Health Care Information Experts Imagine the Future

by Randolph Fillmore

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Under the banner "Imagine the Future," the annual meeting of the Health Information Management Systems Society (HIMSS) charged into the world of twenty-first-century health care, promoting the next generation of health care computer technology bristling with the latest bells and whistles. Held February 22-26, 1998 in Orlando, Florida, the meeting burst with ideas on how health care data should be shaped into a seamless, secure, Web-accessible system.

Future health care will rely heavily on computerized medical data.

The next century's health care challenges are creating software and hardware for disease management, outcomes measurement, information security, practicing medicine on the Internet, creating health care data warehouses, designing military telemedical readiness, and creating portable patient information systems. But how can we keep medical information confidential when it is speeding along the information superhighway? What is telemedicine's future? How can health care organizations marry clinical and billing? Can computerized medication dispensing save money and also provide better patient care?

Keeping Health Data Secure?

Public Key Infrastructure ensures privacy.

In the brave new (and quickly developing) world of computerized medical records and medical data transfers, patients and their health care providers have voiced concerns about data security. Accordingly, computerized health care information security sessions focused on the hows of getting medical records sped along the "information superhighway while maintaining security and confidentiality. Michael Pluscauskas (Center for Health Information Infrastructure) and Andrew Stephens (General Network Services Certification Authority) discussed public key infrastructure (PKI), and policies for maintaining medical record privacy. PKI, they explained, is based on an array of encryption technologies aimed at keeping unauthorized people, or agencies, from gaining data access. Encryption is the process of transforming data into an unreadable format called *cyphertext*.

In a two-key system, a *key certificate* is given to those authorized to decipher cyphertext. The first key is a *private key*; a *public key*, available to everyone, is the second key. When encrypted information is sent from the source to a receiver using the receiver's public key, it is signed with the sender's private key.

A data security system for use on the World Wide Web, called Secure Sockets Layer, allows browser and server to authenticate each other. These Web sites are encoded at the transmission layer. Pluscauskas and Stephens concluded that to ensure security there must be trust between contracting parties, and good user training. In the future, patients will have electronic IDs that will be "part of the PKI fabric." Pluscauskas spoke about security architectures (such as encryption and the two-key system) which would also include a third party - such as a firm specializing in information security - to serve as a security check.

Acknowledging that 100 percent security is not feasible, Saul Schiffman (IBM) said important issues are striking a balance between risk and feasibility, security policies, and spelling out who owns what data.

Applications such as Lotus Notes, said Schiffman, can be used with public and private keys. The panel concluded by discussing an IBM-developed health data network that features encryption, signature, and decoding functions.

Improving Teleimagery's Clinical Benefits

Teleimaging requires high resolution and low-cost technology.

Transmitting quality diagnostic digital images (*teleimages*) over the Internet is becoming popular, but the practice poses several challenges. Sending images inexpensively, and with resolution good enough for clinicians to read, is the foremost challenge. The requirements for successful teleimaging vary depending on the type of image being transmitted, said an HIMSS panel. Bone fracture images, for example, require less resolution than chest X rays. Mammographies require that a large amount of data, with good resolution, be sent to image analysts. The resolution of a picture is based on the number of picture elements, or *pixels*, measured in horizontal and vertical lines. While the American College of Radiology recommends that small images be digitized with a minimum of 500 x 500 x 8 bits per pixel, large images must have 2,000 x 2,000 x 8 bits per pixel. However, the panel noted that there is little to no agreement on the lowest image resolution needed for accurate interpretation. While transmission of very large images may be prohibitively expensive, the panel suggested that transmission costs may be reduced by using popular JPEG algorithms or data compression chips.

Telemedicine's Best Uses

Had telemedicine not been available, many of the infants would have needed urgent transfer for evaluation.

Telemedicine shined recently in a study conducted by Joel Barry Fisher, Geary M. Davis, Patricia Isbell, and Pat Stack, all of Northwest Community Healthcare, and Kaliope Berdusis of Children's Memorial Hospital. Presenting the results of a study using integrated services digital network (ISDN) lines and videoconferencing-equipped PCs to evaluate newborns with suspected congenital cardiac defects, they explained how data was "teleconferenced" between remote pediatric cardiologists and sonographers on site in the nursery. Their IRB-approved study of 88 newborns with cardiac problems validated the diagnostic accuracy of the images. They concluded that had telemedicine not been available, many of the infants would have needed urgent transfer for evaluation. The accuracy of the ISDN telemedicine technology meant that only 11 of 88 newborns were transferred for immediate intervention.

Information Management Tools

The physician's assistant is a radio frequency mobile computer.

Portable radio frequency computers are used by many industries, including car rental agencies for parking lot check in and check out and package delivery companies, such as Federal Express. Now, patients can be checked in and out like cars, and may even be bar-coded, but it is all in the name of efficiency and good medicine. A panel demonstrated how a portable, hand-held computer designed for use in the clinic allows quick patient history review before a physician enters an exam room, and also allows for recording additional information without going to a computer workstation. Their lightweight, radio frequency mobile computer, designed to be practice-specific, can be carried between exam rooms, consulted and quickly updated to reengineer work flow, assist in work flow management, and aid cost savings.

Medical Knowledge Systems

Knowledge systems aid the practice of evidence-based medicine.

While Ben Casey and Dr. Welby never seemed to be without an idea, or at least a hunch, they never appeared to practice evidence-based medicine - they did not go to a statistical, computerized analytical database (beyond their own gray matter and years of experience) to make

decisions about treating sick people. While evidence-based medicine (EBM) has been around for a while, and no one would deny EBM's usefulness, EBM has been moved up another technological notch. Harm J. Scherpbier, (Shared Medical Systems, and Nancy Greengold (Zynx Health) said that evidence-based medicine, formerly a manual process consisting of time-consuming literature searches, has been "upgraded" into an EBM knowledge system that provides "decision support." They discussed the clinical pathway constructor (CPC), developed by Zynx Health. The CPC, they said, is an abstract database organized by "class of evidence" as provided by different types of clinical trials. According to Greengold, the system aims to "couple evidence with point-of-care decision support." The system also offers direct access to MEDLINE and Web-based clinical resources and initiates a "reminder" to the physician when he or she enters a new patient condition into the database. The reminder links to the evidence base as well as activating follow-up and treatment protocols.

Cutting costs through good information technology

That twenty-first-century health care is cost conscious, if not cost driven or cost obsessed, is clear. But developing ways in which information technology can not only cut costs but provide for better health care is a place to tread lightly, especially when there are so many entities in the health care system that must be accounted for. How can a system best integrate good medicine with good numbers for all its players? Matthew Ebaugh (Suburban Hospital, Maryland) and Susan Heichert (St. Johns Hospital and Medical Center) suggested that health systems can best select integrated clinical information systems for "the entire enterprise" by creating a task force comprising physicians, nursing informatics specialists, and representatives from each entity responsible for disseminating or feeding back information. These entities should include laboratories, as well as pharmacy, radiology, nursing and ancillary services. The task force should first be charged with identifying the technology vendor who can provide for the majority of the clinical needs. Departmental cost/benefit analyses must be taken into account through potential staff savings.

Frank Coker (Health Systems Technologies) and Patricia Thompson (Gelsinger System Services) said that even as outcomes tracking is increasingly important in health care costs saving, and information systems that can track and measure are evolving, the need still exists to have these systems integrated into care delivery decision systems. This, they said, is the biggest health care information challenge in the next century. "Outcome data needs to improve population health," said Coker. "A good understanding of the relationship between costs and outcomes can create a significant advantage in contract negations between providers and payers."

The panel outlined the technological solutions to measuring outcomes, including systems that focus on nurse triage, record access, decision support, and case tracking. They also emphasized the importance of measuring different kinds of outcomes, such as patient satisfaction, resource utilization, patient functional status, and clinical outcomes. Provider organizations, said Thompson, need to have formalized processes for outcomes measurement because "the winners in this arena will know how to make their business most responsive to the needs of the market they serve."

Systems to dispense and track medications become significant to cost cutting.

Because part of the outcomes tracking effort is medication-based, systems to dispense and track medications become significant to cost cutting. Mary S. Coniglio (VHA East Coast) and Edward W. Casey (Crozer-Keystone Health Systems) addressed changes in hospital medication distribution processes and suggested changes for improving patient care and reducing costs. Their study showed that when the Pyxis Medstation RX system was installed to monitor controlled substances and floor stock medications, it reduced pharmacy time and eliminated nursing overtime. They estimated that $200,000 was saved annually when the system streamlined medication dispensing and administration.

"Missing medication and unavailable first doses were reduced to zero," Casey said. Ninety-five percent of medications were available within ten minutes of the pharmacy receiving the order. Inventory levels and time

of distribution were both reduced when the medications were made available on the floor.

Not Your Father's Health Care Information System

The days of paper-based medical records are waning. The look and feel of the twenty-first century's health care information management systems is that of a lean, mean machine, distant from the patient, accountable to boards of directors and bean counters. But HIMSS participants insist - and demonstrate - how good health care data management *is* good medicine. For example, the Department of Defense, miles ahead of many health care systems in health care information technology, wowed delegates with huge battlefield-to-hospital telemedicine demonstrations. Meanwhile, hundreds of software and hardware vendors on the exhibition floor did their best to vie for the DoD's attention and the attention of chief information officers from every imaginable health care system. At stake at the federal level is a huge government contract that will lay the technological foundation for the Composite Health Care System II, aimed at providing computer-based patient records for the DoD and the Department of Veterans Affairs Health Care Systems, the world's two biggest, farthest-flung health systems.

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Endlinks

Joint Healthcare Information Technology Alliance - a collaboration of the American Medical Informatics Association , the Center for Healthcare Information Management, the American Health Information Management Association, the College for Healthcare Information Management Executives, and the Health Information Management Systems Society . The site maintains a series of advocacy papers and a calendar of events along with other information technology-related resources.

An Introduction to Cryptography - introductory information to several of the concepts discussed in this article, including public key infrastructure. From IBM Registry, an Internet security platform.

International PGP Home Page - powerful public-key system for encrypting information on the Internet.

Medical Records, Privacy, and Confidentiality - a resource of links concerning clinical data management in the electronic age. The annotated list includes standards for medical reports, studies and reports, and legislation and legislative models. From the Health Law Resource.

Telemedicine and Health Care Informatics Legal Issues - another list of Internet resources from the Health Law Resource including a few sites on digital signatures.

Telemedicine Information Exchange - provides information for clinicians and patients, including a background to telemedicine, legal and ethical concerns, and selected full-text articles from Telemedicine Today.

Evidence-Based Medicine - this extensive list of sites is organized by subcategory. From MedWeb.

Previous Meeting Briefs

- Monkey Ties: What Primates Tell Us About Families
  by Brian Vastag (Posted April 17, 1998 Issue 28)
- When RNA Ruled Another Lost World?
  by Karen Hopkin (Posted March 23, 1998 Issue 27)

- Evolution: Lost Worlds
  by Laura F. Landweber and Laura A. Katz (Posted March 6, 1998 Issue 26)
- "Traffic Jams" and Other Neuronal Malfunctions
  by William Wallace (Posted February 20, 1998 Issue 25)
- State of the World Forum Report
  by Richard Brodie (Posted January 30, 1998 Issue 24)
- What's New in Biofactories: Third Annual Topics in Gene Expression Systems Conference
  by M. Walid Qoronfleh (Posted January 9, 1997 Issue 23)

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