

TELEMEDICINE

at the COMMUNITY CANCER CENTER



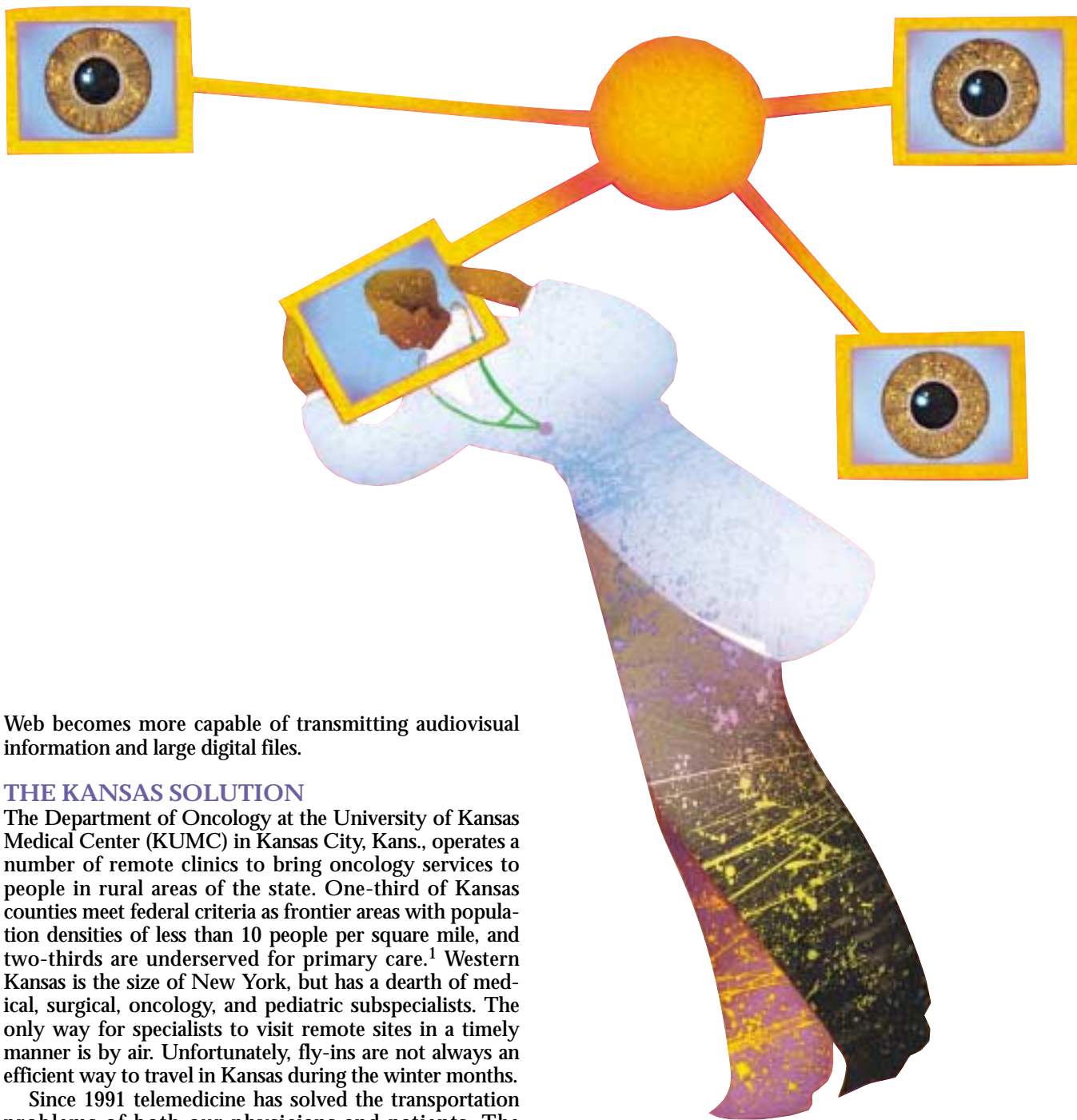
by Ace Allen, M.D., and
Astara March

Telemedicine is defined as the delivery of health care and the sharing of medical knowledge over a distance using telecommunications systems. In its modern form (made possible by recent advances in data transmission and the falling price of technology), it refers to full-motion, high-resolution, two-way interactive video communication (IAVC) and information transfer over long distances within a medical setting. Telemedicine development is proceeding so rapidly that, within a few years, the technology should be available to most rural and inner city communities, and even to physicians' offices.

Inexpensive televideo and telemonitoring technologies (increasingly mediated by the Internet) allow clinicians to assess, manage, and treat off-site patients and exchange digital radiographs, pathological images, and multimedia medical records. Home monitoring of EEGs, EKGs, temperature, blood pressure, and infusion pumps is also becoming possible, saving patients exhausting trips across the country in rural areas, and across the city in urban areas.

Telemedicine offers a direct, usually real-time connection between a patient or health care practitioner on one end and a doctor, nurse, or allied health caregiver on the other end. Patients on home monitoring communicate with their nurses through a video device and send monitoring data to the hospital through their computer. The information they transmit goes into a database that is reviewed by medical professionals at predetermined times.

While telemedicine has usually been practiced over phone and digital telecommunications lines (ISDN, T1, and public-switched telephone networks), it is being handled more and more by the Internet as the World Wide



Web becomes more capable of transmitting audiovisual information and large digital files.

THE KANSAS SOLUTION

The Department of Oncology at the University of Kansas Medical Center (KUMC) in Kansas City, Kans., operates a number of remote clinics to bring oncology services to people in rural areas of the state. One-third of Kansas counties meet federal criteria as frontier areas with population densities of less than 10 people per square mile, and two-thirds are underserved for primary care.¹ Western Kansas is the size of New York, but has a dearth of medical, surgical, oncology, and pediatric subspecialists. The only way for specialists to visit remote sites in a timely manner is by air. Unfortunately, fly-ins are not always an efficient way to travel in Kansas during the winter months.

Since 1991 telemedicine has solved the transportation problems of both our physicians and patients. The KUMC telemedicine system has grown rapidly, and now primary care physicians all around Kansas can refer their patients to a telemedicine oncology clinic in their area of the state. Local oncologists, if they are available, can practice together with KUMC physicians. Treatment plans can be carried out close to the patient's home under the supervision of the KUMC oncology staff, and KUMC physicians can also monitor the patient's progress and adjust regimens as needed. In addition, local hospitals do not lose revenue to urban tertiary care facilities.

Since 1995 KUMC has also used its telemedicine system for tumor boards and for the continuing medical education of physicians, nurses, and allied health professionals in rural areas.

Kansas is not the only state to implement telemedicine.

There are telemedicine programs in 42 of the 50 states plus Puerto Rico. For more information about programs and resources, see Table 1.

VISITING THE DOCTOR ONLINE

One of the KUMC oncology outreach clinics is located at the Hays Medical Center in Hays, Kans., 280 miles west of Kansas City. It has been in operation since 1983 and is staffed by both local oncologists and specialists from KUMC. Hays is a town of 18,000 with a modern hospital and excellent primary care coverage.² Another telemedicine site with regular weekly oncology clinics is at Horton, Kans., and there are smaller, as-needed clinics at Liberal, Caldwell, Parsons, and Beloit. A tumor board is

Table 1: Selected Resources for Tracking E-Health and Telemedicine

Journals

- Health Data Management (www.healthdatamanagement.com)
- Health Management Technology (www.healthmgttech.com)
- Journal of Telemedicine and Telecare (www.coh.uq.edu.au/jtt/)
- Journal of the American Informatics Association (www.jamia.org)
- MD Computing (www.mdcomputing.com)
- Medicine on the Net (www.corhealth.com)
- Oncology net guide (www.oncologynetguide.com)
- Telemedicine Journal and E-Health (www.liebertpub.com/TMJ/)

Newsletters

- eHealthCoach (www.ehealthcoach.com)
- Internet Healthcare Strategies (www.corhealth.com)
- Internet Medicine (www.lww.com)
- The Telehealth Law Report (www.civicsresearchinstitute.com)

Internet-based News (daily updates)

- ehealthEDGE (www.ehealthedge.com)
- ePharmaceuticals (www.epharm5.com)

held with representatives from the Hays center and a radiation oncologist and medical oncologist from Pittsburg, Kans. every Friday morning.

Telemedicine was brought to the Hays site in 1993, and the telemedicine oncology practice was started by former KUMC physician Ace Allen, M.D., that winter after storms prevented him from reaching the Hays clinic on several different occasions. KUMC oncologist Gary Doolittle, M.D., is now in charge of the clinic, and oncologists Stephen Williamson, M.D., and Linda Campbell, M.D., joined the KUMC teleoncology staff last year.

Doolittle describes the practice as dynamic and his role in it as constantly changing. At first he was the only oncologist on staff. When another oncologist was hired at Hayes, he switched to seeing more hematologic oncology patients, and when that medical oncologist left the Hayes center, his caseload had more solid tumor patients. He is now seeing a mix of both solid tumor and hematologic oncology cases. All three KUMC physicians cross-cover for their Hays colleagues, provide second opinions, are primary physicians of record, and participate in tumor boards.

A teleoncology physician travels to the Hays Cancer Center at least twice a month to see patients face-to-face, and there are two teleoncology clinics per week. While some practitioners believe the ideal scenario is for patients to have their first appointment with the doctor in person and follow-up appointments online, Doolittle says he does not adhere to this formula and the results have been good. "The most important thing is to see the cancer patient in a timely manner," Doolittle said, "whether the visit is in person or in the teleoncology clinic."

Weekly telemedicine oncology clinics last two hours, during which two to four patients may be scheduled. A patient referred to the Hays telemedicine clinic is given a brief introduction to the system, makes the usual preparations, and is ushered into the telemedicine exam room by the nurse who will present the case and who is familiar with the operation of the video controls.² The patient is seated before a television monitor and a small camera, and speaks to the physician "face-to-face." The doctor elicits a history in the normal fashion and conducts a physical exam, using the Hays nurse specialist as a proxy for palpation. The KUMC physician will have already trained the nurse in his or her own brand of exam to make sure that the nurse can identify the same structures the physician would find significant in a physical evaluation.

The basic IAVC system has several useful attachments, including a specially adapted stethoscope that transmits breath and cardiac sounds and an endoscopic attachment that allows close-up evaluation of the oropharynx. An



STETHESCOPE PHOTOGRAPH BY PHOTODISC

H

health care practitioners are increasingly adopting interactive video systems to deliver enhanced access to medical services, as well as improve the quality of that care at reduced prices.

ultrasound transducer can be held over the patient's chest to produce an echocardiogram, which is instantly transmitted to the KUMC physician directing the exam. In addition, the camera can zoom close to assess skin changes, mucositis, and other visual physical findings, or back up to evaluate gait and movement abnormalities. During the entire medical visit there is normal, two-way conversation between the people in Hays and the people in Kansas City.

Using a graphics stand, radiographs (plane films, CTs, MRIs, and bone scans) can be transmitted with great fidelity to KUMC by computer. Labs and EKGs are faxed. In addition, a video recording with two-way audio can be made at either end of the system.

An advantage of the telemedicine format is that it is perfectly suited for recording. Videotapes, obtained with the permission of the patient, can be used to review findings or to compare findings from one visit to the next. Patients can also review the tapes and show them to their family members, who can hear the oncologist's opinion for themselves and review any recommendations that are made. Although videotapes are not routinely made at the Hays center, they are available upon request.

To date, both patient and physician satisfaction with the system has been high. Children, especially, seem to enjoy being "on TV." While most Hays patients use the telemedicine system, some still prefer in-person visits in the outreach setting.

An initial drawback to the telemedicine format was that it was more time-consuming than an on-site encounter. The physician could not move quickly to another room to see a second patient while the nurse was preparing the first patient for an exam, or while waiting for labs and radiographs.² Advances in technology have solved this problem by creating monitors that can be rolled from room to room. Lowered costs have also helped. The original Hays videoconferencing equipment cost \$100,000 in 1991. Now they have units in at least three rooms that cost only \$12,000 each. Computer-based videoconferencing units (that do not permit attachment of the peripheral devices) list at around \$3,500.

Patients are scheduled every 30 minutes. While new patient appointments usually take all the allotted time, follow-up visits often last just 20 minutes, leaving the staff time to write up notes and prepare the next patient during the interval. The flow is as efficient as that of an on-site clinic.

The key to practicing oncology in a telemedicine setting is having a good clinical group on site. "This is about people, not gadgets," says Doolittle. "I'm an oncology consultant working closely with a rural team. Having good equipment to transmit X-rays, bone scans, and CT

scans is important; but the most important component is a local internist, family practitioner, or nurse practitioner who is dedicated to cancer patients and is willing to shoulder new responsibilities. If the people are solid, the technology falls into place."

HOME TELECARE

Home telecare allows doctors and nurses to have contact with homebound patients several times a day instead of several times a week via a visiting nurse.³ Homebound patients receive far better care without having to struggle with the problems of transportation (See Home Telecare: A Closer Connection on p. 22). Another benefit is that patients who use home telecare can be released from the hospital earlier without endangering their condition since they can be reliably monitored at home.³

Home telecare equipment can be easily installed and allows vitals, EKGs, and other tests to be run and reviewed every few hours, if necessary. Using a voice simulator, the machine will remind patients to both perform their self-exams and take their medicine at the correct times. If the patient doesn't respond, the machine will increase the volume of the verbal prompt ("Excuse me, excuse me!") to unpleasant levels, then notify the patient's nurses.³ Top-of-the-line equipment can cost as much as \$12,000, but physicians have also had good results with devices that cost less than \$1,000.³

Diagnostic measurements that have been handled successfully in a home telecare environment include heart and lung monitoring (with a stethoscope attachment), pulse oximetry, respiratory flow data, blood glucose monitoring and visual observation of the insulin syringe prior to injection, blood pressure, and fetal heart monitoring.³

TELEMEDICINE SERVICES ARE EXPANDING THEIR REACH

Health care practitioners are increasingly adopting interactive video systems to deliver enhanced access to medical services, as well as improve the quality of that care at reduced prices.⁴ A report from Frost & Sullivan, "U.S. Telemedicine Videoconferencing Systems and Services Market," reveals that telemedicine generated \$119 million in 2000 and projects revenues will reach \$275 million by 2007.⁴

The availability of technologies that deliver high video quality at drastically reduced costs, combined with the gradual migration to IP networks, will continue to drive the adoption of telemedicine over the next few years.⁴ Many programs are applying the technologies in novel ways, including using videoconferencing to help family



HOME TELECARE

A Closer Connection

Former hospice nurse Barbara Johnston, R.N., says her involvement in home telecare stemmed from a visit she made to the rural home of a 27-year-old breast cancer patient with advanced metastatic lesions in her bones and brain. The woman was writhing in pain and screaming. Her two small children were terrified, and her elderly parents were distraught. Johnston spent four hours at the house starting a morphine drip via a central line and teaching the parents about the computerized pain delivery system she left them. At the end of four hours, the patient's pain was under control, but Johnston said she found it very hard to leave.

"I was an hour and a half away. If something happened to the machine, it might take hours to get the IV functioning again. The family would have to call an ambulance, and the patient might go for four or five hours without adequate pain control. I knew there had to be a better way."

Johnston drove to the nearest library and went online. She discovered the infant telemedicine industry, and immediately wrote a grant that allowed her employer, Kaiser Permanente, to experiment with new ways to connect patients and health care providers.

"Immunocompromised, malnourished, fatigued, and pain-ridden cancer patients shouldn't have to be carted around to be seen. They spend more time being taken to the clinic than seeing the practitioner after they arrive. Using home telecare for routine evaluations is so much better for everyone."

Interestingly, Johnston has found nurses most resistant to the idea of

home telecare. Her nursing colleagues told her they didn't think they were providing enough nurturance unless they could actually see and touch their patients. The patients don't agree.

"The patients say the home telecare units make them feel connected. When they are onscreen with the nurse or doctor, they say they have the practitioner's undivided attention. They absolutely refuse to give up the units when they go into hospice care, saying it's like having 911 right in the room with them so they feel safe."

Johnston says that using the machines is always voluntary. Patients are offered the option of a home telecare unit. If they are interested, Johnston shows them a video about the process. Patients who decide to participate set up a visit schedule before they leave.

The home telecare units Kaiser uses simply plug into the wall like a toaster with one additional plug to the phone line. Installation is so simple that often Kaiser sends the units to patients through the mail.

"Most of our units are very consumer-friendly," said Johnston. "They have only one or two big buttons so seniors with failing

vision can operate them easily. The video option is controlled by the patient. There is no 'big brother' element where the practitioner invades a patient's home space uninvited. I call the patient up, and then suggest we go on video. The patient pushes the button to make it happen or can refuse if he or she wants to.

"We can do a complete physical exam using nothing but the machine. There is a blood pressure cuff, a stethoscope that the patient can position so we can listen to breath, heart, and bowel sounds, a respiratory function attachment that can measure peak flow and pulse oximetry, and an EKG attachment. We can't do a urinalysis, but the patient can place a finger on the machine for a needle stick, and we can monitor the patient's hematocrit. More lab values will be available as soon as some of the new technologies come out.

"Now we have instant data capture, and doctors can receive information on patients every day. The data can even be graphed. It used to take us forever to copy all those values down by hand, and there were big delays before the data

were ready for the physician. We also couldn't pull the records for all our patients at once. Now we can look at everyone at the same time and plan our day around the patients who need extra attention."

Johnston says one of the most remarkable things about home telecare is that, "when you're actually doing it, the box fades away. There's just you and the patient." 📞



After initial home visits, telecare can connect patients to their nurses and doctors.

Benefits of Telemedicine for Patients and Clinicians

★ Clinical consultations (patient/clinician)

Interactive video mediates diagnosis, treatment, and management.

★ Home telecare

A nurse at a central station sees patients in their homes.

★ Teleradiology and telepathology

Records are collected and managed via a multimedia approach.

★ Telemonitoring and disease management

Labs, vital signs, and mental status are tracked over wireless or phone lines, often using electronic blood pressure cuffs.

★ Outsourced expertise and second opinions

Remote experts interpret radiographs, and pathology materials, for example.

★ Tele-hospice care (a type of home telecare)

Hospice patients are observed and cared for over low-end (standard phone line) video systems.

members “visit” their loved ones in the ICU, allowing inpatients to attend important social events in their lives, and expanding the number of physicians who participate in grand rounds. To learn more about the variety of clinical services being offered by telemedicine programs, visit the Association of Telehealth Service Providers (ATSP) at www.atasp.org.

Patients in rural areas now have the opportunity to receive care from physicians they could not hope to visit without great expense and inconvenience. Their primary care physicians are learning at the same time. Under the current Medicare rules, primary care physicians who refer patients to a telemedicine clinic must be present during the appointment for the specialist to be reimbursed.⁹ Being present during a specialist consultation is teaching rural primary care physicians new skills that directly contribute to improved health care in remote areas. In addition, continuing medical education for the entire staff can easily be conducted over a telemedicine system.

Cancer care has focused on a multidisciplinary approach for the last 10 years or so, and telemedicine allows KUMC to offer the services of a variety of oncology specialists to the rural population of the state. Scans, films, and other test results, including a video of the latest examination, can be brought to a tumor board attended by medical and radiation oncologists and oncology surgeons and discussed like any other case.

A telemedicine system can also have important cost-benefit consequences for rural areas. Keeping one bed in a rural hospital occupied for one year generates from \$100,000 to \$150,000 in revenue for that hospital.⁶ Since telemedicine allows patients to receive specialty care in rural areas instead of having to be transferred to a distant tertiary care center, the \$35,000 to \$50,000 price tag for one telemedicine site begins to look like a good investment.⁶

THE DOWNSIDE

Along with the many benefits come some problems, including changed relationships with caregivers and patient anxiety about some aspects of the technology.⁷

Changed relationships. Standard hierarchical and authority relationships between the physician and the patient may be altered in the telemedicine environment. Rather than being in the provider’s “territory,” the patient is in a separate location, and direct care is provided by other physicians. The practitioner must recognize this difference and consider it consciously before deciding to be part of telemedicine encounters.⁷

The physician’s relationship with the nurse who will be presenting the cases is particularly important, since the nurse is the physician’s eyes and hands on site. Telemedicine physicians will need to train this new colleague to perform the type of physical exam they prefer.

Frame tension. This term refers to patient anxiety about who is in the room with the practitioner but outside the frame of the television screen and hidden from view. Such anxiety can interfere with trust and open communication, which are crucial to eliciting sensitive clinical information or psychologically evaluating the patient.⁷ Introducing everyone in the room before the session begins can help to solve this problem.

Gaze dysfunction. Because the camera and the monitor of most telemedicine systems are separated by several inches, a practitioner in a televideo interaction who looks at the patient’s eyes in the monitor will be perceived by the patient as *not* meeting his or her gaze. Patients may find this lack of eye contact unsettling, but it is easily remedied by adjusting the camera or using more sophisticated optic devices.⁷ Physicians should look into the camera rather than the monitor (or at least switch back and forth during the session) and sit at least 7 to 8 feet away from the camera that is focused on them.

Security and confidentiality. While making e-mail communication secure is easy and inexpensive, two-way video transmissions by satellite are not secure unless scrambling technology is used. Satellite communication is also quite expensive. Interactive video and store-and-forward exchanges (used in teleradiology and telepathology, where reports are forwarded to the teleoncologist and stored at his or her facility) generally use telephone

Reimbursement for telemedicine consultations

is becoming easier.



or cable lines. Since these images are decompressed at the receiving end of the transmission, they are relatively secure.⁷

Physician licensing. Time will tell if telemedicine is seen as bringing the patient to the doctor or the doctor to the patient. Currently, the state medical boards that regulate telemedicine see the doctor coming to the patient and expect anyone performing a consult in their state to have a state medical license. Some practitioners within the telemedicine community are calling for national licensure of telemedicine physicians. For now, however, the consultant should hold a professional license in the state in which the patient resides.⁷

REIMBURSEMENT AND COSTS

Reimbursement for telemedicine consultations is becoming easier. Starting in January 1999, the Comprehensive Telehealth Act of 1999 (Public Law 105-33, H.R. 2015) gave the Centers for Medicare & Medicaid Services (CMS, formerly HCFA) permission to pay for some telemedicine services for Medicare patients in underserved rural areas, as long as the referring practitioner is present and receives 25 percent of the Medicare payment. Some private health insurance companies, managed care organizations, and state Medicaid programs reimburse telemedicine services; and Louisiana, California, and several other states have passed laws requiring reimbursement for telemedicine consultations.⁵

In August 2001, Rep. Doug Ose (R-Calif.) introduced the Medicare Telehealth Validation Act of 2001 (H.R. 2706) in the House of Representatives. The bill would improve telehealth services in the Medicare program and provide grants for the development of telehealth networks. The networks would be administered by the Office for the Advancement of Telehealth (OAT), which was created in 1998 and is part of the Department of Health and Human Services. H.R. 2706 also calls for expanding access to telehealth services in both urban and rural areas, and expanding the reimbursement of store-and-forward technology to other states besides Alaska and Hawaii. The bill would also set up a joint working group on telemedicine made up of individuals who represent the interests of rural and underserved areas. The group would identify, monitor, and coordinate federal telehealth projects, and analyze and report on the general state of the telehealth field. To read H.R. 2706, visit <http://thomas.loc.gov>.

Because of improvements in the technology and lower prices, the current difference between the cost of an on-site visit and a teleoncology visit in the clinics in Kansas is now less than \$200.¹ This is a change from a 1997 report published by the Office of Rural Health

Policy that cited a fee of around \$1,650 for the use of the technology alone, exclusive of physician fees. The financial gap between on-site physician visits and teleoncology visits will no doubt close even more rapidly in the future.

A pilot study by Kaiser Permanente also revealed a significant economic benefit for home telecare. While a visiting nurse appointment costs about \$90, the price of a nurse's televisit was only about \$15 to \$20.⁸

Some say that telemedicine will be a success when the word *telemedicine* goes away and the technology is seen as merely another tool in the comprehensive framework of health care delivery. To arrive there, clinicians need to be open to all the possibilities technology offers, while carefully and critically evaluating and improving the outcomes that telemedicine services produce. Doing so will help ensure that telemedicine systems evolve and incorporate the new technological and clinical advances so abundant in cancer care today. 🐱

REFERENCES

- ¹In a conversation with Gary Doolittle (September 2001).
- ²Allen A, Cox R, Thomas C. Telemedicine in Kansas. *Kansas Med.* December 1992:323-325.
- ³Nagourney E. Visiting the doctor, via the dining room. *New York Times.* April 6, 1999:107.
- ⁴Association of Telehealth Service Providers. Tremendous potential projected for telemedicine. Available at: <http://www.atasp.org/news/research.asp/>. Accessed October 1, 2001.
- ⁵Strode SW, Gustke S, Allen A. Technical and clinical progress in telemedicine. *JAMA.* 1999;281(12):1066-1068.
- ⁶Carlson RP. Can telemedicine deliver what it promises? *Fam Pract Manage.* March 1996:45.
- ⁷Mair F, Whitten P, Allen A. Interpersonal and organizational issues in telemedicine. *Health Soc Care Community.* 1997;5(1):55-62.
- ⁸Johnston B, Wheeler L, Deuser J. Kaiser Permanente Medical Center's pilot telehome health project. *Telemed Today.* 1997;5(4):16-19.

Ace Allen, M.D., is a medical oncologist and a former associate professor of medicine at the University of Kansas Medical Center. He is also a founding member of the American Telemedicine Association and of the International Society for Telemedicine. He is the former editor and publisher of Telemedicine Today magazine, and the CEO of VitalSeek, a web site that matches Net searchers with quality-filtered health information and resources. Astara March is ACCC associate editor. Special thanks to Gary Doolittle, M.D., for his advice and review of this article.