Telemedicine and Information Technology at the Veterans Administration Palo Alto Health Care System: Serving Patient Care

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Objectives/Goals

In the Department of Veterans Affairs (VA), information technologies have been key to the delivery of high-quality medical care. The Veterans Administration Palo Alto Health Care System (VAPAHCS), one of the largest VA facilities in the western United States, is a new, 650,000-square foot, 961-bed tertiary care facility with seven outpatient satellite clinics that serve patients scattered over hundreds of miles. The VAPAHCS is also a major referral center in a regional health care system that stretches from Reno, Nevada, to Honolulu, Hawaii.

At our facility, we view telemedicine and information technology as more than simply remote diagnosis. Although most projects in telemedicine concentrate on assessing distant medical diagnosis and patient triage, we believe that a more inclusive definition of this technology makes better use of the medical specialists and computer hardware and software on which success depends. Our operative definition of telemedicine—changing the time and place of health care delivery—makes sense from both economic and patient care perspectives.

Program Details

The strategic view of information technology in the Department of Veterans Affairs centers on the telecommunications, software, and networking standards of our system, which are common to all the VA facilities around the country. Telecommunication within the Department of Veterans Affairs is supported by an infrastructure of computer hardware, software development tools, compatible hospital information systems, and an e-mail system. The Hospital Information System has been developed and maintained by the staff of the Department of Veterans Affairs and can exchange data among over 600 major VA facilities. Our network consists of more than 23,000 miles of fully digital fiberoptic cable and can support numerous telecommunications protocols. Data transmission rates of 1.544 megabits per second (T-1 data rates) are possible with this system and are important when large digital-image files are moved rapidly across the network.

Following is a discussion of the telemedicine and information programs we have implemented recently. The VistA imaging software (Washington Information

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Group, Washington, D.C.) is a VA-developed product capable of accepting medical images from various image formats. These images are integrated with reports in our computerized medical record. Medical specialties that use this software include gastroenterology, dermatology, pulmonology, ophthalmology and podiatry; radiology will be integrated within the next 12 months. These systems are in the public software domain and are being used in other countries. The imaging software will be linked to the VA-developed computerized patient record that is being deployed nationally.

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Radiographs are captured at local satellite clinic sites, scanned, and transmitted over T-1 lines to the tertiary care facility, where they are interpreted by radiologists. The quality of such images may be virtually identical to that of the nondigitized image. However, confident interpretation of these images involves a learning curve that depends, at least in part, on the quality of the computer hardware and software. A complete digital radiology software package developed by Cemax-Icon (Imation, Fremont, California) includes a 5.5-terabyte server and remote reading workstations in the emergency department, intensive care unit, and selected clinics; it is due to be activated this year. The project design also allows database access from a World Wide Web browser.

The virtual medical conference combines the VistA imaging software and videoconferencing equipment and allows medical images, radiographs, and documents to be shared with local and regional VA medical personnel through videoconferencing. General and urology tumor boards and other medical specialties are using this approach to improve patient care. We have constructed a Web-based questionnaire that allows participants to assess the quality of information provided and to give feedback that will improve the conferences.

Software that is linked to the VistA imaging software allows health care personnel at our facility to share electrocardiograms (ECGs) over the area network. Thus, clinicians in remote local and regional clinic sites may access all ECGs in the patient's database from desktop computers, allowing more rational patient care.

A Web-based archive with an interactive graphic user interface is being used in several of our remote clinic sites. The program, Deliver Explorer (Deliverex, San Jose, California), contains patient notes that have been scanned into software from which they can be easily retrieved. Availability of the notes from a patient's previous clinic visits improves care.

By using fiberoptic technology, we have broadcast a live video of two innovative surgical procedures from the operating room at the VAPAHCS to a group of urologists at a conference facility 30 miles away.

Finally, in an eye clinic at one of our satellite facilities, we developed a new paradigm for care by using different aspects of information technology. Patients in the clinic waiting area were able to use multimedia, computerized assistance, and medical Web sites to learn more about their ocular health and eye conditions. In the examination room, an easily accessed CD-ROM allowed clinicians to show patients examples of their eye problems on a high-resolution computer monitor. In addition, medical trainees from different specialties were able to access and use digitized images, CD-ROM, and on-line information resources to improve quality of care.

Costs

The radiology project has saved tens of thousands of dollars in professional personnel costs at remote sites. It has also saved an unknown quantity of resources through more appropriate triage of patients and has been a finalist for national information technology awards.

The ECG project required an upgrade to the cardiology database server that cost approximately $60,000. The high clinical usefulness of this project has been documented in a study done at the Department of Veterans Affairs hospital in Washington, D.C. The costs of the project are small compared with the savings resulting from the more rational hospital admissions and patient services that will be possible when physicians can find out whether a patient's ECG changes are old or new.

We spent approximately $36,000 on the eye care project. After installing the educational kiosk and making administrative changes, we saw more than twice as many patients in an average month. In addition, the educational program allows our full-time licensed vocational nurse to now work half-time in our clinic. This has enabled her to work in other clinics, resulting in additional savings.

Evaluation

The projects described here have been in place for varying periods, ranging from more than 2 years for the eye care project to several months for the ECG project. For

our virtual conference, questionnaires surveyed the quality of presentation, time savings, and recommendations for improvement. Participants uniformly believed that the quality of images and structure of the conference allowed them to have the same benefit as if they had been at the primary site of care. We have also reproduced our questionnaire on a Web-accessible site, allowing participants to provide information on the quality of presentations at any time.

The ECG project may have great influence on delivery of cardiac care in our system because charts may not be available at remote sites. We are measuring hits on the cardiology database server to assess the frequency of use and are working on studies to measure outcomes from the availability of this information.

A survey questionnaire that was part of the evaluation of the eye care project showed that elderly patients widely accepted and were enthusiastic about the technology. Of all patients, 87.5% reported that they wanted to see the educational CDs and less than 3.5% reported that they would rather not have seen them. Patients have a strong interest in such educational material; 83% of the patients disagreed with the statement that they were shown too much information, and more than half of all respondents agreed or partially agreed with the statement that they would have liked more time to view the images. Most important, although 5.1% of the respondents reported that they did not feel the pictures were helpful, 81.1% felt that viewing the material facilitated understanding of their eye condition. More than 90% of the patients agreed (78.4%) or partially agreed (11.9%) with the statement, "Do you think you will be more likely to follow your doctor's advice because you have seen the pictures?" Less than 4% disagreed.

Risk management issues have been raised about remote primary diagnosis in telemedicine. These issues will become more important as the entire patient record becomes digitized, especially in large health care organizations. As our organization moves toward this goal, digital imaging systems intended for primary diagnosis are undergoing rigorous testing for reliability compared with the nondigitized version. Many of these issues will probably be redefined in the next decade as most medical images become digital and are routinely retrieved from large databases.

Recommendations to Others

These information technology projects require strong administrative direction as well as the presence of a rapid-response informatics team that includes representatives from computer networking, operations, systems, and logistics. Strong support and communication with medical departments are necessary if such projects are to be useful to patients and health care providers. The leadership of knowledgeable physicians is crucial to the success of these efforts.

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