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Medical Records: From Clipboard To Point-and-Click

BY TRUDY E. BELL

Call them electronic charts or electronic medical records: whatever the name, the days of patients' medical conditions and diagnoses being written illegibly on paper and stored in manila folders are numbered. Medical records, according to plans under way, are going electronic.

The days are numbered for storing medical records in paper folders, thanks partly to the IEEE's work on e-medical systems.

To help make that happen, the IEEE has joined forces with the American Medical Association and eight other major nonprofit medical and engineering societies to form an umbrella consortium, the Biotechnology Council. The council's primary goal is nothing less than standardizing everything from medical terminology to networking protocols so that medical records can be stored electronically and sent instantly anywhere in the world—with absolute privacy, security, and understandability.

In a few months, the first fruits of the Biotechnology Council's efforts—the council passed its first anniversary in November—will ripen. Its first technical conference, the Distributed Diagnosis and Home Health Care Conference on remote-monitoring technologies and policies, is scheduled for 3 and 4 April in Washington, D.C. The council also plans to hold a workshop on what it terms Bio-Economics, in Washington, sometime in August. Other activities and publications are planned as well.

Perhaps the Biotechnology Council's most important goal is "for patient medical records to be available 24/7—anywhere, anytime, anyplace in the world," says the council's chair, IEEE Senior Member Richard L. Doyle, former Division VI director. By focusing the expertise of some of the world's top engineering and medical organizations, the Biotechnology Council hopes to influence the creation of universal standards for electronic medical records. Among other goals, the council hopes to work with the new Office of the National Coordinator for Health Information Technology, an office founded last year within the U.S. Department of Health and Human Services. The coordination office wants the U.S. medical community to migrate to e–medical records within the next decade.

TOP CHALLENGES Advanced medical technology for treating patients may be pioneering new approaches in the 21st century, but most patients' records are still handled as they were in the 19th, handwritten on paper. They are then stored in file cabinets along with, say, X-rays on film and paper EKG printouts. According to a U.S. study earlier this year, fewer than a third of hospitals and well under a fifth of private-practice physicians use electronic medical records. True, most doctors and hospitals rely on computers to bill for services—but in many cases, that's it.

The council hopes to influence the creation of UNIVERSAL STANDARDS for electronic medical records

The fact that most medical records are still on paper and film leads to many problems. For example, ambiguous terminology or hard-to-read handwriting can lead to errors in other physicians' interpretation of the records or in the filling of prescriptions. Miscommunication has even led to surgery on the wrong body part or the wrong patient. What's more, in an emergency it can be difficult, if not impossible, to transmit paper records electronically for interpretation by specialists. And backup copies of paper and film are seldom made.

"The notion and concept of e–medical records have existed since the 1960s. So why haven't we had them before now?" asks Michael Rozen, IEEE senior member and the institute's representative on the Biotechnology Council. The delay, says Rozen, is due to three factors: "standards, interoperability, and privacy."

The absence of data-storage and networking standards for both medical equipment and administrative computers has been a major technology barrier. "In an integrated world, every medical machine should be able to communicate with other equipment, computers, and displays," Rozen says. Of equal importance, each patient and physician must be uniquely identified across machines, so "we know that 'Mary Smith' is the correct Mary Smith," he continues. Thus, standards are needed to authenticate both the patient and the requesting entity, to create an audit trail of those who have read or added to the file, and to maintain data integrity during transmission. Moreover, standards are needed for handling inputs from many devices used by physicians that were originally created for nonmedical uses, such as cellphones and PDAs.

INTEROPERABILITY The stumbling block the e–medical records community calls interoperability refers not so much to machines working together as to human beings understanding each other. "The medical language in each e–medical record must follow a structured terminology that has universal acceptance, so it can be unambiguously interpreted by any skilled personnel," Doyle points out. The word "cold," for example, can bring to mind a viral infection or someone with a temperature, "and there are 126 different ways of saying 'high blood pressure,' " adds Rozen, who is also chair of the IEEE-USA Medical Technology Policy Committee (MTPC).

With electronic medical records, X-rays and MRI scans will be available to doctors using devices like a tablet computer as seen here.

For e–medical records to be completely interoperable, however, ambiguity must be removed between medical and lay terms. "Individual medical practitioners and their patients must understand each other across all specialties, which requires consistent terminology," Doyle says. And that is yet to be achieved.

Rozen's third factor, privacy, including the security of patient records in an electronic environment, is only part of the way to a solution. In the last five years, the United States and other countries have developed enough stringent safeguards that most of the population would "probably go along" with having medical records stored and transmitted electronically, says Rozen. Still, important questions remain. For example, can records be made absolutely hack-proof? Is it possible, for example, to ensure absolute confidentiality of a patient's psychiatric background, HIV status,

THE IEEE IN THE BIOTECHNOLOGY COUNCIL

In addition to the IEEE Standards Association and IEEE-USA, six IEEE societies and two councils are participating in the Biotechnology Council:

- Circuit and Systems Society
- Computational Intelligence Society (formerly the Neural Networks Society)
- Computer Society
- Engineering in Medicine and Biology Society
- Lasers and Electro-Optics Society
- Signal Processing Society
- Nanotechnology Council
- Sensors Council

genetic background, or similar sensitive information? Who should control access to the records?

THE IEEE'S ROLE The Biotechnology Council comprises 10 nonprofit organizations, including the American Institute of Chemical Engineers and the American Society of Mechanical Engineers, along with the IEEE and the American Medical Association. The IEEE's participation actually consists of contributions from 10 IEEE entities, including IEEE-USA's Medical Technology Policy Committee and the IEEE Standards Association [see sidebar, above].

Given the IEEE's long experience with networking and computer standards, Doyle observes, "we're the 800-pound gorilla in the corner." But to meet the needs of all manner of physicians, instrument and device companies, biotechnology organizations, hospitals, and insurance companies, to say nothing of patients, "the IEEE can't go it alone," he acknowledges. Hence, the Biotechnology Council has devoted its first year to setting up formal mechanisms for cooperation and funding among its members. The resulting consortium collectively represents more than a million physicians, engineers, and other professionals.

OPEN QUESTIONS Other knotty issues remain. How should the records be stored? "Should everything be in a central database, or could patients carry the records with them on an ID card, much like a driver's license, that could be scanned at every doctor's office?" asks Doyle. Who should administer the system, and how should records and users be identified and authenticated?

Interoperability refers not so much to machines working together but HUMAN BEINGS UNDERSTANDING each other

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Then there is the gray area of just how much information should be consolidated. "If a patient has an artificial heart valve, should the record include the valve's manufacturer and serial number?" asks Doyle. "Should the records include all the digital X-rays and MRI scans, as well as test results from all physicians? Should all records of medical insurance claims be included?"

In the United States, at least, an example of an e–medical records system already exists. "VA [Veterans Administration] hospitals already own a pretty good e–medical records–keeping model," says Rozen. "VA patients have their medical records, blood tests, X-rays, and other imaging results stored electronically and accessible to any of the VA hospitals. The VA is now trying to bridge the gap between VA physicians and private physicians who are treating the same patient, by trying to provide them access to the VA record of the patient."

NEXT STEPS At this stage, "it is premature to think about [the Biotechnology Council] drafting white papers" representing the consensus of its 10 organizations, Doyle says. Nonetheless, the IEEE-USA MTPC was scheduled to release its own individual white paper before the year's end on challenges of and recommendations for interoperability.

It is also too early to add non–U.S. organizations to the council, although "world standards ultimately will be part of our activities," Doyle adds. "Some European nations are well advanced, and we can all benefit from their achievements. Moreover, Asia is among the fastest-developing regions in the world, and we need to share our knowledge with their officials."

In the long term, the influence of the Biotechnology Council on national policy will lie in the fact that "its constituent members have no axe to grind politically and no software to sell," Rozen points out. "This neutrality can provide legislators and regulators unbiased information to assist them in their deliberations."

FOR MORE INFORMATION
White papers by IEEE-USA on aspects of issues related to e–medical records appear at http://www.ieeeusa.org/policy/issues/EHealth

The Office of the National Coordinator for Health Information Technology's Web site is at http://www.hhs.gov/healthit; for more information see http://waysandmeans.house.gov/ hearings.asp?formmode=view&id=2944

Statistics on the meager use of e–medical records by hospitals and private physicians can be found in "Use of Computerized Clinical Support Systems in Medical Settings: United States, 2001–2003," available from the U.S. Centers for Disease Control and Prevention at http://www.cdc.gov/nchs/pressroom/05news/medicalrecords.htm and at http://www.cdc.gov/nchs/about/major/ahcd/ahcd1.htm

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