

Documenting Patient Care at Markham Stouffville Hospital: Combining Best Practices with Wireless Applications

By Scott R. Briggs

Two years ago, Markham Stouffville Hospital (MSH) implemented a project that changed the way staff and clinicians document patient care. The Electronic Documentation project, or "ED," represented two elements of change introduced simultaneously – new technology to facilitate charting combined with changes to the charting methodology itself. Recognizing that a balance between technology and practice change was required for success, the project was initiated jointly by the Professional Practice and Information Technology departments.

One of the goals of the ED project was to facilitate clinical documentation at the point-of-care. Theoretically, point-of-care computing would mean timely documentation, higher accuracy and more time for direct clinician/patient interaction. This goal shaped the requirements for a mobile device operating in a wireless network.

Wireless Network

The wireless network at MSH was designed to support the goals of the ED project as well as providing an infrastructure that could be utilized for other applications. In particular, wireless telephony was contemplated as part of the network design. Other considerations included standards, security, site surveying and interference with biomedical devices.

The technology for supporting wireless networks is known for its myriad of standards. At the time of evaluation and implementation, there were two standards for wireless products to choose from: IEEE 802.11b and the newer IEEE 802.11a. The selection of 802.11b was driven by cost and technical requirements as well as availability of products to meet project timelines. The recent explosion of products based on the 802.11b standard has further benefited the hospital as the cost of technology decreases and new devices are introduced that are compatible with the network.

Considerable analysis was done to determine what was required to adequately secure the network and protect patient information. Coincidentally, media reports concerning wireless network security were becoming more prominent at the same time (Ross 2001). There were two major concerns. The first was that many organizations were installing wireless networks without enabling the security protocol included in standard products, WEP (Wired Equivalent Privacy). This management issue can be addressed through appropriate policy, design, process and change controls.

The second matter, however, was more problematic: the WEP protocol was defective (Stubblefield, Ioannidis and Rubin 2001). This revelation meant that wireless products, even with appropriate policy and management, were not secure. At the time, the best practice and advice was to create another layer of security on the wireless network that was independent of the wireless security (National Infrastructure Protection Center 2002; Wireless Ethernet Compatibility Alliance 2001). The hospital chose to implement a Virtual Private Network (VPN) to address this issue. The technology is very similar to that commonly deployed on the Internet to enable remote and secure access to corporate networks. Until the new IEEE standards regarding wireless security are approved and implemented consistently by manufacturers, this continues to be the safest method for exchanging confidential information across a wireless network.

Site Survey

To achieve the best results and meet coverage expectations, a site survey prior to implementation is highly recommended by most consultants and vendors. The experience at MSH supports this advice and would further suggest that:

- The site survey is based on specific coverage statements (e.g. 100% coverage at a minimum speed of 5.5 mb/s with room doors in the closed position).
- Attention is given to locations within hospitals that have unique construction such as lead-lined rooms or operating-room suites.
- The site survey is based on all planned applications for the wireless network. In particular, demanding applications such as voice are surveyed at the outset even if implementation is scheduled for a later date.
- Contracts and coverage guarantees include all labour and parts required to resolve any coverage issues and are negotiated to be in place for at least six months.

The final task was to ensure that the new technology did not interfere with any of the hospital's biomedical devices and that the biomedical equipment did not interfere with the wireless network. A biomedical survey was commissioned and involved testing each type of biomedical device in use at MSH. The results of the survey were satisfactory with no occurrences of interference. In the two years of operation, the hospital has not experienced any events related to the interference of the wireless network.

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What Happened to ED?

The ED project is considered to be a success and a foundation for next steps in the electronic health record journey at MSH. The project has led to many clinical practice improvements and an improved definition of practice standards. While the wireless network is performing well, the degree to which point-of-care documentation has been adopted varies across the organization and did not meet initial expectations. Further investigation found that each clinical area in the hospital has an affinity for point-of-care documentation or centralized charting. For clinical units where centralized charting was prevalent, mobile devices were observed to be located in stationary positions, often the nursing station.

This observation was studied further by MSH and the results were reported at the 2004 e-Health Conference (Gross and Blastorah, 2004). The study found that point-of-care documentation works well in areas where patient acuity is high, the nurse-patient ratio is low and the geographic location of assigned patients shows little variation. The unique mix of these properties found in each clinical area of the hospital explains the variation in support for point-of-care documentation. The conclusion at the hospital is that the universal goal of point-of-care documentation throughout the organization, in hindsight, was not appropriate for clinical documentation.

The results of this study have been used to develop a plan to improve existing mobile devices to maximize their potential in clinical areas where point-of-care documentation works well and to re-deploy mobile devices in a stationary form to support centralized charting in other areas.

Telephony

Last year, the hospital leveraged the wireless infrastructure to implement wireless telephones that are fully integrated with the existing telephone system. Emergency physicians, facilities maintenance staff, housekeeping staff, OR attendants and information technology staff are currently using the phones. Since they are very similar to cellular telephones, and most staff are familiar with cellular technology, the learning curve is quite short for this technology and benefits are realized quickly.

Wireless phones are more demanding of the wireless network, and even though the network was surveyed for telephony applications, new "dead spots" were discovered during the implementation of the phones that were not previously observed. This unexpected development slowed deployment of the wireless phones until the network coverage issues could be resolved.

References:

- Drazen, Erica and Haughom, John L. 2004. "Hospital of the Future". *Healthcare Quarterly* 7(2): 65-68.
- Gross, C. and M. Blastorah, 2004. "Determining the Affinity For Centralized Versus Point-of-Care Documentation for Nursing Units as a Tool to Assist in Planning for Clinical Computing Devices." e-Health 2004 Poster Presentation.
- National Infrastructure Protection Center. 2002. "Best Practices for Wireless Fidelity (802.11b) Network Vulnerabilities." Retrieved February 9, 2002 from <http://www.nipc.gov/publications/nipcpub/bestpract.html>.
- Ross, Rachel. 2001. "The Weakest Link". *Toronto Star* October 1, 2001.
- Stubblefield, A., J. Ioannidis and A. Rubin. 2001. "Using the Fluhrer, Mantin, and Shamir Attack to Break WEP." Retrieved May 10, 2004 from <http://citeseer.ist.psu.edu/503254.html>.
- Wireless Ethernet Compatibility Alliance. 2001. "WEP Security Statement." Retrieved May 10, 2004 from http://www.wlana.org/pdf/security_weca.pdf.

Once these issues were resolved, users were thrilled with the performance of the phones and generally report increased productivity and improved communications with customers or colleagues.

Patient Safety

In the context of the hospital safety plan, smart IV pumps were recently acquired that will provide decision support to clinicians at the bedside when starting an IV medication. The system protects patients from infusion programming errors through a drug library that includes safety limits for dosing that are based on best practice guidelines. The pumps keep a detailed log of all events which is used for ongoing analysis in the context of the hospital safety initiative and quality management. Retrieval of the event logs and updating the best practice guidelines on the pump is a manual process that requires a physical visit to each pump. Fortunately, the MSH plan includes connecting the new pumps to the wireless network which will facilitate real-time access from the Pharmacy. This immediate access to the pumps will eliminate the manual update process, provide timely event log data for analysis, and will minimize risk by ensuring that all pumps remain synchronized with the latest drug library and safety limits.

Looking Ahead

The pursuit of opportunities to leverage the wireless network to solve problems is never-ending. Take the patients of the rehabilitation program at MSH as an example. This program provides services to patients who are typically conscious and can be admitted to the hospital for an extended stay. With increasing frequency, patients bring their own notebook computers to the hospital and are requesting a connection to the Internet to stay in touch with family, friends and work. An idea under consideration is whether wireless internet services can be provided for patients and visitors using the "hot spot" model more commonly found in coffee shops and hotel chains. This concept has the potential to meet the demands of patients and visitors as well as create a new source of revenue.

Wireless technology and mobile computing are clearly a part of the vision for the hospital of the future (Drazen and Haughom 2004). The experience at MSH demonstrates that a hospital of today can use this technology for productivity enhancements, increased communication and enabling strategic applications such as electronic documentation.

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