PCs IN GROUP PRACTICE

A LOOK AT THE NEAR FUTURE

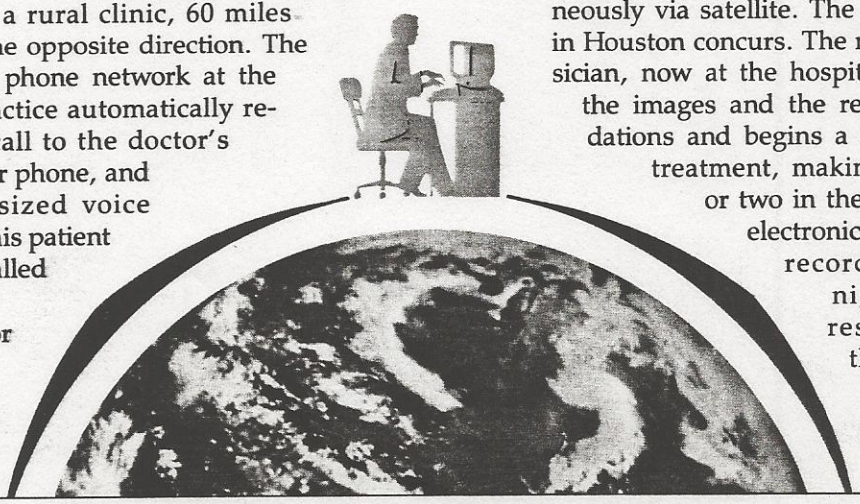
WILLIAM DONOVAN

Consider this fictitious case. A 67-year-old man, who lives alone, forgets to take his blood-pressure medication and ends up unconscious on the floor. He lives in a small town in wide-open west Texas. More than 50 hospitals have closed in Texas in the last four years, and the sheer distance between people and health care is a major peril in a life-threatening emergency.

Today, he'd be a mortality statistic.

In a couple of years, something like this might happen: a computer at Texas Tech University Health Center, 350 miles away in Lubbock, automatically dials his number when he doesn't call in at a pre-appointed time. When he fails to answer, the computer automatically dials his physician. But the doctor has just left his group practice's office for a rural clinic, 60 miles away in the opposite direction. The computer phone network at the group practice automatically relays the call to the doctor's cellular car phone, and a synthesized voice tells him his patient hadn't called in.

The doctor hits an auto-dialer on the phone, calling an ambulance. The ambulance picks up the patient, and en route to the hospital transmits an EKG over its cellular phone. The physician orders angiograms and decides to consult specialists in Houston and at UCLA. The images, EKG, and the patient's medical history are beamed to both places by a satellite link in seconds, on a rush basis. The UCLA cardiologist, at a high-resolution computer screen, dials up a 50,000-image library at the National Library of Medicine, searches for similarities using artificially intelligent search software, downloads the images, and consults his microcomputer's expert diagnostic system. He sees several diagnostic and therapeutic possibilities, culls them into a file and beams them, along with relevant library images, to the hospital and to Houston simultaneously via satellite. The specialist in Houston concurs. The rural physician, now at the hospital, views the images and the recommendations and begins a course of treatment, making a note or two in the patient's electronic medical record for the night-shift resident at the hospital.



Just before

going to bed that night, the rural physician turns on his home computer and dials up the hospital information system to check the patient's status. Everything's fine. The night resident didn't forget to follow up, in part because of the computerized clinical reminder in the hospital computer system.

To some, this may seem like "Star Trek" medicine. In fact, every one of these computer and communications technologies is either in limited use or in clinical or field trials today.

Boston on Beam

A computer system called the Telephone-Linked Computer (TLC), for example, is the subject of a clinical trial as a way to monitor 56 elderly hypertension patients of the Evans Medical Group at Boston University Medical Center. Created by Robert Friedman, M.D., and colleagues at the medical center, it uses Digital Equipment Corp.'s DECTalk computer technology, said a medical center spokesman.

The patient takes his blood pressure at home at a pre-set time, then calls in. The system's synthesized voice asks questions, and the patient responds via touch-tone. Each call is recorded as if it were a lab result. If the patient doesn't call, the computer calls him. If it doesn't reach him, it notifies the physician.

The medical center has received funding to sign up another 500 elderly patients. Dr. Friedman said he anticipates that it will work for patients with a variety of chronic illnesses, including arthritis, diabetes, asthma, chronic lung disease, angina, coronary artery disease, chronic renal ailments, cancer, and possibly AIDS. "Patients really like it," he said in an interview. "I'm convinced that a relationship develops much faster" due to the phone system.

Also, he said, the TLC should help the physician make more rational decisions about when to schedule an appointment with a patient. For chronic problems such as hypertension, the physician typically says, "See you in three or four months," Dr. Freedman notes. Feedback from the system will provide trends and thus a logical basis for when to set an appointment, possibly reducing hospitalizations.

Cheap, Quick

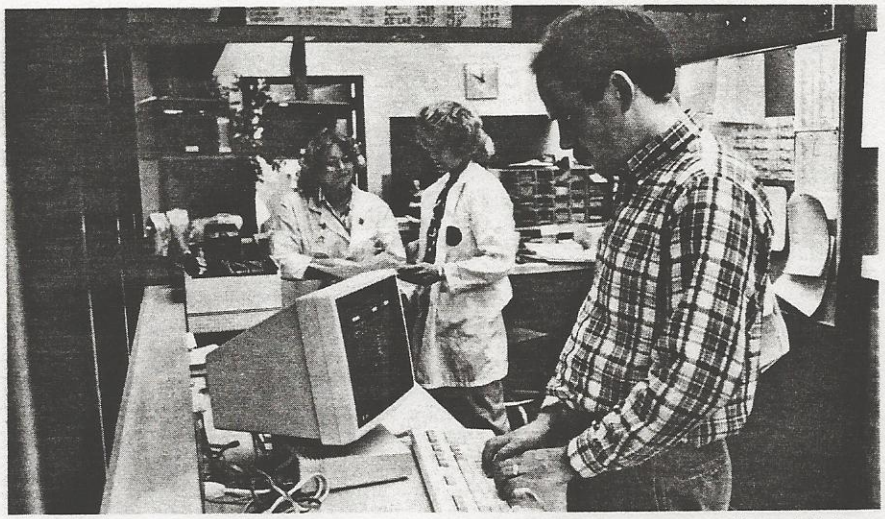
Also, it's inexpensive. For 400 patients, it would cost 50 cents per call, amortizing in one year all hardware, which includes a PC, a coprocessor board and extra memory, a $3,000-$4,000 Digital speech synthesizer, and the software.

Our fictitious doctor in the example above obviously could have left a reminder for the night-shift resident without a computer. However, such computerized notes have distinct advantages over paper. At Ozark Guidance Center in Springdale, AR, a staff member patched its electronic mail system into a partially computerized medical records system, allowing a caregiver to "flag" a patient's file and have that "flag" pop up in the appropriate caregiver's electronic mail. Priority clinical messages thus end up receiving priority attention.

A more complex system for automatically notifying physicians is being performed by the HELP (Health Evaluation through Logical Processes) medical logic system at LDS Hospital, Salt Lake City, Utah. HELP integrates an expert system into the LDS hospital information system. It takes readings from inpatient monitoring devices, and issues an "alert" to the nurse if a patient's readings wander outside pre-set parameters. Taking the process a step farther, HELP also evaluates whether the nurse ought to immediately notify the attending physician.

KARENET in Texas

Rural west Texas was chosen as the location for our fictitious example because it's the site of KARENET, a computer network system created by the Texas Tech University Health Center. Recently, the Department of Health and Human Services (HHS) announced



Rex Castle, continuing education programmer for KARENET, inputs patient data while Lea Hooper, a nursing student, and Pat Conover (right), a health care record programmer, review charts.

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that it had agreed to provide up to $2.2 million over three years to help Texas Tech create MEDNET, a network based in part on KARENET, but using interactive video as well as some computers to link rural physician practices and small clinics in a 135,000-square-mile area of west Texas to hospital specialists.

"Our concern is providing increased access to services" in isolated rural areas, said Dena Puskin, deputy director of rural health policy of the Health Resources and Services Administration (HRSA). Rural physicians and groups would be able to consult on-line with specialists in medical centers, send lab tests and X-rays to hospital-based specialists, and obtain continuing medical education (CME) on line.

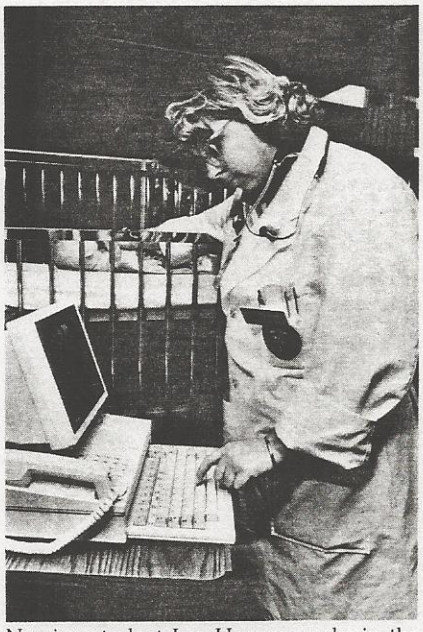
The fact that the Health Care Financing Administration (HCFA) is participating may be the most significant aspect of the project, said Puskin. It's a signal that HCFA is willing to consider the practicality of Medicare and Medicaid reimbursement for on-line consultations between physicians. For such a system to become self-sustaining, it would have to charge users for both consultations and CME, Puskin said.

"The PROs are talking about developing some very intensive training," said Puskin. "Part of this project is to work out how you would do the telecommunications" to disseminate CME on video.

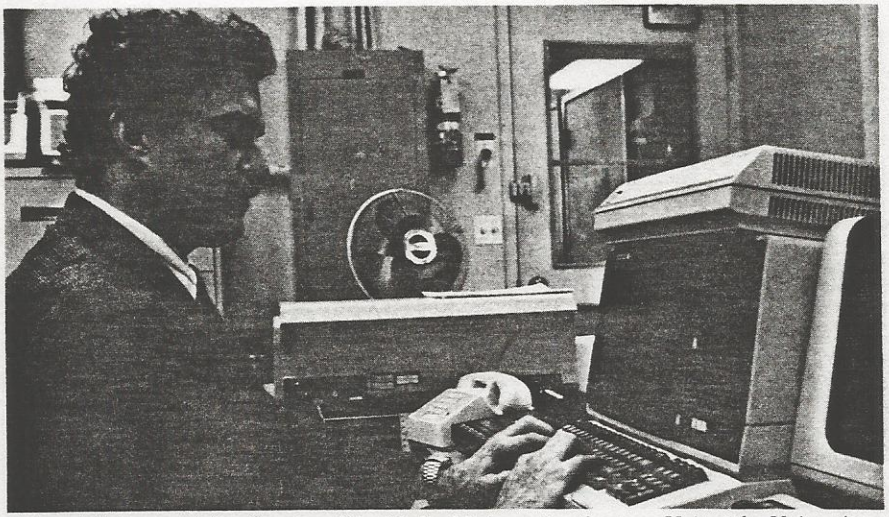
Cellular Services

The system to transmit EKGs from an ambulance by cellular phone was created by University of Chicago emergency physician Pamela Grim, M.D. and co-worker Tad Feldman, using a MAC PC Cellular Cardiograph from Marquette electronics of Milwaukee, WI, and the Ameritech Mobile Communications cellular phone network. In a demonstration last year, EKG signals were sent in about 15 seconds.

In the Chicago test, the cellular linkup was to be used to allow a physician in the hospital to read an EKG taken in the field, and to supervise the administration of clot-reducing drugs by paramedics well before the patient arrives at the hospital, thus reducing severity of and mortality from heart attacks. If the linkup to hospital-based physicians proves effective, there is no reason similar EKG receiving equipment couldn't be located in a group practice as well, allowing the patient's own physician to be consulted. As of this date, Dr. Grim hadn't published her findings, but the technology is undergoing a wider test in the Seattle, Washington area.



Nursing student Lea Hooper works in the clinical simulation center at Texas Tech, useing KARENET in a hands-on training exercise. In this examination the computer is the substitute stethoscope.



Robert Friedman, M.D., director of the Medical Information Systems Unit at the University Hospital and associate professor of medicine at Boston University School of Medicine, "talks" to his patients using the Telephone-Linked Computer System (TLC).

Satellite Images

Satellite transmission of medical images and data is a new, ultra-high-speed service, started last September by Vortech Data, Inc., a Reston, Va. firm. A set of 50-60 MRI images in full resolution can be sent between distant sites in less than a minute at a cost of $4.70,

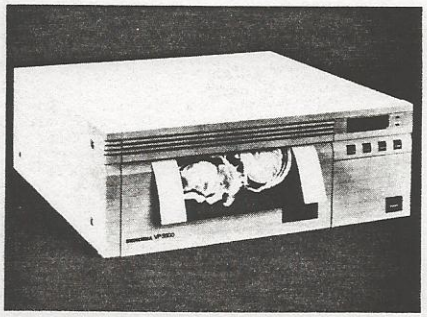
said E. Lee Bryan, Vortech CEO. Because of the cost (the user must have a $60,000 terminal to receive the satellite image or lease it at $2,000/month) hospitals and other fairly large health care entities are the likely hubs for sending and receiving data.

Bryan said he tells hospitals they should install an emerging technology called Picture Archiving and Communications Systems (PACS) to transmit medical images both within the hospital campus and off-site, so primary care physicians can view X-rays and other images at home or at their offices. Radiologists need high-resolution images, which requires very expensive monitors. According to Bryan, however, an X-ray or other image useful to the primary care physician can be transmitted to a PC with a 9600-baud modem, a technology available today.

So many new computer products are being developed for health care, the challenge for the physician is to judge which will do the most to make the practice of medicine more effective, save time, streamline the business end of a practice, and reduce patient injuries and malpractice risks.

Challenging Changes

To date, the physician in the average medical practice has had little contact with these new systems. "The basic functions of practice management haven't changed in 10 years," notes Owen Doyle, a consultant with Arthur Young and Co.'s Portland, OR, and Seattle, WA, practice. Such disparate computer experts as Doyle and Robert A. Greenes, M.D., Ph.D., of Harvard University Medical School and Brigham and Women's Hospital, agree that many of the important events in medical informatics are happening now.

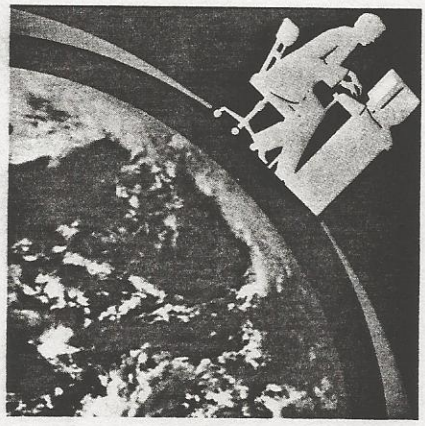


The Seikosha VP-3500 video printer can provide high line rate signals used in such medical disciplines as radiology, cardiology, obstetrics, and orthopedics for diagnosis and other procedures.

The three areas of immediate interest (to the group practice) are knowledge retrieval, decision support, and continuing education capabilities to aid the practicing physician.

Dr. Greenes was program chairman of the November, 1988 Symposium on Medical Applications in Medical Care (SCAMC), in Washington, D.C. the nation's leading annual showcase of the emerging medical uses of computing. SCAMC 1988 didn't come close to covering the entire subject of medical informatics in a mere four days that were packed with five-at-a-time concurrent sessions. However, its 908-page proceedings and the 884-page proceedings of the 1987 SCAMC, together with their demonstrations digests and a tour of their exhibit floors, might comprise a fair measure of the field.

"The three areas of immediate interest (to the group practice) are knowledge retrieval, decision support, and continuing education capabilities to aid the practicing physician," Greenes said of the 1988 meeting. He added a fourth: networking of physicians' computers to other health care information systems.



Artificial IQ

Some clinical decision support software systems (also called artificial intelligence and expert systems) are being used in diagnosis and treatment. Subscribers to AMA's on-line service, AMA/NET, can subscribe to DXplain, which uses a patient's historical, physical symptoms, and lab data to generate a list of diseases which might cause the symptoms. DXplain was developed by the Massachusetts General Hospital and a group of Harvard informatics researchers headed by G. Octo Barnett, M.D.

Dr. Greenes predicts several important artificial intelligence systems for the practice of medicine will be released over the next year to two years. Many of these have been in development in university medical settings for a decade or more. Dr. Greenes' own Harvard and Brigham and Women's group, for example, has adapted two expert systems to work with its Explore-2, a software system for browsing through knowledge bases. One, the group's own CASPER, is a diagnostic workup strategy and test selection system.

The other is an IBM PC-based

differential diagnosis expert system, Quick Medical Reference (QMR), created at the University of Pittsburgh. QMR, an outgrowth of INTERNIST-1, an earlier expert system, is currently being tested at more than 30 university medical centers, said one of its developers, Randolph Miller, M.D, at SCAMC 1988.

During the last two years expert systems have seemed likely to move soon out of the teaching hospital and into the physician's office. One reason is the exponential growth in the power of low-cost microcomputers. The history of one of the best known, expert systems, AI/RHEUM, which diagnoses and recommends therapies in rheumatology, is a good example. It ran only on a $200,000 Digital VAX machine until 1985, when the IBM PC/AT was released with just enough memory to run the system. The trouble was, it ran slowly. A user would have to wait as much as 20 seconds for it to run through its knowledge base and come up with a single idea—too slow for the physician, who might have to try out a number of different hypotheses. Then last year, a National Library of Medicine group wrote CTX, an artificial intelligence software "shell" for the newer, more powerful IBM PS/2 Model 60, speeding up the AI/RHEUM inference process severalfold. A Macintosh version is being written also.

Medical Computing

Among developments in medical computing, telecommunications is causing the biggest changes in the way many physicians practice medicine and run the business end of their practices. Electronic claims submission is one obvious example. Another is MEDLINE, the world's most advanced and thorough file of medical data, giving the physician access to the latest medical knowledge. It's available on-line, and more recently also in CD-ROM, to anyone with a PC and the right peripherals.

Computer-to-computer links are proving a boon to group practices in other ways. The Cleveland Clinic Foundation operates a 900-bed hospital, but does not grant admitting privileges to physicians in the surrounding community. Nonetheless, it does need their patient referrals for its specialties. In 1986, the clinic noticed a drop in referrals from community physicians, said Judith Lester, director of physician liaison. "They didn't feel we were concerned about them," said Ms. Lester. "They were sending us lots of patients and we weren't valuing the business they gave us."

Among the perceived slights: referring physicians had to leave a message on a tape recorder if they wanted a patient admitted late at night. "It infuriated them. Doctors wanted to talk to other doctors," she said.

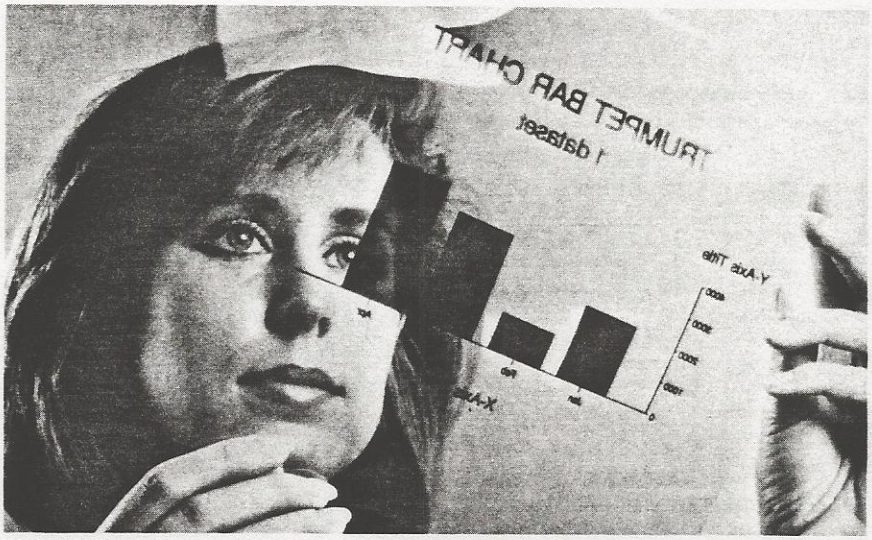
Cleveland Program

To address the problem, the clinic created an Affiliates' Program for referring physicians and began offering a range of services, including an on-line communications linkup. Community physicians can now make patient appointments with clinic physicians from their office computers via modem, and (if they have compatible software), transfer the patient's data from their systems to the clinic's computer without re-keying anything.

They can obtain status of their admitted patients and limited discharge summaries, schedule CME at the foundation through their computers, order patient education brochures on-line, receive on-line calls for patients for upcoming clinical trials, and receive an on-line newsletter. "Some of our departments use it for marketing," Ms. Lester said.

Future functions include interactive on-line CME and lab results reporting, which is "not that far off," Ms. Lester said. The Affiliates' Program has reversed the decline in referrals, boosting them 12 percent in 1987 and again in 1988.

Similarly, a communications link between physicians' PCs and the Little Company of Mary Hospital,



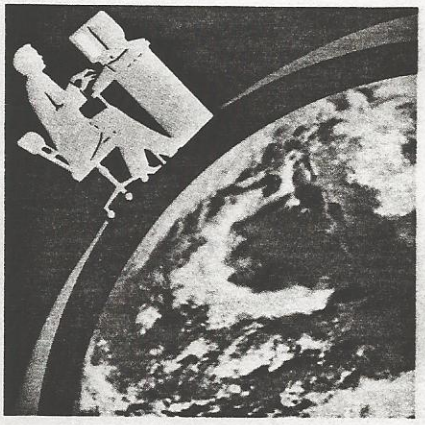
With 3M Transparency Film, presenters can quickly create computer-generated transparencies using a computer printer, pen plotter, plain paper copier or infrared transparency maker.

Evergreen Park, IL, allows a physician to obtain demographic and payor data, patient acuity information, and some clinical data, including blood type, known allergies, medication profiles, and height and weight, and to request a consultation with a hospital-based specialist. A future interface with the hospital's lab computer will allow the physician to read hospital lab results.

This network has grown slowly but steadily, from 60 MDs in 25 practices in early 1986 to 65 practices with close to 110 MDs now. To use the network, the physician's total investment, including practice management software, is about $4,000, said Dennis Reilly, the hospital's director of information systems. The effort has paid off for the hospital in higher market share.

Billing Delays Cut

An on-line link with a hospital's computer system can reduce the billing delays and errors that can occur when the physician's's staff forgets to obtain one or two key bits of demographic or payor data. Another advantage, as physician practices linked with Borgess Medical Center in Kalamazoo, MI found, is a small psychological edge with patients. "People are more likely to go to see a specialist if an appointment's already been made" while they're in the referring physician's office, said Thomas McElroy, Borgess' director of marketing. Borgess' network links close to 300 physicians in 150 practices with the hospital. Borgess provides access to lab and radiology results reporting, patient admissions sheets, demographic and insurance data, and discharge instructions.



A different kind of physician computer network was created by the Massachusetts Medical Society and the Collaborative Perinatal System. They use the society's electronic mail system to find neonatal intensive care beds at nine hospitals throughout the state, saving physicians and staffs from potential hours of telephoning due to a statewide shortage.

A rural group practice was able to streamline operations and increase patient visits.

New HCFA Rule

Another advantage of networking is that it allows the physician greater flexibility with his or her time. An example is the new HCFA rule for hospitals subject to the Prospective Payment (DRG) System. The rule adopted September 30, 1988, will permit physicians to use a computer code to transmit primary and secondary diagnoses required before a bill is paid by HCFA. Being able to file these Medicare attestations on line will eliminate the hand signing of each diagnosis and the time consuming paper work. Instructions for the computerized attestations are being issued by HCFA in its Hospital Manual and Intermediary Manual. Some hospitals probably will set up computer screens to streamline the attestation and allow doctors round-the-clock access.

In another use of computer networking, Highland Physicians Ltd., a rural group medical practice with four offices, was able to increase patient visits, streamline operations, take some lab test work away from a nearby hospital, and reduce its need to duplicate expensive equipment from office to office, two of its physicians reported at the 1987 SCAMC meeting.

Highland manages all four of its offices in Wayne and Pike Counties, PA, with a single, powerful microcomputer. Each office has at least one terminal. The single database captures financial, demographic, allergy, encounter data (varying by specialty), medication, and lab results, all accessible from any location.

A "Query" function lets the practitioners study subsets of patients for clinical or market information. This has helped increase preventive medicine visits. After spending heavily on a successful 1985 media campaign to those who should have flu shots, the following year the practice went into its database and identified 1,800 patients who fit the criteria for receiving shots again, and sent each a letter. A total of 720—40%—came in for the shots, said Jon K. Sternburg, M.D., and Thora R. Jackson in their paper.

The group also queried its database for names of patients aged 36-77 who didn't have an EKG or serum cholesterol documented in their records at the practice. They found 3,000 of their 12,000 patients fit the criteria and sent letters to them recommending cardiovascular risk assessment.

Fast Booking

With a single database covering four offices, a physician at any location can view the schedule for the sonograph at another location and book a patient quickly to a firm appointment. Because the practice's overhead is lower than the hospital's, it can offer a lower price for the sonogram. At the lower price, patients are willing to travel from one office to another for the procedure. Coordinating appointments system-wide reduces duplication of equipment for sonography, flexible colonoscopy, and stress electrocardiograms, the directors said.

Each of these technologies raises its own new medical, social, and legal issues for the physician practice. Networking and sharing data, for example, create confidentiality risks. These issues are most acute in situations in which physicians and other providers share patient data with payors.

Lutheran General Hospital in the Denver, CO, suburbs shares patient data with the Coors Company, which not only self-insures and self-administers its employee health benefits, but also administers its own workmen's compensation programs. Being its own administrator gives the company a legitimate interest in diagnostic and treatment information on its employees, and the data link is proving valuable to both the company and the provider, says Hal Fontinelle, the former vice president-information services at Lutheran, who created the computer linkup. However, before the hospital turns patient data over to Coors, the file must be carefully screened to ensure that any conclusions hinting at substance abuse, emotional or mental disorder, or AIDS are not released.

Exchanging data creates a wide range of confidentiality and security issues, said health care attorney John B. Reiss in a recent interview. Before you can decide which technical steps you must take to protect your HIS system, you must know whom you need to protect it against, Reiss notes.

Medical records, especially in big batches, are vulnerable to a wide range of illegitimate uses by employers, malpractice lawyers, insurors, HMOs, and competing providers, Reiss says. Medical records of famous people could be tempting to news media. Even if these organizations aren't likely to engage in computer hacking, there are plenty of data bandits who know where to sell stolen files.

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Also, Reiss added, there are hidden traps in legitimate divulging of files to insurors, employers, quality assurance organizations, and utilization review groups. One of these traps is "informed consent." If an employer or insuror has obtained a signed consent, your risk is reduced, "unless the patient was induced to consent to something he didn't know he was consenting to," Reiss said. Then the physician who had custody of the record may be at risk of liability for disclosing it. Consent rules vary from state to state. If you don't follow them closely, "You can have a real exposure for negligence or invasion of privacy," Reiss added.

Notwithstanding the risks, outside forces are likely to have a strong role in pushing computerization beyond the business and administrative ends of a medical practice into the treatment of patients. One of these forces is malpractice law. Tort law has generally pushed new technologies upon us. Courts "may impose liability for a hospital's or physician's failure to use a computer where its application would have prevented the injury," attorneys Bruce Watson and Jodi Bernstein said in a paper for the 1988 SCAMC meeting.

Successful liability defenses have been mounted, they noted, on the grounds that a new technology isn't yet operationally effective. For example, a court used these grounds to find that Northwest Airlines was not liable for damages after it failed to use a new technology that might have prevented a crash. The year of that decision was 1955. The equipment deemed ineffective: radar. The lesson is that such defenses don't last forever. ■