, we can eliminate the errors, delays and double handling that can occur when information is not readily available,” said Dr. Heslop. “We believe that, by giving doctors, nurses and other caregivers access to correct, up-to-the-minute information wirelessly, hospitals can work more efficiently and virtually eliminate potential mistakes like administering the wrong treatment to patients.”

In May 2003 CHSOM launched a research project called mWard to measure the business impact and technology suitability of wireless and mobility applications in health care. The mWard project involves a wireless ward at Monash Medical Centre where staff use handheld devices, mobile equipment and wireless local area networks (WLANs) to deliver patient care in the neurology, neurosurgery and stroke areas. Both Motorola handheld devices and a Motorola wireless switch enable doctors and nurses to obtain pathology, patient history reports and input new information anywhere in the hospital.

“The aim of introducing new communication technologies into the hospital is to give health professionals immediate access to patient information regardless of physical location. For this to work, the device needs to be completely reliable and able to withstand the sometimes harsh hospital environment,” said Dr. Heslop. “Most consumer-grade PDAs are too delicate for this kind of environment. The Symbol devices are tough enough to withstand multiple drops to concrete floors, extreme temperature variances and are water- and dust resistant. They include both wireless and barcode scanning functionality, so they’ll be able to scale to suit our needs as the solution evolves.”

Deployment of the network using the wireless switch made Monash Medical Centre the first Australian healthcare site to run a converged data and voice infrastructure securely using a switched wireless network. The WS2000 wireless switch ensures the network prioritizes mission-critical data like phone calls. It also enables each device to have a level of security that is appropriate to both the device and its function, without limiting its performance. The wireless-switched network supports multiple virtual WLANs, each of which can be used for a different purpose, such as voice and data applications. This means that the quality of service for each application can be assured, which is essential for a hospital environment.

Applications can be prioritized according to the organization’s needs, so that certain test results, for example, are delivered urgently, so that doctors can review them and take appropriate action immediately. In non-switched wireless networks, separate infrastructures are required for different functions, like voice calls, paging and data transfer. Because the switched wireless network supports all applications on one infrastructure, there is more flexibility to use converged devices. This means lower costs for the organization and a simplified work environment for doctors and nurses who can now carry one converged device rather than a PDA, wireless phone and pager (for example).

The mWard trial has successfully demonstrated the benefits that can be realized with a range of mobile devices supported by a single wireless infrastructure. The main benefit is an improvement in patient care.

Dr. Heslop said, “This technology will allow the hospital to run more efficiently, enabling us to treat more patients and provide a better level of care. Instead of spending hours waiting to access information, hospital staff will be able to treat and discharge patients quickly and accurately. By making a more comprehensive array of information more readily accessible where it is most needed, we can improve patients’ hospital experiences dramatically.”

Factors to consider in a wireless solution

- Network security and standards compliance (such as HIPAA)
- Site planning, based on desired network cover age, interference, et cetera
- Applications to be supported
- Required bandwidth – will you use bandwidth intensive applications, such as VoIP? How many devices may access the network at once?
- Scalability
- Quality of service (QoS)
- Locationing requirements
- Outdoor applications
- Mesh
- Hotspot capabilities, to provide secure guest access to the Internet
- Ease of monitoring, troubleshooting and day-to-day management
- Roaming capabilities – will the solution allow a user to go from one end of the campus to another with out losing connectivity or having to re-authenticate?
- Support for emerging technologies
- Minimal disruption in the surrounding area during installation

Building a Business Case for Mobility

As illustrated by the examples above, an end-to-end wireless solution in a healthcare setting can increase productivity and reduce errors, while improving the bottom line.

From a business perspective, as indicated in the Institute of Medicine’s July 2006 report referenced earlier, error reduction alone could result in a savings of about \$8,750 US for each error.

Consider then, what Beloit Memorial Hospital, a 175-bed community hospital affiliated with the University of Wisconsin Hospital system, discovered after instituting their wCareMed solution featuring Motorola handheld devices in their Family Care Center – a dramatic decline in medication errors.

Using the estimated error cost of \$8,750, per the Institute of Medicine’s July 2006 report referenced earlier, Beloit’s wireless solution is saving them approximately \$13,125 per month.


Locationing applications enabled by the wireless network can also deliver significant ROI, in three main areas:

- Improved productivity – staff no longer needs to hunt for critical equipment when it is needed most
- Reduced capital expenditures – because equipment is easily located, fewer back-up units are required on site
- Improved process efficiency/error reduction – tracking equipment through use cycles improves equipment cycle time and reduces the chance of dirty equipment being re-used.

	Time Period	No. Mos.	Medication Errors Reported	Average Monthly Error Rate
Before Bar Code Use	Jan. - Aug. 2003	8	18	2.25
After Bar Code Use	Sept. - Dec. 2003	4	3	.75

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After the first four months of use, as compared to the prior eight months, the hospital reported a decrease of 67% in the average monthly medication administration error rate. (The types of medication errors that had been reported in 2003 by the Family Care Center included wrong dosage, doses missed, incorrectly labeled medications, incorrectly identified allergies, and medications hung at the wrong time.) Monthly Medication Administration Errors Reported by the Family Care Center at Beloit Memorial Hospital Prior to and Following the Implementation of the wCareMed™ Bar Code Solution.



Also important to the business aspect of running a healthcare facility, wireless technology creates opportunities for facilities to run their networks more effectively. For example, hospital tenants such as pathology labs typically use and pay for a portion of a hospital's infrastructure. A switched wireless network allows the hospital to identify where the traffic flow comes from, and thus allocate the costs accurately, saving on infrastructure costs.

An Eye to the Future

Motorola constantly strives to improve enterprise mobility. As part of these efforts, Motorola has introduced its Wireless Next Generation (Wi-NG) architecture, which should make healthcare deployments even more robust than before.

Wi-NG architecture offers the superior performance required for mobile healthcare applications. It optimizes voice performance and enables seamless campus-wide roaming across subnets without the need to re-authenticate. Highly scalable, it is designed to offer enhanced security, including advanced intrusion detection tools, making it ideal for even the largest healthcare applications. Wi-NG also lays the foundation to support emerging RF technologies. In the future emerging technologies such as RFID will be supported on the same wireless switch that supports Wi-Fi today. RFID will enable applications such as location-based services and asset tracking, leading to improvements in customer services and supply chain management. Other technologies will also be supported on the same platform and will allow enterprises and service organizations to leverage high bandwidth wireless broadband applications.

Working Together

Because each healthcare facility is unique, each wireless solution is a little different. Motorola's global partner network offers you best-of-breed clinical and administrative applications and comprehensive mobility solutions to meet the unique requirements of

the healthcare industry, and your situation. These partners can work with you to define your needs while working with Motorola and Motorola's technology partners to implement the ideal combination of hardware and software for you – quickly and seamlessly.

Summary

At its best, healthcare technology can help doctors and nurses improve the quality and efficiency of patient care, helping to reduce risk and save lives. Whether connecting patients to doctors on the move, scanning patient information bedside, making test results available immediately, reducing the risk of human error in the lab, pharmacy or donor center, or ensuring the availability of B-negative blood, Motorola's healthcare solutions are designed to streamline, inform, simplify, verify and support – and ultimately, help elevate the quality of patient care to the highest standard.

Learn More Today

Motorola, together with our partners, provides comprehensive, end-to-end mobility solutions that transform healthcare enterprises and help them be more efficient and productive. Motorola's powerful and proven WLAN infrastructure and mobile device hardware provide the ideal platform for the specific medical application solutions provided by our IT solution partners.

For more information about Motorola's wireless healthcare solutions, go to <http://www.symbol.com/healthcare> or contact Motorola at +1.800.722.6234. For global sales contact information, phone numbers and Web site addresses, please visit the "How to Buy" pages at www.symbol.com/howtobuy



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