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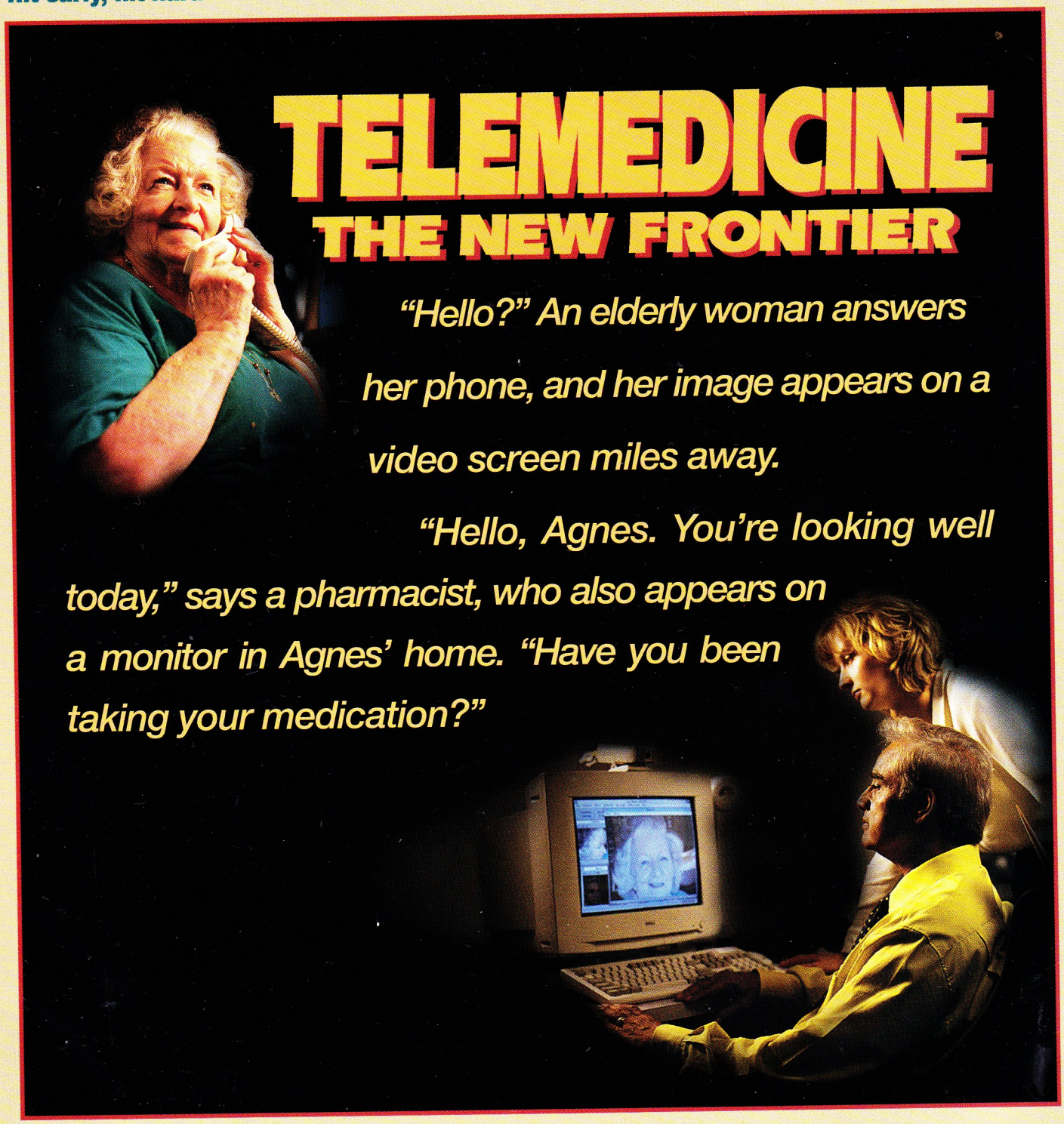

TELEMEDICINE
THE NEW FRONTIER

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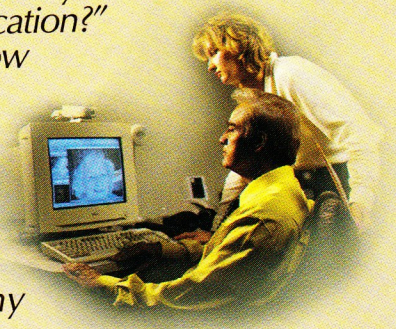


"Oh, yes. I know I have to keep my blood pressure under control."

"How are you feeling? Are you experiencing any side effects?"

"No, I feel pretty good today," claims Agnes.

"Well, let's go ahead then and see if that medicine really is working."

Agnes places a blood pressure cuff around her arm and presses the automatic inflate button. Her video phone console transmits her vital stats to her pharmacist's remote location.

"Looking good, Agnes. Your blood pressure seems to be level. Let's check your heart for good measure."

Agnes places a telephonic stethoscope on her chest. High-quality sounds of her heart and lungs are transmitted across the lines to her pharmacist's machine at the other end.

"Good work, Agnes. Your readings indicate that you've been complying with your prescription. The medicine is doing what it should. How's that wound on your arm coming along?"

"Oh, it's still there, but it seems to be shrinking. That cream the doctor prescribed seems to be doing the trick."

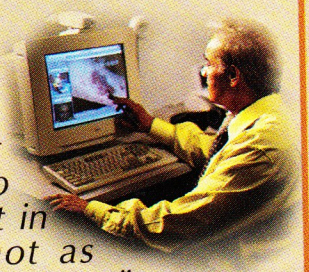
"The doctor is here with me now. Why don't you let her take a look at it."

Agnes lifts the small camera from the top of her monitor and aims it at her forearm. "Can you see it all right?"

An image of her arm appears at the clinic. The pharmacist focuses the image for a clearer picture. "That's fine, Agnes. It's healing nicely, but the doctor wants you to keep applying that cream every day."

"I will. I promise. When will I see you again?" asks Agnes.

"I'll call in a few days to check up on you. How about Wednesday at the same time?"



"That's fine. I'm not going anywhere. It's too hard for me to get out in this weather. I'm not as young and agile as I once was."

"Agnes, I'm sure you'll outlive us all. See you on Wednesday."

Although this scenario may seem like an excerpt from a science fiction novel, it is indeed an accurate depiction of current telemedicine tools in use today. Exchanges like this occur between thousands of patients and health-care providers every day. As technology grows more sophisticated and the cost of health care skyrockets, there is increased pressure to develop better ways to treat patients from remote locations. Many industries, government agencies, and patient advocacy groups have been experimenting with technology to reduce costs, travel, and inconvenience, while improving patient care and outcomes.

Their persistence has paid off. Telemedicine applications that were only a vague dream years ago have become reality. People who might once have received inappropriate care—or even no care at all—have instead been treated quickly and effectively by specialists. Costly and time-consuming trips to health-care facilities have been reduced and even eliminated in some cases. Telemedicine gurus say there are even more impressive developments on the horizon and that the possibilities are endless.

However, there are some barriers blocking the way to full implementation and development of telemedicine. Licensing debates, regulatory issues, malpractice concerns, privacy violations, and the like are all impediments to telemedicine's growth. Can these obstacles be eliminated, ensuring further improvements in patient care and new delivery methods?

Leaders of the telemedicine movement shared with *Drug Topics* their insights into the past, present, and future of this field and its applications in the practice of pharmacy.

Current applications

Broadly speaking, telemedicine refers to the electronic transmission of medical information or expertise to a patient at a remote location. Very basic telemedicine systems use the telephone or fax machine to share medical data. Information can also be shared on a delayed basis, such as a videotape of a patient sent for review by a peer. The most sophisticated systems involve interactive audio-visual consultations using cameras and monitors. Some advanced systems even transmit information collected by medical equipment such as stethoscopes, blood pressure monitors, peak flow meters, and the like.

The Department of Defense (DOD) has been developing both battlefield and peacetime telemedicine applications. A handheld device to assist a combat medic in locating a wounded soldier and monitoring his vital signs is reportedly in the works, as is a virtual reality helmet that would allow combat medics to consult with a physician during the critical hour after which a soldier is wounded. The DOD believes that telemedicine could reduce battlefield morbidity and mortality by 30% to 50%.

The navy has also been trying to establish better communications between deployed ships and U.S. medical centers. Such systems recently allowed a wounded sailor aboard the U.S.S. Abraham Lincoln better access to specialized medical care. A specialist in San Diego, 600 miles away from the ship, consulted with the ship's surgeon on how to treat the soldier's hand, which had been injured on a

THE HISTORY OF TELEMEDICINE

Telemedicine has existed in this country for almost 40 years. The first known project involved the transmission of neurological records across the campus of the University of Nebraska in 1959. Five years later, the university established a link with a state mental hospital 112 miles away.

Since that time, many state and federal agencies as well as private insurers, managed care organizations (MCOs), software companies, and medical device manufacturers have created their own telemedicine initiatives. Although the total amount of money spent on telemedicine research and development is unknown, a recent report by the U.S. General Accounting Office (GAO) places telemedicine investments by nine federal departments and independent agencies at $646 million for fiscal years 1994-1996. According to the report, the Department of Defense (DOD) is by far the biggest investor, allotting $262 million to telemedicine initiatives. The departments of Veterans Affairs, Health & Human Services, and Commerce follow, with each investing approximately $100 million.

More than 40 states have some sort of telemedicine initiatives under way, funded either by the federal or state government or by the private sector. Ten of these states actively sponsor telemedicine initiatives. Some have been working to improve the telecommunications infrastructure in rural areas. Georgia, for instance, has implemented an extensive program that serves rural areas and state correctional facilities. The telemedicine network has particularly improved inmate care. Nonemergency specialty services that once took 30 to 90 days to schedule now take only seven to 21 days. Georgia has also greatly reduced the costs and risks associated with guards transporting inmates to hospitals, clinics, etc.

There is also much movement afoot in the private sector to develop telemedicine applications. The C. Everett Koop Institute at Dartmouth, Hanover, N.H., estimates telemedicine to be a $20 billion market consisting of telecommunications infrastructure, biomedical equipment, and computer hardware and software. Telecommunications companies have improved data transfer systems. Equipment manufacturers have developed devices to aid in remote evaluations of patients. MCOs and private insurers have recognized the cost savings of providing an electronic link to a patient in a remote area rather than sending a health-care worker out to the scene for routine checkups.

gun mount. As a result of this specialized care, the sailor reported for light duty on his ship just three days later.

The military has also been developing peacetime medical communications networks to link its medical centers. These networks support such advances as digitized, filmless X-rays and teleradiology.

These applications are in use in many civilian arenas. For instance, Allina Health Systems, a Minneapolis-based managed care organiazation (MCO), has linked the emergency rooms of eight rural hospitals via telemedicine since 1995. The Mayo Clinic, Rochester, N.Y., is also well known for its telemedicine efforts that employ a satellite communications system to facilitate consultations among doctors, researchers, etc.

Home telemedicine

American TeleCare Inc., based in Eden Prairie, Minn., is one of the companies developing home telemedicine products. Its Personal Telemedicine Systems are being used in telemedicine trials by companies such as Health Partners in St. Paul and Kaiser Permanente in California. The PTS I is a 16-lb. system that can be installed in a patient's home and run through regular telephone lines. It allows two-way video interaction between the patient and the health provider, as well as auscultation, blood pressure, and pulse determination.

The Personal Telemedicine Module (PTM) is a similar device that works in conjunction with a PC and has a 14-in. monitor for enhanced visualization of skin rashes and wounds. The company recommends it for connections between institutional settings or home care settings. These devices are priced between $3,900 and $6,700. While this may seem like a high cost, American TeleCare is quick to point out that the average annual bill for a nursing home is between $30,000 and $35,000.

Such a device could keep a patient out of a nursing home. This market has not been extensively studied yet, in part because there are no interested parties willing to sponsor such studies since HMOs are not at risk for nursing home patients. However, American TeleCare did remove two patients from a nursing home for six months to test their device, with good results. Khalid Mahmud, M.D., founder of American TeleCare, claims their quality of life was better and health-care costs were lower.

The Medi-Monitor by InforMedix reminds patients to take pills and monitors their health.

The PTM systems are also useful for home care patients. According to Mahmud, approximately one-third of home care patients require three or more visits each week. "If we just selected those kinds of patients and tried to cut down the number of visits," he said, "we could save a lot of dollars." He cited a study by the University of Kansas that suggested 50% of all home care visits could have been conducted via telemedicine instead.

Mahmud also recommended his devices for what he calls "high utilizers of care"—people suffering from chronic diseases and advanced medical problems, such as heart disease, lung problems, diabetes, cancer, or AIDS. Their unstable medical conditions often require trips to the emergency room. Mahmud recalled a study claiming 50% of all hospital charges are related to 1.5% of patients. He believes home telemedicine could improve compliance and reduce costs.

"Health Partners of Minnesota did a study and found that they were able to save approximately 50% on hospital charges by using home telemedicine. Kaiser is also doing a larger study; we don't have the final numbers yet, but we know [telemedicine] was helpful in reducing hospitalizations," said Mahmud.

He said his equipment could be simplified to meet the needs of a pharmacist. His company could customize a unit to send medication reminders to a patient and collect compliance data without the costly addition of the heart and blood pressure monitor. He also believes that establishing visual contact between an R.Ph. and a rural patient could facilitate drug utilization reviews so that the R.Ph. could be sure the patient was taking the correct medications properly.

Remote dispensing

Video telepharmacy is a reality now. Automated point-of-care dispensers developed by ADDS Inc. of North Billerica, Mass., allow pharmacists to dispense medication at physician's offices, rural clinics, nursing homes, and assisted living facilities with just the touch of a button. A Pentium PC controls an automated dispensing device containing prepackaged multidose bottles, etc.

The software package prints OBRA-compliant patient education, performs on-line adjudication of third-party claims, and automatically tracks inventory to notify the R.Ph. when the unit needs to be restocked. One of these systems is currently being used to link the University of Utah Hospital & Clinics in Salt Lake City with a remote clinic almost 45 miles away in Park City. A group practice of pharmacists in Michigan is also making use of the system to dispense drugs at physician group practices and clinics.

Compliance aids

Patient compliance with drug regimens may also be improved by telemedicine. InforMedix Inc. of Rockville, Md., believes its portable Personal Medical Assistant, called the Medi-Monitor, may help counter the expensive and life-threatening adverse events caused by improper medication use. The Medi-Monitor currently available can hold up to 10 drugs and costs about $1.50 per patient per day. The device, which reminds patients to take their pills, features an interactive graphic screen that provides them with pictures of the pills and information about their medications and health.

The patients answer a series of questions, tailored to their particular disease state or to them individually, concerning medications, side effects, drug interactions, quality of life, and general health. The data are then uploaded by a built-in modem and transferred to the InforMedix center for analysis. From there, reports are generated and sent to the patients' pharmacists, physicians, etc. InforMedix believes this system may help health professionals detect early warning signs of deteriorating health.

Failure to properly take prescription

medicine results in $100 billion worth of unnecessary medical expenses and lost productivity annually, in addition to $50 billion in lost pharmaceutical sales, according to the National Pharmaceutical Council. The *Archives of Internal Medicine* has also reported that up to 90% of all patients make unintentional medication errors, resulting in $47.4 billion in hospitalization costs. Medi-Monitor inventor Bruce Kehr, M.D., believes this problem will continue to grow as the population ages and more people deal with chronic conditions treated with complex drug regimens.

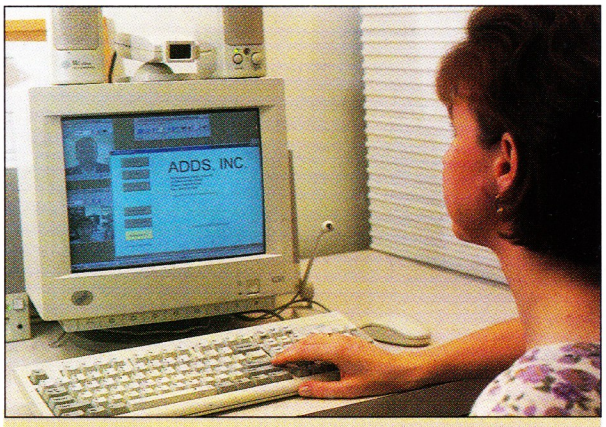
"We believe that we provide not a total solution to that problem, but a partial solution, because we can provide the data to the caregivers to link them with the patient and tell them what the patient is taking or missing and what the patient is doing. This is also within the context of a program that provides the patient with human contact and other kinds of information. We don't want to be a stand-alone," said Kehr.

He said his company is currently talking with home care companies, pharmaceutical companies, and a transplant disease management company about pilot programs and sales involving his Medi-Monitor. He also expects a stripped-down version of this device to be available on the retail market by 1998. This version would be geared toward pharmacists' needs, collecting only compliance data but not health status data.

Pharmacists involved with disease state management might be intrigued by some other devices available that allow them to monitor vital stats. Heart Alert Inc., based in Tampa, Fla., offers the Personal Heart Device to patients so they can record and transmit a 30-second electrocardiogram over the telephone lines to the Heart Alert Monitoring Center. The individual's symptoms and heart rhythm are assessed while he or she remains on the telephone, allowing the recording of symptomatic heart rhythms 24 hours a day, seven days a week.

Similar technology was developed to help asthmatics improve the quality of their lives and reduce health costs. ENACT Health Management Systems of Research Triangle Park, N.C., developed AirWatch to measure peak expiratory flow (PEF) and forced expiratory volume in one second (FEV_1) over standard phone lines. After breathing into the device, asthmatics simply connect the meter to the phone jack to transmit data to a monitoring center. A report is then faxed to the doctor or R.Ph. monitoring the patient.

The company's goal is to keep people out of the hospital and avoid expensive intervention, while promoting patient participation in their own health care. One clinical R.Ph. using the $50 device at a pulmonary clinic said it proved very useful to many poor rural families unable to drive in for weekly appointments.



RCD units by ADDS allow remote drug dispensing and consultation by pharmacists.

Countless telemedicine devices are being developed and tested every day to improve health-care delivery, but is implementation practical, cost-effective, or even realistic?

Some pros

Accounts of nursing home admission being averted and expert care being delivered to patients in the most remote parts of the globe leave little doubt that this technology has the potential to change the face of health care for the better.

Proponents of telemedicine say it has the potential to help the elderly and disabled live on their own, thereby eliminating the high costs of institutional care and often improving the patient's quality of life.

Others believe remote monitoring of drug therapy and general health can cut down on the time and money wasted when a health-care professional must travel a great distance to see a patient. It also ensures that a patient will receive quality care no matter where he or she lives. Satellite technology and advanced communication infrastructure can bridge the gap between a patient in a rural area and a specialist in a distant city.

Furthermore, patients may be able to avoid adverse events and unnecessary hospitalization by regularly keeping their health-care providers apprised of their conditions. This timely monitoring could not easily be achieved in a traditional outpatient setting.

The imagination can easily explore the possibilities telemedicine has to offer. Unfortunately, the GAO reports that the benefits of telemedicine are mostly anecdotal at this point. Actual cost savings and outcomes are difficult to determine because this information is often buried deep within the general accounting of health-care costs.

And some cons

The harsh realities of the current health-care environment sometimes hinder the innovative strides being made by the visionaries in this field. Lack of reimbursement, licensure conflicts, regulatory issues, and malpractice fears are just a few barriers standing in the way of true space-aged health care.

One major stumbling block involves the licensing of health-care professionals involved in telemedicine. Is it enough for a pharmacist or doctor to be licensed only in the state from which he or she is dispensing medications and advice, or must that professional also procure a license in the state of residence of his or her "telepatient"? Perhaps, a telemedicine license is in order, instead.

Pharmacy only recently began to address this issue. The National Association of Boards of Pharmacy (NABP) asked two of its advisory groups to consider the issue. The groups recommended that language be added to the NABP model act and rules for state boards to consider. They felt that interested R.Ph.s should pay a fee to join a multistate registry of telepharmacists. The NABP's National Disciplinary Clearinghouse would then be used as a databank for

verification of information by state boards. Proof of licensure in good standing and compliance with state board rules were also recommended. However, the advisory committees felt that requiring R.Ph.s to pass the jurisprudence exams in each state of practice would be too burdensome for telepharmacists. It remains to be seen how the issue will ultimately be handled.

Doctors have been wrestling with this dilemma for some time now and have still not found an appropriate compromise. The Federation of State Medical Boards of the United States developed a model act in 1996 that would create a special license for physicians to practice telemedicine, thereby eliminating the need for them to obtain full licenses in multiple states. The American Medical Association, however, remains opposed to this model act, recommending full and unrestricted licensure by individual states for physicians who want to practice across state lines. Some physicians have also expressed concern that patients may be lured away from local doctors by telemedicine practitioners. But in most cases so far, patients have remained with their general practitioners, using telemedicine only to consult with specialists for a particular medical problem.

Another concern for doctors has been malpractice. Some want assurances, for example, that the technology is properly transmitting the necessary data and images to be evaluated. Others are concerned that the lack of clear licensure regulations could result in a patient's ability to sue a telemedicine physician in the state with the most favorable malpractice settlements, even if the patient was not treated in that state but the physician practices there on occasion.

Many patient advocacy groups have also voiced concern about privacy issues. They want assurances that the abundance of data being collected about them are secure. There have been cases in which automation has generated reports revealing very personal details to employers and others. Patients obviously don't want these data made public. They also worry that their names, addresses, and health records are being sold to interested parties for marketing purposes. The Kennedy-Kassebaum Health Insurance Portability Act of 1996 addressed the need for rules governing electronic health information and called for Congress to enact privacy rules to protect information within 36 months.

Reimbursement remains a problem with telemedicine, dissuading many from participating in this evolution. Currently, the Health Care Financing Administration (HCFA) does not reimburse for telemedicine consultations, requiring instead an in-person face-to-face meeting between the patient and practitioner.

However, many states are investing in this technology. American TeleCare's Mahmud reported that 10 to 13 Medicaid programs cover some telemedicine costs and that many MCOs are following suit. Medicare is reportedly conducting telemedicine trials to determine the quality and cost of tele-health care.

Technical issues may also pose a problem in the future. There are currently no standards in place to ensure that all telemedicine systems will be compatible with each other or the infrastructure on which they will depend. The cost of running fiberoptic or ISDN lines to rural areas also needs to be addressed. Some states have been requiring utility companies to reduce charges to nonprofit health and education facilities.

Finally, changing the mentality of certain patients and health-care providers may be a challenge. Some are likely to resist this new technology. Mahmud said patient satisfaction has been very high among users of his PTS I, none of whom ever asked that the unit be removed from the home. However, he admitted that some MCOs were unable to convince a few hesitant patients to try the system.

He also described some health-care providers as "early adopters," excited about using cutting-edge technology even before it becomes fashionable. Others will remain "late adopters," interested in using the technology only after it has been proven and tested by their peers. However, he doesn't believe they'll be able to resist it for long. He likens their apprehension to his unwillingness to see the value of a fax machine when it was first introduced. Now, he couldn't get by without it.

Karyn Snyder