

AUGUST 4, 1997

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TELEMEDICINE THE NEW FRONTIER

*"Hello?" An elderly woman answers
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video screen miles away.*

*"Hello, Agnes. You're looking well
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"Hello?" An elderly woman answers her phone, and her image appears on a video screen miles away.

"Hello, Agnes. You're looking well today," says a pharmacist, who also appears on a monitor in

Agnes' home. "Have you been taking your medication?"

"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?"

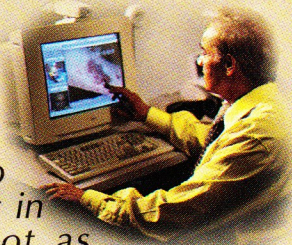
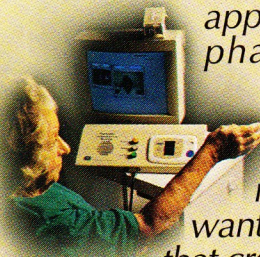
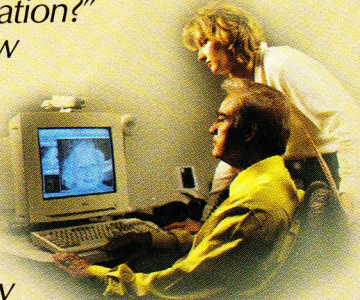
An image of her arm appears at the clinic. The pharmacist focuses the image for a clearer picture. "That's fine, Agnes. It's healing nicely, but the doctor wants you to keep applying that cream every day."

"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. Non-emergency 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 organization (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



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

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 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.

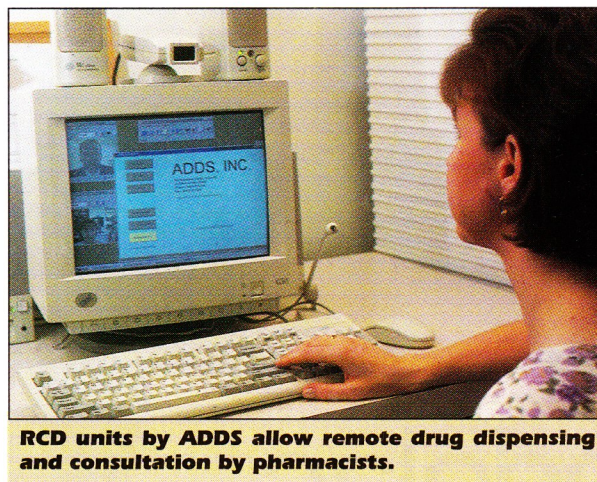
He said his company is currently talking with home care companies, pharmaceutical companies, and a transplant disease management company about pilot programs and sales involving his Medi-Monitor. He also expects a stripped-down version of this device to be available on the retail market by 1998. This 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 (FEV₁) 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

Levoxyl[®]

(Levothyroxine Sodium Tablets, USP)

FOR ORAL ADMINISTRATION

INDICATIONS AND USAGE: LEVOXYL (L-thyroxine) tablets are indicated as:

1. Replacement therapy for any form of diminished or absent thyroid function, e.g., as in cretinism, myxedema, or hypothyroidism, and including hypothyroidism in severely debilitated, infirm, and elderly. The hypothyroidism may result from functional deficiency, primary atrophy, or partial or complete absence of the thyroid gland; from the effects of surgery, radiation or antithyroid agents on the thyroid gland; or from pituitary or hypothalamic disease. LEVOXYL therapy must usually be maintained continuously to control the hypothyroidism. When hypothyroidism is due to subtotal or postpartum thyroiditis, it may be temporary and treatment need not be permanent.
2. A means of suppressing pituitary secretion of TSH in euthyroid patients in order to treat or prevent the recurrence of various types of goiter, including thyroid nodules, lymphocytic thyroiditis (Hashimoto's), multinodular goiter, and as part of the management of thyroid cancer. An exception is a patient with euthyroid autonomous function wherein the goiter is not under the control of pituitary TSH. T₄ therapy is not indicated in such patients (see below under **CONTRAINDICATIONS**).
3. A diagnostic agent in suppression tests to aid in the diagnosis of suspected mild hyperthyroidism or thyroid gland autonomy. This should be done rarely, only when clinically indicated and only when other tests such as stimulation with thyrotropin-releasing hormone (TRH) have not resolved the problem.

CONTRAINDICATIONS: L-thyroxine therapy is contraindicated in untreated thyrotoxicosis, in other states of thyroid autonomy, acute myocardial infarction and uncorrected adrenal insufficiency.

WARNINGS:

Drugs with thyroid hormone activity, alone or together with other therapeutic agents, have been used for the treatment of obesity. In euthyroid patients, doses within the range of daily hormonal requirements are ineffective for weight reduction. Larger doses may produce serious or even life-threatening manifestations of toxicity, particularly when given in association with sympathomimetic amines such as those used for their anorectic effects.

PRECAUTIONS: **General:** Caution must be exercised in the administration of this drug to patients with cardiovascular disease. Development of chest pain or other aggravation of the cardiovascular disease may preclude its use or require a reduction of dosage in treated patients (see also **DRUG INTERACTIONS**). Institution of levothyroxine therapy in patients with adrenal insufficiency requires concomitant glucocorticoid therapy.

Information For The Patient:

- Patients taking LEVOXYL and parents of children taking LEVOXYL should be informed that:
1. The replacement therapy is to be taken essentially for life, with the exception of cases of transient hypothyroidism, usually associated with thyroiditis, and in those patients receiving a therapeutic trial of the drug.
 2. They should immediately report during the course of therapy any signs or symptoms of thyroid hormone toxicity, e.g., chest pain, increased pulse rate, palpitations, excessive sweating, heat intolerance, nervousness, or any other unusual event.
 3. In case of concomitant diabetes mellitus, the daily dosage of antidiabetic medication may need adjustment as thyroid hormone replacement is achieved. If LEVOXYL is stopped, a downward readjustment of the dosage of insulin or oral hypoglycemic agent may be necessary to avoid hypoglycemia. Monitoring of urinary or blood glucose levels is mandatory in such patients during changes in thyroid medication.
 4. In case of concomitant oral anticoagulant therapy, the prothrombin time should be measured frequently to determine if the dosage of oral anticoagulants is to be readjusted.
 5. Patients taking LEVOXYL who then become pregnant should be monitored closely with measurements of serum TSH concentration because the requirement for T₄ usually increases during pregnancy. The daily dose of LEVOXYL may need to be increased to maintain the serum TSH concentration within the normal reference range.
 6. Partial loss of hair may be experienced in the first few months of thyroid therapy, but this is usually a transient phenomenon and later recovery is the rule.

Drug Interactions: In patients with diabetes mellitus, addition of oral T₄ therapy may cause an increase in the required dosage of insulin or oral hypoglycemic agent. Therefore, patients with diabetes mellitus should be observed closely for possible changes in antidiabetic drug dosage requirements.

Patients stabilized on oral anticoagulants who are found to require thyroid replacement therapy should be watched very closely when therapy is started; successful treatment with LEVOXYL in a patient who is initially hypothyroid may result in a need for a lower dose of oral anticoagulant. No special precautions appear to be necessary when oral anticoagulant therapy is begun in a patient already stabilized on maintenance LEVOXYL therapy. Cholestyramine and colestipol bind T₄ in the intestine, thus impairing its absorption. In vitro studies indicate that the binding is not easily reversed. Therefore, four to five hours should elapse between administration of cholestyramine and oral T₄. Other medications that interfere with absorption of oral T₄ from the gut include sucralfate, ferrous sulfate, aluminum hydroxide and soy-containing dietary supplements. Estrogens tend to increase serum thyroxine-binding globulin (TBG). In a patient with a non-functioning thyroid gland who is receiving thyroid replacement therapy, free thyroxine may be decreased when estrogens are started thus increasing LEVOXYL requirements. Therefore, patients without a functioning thyroid gland who are on thyroid replacement therapy may need to increase their dosage of LEVOXYL if estrogens or estrogen-containing oral contraceptives are given. This need can be assessed by measurement of the serum TSH level. Similarly, androgen therapy in hypogonadal men, or women with breast cancer, can decrease TBG; the result may be a decrease in TBG, and so the dosage of LEVOXYL may need to be decreased. Again, measurement of the serum TSH level is a good method of assessing this possibility.

Drug/Laboratory Test Interactions: The following drugs or moieties are known to interfere with laboratory tests performed on patients taking thyroid hormone: androgens, corticosteroids, estrogens, oral contraceptives containing estrogens, iodine-containing preparations, and salicylates. In some instances, e.g., the use of androgens, estrogens, or oral contraceptives, patients' thyroid status may be affected and monitoring with serum TSH measurement may be indicated.

1. Pregnancy, estrogens, and estrogen-containing oral contraceptives increase TBG concentrations. TBG may also be increased during infectious hepatitis. Increases in TBG concentrations can occur in nephrosis, acromegaly, or during androgen or corticosteroid therapy. Familial hyper- or hypo-thyroxine-binding-globulinemias have been described. The binding of thyroxine by thyroid-binding-prealbumin (TBPA) is inhibited by salicylates. In all these cases of changes in L-T₄ binding to serum proteins, the serum T₄ level may change. Measurement of the serum TSH level will determine the clinical significance of any change in serum T₄.
2. A high iodine intake interferes with radio-iodine uptake (RAIU) in normal persons but the RAIU would be low in those taking thyroxine in any case; this test has little use in patients treated with oral T₄ and the interference of a high iodine intake is of little clinical relevance.
3. Continued evidence of hypothyroidism in spite of apparently adequate dosage replacement indicates poor patient compliance, poor absorption, excessive fecal loss, interference by concomitantly ingested food, or inactivity of the preparation. Poor compliance is the most common cause but each possible cause should be considered.

Carcinogenesis, Mutagenesis, and Impairment of Fertility: A reportedly apparent association between prolonged thyroid therapy and breast cancer has not been confirmed and patients taking LEVOXYL for established indications should not discontinue therapy. There are no data suggesting that L-T₄ is mutagenic or impairs fertility, such studies in long term have not been performed.

Pregnancy - Category A: Thyroid hormones do not readily cross the placental barrier. Clinical experience to date does not indicate any adverse effect on fetuses when thyroid hormones are administered to pregnant women. On the basis of current knowledge, LEVOXYL replacement therapy to hypothyroid women should not be discontinued during pregnancy. During pregnancy, LEVOXYL requirements may increase; dosage should be guided by periodic measurement of serum TSH concentration.

Nursing Mothers: Some thyroid hormone is excreted in human milk but this is usually insufficient for hypothyroid nursing neonates. L-T₄ taken by nursing mothers is not associated with serious adverse reactions and does not have a known tumorigenic potential; properly indicated LEVOXYL therapy should be continued.

Pediatric Use: Congenital hypothyroidism is uncommon (1:4,000) and is not prevented by the small amounts of hormone that cross the placenta. Determination of serum T₄ and/or TSH is needed to make the diagnosis in neonates and must be done within a few days of birth to prevent the serious effects of hypothyroidism on growth and development, particularly of the brain and nervous system. Treatment should be initiated immediately upon diagnosis, and maintained for life, unless transient hypothyroidism is suspected in which case therapy may be interrupted for 2 to 8 weeks after the age of 3 years to reassess the condition. Cessation of therapy is justified in patients who have maintained a normal TSH during those 2 to 8 weeks.

ADVERSE REACTIONS: Adverse reactions are due to overdosage and are those of induced hyperthyroidism.

OVERDOSAGE: Excessive dosage of thyroid medication may result in symptoms of hyperthyroidism. Since, however, the effects do not appear at once, the symptoms may not appear for one to three weeks after an excessive dose is begun. The most common signs and symptoms of overdosage are weight loss, palpitation, nervousness, diarrhea or abdominal cramps, sweating, tachycardia, cardiac arrhythmias, angina pectoris, tremors, headache, insomnia, and intolerance to heat. If symptoms of overdosage appear, discontinue the medication for several days, and reinstitute treatment at a lower dosage level. Laboratory tests such as serum T₄, serum T₃, and the free thyroxine index will be elevated during the period of overdosage and the hallmark is a clearly suppressed serum TSH level. Complications as a result of the induced hypermetabolic state may include cardiac failure and death due to arrhythmia or failure.

TREATMENT OF OVERDOSAGE: Dosage should be reduced or therapy temporarily discontinued if signs and symptoms of overdosage appear. Treatment may be instituted at a lower dosage. Treatment of acute massive thyroid hormone overdosage is aimed at reducing gastrointestinal absorption of the drug and counteracting central and peripheral effects, mainly those of increased sympathetic activity. Vomiting may be induced initially if further gastrointestinal absorption can reasonably be prevented provided there are no contraindications such as coma, convulsions, or loss of the gag reflex. Treatment is mainly symptomatic and supportive. Oxygen may be administered and ventilation maintained. Cardiac glycosides may be indicated if congestive heart failure develops. Measures to control fever, hypoglycemia, or fluid loss should be instituted if needed. Antidrenergic agents, particularly propranolol, have been used advantageously in the treatment of increased sympathetic activity. Propranolol may be administered intravenously at a dosage of 1 to 3 mg over a 10 minute period or orally, 80 to 160 mg/day, especially when no contraindications exist for its use.

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Cover Story

verification of information by state boards. Proof of licensure in good standing and compliance with state board rules were also recommended. However, the advisory committee 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 Insur-

ance 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